3500 Parkway Lane, Suite 500
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T: 678.336.7740 | F: 678.336.7744
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June 10, 2022

Tim Jennette
TDEC Division of Water Resources
Nashville Field Office
Tim.Jennette@tn.gov
CC: dwr.nefo@tn.gov
(615) 687-7060

Qualified Hydrologic Professional:
Kayla Theilig, QHP-IT
Pond & Company

**Subject:** **Hydrologic Determination & Site Survey Report**
**ATMOS – Brinkley Road Replacement Project**
**Murfreesboro, Rutherford County, Tennessee**

Pond and Company (Pond), on behalf of the ATMOS Energy Corporation, has completed a stream and wetland delineation and this Hydrologic Determination Report for your review and concurrence. This report was completed to describe environmental features observed during the field delineation along the approximately 700 linear feet of 4-inch High-Density Polyethylene (HDPE) natural gas pipe within City of Murfreesboro roadside right-of-way (ROW) in Murfreesboro, Rutherford County, Tennessee (**Figure 1-2**). The purpose of this project is to replace an existing pipeline because of a bridge replacement. The field delineation took place on May 10, 2022, and the review area was limited to the apparent roadside ROW, proposed workspace, and City of Murfreesboro easement along the proposed project route. Prior to the field delineation, a review of pertinent geographic information system (GIS) data was completed to identify potential aquatic resources and protected species habitat that may be present within the immediate area of the proposed project. Sources of these data included but were not limited to the:

- U.S. Geological Survey (USGS) National Hydrography Dataset (NHD)
- USGS Topographic Quadrangles
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI)
- USFWS Information for Planning and Consultation (IPaC)
- Tennessee Department of Environment & Conservation (TDEC) Rare Species
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey
- Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL)

This report summarizes the findings from the May 2022 hydrologic determination.

**Water Resources**

Land area within the environmental survey boundary (ESB) surrounding the proposed project route includes previously cleared and maintained roadside ROW adjacent to maintained residential property, active development, and mixed pine-hardwood forest. A total of 2 water resources were identified during the field delineation (**Table 1).** One (1) Perennial Stream and its associated Murfreesboro-regulated Water Quality Protection Areas (WQPAs) were identified (**Figure 3**). Additionally, one (1) wet weather conveyance was identified within and adjacent to the ESB (**Attachment D**). The identified stream would likely be considered a jurisdictional Water of the U.S. (WOTUS) and be regulated by the U.S. Army Corps of Engineers (USACE). Per

the Murfreesboro, Tennessee Code of Ordinances, Section 27.5-19, "Zone widths and target vegetation within the WQPA are as follows: (A) Zone 1 is measured perpendicular to the stream channel. Zone 2 is measured along the same line beginning at the outside edge of Zone 1. (B) Where a stream is indicated as a continuous blue line or double blue line on the USGS map, Zone 1 shall measure 35 feet from top of bank, and Zone 2, 15 feet. (C) Where a stream is indicated as a dashed blue line on the USGS map, Zone 1 shall measure 35 feet from top of bank, and Zone 2, 15 feet. (D) Where a stream is not indicated on the USGS map, Zone 1 shall measure 20 feet from top of bank, and Zone 2, 15 feet." Wetland WQPAs include "the extent of the wetland plus a 35-foot zone extending beyond the wetland edge". All identified streams are represented on USGS maps by a solid blue line. All identified streams are located within Murfreesboro city limits (**Figure 1**).

**Table 1: Water Resources Summary**

| Resource Name | Upstream Coordinates (Decimal Degrees) | | Downstream Coordinates (Decimal Degrees) | |
|---|---|---|---|---|
| | Latitude | Longitude | Latitude | Longitude |
| Perennial Stream 1 (PS 1) | 35.857239 | -86.484432 | 35.858826 | -86.483489 |
| Wet Weather Conveyance 2 (WWC 2) | 35.859262 | -86.484160 | 35.859128 | -86.484080 |

**Threatened and Endangered Species**

A review of the USFWS IPaC resulted in the identification of seven (7) federally protected species and one (1) candidate species with ranges known to occur within the project area (see **Table 2**). Potentially suitable foraging habitat was identified for three (3) listed bat (*Myotis)* species. Potentially suitable *Myotis* roosting habitat was not identified within the ESB. Potentially suitable habitat for two (2) of the remaining species included on the USFWS IPaC report were identified within the project area, *Pegias fabula*, and *Danaus plexippus*. (**Table 2**). According to the IPaC report, there is no critical habitat within the project area (**Attachment C**). A review of the TDEC list of state protected species within the HUC 12 watershed (051302030204 – Overall Creek) was completed to identify potentially suitable habitat for state protected species within the ESB (**Table 3**). Potentially suitable habitat for four (4) state protected species was observed within the ESB. The natural gas pipeline corridor construction techniques have been selected to minimize the need for clearing. The proposed workspace is entirely within the limits of the existing construction effort to replace the Overall Creek bridge structure along Brinkley Road.

**Table 2: Federal Threatened and Endangered Species Summary**

| Common Name | Scientific Name | Federal Status | Habitat Requirements | Potential Presence within Project Area |
|---|---|---|---|---|
| **Flora** | | | | |
| Braun's Rock-Cress | *Arabis perstellata* | E | Wooded steep slopes with limestone outcrops. | Potentially suitable habitat was not observed within the proposed project area. |
| Pyne's Ground-Plum | *Astragalus bibullatus* | E | Inhabits edges of limestone cedar clearings and in the open areas of surrounding cedar woodlands in full to moderate light. | Potentially suitable habitat was not observed within the proposed project area. |

| Common Name | Scientific Name | Federal Status | Habitat Requirements | Potential Presence within Project Area |
|---|---|---|---|---|
| Leafy Prairie-Clover | *Dalea foliosa* | E | Inhabits wet calcareous barrens and moist prairies or cedar glades, usually near streams or where limestone seepage provides seasonal moisture. | Potentially suitable habitat was not observed within the proposed project area. |
| **Fauna** | | | | |
| Northern Long-Eared Bat | *Myotis septentrionalis* | T | Will roost in tree cavities and under exfoliating bark during summer; Winter hibernation takes place in tight crevices in caves and mines. | Potentially suitable roosting habitat was not observed within the project area. |
| Indiana Bat | *Myotis sodalis* | E | Roosts in caves during the winter, under exfoliating bark or hollow trees in the summer; forages in riparian floodplains and upland forests. | Potentially suitable roosting habitat was not observed within the project area. |
| Gray Bat | *Myotis grisescens* | E | Roosts in caves and forages in surrounding forested areas. | Potentially suitable roosting habitat was not observed within the project area. |
| Littlewing Pearlymussel | *Pegias fabula* | E | Inhabits small- to medium-sized cool water streams with low turbidity and a high to moderate gradient in the Cumberland and Tennessee River basins. | Potentially suitable habitat was observed within the proposed project area; however, Tennessee Wildlife Resources Agency (TWRA) has confirmed no listed species are located within a mile of the project site. |
| Monarch Butterfly | *Danaus plexippus* | C | Open fields and meadows where milkweed (*Asclepias sp.*) is present. | Potentially suitable habitat was observed within the proposed project area, however TWRA has confirmed no listed species are located within a mile of the project site. |

E = Endangered T = Threatened C = Candidate

**Table 3: State Rare, Threatened, and Endangered Species within HUC 12 Watershed Summary**

| Common Name | Scientific Name | State Status | Habitat Requirements | Potential Presence within Project Area |
|---|---|---|---|---|
| **Flora** | | | | |
| Duck River Bladderpod | *Paysonia densipila* | S | Inhabits open limestone glades to disturbed lowlands along river and stream bottoms. | Potentially suitable habitat was not observed within the project area. |
| Flat-Stemmed Spike-Rush | *Eleocharis compressa* | S | Found in moist to wet, often calcareous prairies and mud flats. | Potentially suitable habitat was not observed within the proposed project area. |

| Common Name | Scientific Name | State Status | Habitat Requirements | Potential Presence within Project Area |
|---|---|---|---|---|
| Yellow Sunnybell | *Schoenolirion croceum* | T | Found in longleaf pine savannas and wet areas in calcareous glades. | Potentially suitable habitat was not observed within the proposed project area. |
| Pyne's Ground-Plum | *Astragalus bibullatus* | E | Inhabits edges of limestone cedar clearings and in the open areas of surrounding cedar woodlands in full to moderate light. | Potentially suitable habitat was not observed within the proposed project area. |
| Tennessee Milkvetch | *Astragalus tennesseensis* | S | Inhabits cedar glades and prairies. | Potentially suitable habitat was not observed within the proposed project area. |
| Sharp's Lejeune | *Lejeunea sharpii* | E | Occurs in areas with dry to wet rock substrates, often along streams, waterfalls, and cave entrances. | Potentially suitable habitat was observed within the proposed project area, however TWRA has confirmed no listed species are located within a mile of the project site. |
| Braun's Rock-Cress | *Boechera perstellata* | E | Wooded steep slopes with limestone outcrops. | Potentially suitable habitat was not observed within the proposed project area. |
| Limestone Fameflower | *Phemeranthus calcaricus* | S | Occurs in rocky areas of cedar glades. | Potentially suitable habitat was not observed within the proposed project area. |
| Alabama Snow-Wreath | *Neviusia alabamensis* | T | Occurs in moist hardwood forests with rocky limestone-based substrates. | Potentially suitable habitat was not observed within the proposed project area. |
| Western Hairy Rockcress | *Arabis hirsuta* | T | Moist to dry calcareous glades, open woods, stream banks, ledges, cliffs, bluffs, and floodplains. | Potentially suitable habitat was observed within the proposed project area, however TWRA has confirmed no listed species are located within a mile of the project site. |
| Ornate Cololejeunea | *Cololejeunea ornata* | T | Inhabits sinks and high humidity areas on limestone and subcalcareous rocks. | Potentially suitable habitat was not observed within the proposed project area. |
| Missouri Gooseberry | *Ribes missouriense* | S | Occurs in partially shaded woods, woodland edges, thickets, floodplains, and fields. | Potentially suitable habitat was not observed within the project area. |
| American Ginseng | *Panax quinquefolius* | S-CE | Rich Woods | Potentially suitable habitat was not observed within the project area. |
| **Fauna** | | | | |
| Bedrock Shiner | *Notropis rupestris* | D | Inhabits bedrock pools of low-gradient streams of the Nashville Basin. | Potentially suitable habitat was observed within the proposed project area; however, TWRA has confirmed no listed species are located within a mile of the project site. |

| Common Name | Scientific Name | State Status | Habitat Requirements | Potential Presence within Project Area |
|---|---|---|---|---|
| Echo Cave Beetle | *Pseudanophthalmus acherontis* | R | Terrestrial cave obligate in the Central Basin; has been reported from Wilson & Rutherford Counties. | Potentially suitable habitat was not observed within the proposed project area. |
| Tennessee Clubtail | *Gomphus sandrius* | R | Slow streams with bare bedrock shores; Central Basin; upper Duck River and middle Cumberland River watersheds. | Potentially suitable habitat was not observed within the proposed project area. |
| Tennessee Cave Salamander | *Gyrinophilus palleucus* | T | Aquatic cave obligate; inhabits cave streams and rimstone pools in the Central Basin, Eastern Highland Rim, and Cumberland Plateau. | Potentially suitable habitat was not observed within the proposed project area. |
| Streamside Salamander | *Ambystoma barbouri* | E | Seasonally flowing karst streams; middle Tennessee | Potentially suitable habitat was not observed within the proposed project area. |
| Southern Cavefish | *Typhlichthys subterraneus* | D | Aquatic cave obligate; cave streams, karst waters, and water supply wells | Potentially suitable habitat was not observed within the proposed project area. |

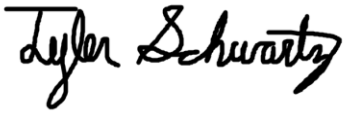
S = Special Concern E = Endangered T = Threatened D = Deemed in Need of Management R = Rare, not state listed
S-CE = State Listed, Commercially Exploited

*The remainder of this page intentionally left blank*

**Conclusions**

This report has been prepared to assist TDEC, Nashville Field Office, Water Resources Division in their review of our hydrologic determination. Additionally, the findings presented in this report will be utilized to assist with avoidance and minimization of impacts to environmental resources. If you have any questions or require additional information, please contact Alex Darr at (470) 387-8899; Darra@pondco.com.

Sincerely,



Tyler Schwartz
Environmental Scientist

Kayla Theilig, QHP-IT
Environmental Scientist

**CC:**

Bobby Worthington, P.E.
Senior Engineer
ATMOS Energy Corporation
Bobby.Worthington@atmosenergy.com

Taylor Sanders
Project Engineer
ATMOS Energy Corporation
Taylor.Sanders@atmosenergy.com

**Attachments**: Attachment A – Project Figures
Attachment B – Project Photolog
Attachment C – Threatened and Endangered Species Information
Attachment D – Hydrologic Determination Data Forms
Attachment E – Precipitation Data
Attachment F – NRCS Soil Data

# Hydrologic Determination Report Submittal Checklist

TDEC Reviewer: _____

**Standard Submittal**

Waterlog HD #_____ Project name: ATMOS Brinkley Road Replacement Project County: Rutherford County, TN
Other Tracking #_____

Page 6 1. Contact information of the current property owner(s).

X 2. Name, affiliation, and certification identification number of the QHP or QHP IT submitting the report.

X 3. QHP or QHP IT status verified. Kayla Theilig, QHP IT: https://tnhdt.org/inTraining.asp
Certification Number Not Applicable due to QHP IT Status

Table 1 4. The identification of the starting and ending points along a watercourse of the areas determined to be a wet weather conveyance.

Attach. A 5. A vicinity map, including the property boundaries or hydrologic determination review area (if different than property boundary). On linear projects, start and terminus points are required. The map should clearly indicate the specific locations of all hydrologic features identified in the report.

Table 1 6. Specific latitude/longitude coordinates (decimal degrees) either included on the map or in the body of the hydrologic determination report.

Attach. A, B 7. Color photographs of each of the hydrologic features to potentially be altered or otherwise identified in the report; including the date each photograph was taken, latitude and longitude, in decimal degrees of each photograph location and indicate the location and direction of each photographic view on the site map or plan. These photographs must be representative of the overall reach of water feature evaluated. At a minimum, include a photograph of the area to potentially be altered, immediately up channel of the area to potentially be altered, and immediately down channel.

Attach. D 8. TDEC Hydrologic Determination Field Data Sheets, completed in conformance with the current TDEC-DWR Guidance for Making Hydrologic Determinations. At least one data sheet must be submitted for each watercourse to potentially be altered or identified.

X 9. Any previous assessments of hydrologic features on site known to the submitter. (See : http://tdeconline.tn.gov/dwr/ )
Previous HD's submitted or found during TDEC review:
CGP TNR245308 https://dataviewers.tdec.tn.gov/pls/enf_reports/f?p=9034:34051:::NO:34051:P34051_PERMIT_NUMBER:TNR245308
ARAP NR2104.180 https://dataviewers.tdec.tn.gov/pls/enf_reports/f?p=9034:34051:::NO:34051:P34051_PERMIT_NUMBER:NR2104.180

Attach. E 10. Evidence HD was conducted under normal weather conditions.

X 11. List any other information submitted with report(e.g. NRCS Soil Maps, precipitation data, site plan etc.):
NRCS Soil Map and supplementary information, US Fish and Wildlife list of threatened and endangered species occuring in project area, Precipitation data including calculation of normal weather conditions

EFO administrative required information:

_____ 1. Property owner(s) granted written permission to access land/site.

_____ 2. Is there a site, associated with this HD? If yes, then associate HD to site within Waterlog.

_____ 3. Verified HD was conducted under normal weather conditions.

Report Received: ____/____/____ Assigned date: ____/____/____ Application Complete: ____/____/____

Deficiency Letter Sent: _____ Date: ____/____/____ Field Verified: _____ Date:____/____/____

List of Report Deficiencies: Final Determination Notification Date:____/____/____

_____

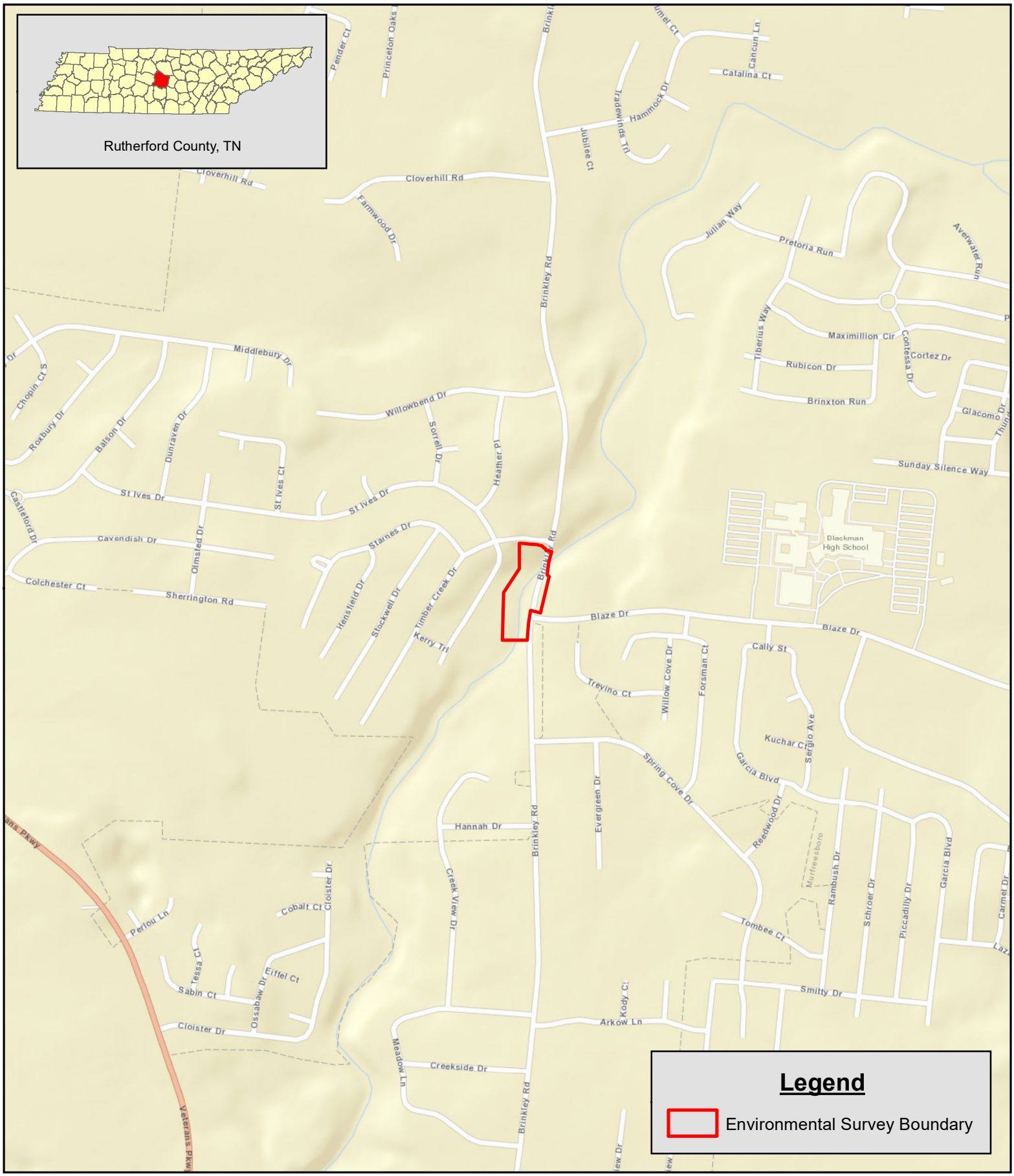
_____

_____

All Required Info Received: ____/____/____

MS4: _____ MS4 Contact Date: ____/____/____

# Attachment A – Project Figures




Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

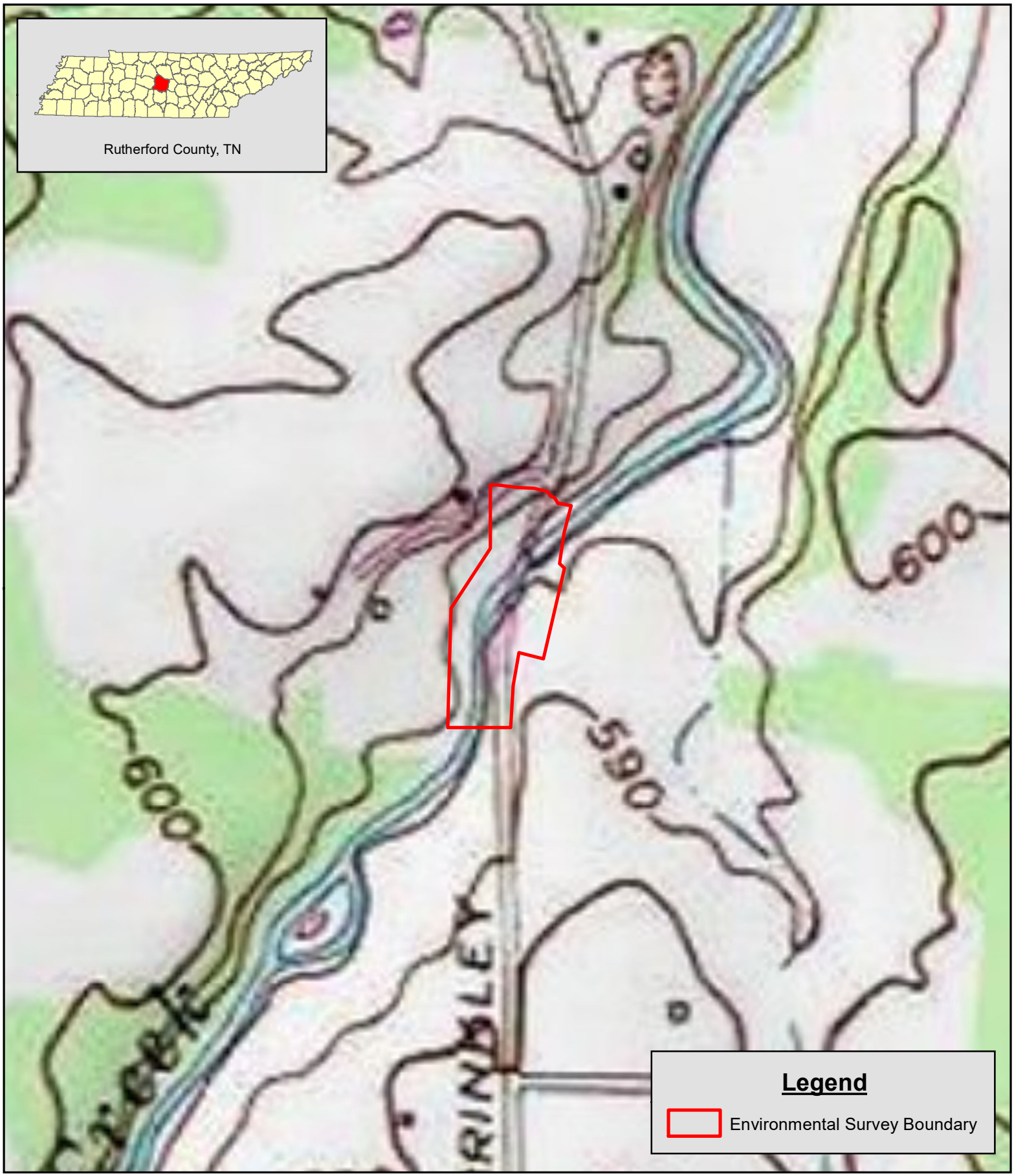
**Figure 1**
**Project Location Map**

POND

0 2,000 4,000 Feet
0 650 1,300 Meters

1 in = 2,000 ft

Brinkley Road Pipeline Replacement Project
Rutherford County, TN
June 2022




Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors,

**Figure 2**
**USGS Topographic Map**

POND

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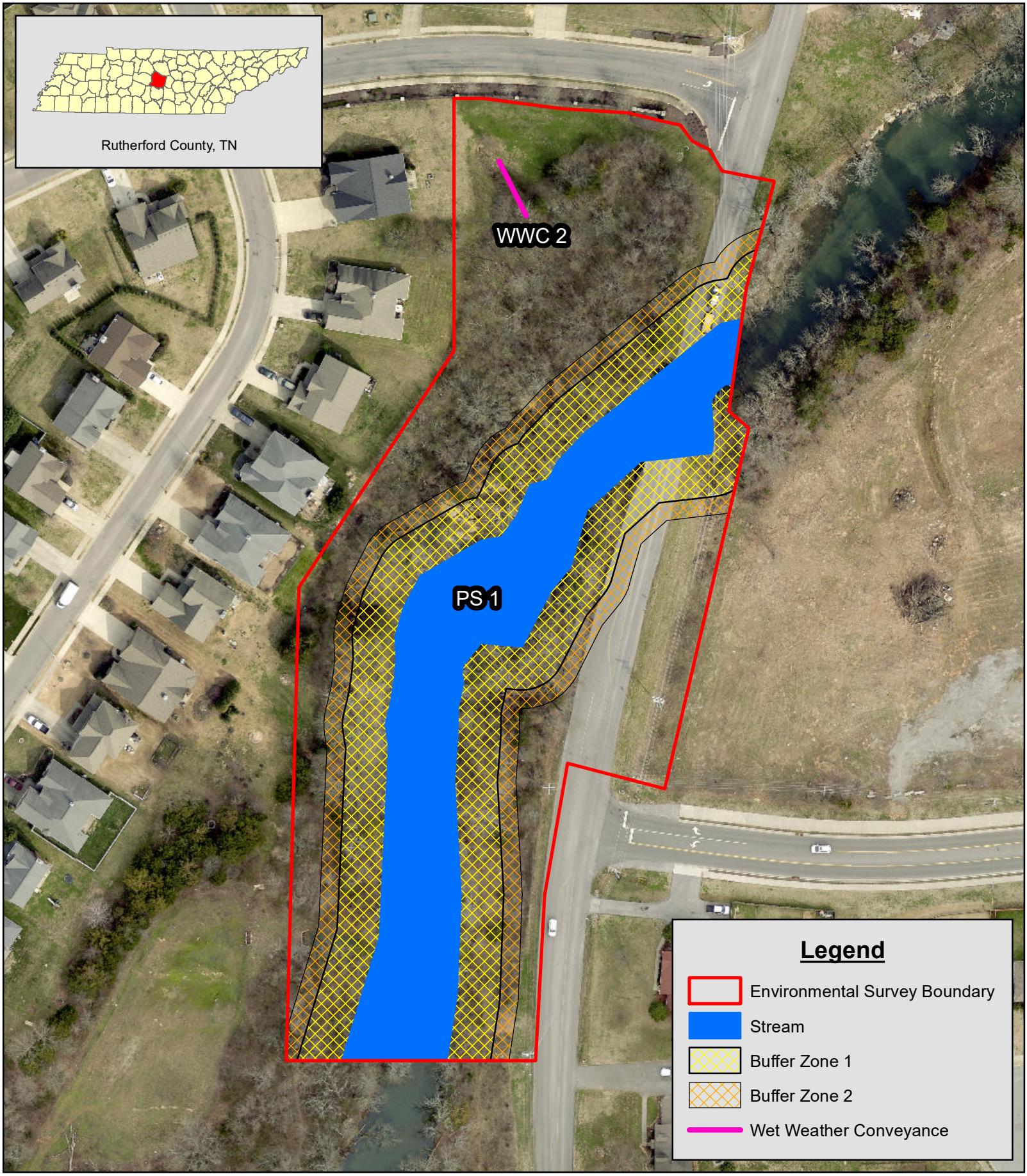
0 130 260 Meters

1 in = 400 ft

Brinkley Road Pipeline Replacement Project
Rutherford County, TN
June 2022




Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

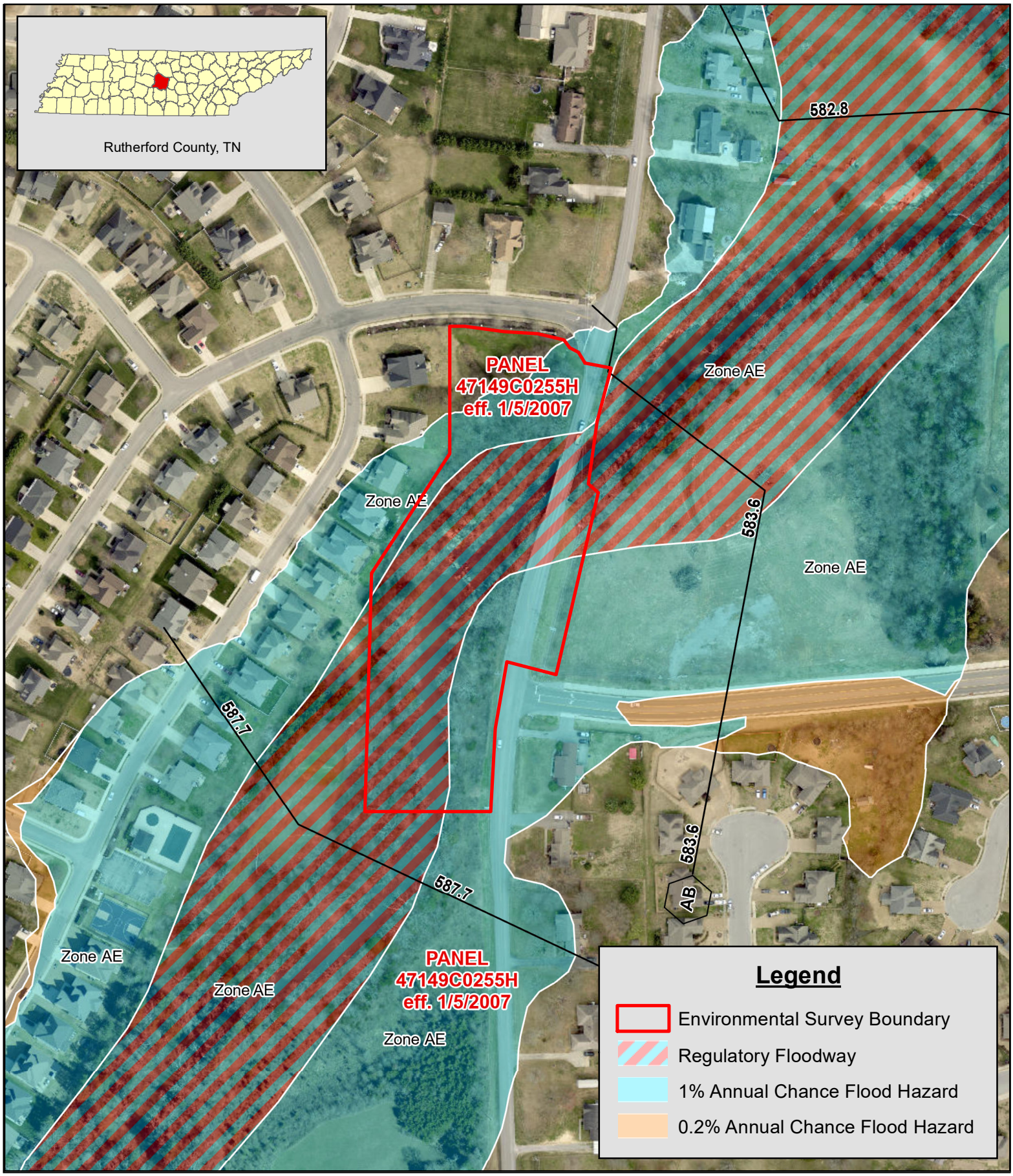
**Figure 3**
**Aquatic Resources Map**

POND

0 100 200 Feet
0 30 60 Meters

1 in = 100 ft

Brinkley Road Pipeline Replacement Project
Rutherford County, TN
June 2022




Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

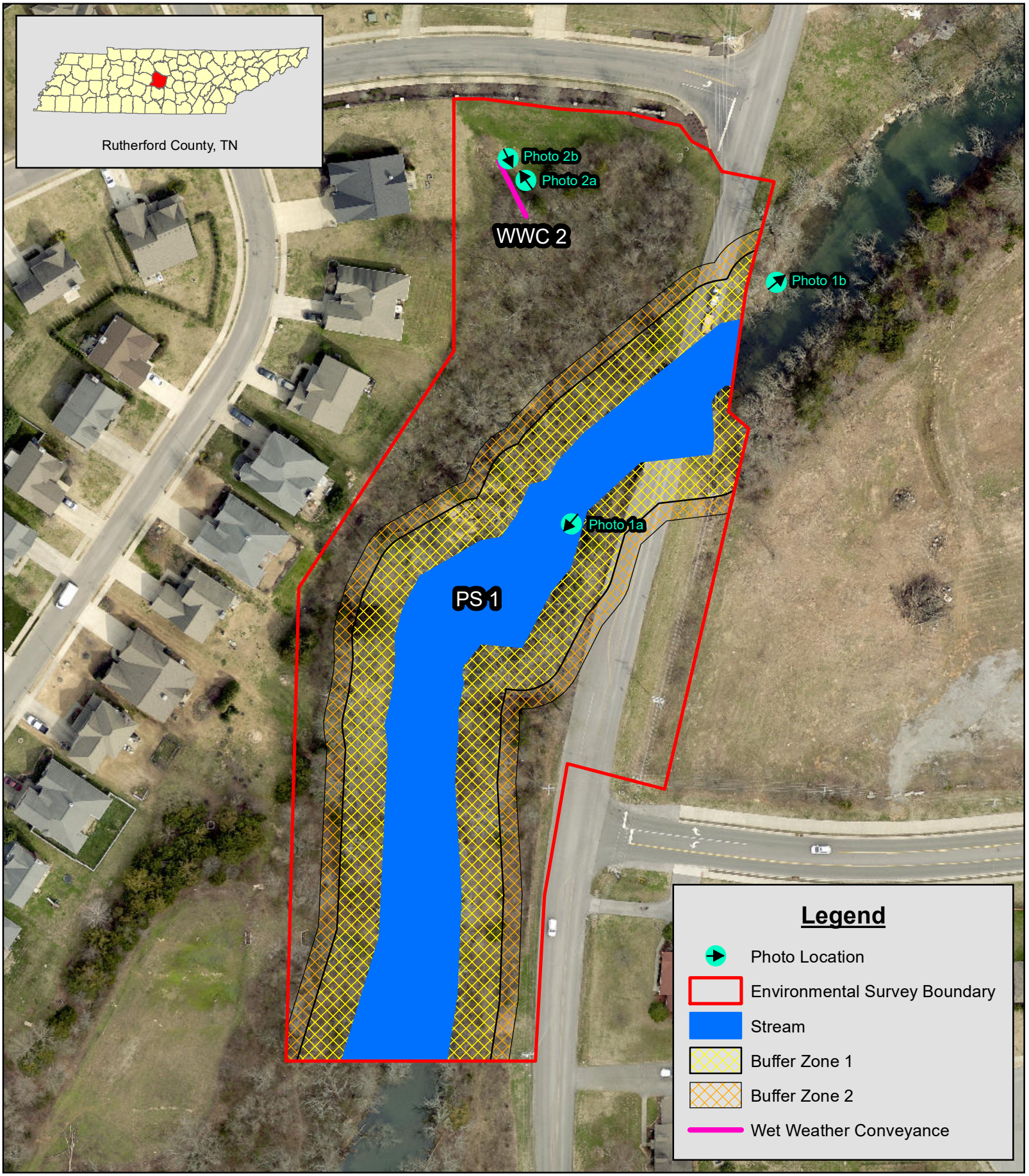
**Figure 4**
**FEMA National Flood Hazard Layer Map**

POND

0 2,000 4,000 Feet
0 650 1,300 Meters

1 in = 2,000 ft

Brinkley Road Pipeline Replacement Project
Rutherford County, TN
June 2022




Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

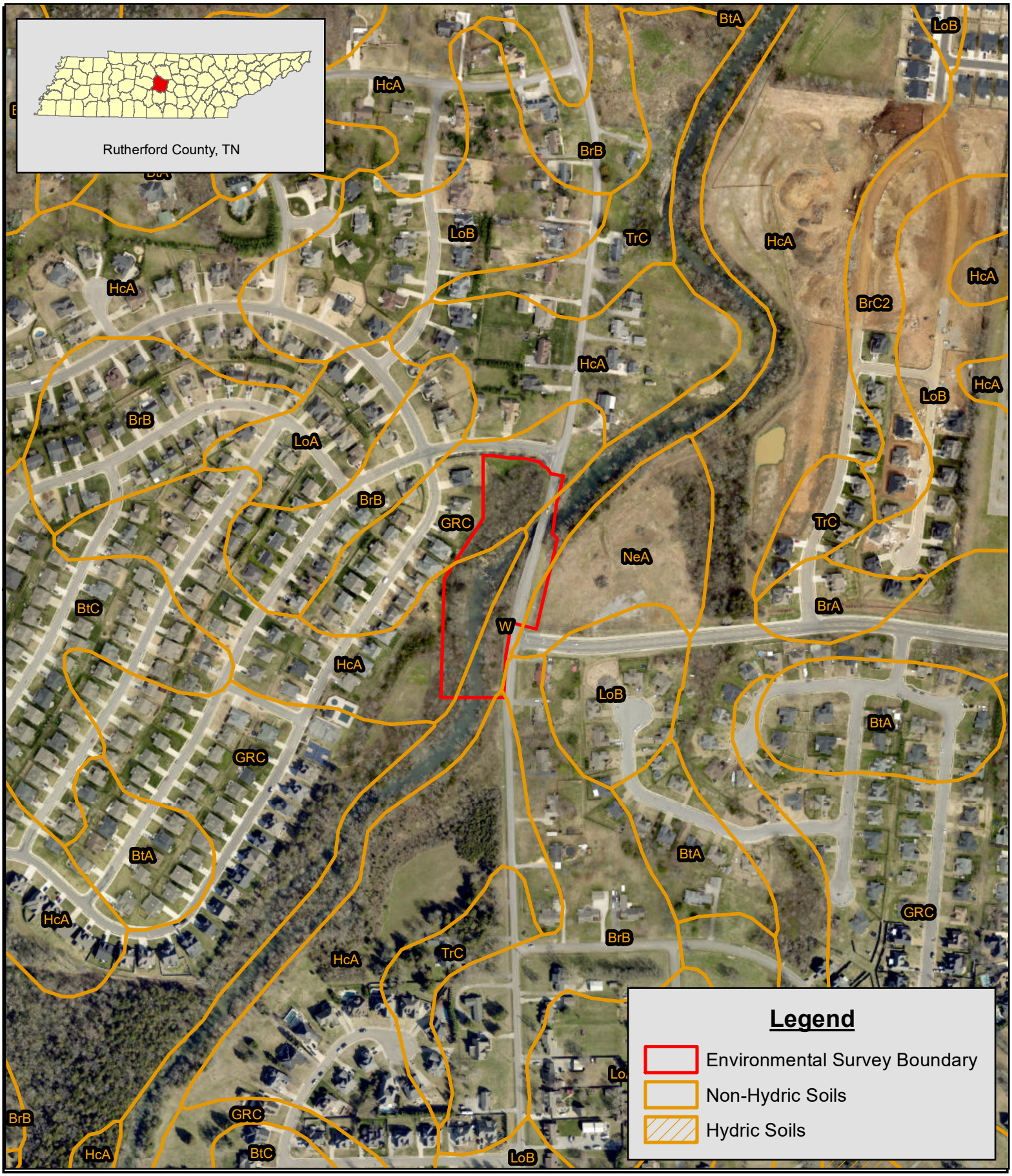
**Figure 5**
**Hydrologic Determination Photolog Map**

POND

0 100 200 Feet
0 30 60 Meters

1 in = 100 ft

Brinkley Road Pipeline Replacement Project
Rutherford County, TN
June 2022




Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**Figure 6**
**NRCS Soils Map**

POND

0 400 800 Feet
0 130 260 Meters

1 in = 400 ft

Brinkley Road Pipeline Replacement Project
Rutherford County, TN
June 2022

# Attachment B – Project Photolog


**Photo 1a: PS 1, Looking Upstream**

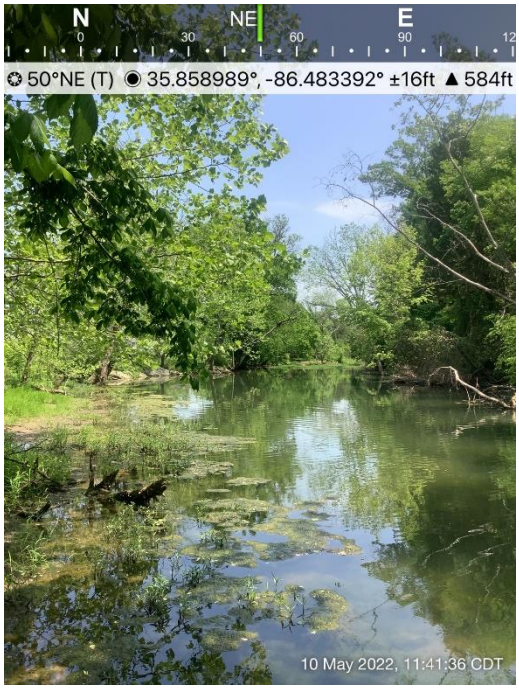



**Photo 1b: PS 1, Looking Downstream**

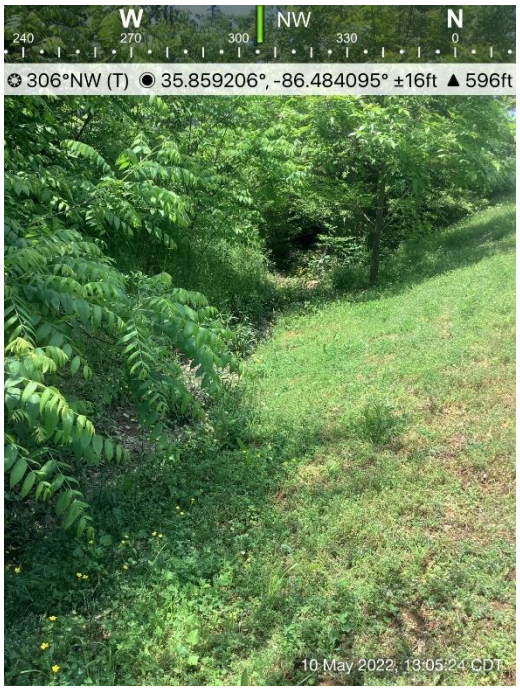



**Photo 2a: WWC 2, Looking Upstream**


**Photo 2b: WWC 2, Looking Downstream**

# Attachment C – Threatened and Endangered Species Information

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, TN 38501-4027
Phone: (931) 528-6481 Fax: (931) 528-7075

In Reply Refer To: May 05, 2022
Project Code: 2022-0039472
Project Name: ATMOS - Brinkley Road Replacement Project

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

**Migratory Birds**: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

# Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

**Tennessee Ecological Services Field Office**
446 Neal Street
Cookeville, TN 38501-4027
(931) 528-6481

# Project Summary

Project Code: 2022-0039472
Event Code: None
Project Name: ATMOS - Brinkley Road Replacement Project
Project Type: Natural Gas Distribution
Project Description: Natural Gas Relocation
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.8580657,-86.48437485208365,14z

Counties: Rutherford County, Tennessee

# Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

## Mammals

| NAME | STATUS |
|---|---|
| Gray Bat *Myotis grisescens*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/6329 | Endangered |
| Indiana Bat *Myotis sodalis*<br>There is **final** critical habitat for this species. The location of the critical habitat is not available.<br>Species profile: https://ecos.fws.gov/ecp/species/5949 | Endangered |
| Northern Long-eared Bat *Myotis septentrionalis*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9045 | Threatened |

## Clams

| NAME | STATUS |
|---|---|
| Littlewing Pearlymussel *Pegias fabula*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/2572 | Endangered |

## Insects

| NAME | STATUS |
|---|---|
| Monarch Butterfly *Danaus plexippus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9743 | Candidate |

## Flowering Plants

| NAME | STATUS |
|---|---|
| Braun's Rock-cress *Arabis perstellata* | Endangered |
| There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4704 | |
| Guthrie's (=pyne's) Ground-plum *Astragalus bibullatus* | Endangered |
| No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1739 | |
| Leafy Prairie-clover *Dalea foliosa* | Endangered |
| No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5498 | |

## Critical habitats

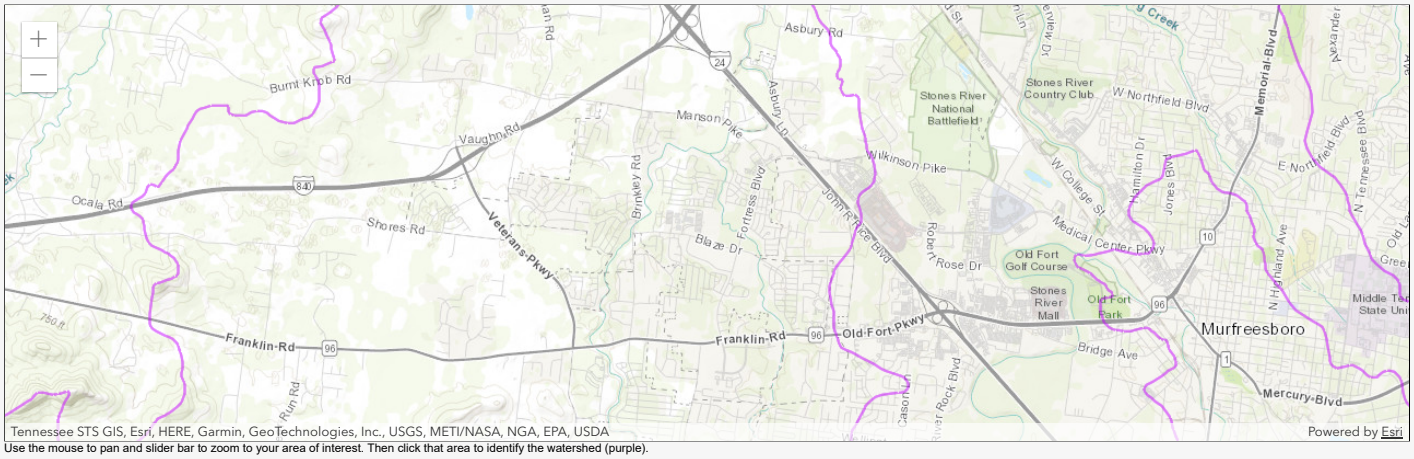
THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Help

Key to Status and Ranks

- Download Status and Ranks

## Watershed Map




Use the mouse to pan and slider bar to zoom to your area of interest. Then click that area to identify the watershed (purple).

## Rare Species By Tennessee Watershed

Data is refreshed on or around January and July each year.

Go | Actions

Huc 12 Name = 'Overall Creek'

1 - 15 of 19

| Huc 8 | Huc 8 Name | Huc 12 | Huc 12 Name | Type | Category | Scientific Name | Common Name | Global Rank | State Rank | Fed Status | State Status | Habitat Description | Wet Habitat Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05130203 | Stones River | 051302030204 | Overall Creek | Invertebrate Animal | Insect | Pseudanophthalmus acherontis | Echo Cave Beetle | G1 | S1 | -- | Rare, Not State Listed | Terrestrial cave obligate; Central Basin; reported from Wilson & Rutherford counties. | Upland |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Paysonia densipila | Duck River Bladderpod | G3 | S3 | -- | S | Cultivated Fields | Possible |
| 05130203 | Stones River | 051302030204 | Overall Creek | Invertebrate Animal | Insect | Gomphus sandrius | Tennessee Clubtail | G1 | S1 | -- | Rare, Not State Listed | Slow streams with bare bedrock shores; Central Basin; upper Duck River and middle Cumberland River watersheds. | Aquatic |
| 05130203 | Stones River | 051302030204 | Overall Creek | Nonvascular Plant | Non-Vascular Plant | Lejeunea sharpii | Sharp's Lejeunea | G2G3 | S1S2 | -- | E | Calcareous Bluffs, Rock & Logs Of Wet Sinks | Possible |
| 05130203 | Stones River | 051302030204 | Overall Creek | Nonvascular Plant | Non-Vascular Plant | Cololejeunea ornata | Ornate Cololejeunea | G2G4 | S1 | -- | T | Sinks & High Humidity Areas On Limestone | Possible |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Schoenolirion croceum | Yellow Sunnybell | G4 | S3 | -- | T | Wet Areas In Glades | Possible |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vertebrate Animal | Amphibian | Gyrinophilus palleucus | Tennessee Cave Salamander | G2G3 | S2 | -- | T | Aquatic cave obligate; cave streams & rimstone pools; Central Basin, Eastern Highland Rim, & Cumberland Plateau. | Aquatic |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vertebrate Animal | Amphibian | Ambystoma barbouri | Streamside Salamander | G4 | S2 | -- | E | Seasonally flowing karst streams; middle Tennessee. | Aquatic |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Astragalus tennesseensis | Tennessee Milk-vetch | G3 | S3 | -- | S | Glades | Upland |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vertebrate Animal | Fish | Notropis rupestris | Bedrock Shiner | G2 | S2 | -- | D | Bedrock pools of some low-gradient streams of the Nashville Basin. | Aquatic |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Astragalus bibullatus | Pyne's Ground-plum | G1 | S1 | LE | E | Ordovician Limestone Glades | Upland |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Ribes missouriense | Missouri Gooseberry | G5 | S2 | -- | S | Rocky Woods | Upland |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vertebrate Animal | Fish | Typhlichthys subterraneus | Southern Cavefish | G4 | S3 | -- | D | Aquatic cave obligate; cave streams, karst waters, and water supply wells; reported from all | Aquatic |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | karst regions excluding RV & BR. | |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Boechera perstellata | Braun's Rockcress | G2 | S1 | LE | E | Limestone Bluffs | Upland |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Panax quinquefolius | American Ginseng | G3G4 | S3S4 | -- | S-CE | Rich Woods | Possible |

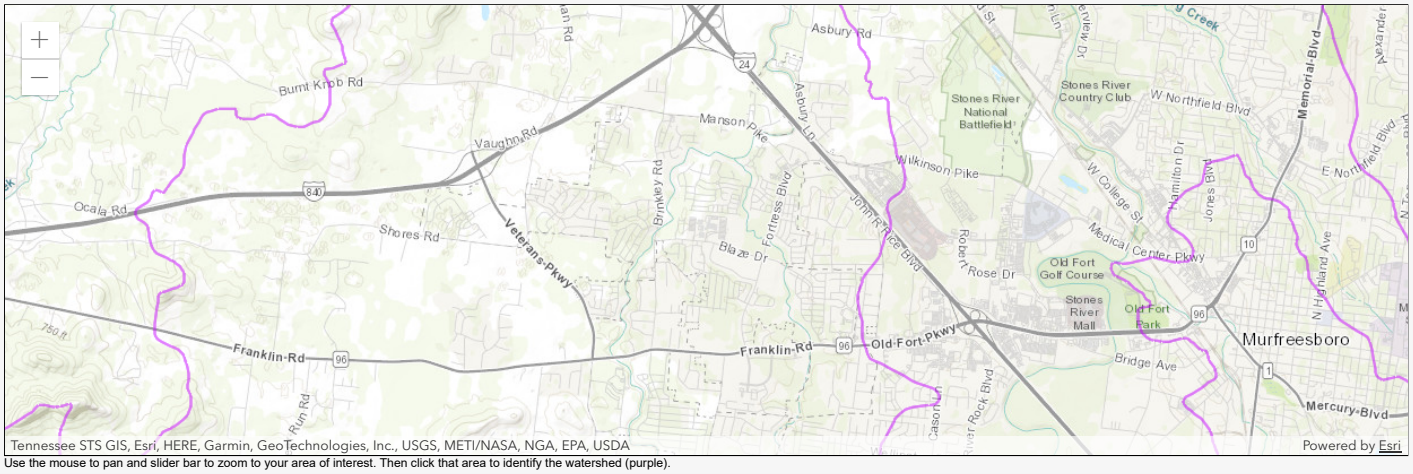
Please deselect the filter(s) that you do not wish to display. Only 1 filter can be displayed at any given time.

Help

Key to Status and Ranks

- Download Status and Ranks

## Watershed Map




Use the mouse to pan and slider bar to zoom to your area of interest. Then click that area to identify the watershed (purple).

## Rare Species By Tennessee Watershed

Data is refreshed on or around January and July each year.

Go | Actions

Huc 12 Name = 'Overall Creek'

16 - 19 of 19

| Huc 8 | Huc 8 Name | Huc 12 | Huc 12 Name | Type | Category | Scientific Name | Common Name | Global Rank | State Rank | Fed Status | State Status | Habitat Description | Wet Habitat Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Arabis hirsuta | Western Hairy Rockcress | G5 | S1 | -- | T | Glades And Limestone Bluffs | Possible |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Eleocharis compressa | Flat-stemmed Spike-rush | G4 | S1 | -- | S | Wet Limestone Glades | Possible |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Phemeranthus calcaricus | Limestone Fame-flower | G3 | S3 | -- | S | Glades | Upland |
| 05130203 | Stones River | 051302030204 | Overall Creek | Vascular Plant | Flowering Plant | Neviusia alabamensis | Alabama Snow-wreath | G3 | S2 | -- | T | Upland Woods | Upland |

Please deselect the filter(s) that you do not wish to display. Only 1 filter can be displayed at any given time.

# Attachment D – Hydrologic Determination Data Forms

# Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.5

| | |
|---|---|
| Named Waterbody: Overall Creek | Date/Time: 5/10/22 |
| Assessors/Affiliation: Pond & Company | Project ID : PS 1 |
| Site Name/Description: ATMOS Brinkley Road Pipeline Replacement Project | |
| Site Location: Intersection of Brinkley Rd and Blaze Dr, Murfreesboro TN | |
| HUC (12 digit): 051302030204 | Lat/Long: 35.858826 -86.483489 |
| Previous Rainfall (7-days) : 1.55 inches | |
| Precipitation this Season vs. Normal : abnormally wet elevated (average) low abnormally dry unknown<br>Source of recent & seasonal precip data : Weather.gov | |
| Watershed Size : 56.79 square miles | County: Rutherford, TN |
| Soil Type(s) / Geology : W, HcA, GRC, NeA | Source: NRCS |
| Surrounding Land Use : Residential | |
| Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) :<br>Severe (Moderate) Slight Absent | |

## Primary Field Indicators Observed

| Primary Indicators | NO | YES |
|---|---|---|
| 1. Hydrologic feature exists solely due to a process discharge | X | WWC |
| 2. Defined bed and bank absent, vegetation composed of upland and FACU species | X | WWC |
| 3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions | X | WWC |
| 4. Daily flow and precipitation records showing feature only flows in direct response to rainfall | X | WWC |
| 5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase | | (Stream) |
| 6. Presence of fish (except *Gambusia*) | | (Stream) |
| 7. Presence of naturally occurring ground water table connection | | (Stream) |
| 8. Flowing water in channel and 7 days since last precip >0.1" in local watershed | | Stream |
| 9. Evidence watercourse has been used as a supply of drinking water | X | Stream |

**NOTE: If any Primary Indicators 1-9 = "Yes", then no further investigation is necessary. However, assessors may choose to score secondary indicators as supporting evidence.**

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.5*

**Overall Hydrologic Determination =** Perennial Stream 1; Overall Creek

**Secondary Indicator Score (if applicable) =** 35.5

**Justification / Notes :** Overall Creek is a named USGS blue-line stream crossed by multiple bridges upstream from the project location. Roads with bridges crossing Overall Creek from its headwaters to the project site include Windrow Rd, Veterans Pkwy, Moreland Rd, Kingdom Dr, Franklin Rd (Hwy 96), and Brinkley Rd.
Source:Google Earth

Observed obligate lotic populations: Alabama Hogsucker (Hypentelium etowanum), Bass (fish of the genus Micropterus)

# Secondary Field Indicator Evaluation

| **A. Geomorphology** (Subtotal = 15.5) | **Absent** | **Weak** | **Moderate** | **Strong** |
|---|---|---|---|---|
| 1. Continuous bed and bank | 0 | 1 | 2 | (3) |
| 2. Sinuous channel | 0 | (1) | 2 | 3 |
| 3. In-channel structure: riffle-pool sequences | 0 | 1 | (2) | 3 |
| 4. Sorting of soil textures or other substrate | 0 | 1 | (2) | 3 |
| 5. Active/relic floodplain | 0 | 0.5 | 1 | (1.5) |
| 6. Depositional bars or benches | 0 | (1) | 2 | 3 |
| 7. Braided channel | (0) | 1 | 2 | 3 |
| 8. Recent alluvial deposits | 0 | (0.5) | 1 | 1.5 |
| 9. Natural levees | (0) | 1 | 2 | 3 |
| 10. Headcuts | (0) | 1 | 2 | 3 |
| 11. Grade controls | (0) | 0.5 | 1 | 1.5 |
| 12. Natural valley or drainageway | 0 | 0.5 | 1 | (1.5) |
| 13. At least second order channel on existing USGS or NRCS map | No = 0 | | (Yes = 3) | |

| **B. Hydrology** (Subtotal = 9.5 ) | **Absent** | **Weak** | **Moderate** | **Strong** |
|---|---|---|---|---|
| 14. Subsurface flow/discharge into channel | 0 | 1 | 2 | (3) |
| 15. Water in channel and >48 hours since sig. rain | 0 | 1 | 2 | (3) |
| 16. Leaf litter in channel (January – September) | 1.5 | (1) | 0.5 | 0 |
| 17. Sediment on plants or on debris | 0 | 0.5 | (1) | 1.5 |
| 18. Organic debris lines or piles (wrack lines) | 0 | 0.5 | 1 | (1.5) |
| 19. Hydric soils in channel bed or sides of channel | (No = 0) | | Yes = 1.5 | |

| **C. Biology** (Subtotal = 10.5 ) | **Absent** | **Weak** | **Moderate** | **Strong** |
|---|---|---|---|---|
| 20. Fibrous roots in channel bed [1] | (3) | 2 | 1 | 0 |
| 21. Rooted plants in the thalweg [1] | (3) | 2 | 1 | 0 |
| 22. Crayfish in stream (exclude in floodplain) | (0) | 1 | 2 | 3 |
| 23. Bivalves/mussels | (0) | 1 | 2 | 3 |
| 24. Amphibians | (0) | 0.5 | 1 | 1.5 |
| 25. Macrobenthos (record type & abundance) | 0 | 1 | (2) | 3 |
| 26. Filamentous algae; periphyton | 0 | 1 | (2) | 3 |
| 27. Iron oxidizing bacteria/fungus | 0 | (0.5) | 1 | 1.5 |
| 28.Wetland plants in channel bed [2] | (0) | 0.5 | 1 | 1.5 |

[1] Focus is on the presence of terrestrial plants.

[2] Focus is on the presence of aquatic or wetland plants.

Total Points = 35.5

*Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points*

**Notes :** Stream flow is gently sinuous with few riffle-pool sequences. The bank width is about 40ft. Substrate cobble with sorted gravel, sand, and silt. Banks densely populated with various vascular plants.

Observed species: Beaver (Castor canadensis), Banded Water Snake (Nerodia fasciata), Broadhead Skink (Plestiodon laticeps), Alabama Hogsucker (Hypentelium etowanum), Bass (fish of the genus Micropterus)

# Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.5

| | |
|---|---|
| Named Waterbody: Overall Creek | Date/Time: May 10 |
| Assessors/Affiliation: Tyler S. ; Alex D. / Pond & Company | Project ID : WWC 2 |
| Site Name/Description: ATMOS Brinkley Road Pipeline Replacement Project | |
| Site Location: Intersection of Brinkley Rd and Blaze Dr, Murfreesboro TN | |
| HUC (12 digit): 051302030204 | Lat/Long: 35.859256 -86.484144 |
| Previous Rainfall (7-days) : 1.55 inches | |
| Precipitation this Season vs. Normal : abnormally wet elevated (average) low abnormally dry unknown<br>Source of recent & seasonal precip data : Weather.gov | |
| Watershed Size : <0.1 square miles | County: Rutherford |
| Soil Type(s) / Geology : W, HcA, GRC, NeA | Source: NRCS |
| Surrounding Land Use : Residential | |
| Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) :<br>Severe Moderate Slight (Absent) | |

## Primary Field Indicators Observed

| Primary Indicators | NO | YES |
|---|---|---|
| 1. Hydrologic feature exists solely due to a process discharge | X | WWC |
| 2. Defined bed and bank absent, vegetation composed of upland and FACU species | | (WWC) |
| 3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions | | (WWC) |
| 4. Daily flow and precipitation records showing feature only flows in direct response to rainfall | X | WWC |
| 5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase | X | Stream |
| 6. Presence of fish (except *Gambusia*) | X | Stream |
| 7. Presence of naturally occurring ground water table connection | X | Stream |
| 8. Flowing water in channel and 7 days since last precip >0.1" in local watershed | X | Stream |
| 9. Evidence watercourse has been used as a supply of drinking water | X | Stream |

**NOTE: If any Primary Indicators 1-9 = "Yes", then no further investigation is necessary. However, assessors may choose to score secondary indicators as supporting evidence.**

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.5*

**Overall Hydrologic Determination =** Wet Weather Conveyance 2 (WWC 2)

**Secondary Indicator Score (if applicable) =** 3

**Justification / Notes :** Degree of historical alteration to natural channel morphology & hydrology is absent because this is a constructed feature, therefore alteration to natural channel morphology is not applicable.

# Secondary Field Indicator Evaluation

| **A. Geomorphology** (Subtotal = 3 ) | **Absent** | **Weak** | **Moderate** | **Strong** |
|---|---|---|---|---|
| 1. Continuous bed and bank | 0 | 1 | 2 | 3 |
| 2. Sinuous channel | 0 | 1 | 2 | 3 |
| 3. In-channel structure: riffle-pool sequences | 0 | 1 | 2 | 3 |
| 4. Sorting of soil textures or other substrate | 0 | 1 | 2 | 3 |
| 5. Active/relic floodplain | 0 | 0.5 | 1 | 1.5 |
| 6. Depositional bars or benches | 0 | 1 | 2 | 3 |
| 7. Braided channel | 0 | 1 | 2 | 3 |
| 8. Recent alluvial deposits | 0 | 0.5 | 1 | 1.5 |
| 9. Natural levees | 0 | 1 | 2 | 3 |
| 10. Headcuts | 0 | 1 | 2 | 3 |
| 11. Grade controls | 0 | 0.5 | 1 | 1.5 |
| 12. Natural valley or drainageway | 0 | 0.5 | 1 | 1.5 |
| 13. At least second order channel on existing USGS or NRCS map | No = 0 | | Yes = 3 | |

| **B. Hydrology** (Subtotal = 0 ) | **Absent** | **Weak** | **Moderate** | **Strong** |
|---|---|---|---|---|
| 14. Subsurface flow/discharge into channel | 0 | 1 | 2 | 3 |
| 15. Water in channel and >48 hours since sig. rain | 0 | 1 | 2 | 3 |
| 16. Leaf litter in channel (January – September) | 1.5 | 1 | 0.5 | 0 |
| 17. Sediment on plants or on debris | 0 | 0.5 | 1 | 1.5 |
| 18. Organic debris lines or piles (wrack lines) | 0 | 0.5 | 1 | 1.5 |
| 19. Hydric soils in channel bed or sides of channel | No = 0 | | Yes = 1.5 | |

| **C. Biology** (Subtotal = 0 ) | **Absent** | **Weak** | **Moderate** | **Strong** |
|---|---|---|---|---|
| 20. Fibrous roots in channel bed [1] | 3 | 2 | 1 | 0 |
| 21. Rooted plants in the thalweg [1] | 3 | 2 | 1 | 0 |
| 22. Crayfish in stream (exclude in floodplain) | 0 | 1 | 2 | 3 |
| 23. Bivalves/mussels | 0 | 1 | 2 | 3 |
| 24. Amphibians | 0 | 0.5 | 1 | 1.5 |
| 25. Macrobenthos (record type & abundance) | 0 | 1 | 2 | 3 |
| 26. Filamentous algae; periphyton | 0 | 1 | 2 | 3 |
| 27. Iron oxidizing bacteria/fungus | 0 | 0.5 | 1 | 1.5 |
| 28.Wetland plants in channel bed [2] | 0 | 0.5 | 1 | 1.5 |

[1] Focus is on the presence of terrestrial plants.

[2] Focus is on the presence of aquatic or wetland plants.

Total Points = 3

*Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points*

**Notes :** Constructed grass-lined ditch. Channel bed is composed of upland vegetation. See photolog.

# Attachment E – Precipitation Data

| Normal Weather Conditions Calculation Table - Rutherford County, TN | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Long-Term Rainfall Records | | | | | | | |
| | Month | Standard Deviation | Minus One Std. Dev. (Dry) | Normal (Mean Inches) | Plus One Std. Dev. (Wet) | Actual Rainfall | Conditions (elevated, low, average) | Condition Value | Month Weight Value | Product of previous two columns |
| 1st Month Prior | April 2021 | 2.00 | 2.3 | 4.3 | 6.3 | 4.23 | Average | 2 | 3 | 6 |
| 2nd Month Prior | March 2021 | 2.70 | 2.8 | 5.50 | 8.2 | 4.15 | Average | 2 | 2 | 4 |
| 3rd Month Prior | Feb 2021 | 2.10 | 2.1 | 4.2 | 6.3 | 8.43 | Elevated | 3 | 1 | 3 |
| | | | | | | | | | Sum= | 13 |

Note:

| If sum is: | |
|---|---|
| 6-9 | Then prior period has been abnormally dry |
| 10-14 | Then prior period has been normal (average) |
| 15-18 | Then prior period has been abnormally wet |

| Condition Value: | |
|---|---|
| Low | 1 |
| Average | 2 |
| Elevated | 3 |

# Attachment F – NRCS Soil Data

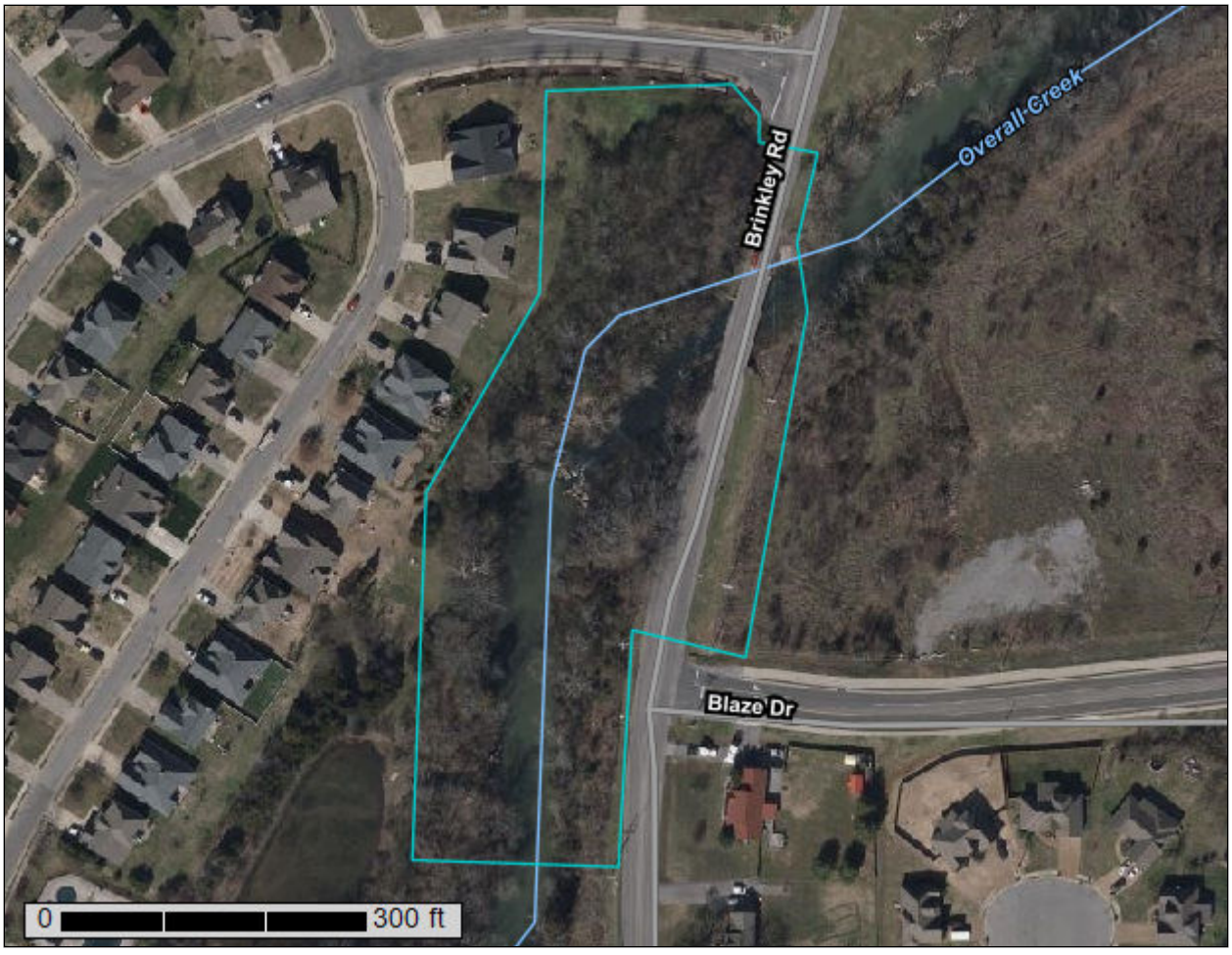
United States Department of Agriculture

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 Rutherford County, Tennessee




June 6, 2022

# 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.

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# 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.

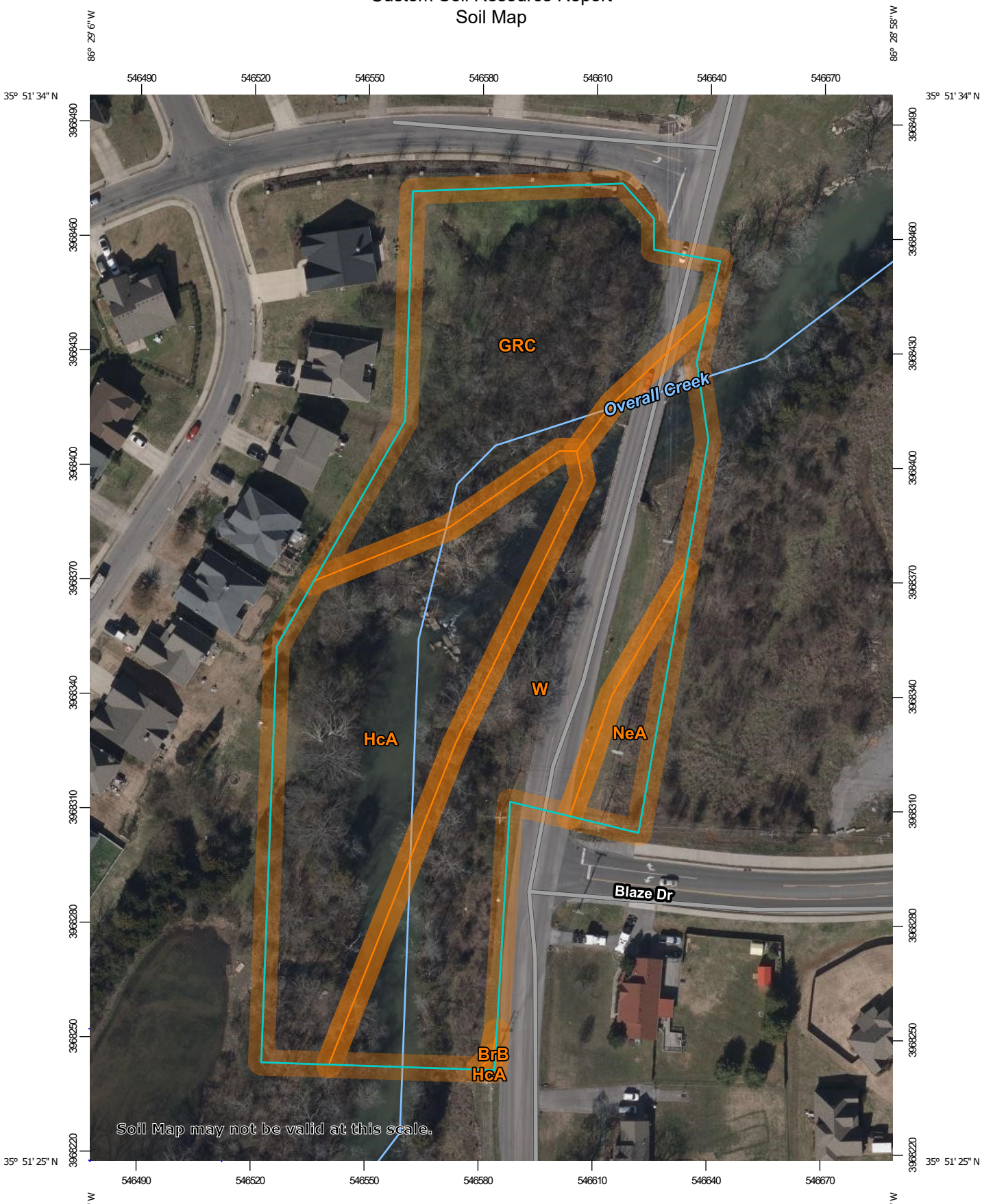
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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.

# Custom Soil Resource Report
## Soil Map




Map Scale: 1:1,360 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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: Rutherford County, Tennessee
Survey Area Data: Version 18, Sep 10, 2021

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

Date(s) aerial images were photographed: Feb 14, 2020—Mar 1, 2020

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 |
|---|---|---|---|
| BrB | Bradyville silt loam, 2 to 5 percent slopes | 0.0 | 0.0% |
| GRC | Gladeville-Rock outcrop complex, 2 to 15 percent slopes, extremely stony | 1.4 | 29.5% |
| HcA | Harpeth silt loam, 0 to 2 percent slopes | 1.5 | 33.0% |
| NeA | Nesbitt silt loam, 0 to 2 percent slopes | 0.2 | 4.2% |
| W | Water | 1.5 | 33.3% |
| **Totals for Area of Interest** | | **4.6** | **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.

# Rutherford County, Tennessee

## BrB—Bradyville silt loam, 2 to 5 percent slopes

### Map Unit Setting

*National map unit symbol:* 2qh79
*Elevation:* 450 to 850 feet
*Mean annual precipitation:* 48 to 58 inches
*Mean annual air temperature:* 57 to 59 degrees F
*Frost-free period:* 190 to 230 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Bradyville and similar soils:* 91 percent
*Minor components:* 9 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Bradyville

#### Setting

*Landform:* Hillslopes
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Crest
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Parent material:* Clayey residuum weathered from limestone

#### Typical profile

*Ap - 0 to 6 inches:* silt loam
*Bt1 - 6 to 19 inches:* silty clay loam
*Bt2 - 19 to 48 inches:* clay
*R - 48 to 58 inches:* bedrock

#### Properties and qualities

*Slope:* 2 to 5 percent
*Depth to restrictive feature:* 39 to 59 inches to lithic bedrock
*Drainage class:* Well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.01 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water supply, 0 to 60 inches:* Moderate (about 6.0 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 2e
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

### Minor Components

#### Talbott

*Percent of map unit:* 9 percent

*Landform:* Hillslopes
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Crest
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Hydric soil rating:* No

**Rock outcrop**

*Percent of map unit:* 0 percent
*Landform:* Hillslopes
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Crest
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Hydric soil rating:* No

## GRC—Gladeville-Rock outcrop complex, 2 to 15 percent slopes, extremely stony

### Map Unit Setting

*National map unit symbol:* 2v58s
*Elevation:* 380 to 1,290 feet
*Mean annual precipitation:* 48 to 58 inches
*Mean annual air temperature:* 57 to 61 degrees F
*Frost-free period:* 190 to 230 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Gladeville and similar soils:* 60 percent
*Rock outcrop:* 31 percent
*Minor components:* 9 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Gladeville

#### Setting

*Landform:* Flats
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Clayey residuum weathered from limestone

#### Typical profile

*A - 0 to 8 inches:* very flaggy silty clay loam
*C - 8 to 10 inches:* very flaggy clay
*R - 10 to 20 inches:* bedrock

#### Properties and qualities

*Slope:* 2 to 15 percent
*Surface area covered with cobbles, stones or boulders:* 10.0 percent

*Depth to restrictive feature:* 8 to 20 inches to lithic bedrock
*Drainage class:* Well drained
*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 content:* 5 percent
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water supply, 0 to 60 inches:* Very low (about 1.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 7s
*Hydrologic Soil Group:* D
*Hydric soil rating:* No

**Description of Rock Outcrop**

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 8s

**Minor Components**

**Talbott**

*Percent of map unit:* 9 percent
*Landform:* Hills
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear
*Across-slope shape:* Convex
*Hydric soil rating:* No

## HcA—Harpeth silt loam, 0 to 2 percent slopes

**Map Unit Setting**

*National map unit symbol:* kqnw
*Elevation:* 700 to 1,300 feet
*Mean annual precipitation:* 48 inches
*Mean annual air temperature:* 57 degrees F
*Frost-free period:* 190 to 205 days
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**

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

### Description of Harpeth

#### Setting

*Landform:* Flats
*Landform position (three-dimensional):* Talf
*Parent material:* Loess or loamy alluvium over clayey residuum weathered from limestone

#### Typical profile

*H1 - 0 to 12 inches:* silt loam
*H2 - 12 to 37 inches:* silty clay loam
*H3 - 37 to 78 inches:* silty clay loam

#### Properties and qualities

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.60 to 2.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* High (about 10.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 1
*Hydrologic Soil Group:* B
*Hydric soil rating:* No

## NeA—Nesbitt silt loam, 0 to 2 percent slopes

### Map Unit Setting

*National map unit symbol:* kqpc
*Elevation:* 520 to 840 feet
*Mean annual precipitation:* 46 to 60 inches
*Mean annual air temperature:* 57 to 61 degrees F
*Frost-free period:* 190 to 200 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

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

### Description of Nesbitt

#### Setting

*Landform:* Flats
*Landform position (three-dimensional):* Talf
*Parent material:* Silty alluvium

**Typical profile**

*H1 - 0 to 8 inches:* silt loam
*H2 - 8 to 25 inches:* silty clay loam
*H3 - 25 to 55 inches:* silty clay loam
*H4 - 55 to 65 inches:* clay

**Properties and qualities**

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)
*Depth to water table:* About 20 to 48 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* High (about 9.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 1
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

## W—Water

**Map Unit Composition**

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

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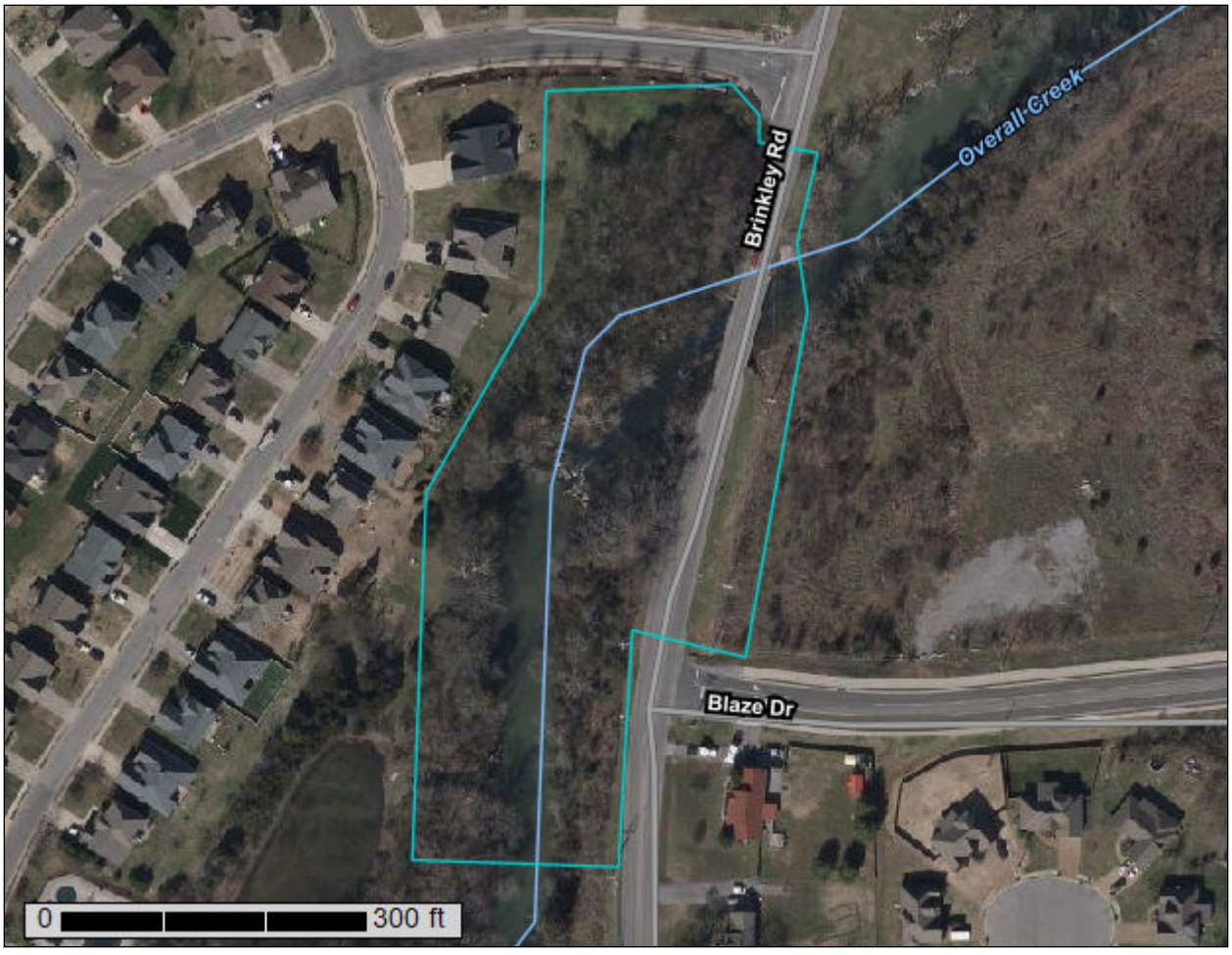
United States Department of Agriculture

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 Rutherford County, Tennessee




June 6, 2022

# 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.

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# 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.

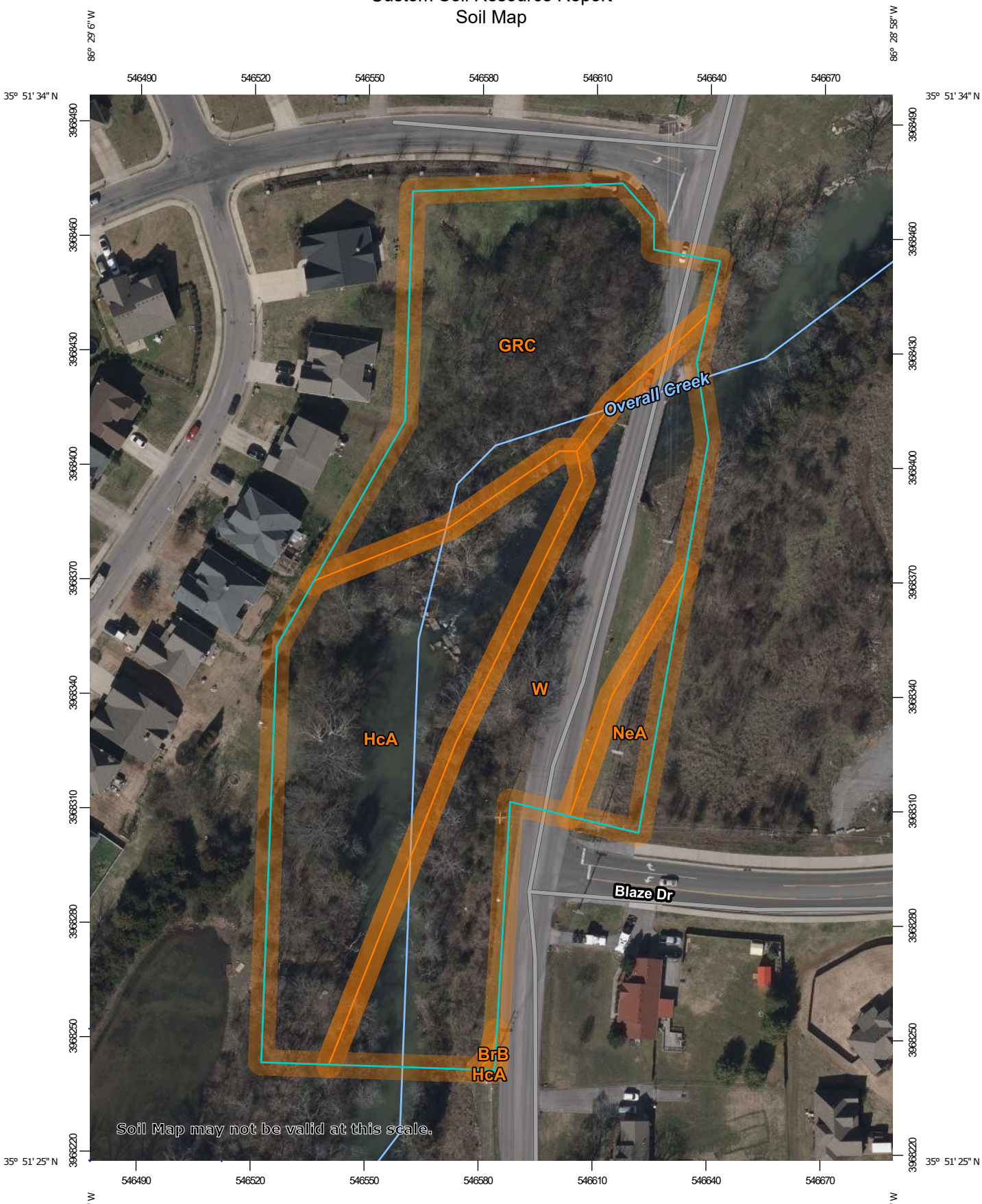
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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.

# Custom Soil Resource Report
## Soil Map




Map Scale: 1:1,360 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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: Rutherford County, Tennessee
Survey Area Data: Version 18, Sep 10, 2021

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

Date(s) aerial images were photographed: Feb 14, 2020—Mar 1, 2020

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 |
|---|---|---|---|
| BrB | Bradyville silt loam, 2 to 5 percent slopes | 0.0 | 0.0% |
| GRC | Gladeville-Rock outcrop complex, 2 to 15 percent slopes, extremely stony | 1.4 | 29.5% |
| HcA | Harpeth silt loam, 0 to 2 percent slopes | 1.5 | 33.0% |
| NeA | Nesbitt silt loam, 0 to 2 percent slopes | 0.2 | 4.2% |
| W | Water | 1.5 | 33.3% |
| **Totals for Area of Interest** | | **4.6** | **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.

# Rutherford County, Tennessee

## BrB—Bradyville silt loam, 2 to 5 percent slopes

### Map Unit Setting

*National map unit symbol:* 2qh79
*Elevation:* 450 to 850 feet
*Mean annual precipitation:* 48 to 58 inches
*Mean annual air temperature:* 57 to 59 degrees F
*Frost-free period:* 190 to 230 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Bradyville and similar soils:* 91 percent
*Minor components:* 9 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Bradyville

#### Setting

*Landform:* Hillslopes
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Crest
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Parent material:* Clayey residuum weathered from limestone

#### Typical profile

*Ap - 0 to 6 inches:* silt loam
*Bt1 - 6 to 19 inches:* silty clay loam
*Bt2 - 19 to 48 inches:* clay
*R - 48 to 58 inches:* bedrock

#### Properties and qualities

*Slope:* 2 to 5 percent
*Depth to restrictive feature:* 39 to 59 inches to lithic bedrock
*Drainage class:* Well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.01 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water supply, 0 to 60 inches:* Moderate (about 6.0 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 2e
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

### Minor Components

#### Talbott

*Percent of map unit:* 9 percent

*Landform:* Hillslopes
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Crest
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Hydric soil rating:* No

**Rock outcrop**

*Percent of map unit:* 0 percent
*Landform:* Hillslopes
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Crest
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Hydric soil rating:* No

## GRC—Gladeville-Rock outcrop complex, 2 to 15 percent slopes, extremely stony

### Map Unit Setting

*National map unit symbol:* 2v58s
*Elevation:* 380 to 1,290 feet
*Mean annual precipitation:* 48 to 58 inches
*Mean annual air temperature:* 57 to 61 degrees F
*Frost-free period:* 190 to 230 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Gladeville and similar soils:* 60 percent
*Rock outcrop:* 31 percent
*Minor components:* 9 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Gladeville

#### Setting

*Landform:* Flats
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Clayey residuum weathered from limestone

#### Typical profile

*A - 0 to 8 inches:* very flaggy silty clay loam
*C - 8 to 10 inches:* very flaggy clay
*R - 10 to 20 inches:* bedrock

#### Properties and qualities

*Slope:* 2 to 15 percent
*Surface area covered with cobbles, stones or boulders:* 10.0 percent

*Depth to restrictive feature:* 8 to 20 inches to lithic bedrock
*Drainage class:* Well drained
*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 content:* 5 percent
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water supply, 0 to 60 inches:* Very low (about 1.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 7s
*Hydrologic Soil Group:* D
*Hydric soil rating:* No

**Description of Rock Outcrop**

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 8s

**Minor Components**

**Talbott**

*Percent of map unit:* 9 percent
*Landform:* Hills
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear
*Across-slope shape:* Convex
*Hydric soil rating:* No

## HcA—Harpeth silt loam, 0 to 2 percent slopes

**Map Unit Setting**

*National map unit symbol:* kqnw
*Elevation:* 700 to 1,300 feet
*Mean annual precipitation:* 48 inches
*Mean annual air temperature:* 57 degrees F
*Frost-free period:* 190 to 205 days
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**

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

### Description of Harpeth

#### Setting

*Landform:* Flats
*Landform position (three-dimensional):* Talf
*Parent material:* Loess or loamy alluvium over clayey residuum weathered from limestone

#### Typical profile

*H1 - 0 to 12 inches:* silt loam
*H2 - 12 to 37 inches:* silty clay loam
*H3 - 37 to 78 inches:* silty clay loam

#### Properties and qualities

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.60 to 2.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* High (about 10.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 1
*Hydrologic Soil Group:* B
*Hydric soil rating:* No

## NeA—Nesbitt silt loam, 0 to 2 percent slopes

### Map Unit Setting

*National map unit symbol:* kqpc
*Elevation:* 520 to 840 feet
*Mean annual precipitation:* 46 to 60 inches
*Mean annual air temperature:* 57 to 61 degrees F
*Frost-free period:* 190 to 200 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

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

### Description of Nesbitt

#### Setting

*Landform:* Flats
*Landform position (three-dimensional):* Talf
*Parent material:* Silty alluvium

**Typical profile**

*H1 - 0 to 8 inches:* silt loam
*H2 - 8 to 25 inches:* silty clay loam
*H3 - 25 to 55 inches:* silty clay loam
*H4 - 55 to 65 inches:* clay

**Properties and qualities**

*Slope:* 0 to 2 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)
*Depth to water table:* About 20 to 48 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* High (about 9.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 1
*Hydrologic Soil Group:* C
*Hydric soil rating:* No

## W—Water

**Map Unit Composition**

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

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