

Waters Investigation Report



*26th Ave. – Blizzard Drive Widen,
Add Lanes (0.49 mi)*

State Project: U354-14-9.23 00 /STP-0014(174)D
Parkersburg, West Virginia

Prepared for:

West Virginia Department of Transportation
Division of Highways
1334 Smith Street
Charleston, West Virginia 25301
October 2020

BURGESS & NIPLE

WATERS INVESTIGATION REPORT
26TH AVE. - BLIZZARD DRIVE WIDEN, ADD LANES (0.49 MI)
STATE PROJECT: U354-14-9.56 00 /STP-0014(174)D
FEDERAL PROJECT: N/A

PREPARED FOR:

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
1334 SMITH STREET
CHARLESTON, WEST VIRGINIA 25301

OCTOBER 2020

PREPARED BY:

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4424 EMERSON AVENUE
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EXECUTIVE SUMMARY

Client: West Virginia Department of Transportation
Division of Highways
Project Name: 26th Ave. – Blizzard Drive Widen,
Add Lanes (0.49 mi.)
County: Wood County, WV
USGS Quadrangle: South Parkersburg, WV
Hydrologic Unit Code (HUC): 0503 0203 1306 (Neal Run-Little Kanawha River)
Latitude/Longitude: 39.232971, -81.541943
Investigator(s): Matthew Kestner
Date(s) of Field Investigation: August 6, 2020

Burgess & Niple, Inc., on behalf of the West Virginia Department of Transportation – Division of Highways (WVDOH), is conducting environmental due diligence for the operational improvements of WV 14 between Blizzard Drive and 26th Avenue in Parkersburg, WV. B&N performed a Waters Investigation on the approximately 18.3-acre project area.

Based upon a desktop and field reconnaissance, the following was concluded:

- Unnamed Tributary (UNT) to Wards Run is the only stream within the project area.
- No wetlands were observed within the project area.

The U.S. Army Corps of Engineers (USACE) is the regulatory authority responsible for determining whether a water is a jurisdictional “waters of the U.S.” (WOTUS). B&N recommends requesting an Approved Jurisdictional Determination (AJD) from the USACE before conducting any earth-moving or construction activities at the site. An AJD may be requested in the context of obtaining Clean Water Act (CWA) Section 404/401 authorization for proposed project impacts, or as a separate action. This site is under the jurisdiction of the following USACE District:

**U.S. Army Corps of Engineers
Huntington District
502 Eighth Street
Huntington, WV 25701**

1.0 INTRODUCTION

This report summarizes the findings of a Waters Investigation conducted for an approximately 0.49 mile length along WV 14 between Blizzard Drive and 26th Avenue in Parkersburg, WV. The operational improvements for WV 14 include modifications to the intersections at Pike Street with Blizzard Drive/Broadway Avenue and Gihon Road/Rayon Drive and a five-lane roadway segment along WV 14 (Pike Street) between Blizzard Drive/Broadway Avenue and 26th Avenue. The Waters Investigation was conducted to identify, delineate and assess streams, wetlands, and other potentially regulated water resources within the investigation area.

A project location map is provided as **Attachment 1**.

The Waters Investigation was conducted by Matthew Kestner, Environmental Scientist of Burgess & Niple, Inc. (B&N). The field investigation was conducted on August 6, 2020. Matthew Kestner is the principal author of this report.

2.0 METHODOLOGY

2.1 Regulatory Background

This Waters Investigation was conducted to identify, delineate and assess streams, wetlands, and other potentially regulated water resources within the investigation area. Potentially regulated water resources include, but are not necessarily limited to:

2.1.1 Federally Regulated Waters

“Waters of the U.S.” (WOTUS) as currently defined in 33 CFR 328.3 and current associated guidance, policy, and judicial decision documents. WOTUS are subject to federal permitting requirements administered by USACE under Clean Water Act (CWA) Sections 404 and 401. WOTUS include:

- U.S. territorial seas and waters subject to the ebb and flow of the tides;
- Major rivers and streams that are, have been, or may be navigated by watercraft or are/may otherwise be used in interstate or foreign commerce;
- Lakes, ponds and other impoundments located in or contributing surface flow to other WOTUS;
- Direct or indirect tributaries to other WOTUS with perennial or intermittent flow regimes;
- Wetlands that directly abut or are located immediately adjacent to other WOTUS.
- Ditches constructed in WOTUS or which themselves exhibit perennial or intermittent flow regimes and other characteristics of a federally regulated “tributary”.

2.1.2 State Regulated Waters

In accordance with the West Virginia Water Pollution Control Act (WPCA), the WVDEP has the responsibility to protect all waters of the State. The WPCA requires a permit for activities that may cause an alteration to the physical or biological integrity of the waters of the State. This is for any activity involving a discharge into federally non-jurisdictional waters of the State which require a West Virginia State Waters Permit from the West Virginia Department of Environmental Protection (WVDEP).

2.2 Investigation Methodology

This Waters Investigation generally consisted of:

- A desktop reconnaissance to review relevant background information including, but not necessarily limited to, proposed project plans, U.S. Geological Survey (USGS) topographic maps, current aerial photography, National Wetlands Inventory (NWI) maps, soils maps and soil survey information, and Federal Emergency Management Agency (FEMA) flood hazard mapping, as applicable.
- A wetland field delineation conducted in accordance with protocols outlined in the 1987 *Corps of Engineers Wetlands Delineation Manual* and relevant Regional Supplements (*2012 Eastern Mountain and Piedmont Region*). The field delineation generally consisted of an overall site reconnaissance, identification of areas exhibiting potential wetland indicators, selection of representative sample plot locations, data collection, and delineation of wetland boundaries where positive indicators of all three wetland criteria (hydrophytic vegetation, hydric soils, wetland hydrology) were found. Sample plot locations and wetland boundaries were recorded in the field using Global Positioning System (GPS) instrumentation.
- If rivers, streams, ponds, lakes or other water resources are identified in the investigation area, existing conditions in these areas were documented using photographs, field notes, site maps, and GPS instrumentation, as applicable.
- Functional assessment of delineated streams and wetlands were conducted in accordance with the WWSWVM.

3.0 DESKTOP RECONNAISSANCE

The desktop reconnaissance for this report included review of proposed project plans, U.S. Geological Survey (USGS) topographic maps, current aerial photography, National Wetlands Inventory (NWI) maps, soils maps and soil survey information, Federal Emergency Management Agency (FEMA) flood hazard mapping, and other literature sources, as applicable. Findings of the literature review are summarized below.

3.1 USGS Topographic Mapping and Aerial Photography

The investigation area is depicted on the South Parkersburg, WV 7.5-Minute Series USGS topographic quadrangle. Aerial photography was evaluated from imagery obtained from the ESRI Online Mapping Service, World Imagery Basemap.

The USGS Topographic Map shows the project area in a low-lying flat area (elevation 638 ft) surrounded by hillsides to the north and south (elevation ~800 ft).

Aerial photographs show the project area is located in a primarily urban setting with some residential areas adjacent.

A USGS topographic map excerpt covering the project area is included as **Attachment 2**. An aerial map showing the investigation area is included as **Attachment 3**.

3.2 Soils

Soil mapping and descriptions for the investigation area were obtained for review from the Natural Resources Conservation Service (NRCS) Web Soil Survey (<https://websoilsurvey.nrcs.usda.gov>). Made Land (Ma) was the only soil unit found within the project area. This soil is classified as non-hydric.

Soil mapping and unit description review results for the investigation area are summarized in **Tables 1** below. Soil mapping and unit descriptions are included in **Attachment 4**.

Table 1
NRCS Soil Survey Summary

Map Symbol	Soil Unit Name	Hydric?	Acres within Project Area	% of Project Area
Ma	Made land	Non-Hydric	18.3	100

3.3 National Wetland Inventory Maps

National Wetland Inventory (NWI) mapping obtained from the U.S. Fish & Wildlife Service (USFWS) Wetlands Mapper application (<https://www.fws.gov/wetlands/Data/Mapper.html>) depicts one (1) riverine feature within the project area. Wards Run (R4SBC) runs along the southeast side adjacent to the project area. It flows from south to northeast where it meets its confluence with the Little Kanawha River off-site.

NWI mapping covering the investigation area is included in **Attachment 5**.

3.4 Flood Hazard Mapping

The project location appears on Federal Insurance Rate Map (FIRM) panel 54107C0231D. It is shown located primarily within Zone X, indicating that it is in the Areas of Minimal Flood Hazard with a very small area along the south eastern edge of the project falling within Zone AE indicating a Regulatory Floodway, Zone X indicating an area of 0.2% Annual Chance Flood Hazard, and Zone A, indicating an area of 1% Annual Chance Flood Hazard.

A copy of the FEMA flood hazard map covering the investigation area is included in **Attachment 6**.

4.0 FIELD INVESTIGATION

The investigation area was visited by Matthew Kestner, Environmental Scientists of B&N, on August 6, 2020 to evaluate general site conditions, identify potentially regulated water resources, conduct stream assessments, collect wetland data, and delineate wetland boundaries, as applicable. Weather conditions were sunny with a high temperature of 84°F. The last recorded precipitation was 0.14 inches on August 5, 2020. Findings of the field investigation are summarized below.

Site photographs are included in **Attachment 7**. An exhibit depicting identified water resources in the investigation area are included in **Attachment 8**.

4.1 Streams

As summarized in **Section 2.1** above, navigable rivers and lakes, and non-navigable streams with perennial or intermittent flow regimes are by definition federally regulated WOTUS. Streams with ephemeral flow regimes are not federally regulated but are subject to state regulation by WVDEP and may require a West Virginia State Waters Permit For Federally Non-Jurisdictional Waters under the WPCA.

One (1) potentially jurisdictional stream resource was identified in the investigation area, as summarized below:

4.1.1 UNT to Wards Run

The UNT to Wards Run is an intermittent stream that runs approximately 180 ft. from west to east through the project area. UNT to Wards Run enters a culvert west of the project area and crosses under WV 14 and exits the culvert just east of WV 14. Approximately 135 ft of Wards Run is currently culverted within the project area with approximately 45 ft of stream within the project area not culverted. At this location, it has an average estimated OHWM width of 8.5 ft. and an average estimated OHWM depth of 0.75 ft. with a sand/silt substrate and drains approximately 0.5 mi². UNT to Wards Run was assessed using the WWSWVM. The Habitat Assessment Field Data Sheet - High Gradient Streams scored a total of 55 points while Functional Capacity Index for Hydrology is 0.13, Biogeochemical Cycling is 0.25, and Habitat is 0.20. The WWSWVM Index is 0.390. The UNT to Wards Run flows into Wards Run off-site which then flows into the Little Kanawha and therefore, it is likely a Jurisdictional Water of the U.S.

Table 2
Stream Resources Summary

Stream ID	Length within Project Area (ft.)	Estimated OHWM Width (ft.)	Estimated OHWM Depth (ft.)	Flow Regime	Appx. Drain age Area (mi. ²)	Dominant Substrate	Connectivity
UNT to Wards Run	180	8.5	0.75	Intermittent	0.5	Sand/Silt	Jurisdictional

4.2 Wetlands

As summarized in **Section 2.2** above, wetlands are defined as areas that exhibit positive indicators of all three wetland delineation criteria - predominantly hydrophytic vegetation, hydric soils, and wetland hydrology. Wetlands that directly abut or are located immediately adjacent to another WOTUS are themselves, by definition, federally regulated WOTUS.

“Isolated” wetlands are wetlands that do not meet any WOTUS location or connection criteria. The “isolated” determination is made by USACE. “Isolated” wetlands are not subject to CWA Section 404 or 401 requirements but may be subject to state permitting and regulation.

No wetland resources exhibiting positive indicators of hydrophytic vegetation, hydric soils, and wetland hydrology were identified in the investigation area.

4.3 Other Waters

Other potentially regulated waters may include ditches with perennial or intermittent flow regimes, lakes, ponds or other open water bodies located in or that contribute flow to other WOUS.

No other waters were identified within the project area.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Water Resources Identified

Based on the findings of this Waters Investigation, B&N concludes that a total of **180 l.f.** of potentially jurisdictional stream resources are located in the investigation area, as summarized in **Table 2** above. Water Resource Documentation are included in **Attachment 9**.

Waters Investigation results are summarized in **Table 3** below:

Table 3
Water Resources Summary

Water(s)	Length within Project Area (l.f.)		Acres within Project Area (ac.)		Total
	Jurisdictional	Isolated	Jurisdictional	Isolated	
Stream(s)	180	-			180
Wetland(s)			-	-	0
Other Water(s)			-	-	0

5.2 Regulatory Implications and Recommendations

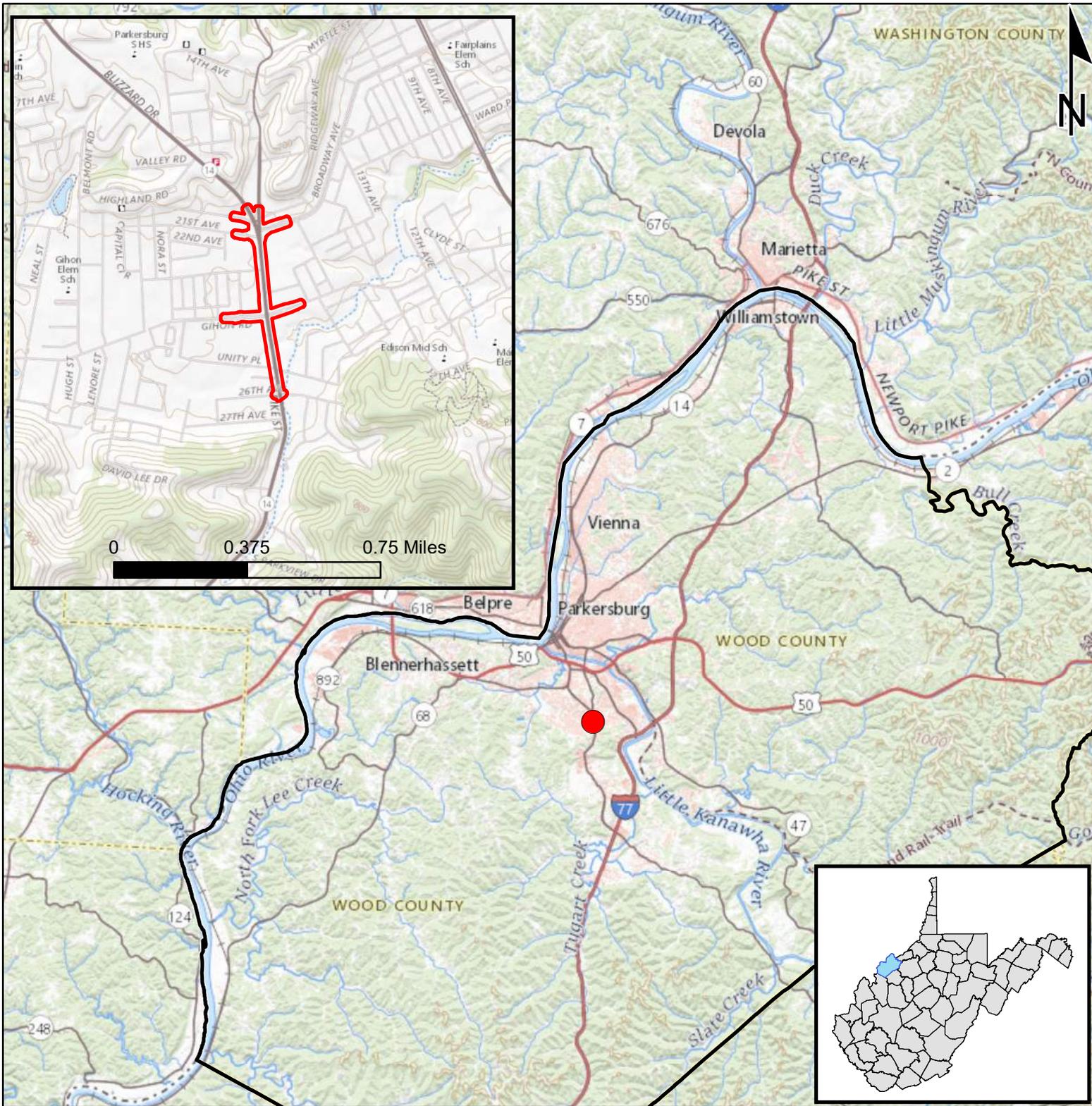
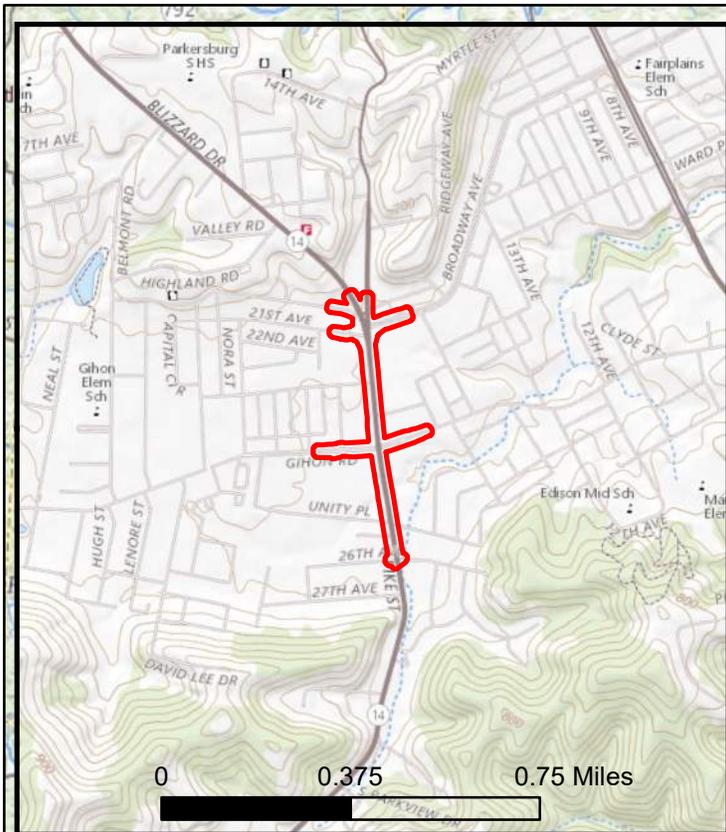
This Waters Investigation Report has been prepared based on the best available information and best professional judgement of the responsible investigator(s). However, only the U.S. Army Corps of Engineers (USACE) can render definitive determinations of jurisdiction under Section 404 of the Clean Water Act (CWA). B&N recommends that WVDOH obtain a formal Jurisdictional Determination (JD) from USACE regarding the above identified resources, either independently or concurrent with obtaining CWA Section 404/401 or other applicable permits.

CWA jurisdictional resources (WOTUS) require a Section 404 permit from USACE and an accompanying Section 401 water quality certification (WQC) prior to undertaking jurisdictional “fill” activities in them. A Regional General Permit (RGP) has been issued between the USACE and the WVDOH. The RGP would authorize the discharge of dredged and/or fill material into waters of the U.S. and/or work with navigable waters of the U.S. for linear transportation projects proposed by the WVDOT pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (CWA). RGPs are “streamlined” Section 404/401 permits that have been assigned predefined terms and conditions.

USACE and WVDEP have imposed numerous specific and regional conditions on RGPs, including conditions affecting project location, resource type, in-water work dates, tree clearing, and high-quality watersheds, among others. If the level of impact or nature of project activities are not eligible for RGP authorization, the project will require either a Nationwide Permit (NWP) or an Individual Section 404 Permit from USACE, and/or an accompanying Individual Section 401 WQC from WVDEP.

Attachment 1

Project Location Map



0 2.5 5 10 Miles



Sources:

Non Orthophotography

Data - Obtained from ESRI Online Services

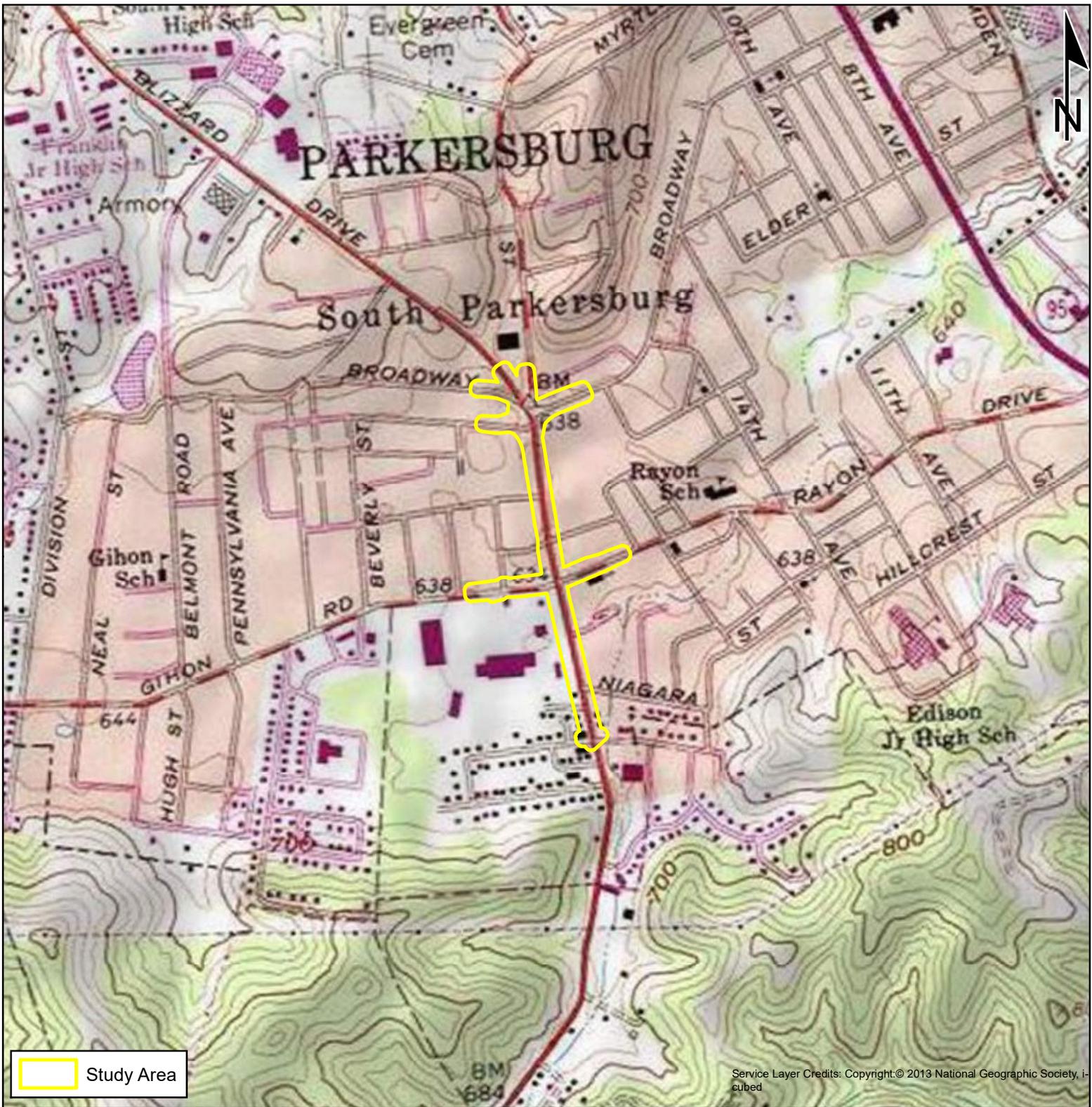
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

West Virginia Department of Transportation
 26th Ave. - Blizard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Project Location Map

Attachment 2

USGS Topographic Map



0 500 1,000 2,000
 Feet

West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography
Data - Obtained from ESRI Online Services USGS Topo Maps (Map Service)
Orthophotography - n/a
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

USGS Topographic Map

Attachment 3

Aerial Map



West Virginia Department of Transportation
26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
State Project: U354-14-9.56 00/STP-0014(174)D
Parkersburg, Wood County

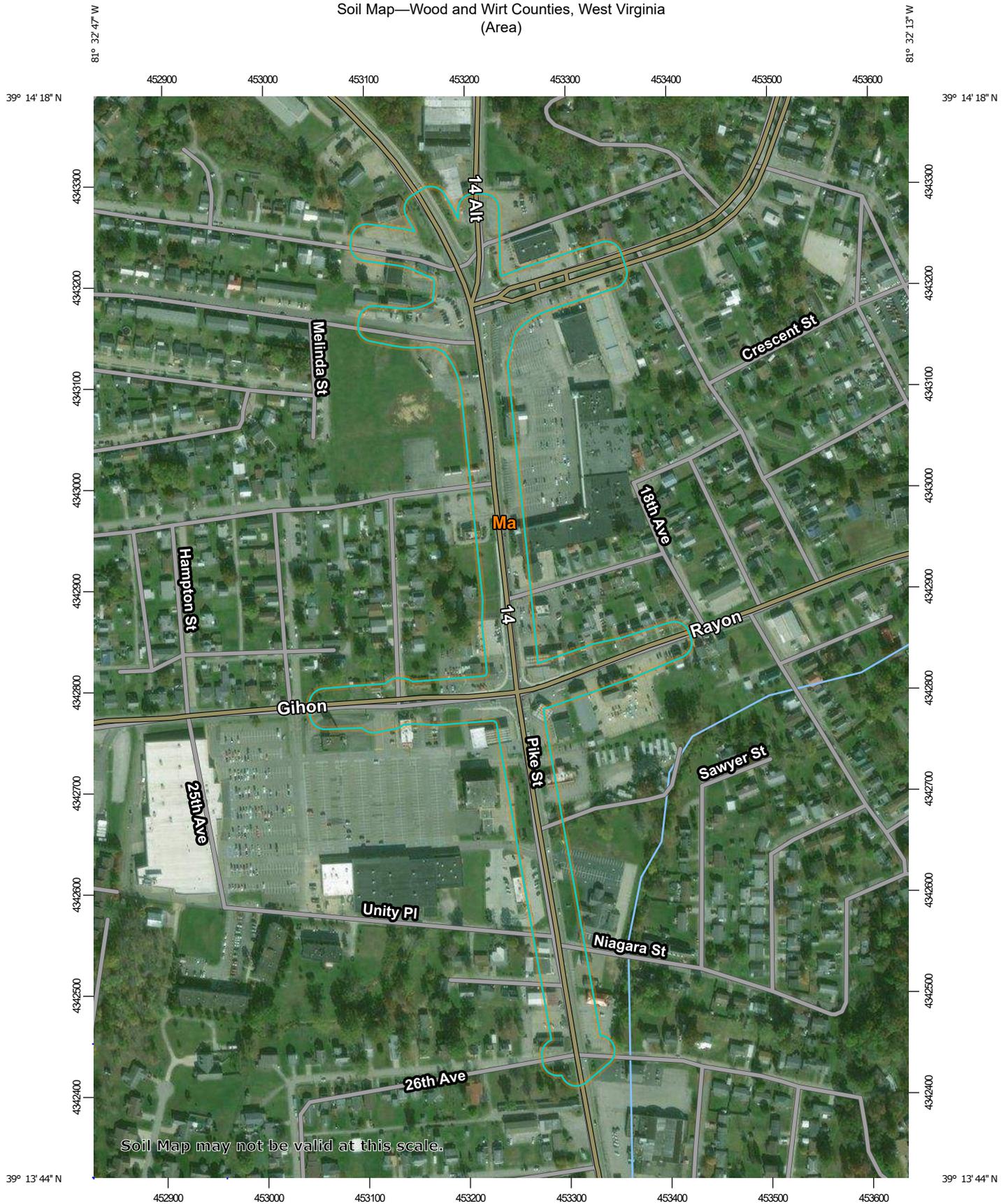
Sources:
Non Orthophotography Data - n/a
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

Aerial Map

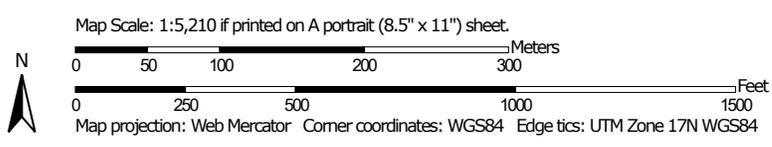
Attachment 4

NRCS Soil Survey

Soil Map—Wood and Wirt Counties, West Virginia
(Area)



Soil Map may not be valid at this scale.



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: Wood and Wirt Counties, West Virginia
Survey Area Data: Version 15, Jun 8, 2020

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

Date(s) aerial images were photographed: Jun 9, 2015—Nov 5, 2016

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
Ma	Made land	18.3	100.0%
Totals for Area of Interest		18.3	100.0%

Wood and Wirt Counties, West Virginia

Ma—Made land

Map Unit Setting

National map unit symbol: k8h8

Elevation: 560 to 1,210 feet

Mean annual precipitation: 34 to 47 inches

Mean annual air temperature: 43 to 64 degrees F

Frost-free period: 161 to 192 days

Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Properties and qualities

Depth to restrictive feature: More than 80 inches

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified

Other vegetative classification: Not Suited (NS)

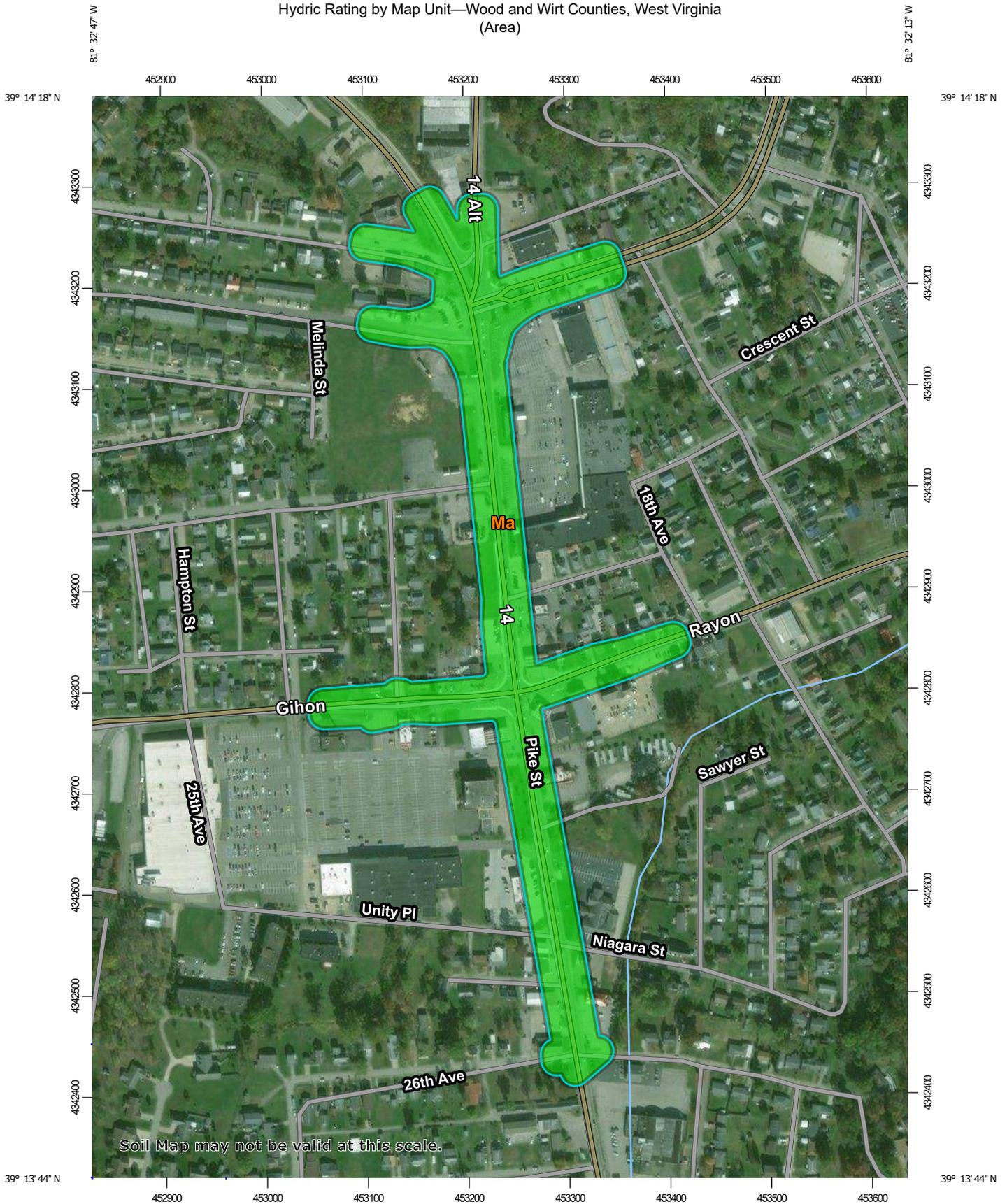
Hydric soil rating: No

Data Source Information

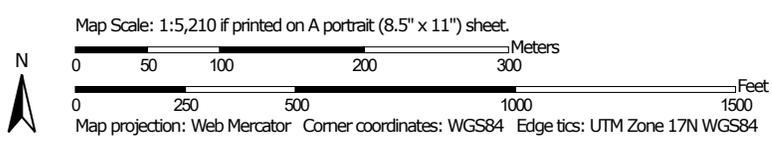
Soil Survey Area: Wood and Wirt Counties, West Virginia

Survey Area Data: Version 15, Jun 8, 2020

Hydric Rating by Map Unit—Wood and Wirt Counties, West Virginia
(Area)



Soil Map may not be valid at this scale.



Hydric Rating by Map Unit—Wood and Wirt Counties, West Virginia
(Area)

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available

Soil Rating Lines

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available

Soil Rating Points

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available

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: Wood and Wirt Counties, West Virginia
Survey Area Data: Version 15, Jun 8, 2020

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

Date(s) aerial images were photographed: Jun 9, 2015—Nov 5, 2016

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.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ma	Made land	0	18.3	100.0%
Totals for Area of Interest			18.3	100.0%

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Rating Options

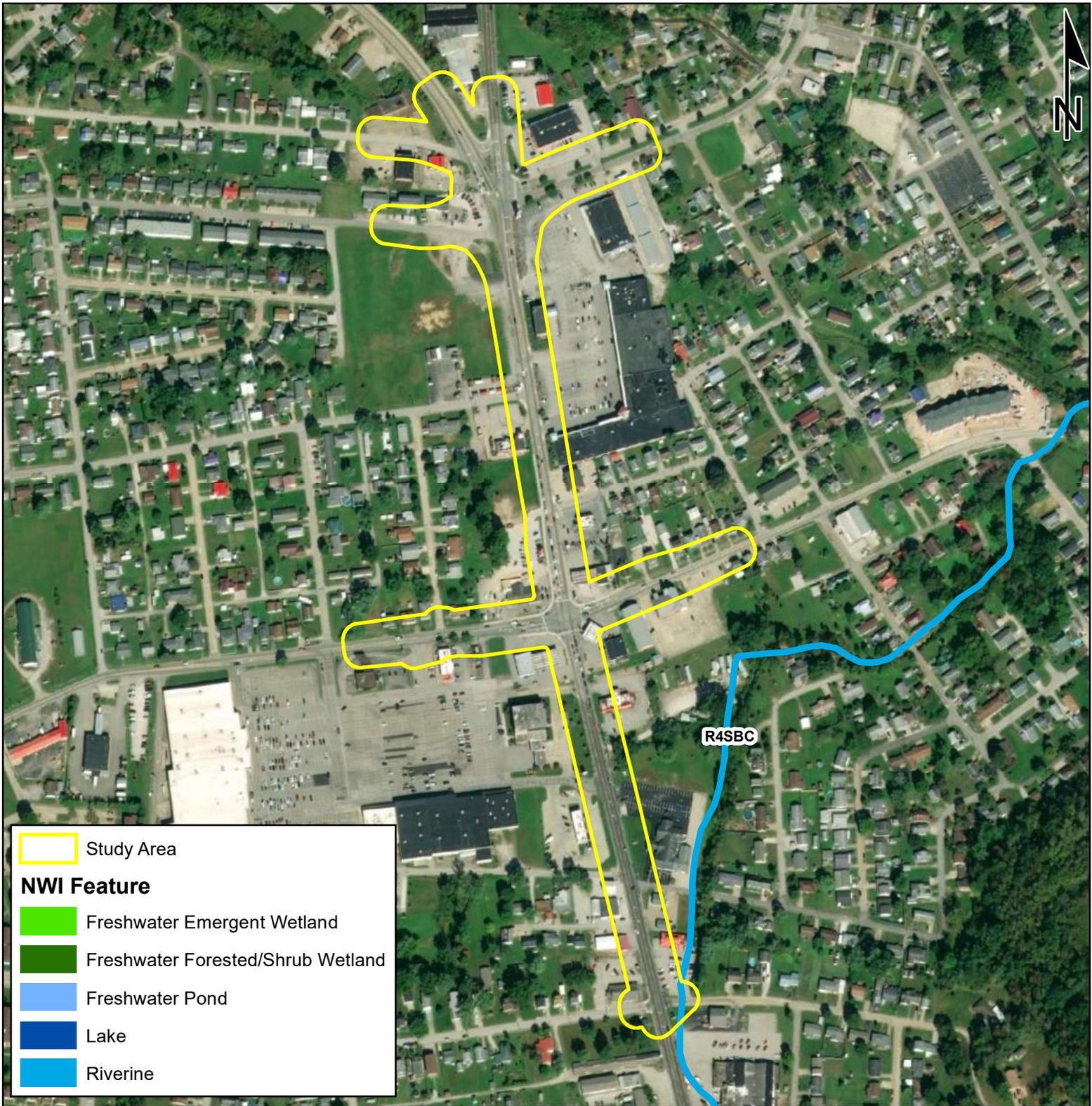
Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Attachment 5

National Wetland Inventory (NWI) Map



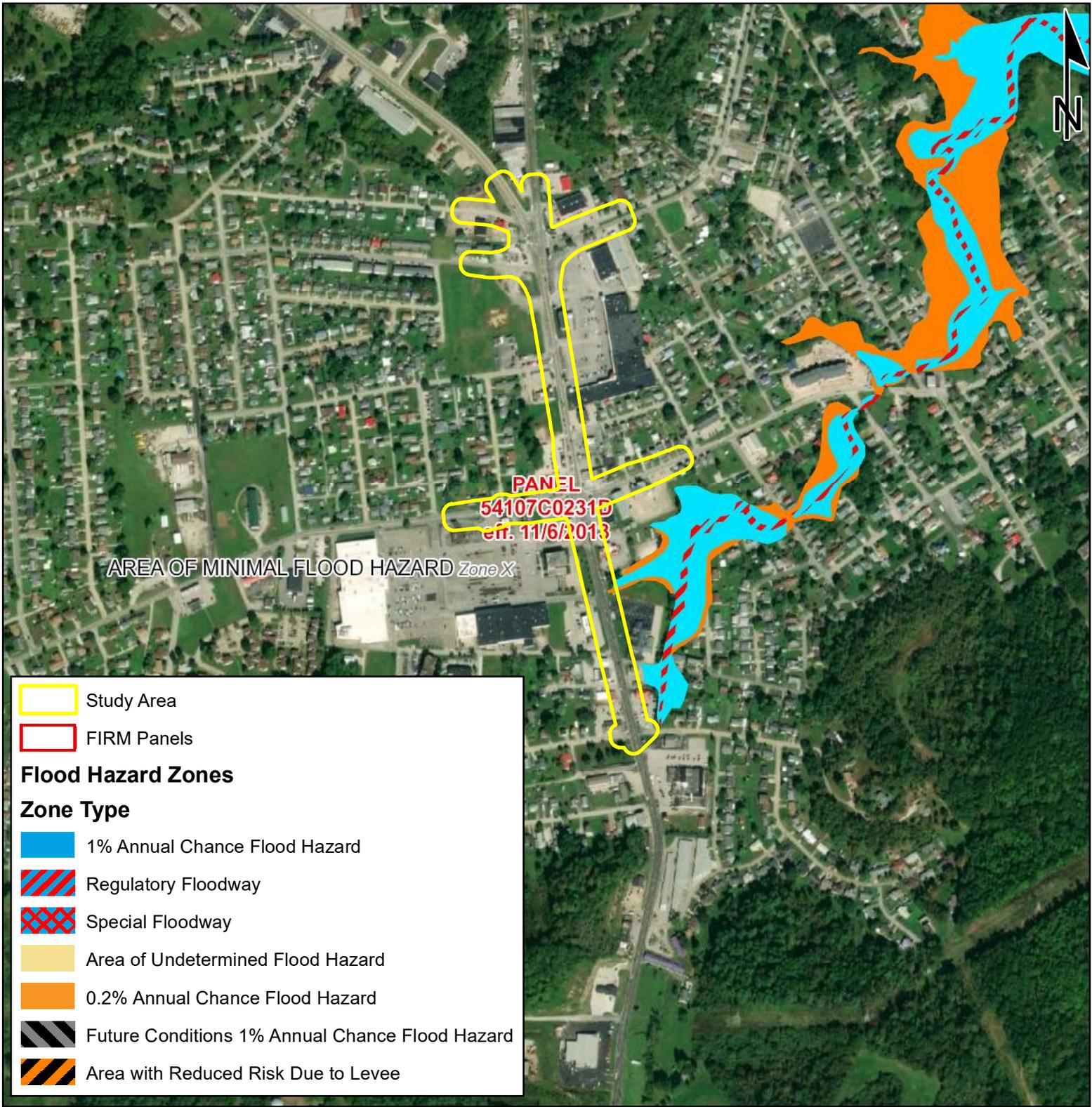
West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography Data - National Wetlands Inventory Layer
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

NWI Map

Attachment 6

FEMA Flood Hazard Map



	Study Area
	FIRM Panels
Flood Hazard Zones	
Zone Type	
	1% Annual Chance Flood Hazard
	Regulatory Floodway
	Special Floodway
	Area of Undetermined Flood Hazard
	0.2% Annual Chance Flood Hazard
	Future Conditions 1% Annual Chance Flood Hazard
	Area with Reduced Risk Due to Levee

0 350 700 1,400
 Feet

West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography Data - FEMA Flood Hazard Layer
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N Map Datum: NAD83

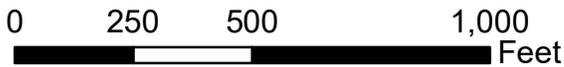
FEMA Flood Hazard Map

Attachment 7

Site Photographs



 Photo
 Study Area



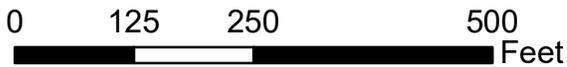
West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography Data - n/a
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

Photo Map



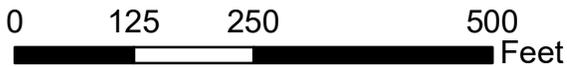
 Photo
 Study Area



West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography Data - n/a
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

Photo Map



West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography Data - n/a
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

Photo Map



Photo 1: Facing north along WV 14 at the northern end of the project.



Photo 2: Facing south along the east side of WV 14.



Photo 3: Between Blizzard Drive and WV 14 at a culvert outlet/inlet.



Photo 4: Facing north along a riprap ditch that feeds into the culvert inlet/outlet.



Photo 5: Facing northwest along Blizzard Drive at the northern end of the project..



Photo 6: Facing south along Blizzard Drive toward WV 14.



Photo 7: Facing west along Broadway Extention.



Photo 8: Facing south along the west side of WV 14.



Photo 9: Facing west along 21st Avenue.



Photo 10: Facing south along the west side of WV 14.



Photo 11: Facing north along the west side of WV 14.



Photo 12: Facing south along the east side of WV 14.



Photo 13: Facing north along the east side of WV 14.



Photo 14: Facing south along the east side of WV 14.



Photo 15: Facing east along Broadway Avenue.



Photo 16: Facing west toward WV 14 from Broadway Avenue.



Photo 17: Facing south along the east side of WV 14.



Photo 18: Facing north along the east side of WV 14.



Photo 19: Facing south along the west side of WV 14.



Photo 20: Facing north along the west side of WV 14.



Photo 21: Facing south along WV 14 toward Rayon Drive/Gihon Road Intersection.



Photo 22: Facing north along the west side of WV 14.



Photo 23: Facing south along the east side of WV 14 toward Rayon Drive/Gihon Road Intersection.



Photo 24: Facing north along the east side of WV 14.



Photo 25: Facing west along the south side of Gihon Road.



Photo 26: Facing east along the south side of Gihon Road.



Photo 27: Facing west along the north side of Gihon Road.



Photo 28: Facing east along the north side of Gihon Road.



Photo 29: Facing west along the south side of Gihon Road.



Photo 30: Facing east along the south side of Gihon Road toward WV 14.



Photo 31: Facing west along the north side of Gihon Road.



Photo 32: Facing east along the north side of Gihon Road toward WV 14.



Photo 33: Facing south along the west side of WV 14 from Gihon Road.



Photo 34: Facing south along the east side of WV 14 from Rayon Drive.



Photo 35: Facing east along the south side of Rayon Drive from WV 14.



Photo 36: Facing east along the north side of Rayon Drive from WV 14.



Photo 37: Facing east along the north side of Rayon Drive.



Photo 38: Facing west along the north side of Rayon Drive toward WV 14.



Photo 39: Facing east along the south side of Rayon Drive.



Photo 40: Facing west along the south side of Rayon Drive toward WV 14.



Photo 41: Facing north along the east side of WV 14 toward Rayon Drive.



Photo 42: Facing south along the east side of WV 14. Note stream along wooded area.



Photo 43: Facing north along the west side of WV 14 toward Gihon Road.



Photo 44: Facing south along the west side of WV 14.



Photo 45: Facing east at the outlet of UNT to Wards Run.



Photo 46: Facing west at the outlet of UNT to Wards Run.



Photo 47: Facing east and downstream along UNT to Wards Run. Note erosion matting on banks/erosion.



Photo 48: Facing west and upstream along UNT to Wards Run.



Photo 49: Facing north along the east side of WV 14.



Photo 50: Facing south along the east side of WV 14 at Niagara Street.



Photo 51: Facing north along the west side of WV 14.



Photo 52: Facing south along the west side of WV 14 at Unity Plaza.



Photo 53: Facing north along the east side of WV 14.



Photo 54: Facing south along WV 14 at 26th Avenue at the southern end of the project.



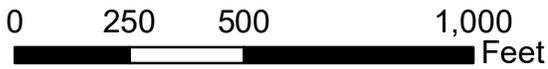
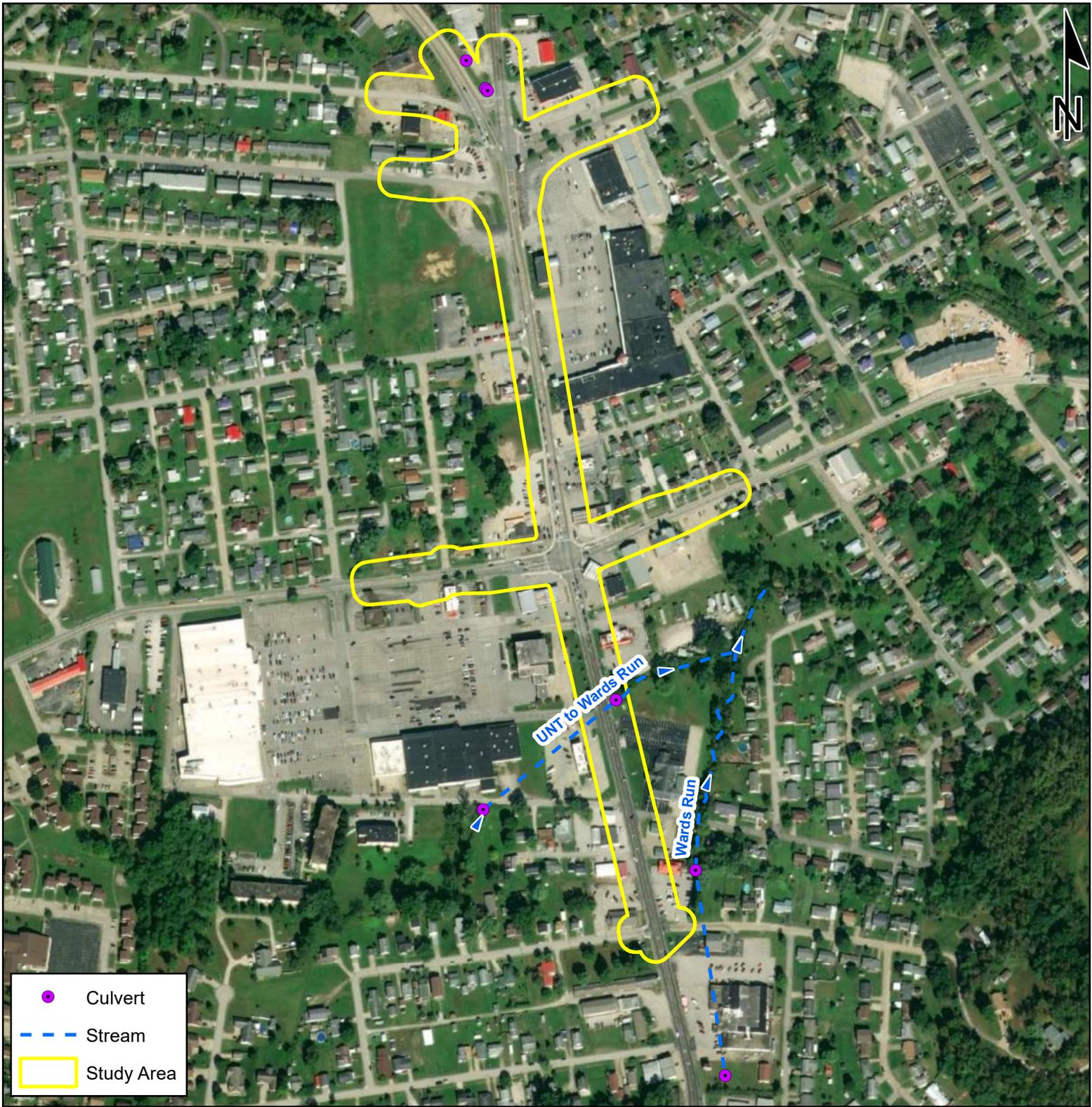
Photo 55: Facing north along the west side of WV 14.



Photo 56: Facing south along WV 14 at 26th Avenue at the southern end of the project.

Attachment 8

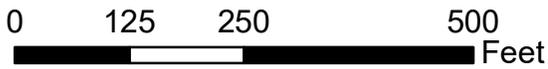
Water Resource Delineation Map



West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography Data - n/a
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

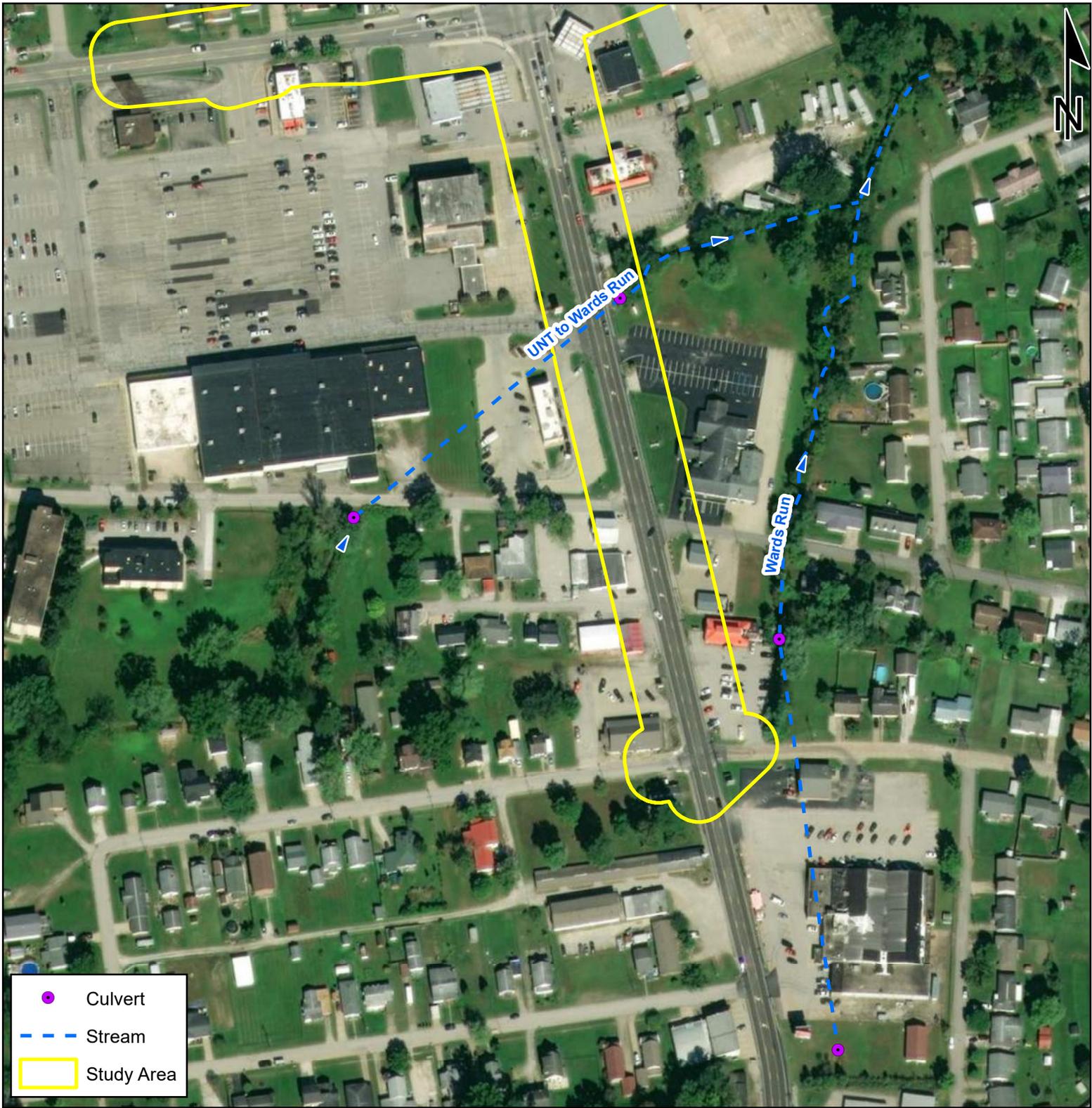
Delineation Map



West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography Data - n/a
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

Delineation Map



- Culvert
- Stream
- Study Area



West Virginia Department of Transportation
 26th Ave. - Blizzard Drive Widen, Add Lanes (0.49 mi)
 State Project: U354-14-9.56 00/STP-0014(174)D
 Parkersburg, Wood County

Sources:
Non Orthophotography Data - n/a
Orthophotography - Obtained from ESRI Online Services World Imagery
Map Projection: UTM Zone 17 N **Map Datum:** NAD83

Delineation Map

Attachment 9

Water Resource Documentation

USACE FILE NO./ Project Name: (v2.1, Sept 2015)		IMPACT COORDINATES: (in Decimal Degrees)		Lat.	39.23212	Lon.	-81.540993	WEATHER:	Sunny	DATE:	10/19/2020			
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)		The UNT to Wards Run is an intermittent stream that runs approximately 180 ft. from west to east through the project area. UNT to Wards Run enters a culvert west of the project area and crosses under WV 14 and exits the culvert just east of WV 14. Approximately 135 ft of Wards Run is currently				MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)		Comments:						
STREAM IMPACT LENGTH:	180	FORM OF MITIGATION:	RESTORATION (Levels I-III)	MIT COORDINATES: (in Decimal Degrees)	Lat.	Lon.		PRECIPITATION PAST 48 HRS:		Mitigation Length:				
Column No. 1- Impact Existing Condition (Debit)			Column No. 2- Mitigation Existing Condition - Baseline (Credit)			Column No. 3- Mitigation Projected at Five Years Post Completion (Credit)			Column No. 4- Mitigation Projected at Ten Years Post Completion (Credit)			Column No. 5- Mitigation Projected at Maturity (Credit)		
Stream Classification:			Stream Classification:			Stream Classification:			Stream Classification:			Stream Classification:		
Percent Stream Channel Slope			Percent Stream Channel Slope			Percent Stream Channel Slope			Percent Stream Channel Slope			Percent Stream Channel Slope		
HGM Score (attach data forms):			HGM Score (attach data forms):			HGM Score (attach data forms):			HGM Score (attach data forms):			HGM Score (attach data forms):		
Average			Average			Average			Average			Average		
Hydrology			Hydrology			Hydrology			Hydrology			Hydrology		
Biogeochemical Cycling			Biogeochemical Cycling			Biogeochemical Cycling			Biogeochemical Cycling			Biogeochemical Cycling		
Habitat			Habitat			Habitat			Habitat			Habitat		
PART I - Physical, Chemical and Biological Indicators			PART I - Physical, Chemical and Biological Indicators			PART I - Physical, Chemical and Biological Indicators			PART I - Physical, Chemical and Biological Indicators			PART I - Physical, Chemical and Biological Indicators		
PHYSICAL INDICATOR (Applies to all streams classifications)			PHYSICAL INDICATOR (Applies to all streams classifications)			PHYSICAL INDICATOR (Applies to all streams classifications)			PHYSICAL INDICATOR (Applies to all streams classifications)			PHYSICAL INDICATOR (Applies to all streams classifications)		
USEPA RBP (High Gradient Data Sheet)			USEPA RBP (Low Gradient Data Sheet)			USEPA RBP (High Gradient Data Sheet)			USEPA RBP (High Gradient Data Sheet)			USEPA RBP (High Gradient Data Sheet)		
1. Epifaunal Substrate/Available Cover			1. Epifaunal Substrate/Available Cover			1. Epifaunal Substrate/Available Cover			1. Epifaunal Substrate/Available Cover			1. Epifaunal Substrate/Available Cover		
2. Embeddedness			2. Embeddedness			2. Embeddedness			2. Embeddedness			2. Embeddedness		
3. Velocity/ Depth Regime			3. Velocity/ Depth Regime			3. Velocity/ Depth Regime			3. Velocity/ Depth Regime			3. Velocity/ Depth Regime		
4. Sediment Deposition			4. Sediment Deposition			4. Sediment Deposition			4. Sediment Deposition			4. Sediment Deposition		
5. Channel Flow Status			5. Channel Flow Status			5. Channel Flow Status			5. Channel Flow Status			5. Channel Flow Status		
6. Channel Alteration			6. Channel Alteration			6. Channel Alteration			6. Channel Alteration			6. Channel Alteration		
7. Frequency of Riffles (or bends)			7. Channel Sinuosity			7. Frequency of Riffles (or bends)			7. Frequency of Riffles (or bends)			7. Frequency of Riffles (or bends)		
8. Bank Stability (LB & RB)			8. Bank Stability (LB & RB)			8. Bank Stability (LB & RB)			8. Bank Stability (LB & RB)			8. Bank Stability (LB & RB)		
9. Vegetative Protection (LB & RB)			9. Vegetative Protection (LB & RB)			9. Vegetative Protection (LB & RB)			9. Vegetative Protection (LB & RB)			9. Vegetative Protection (LB & RB)		
10. Riparian Vegetative Zone Width (LB & RB)			10. Riparian Vegetative Zone Width (LB & RB)			10. Riparian Vegetative Zone Width (LB & RB)			10. Riparian Vegetative Zone Width (LB & RB)			10. Riparian Vegetative Zone Width (LB & RB)		
Total RBP Score			Total RBP Score			Total RBP Score			Total RBP Score			Total RBP Score		
Sub-Total			Sub-Total			Sub-Total			Sub-Total			Sub-Total		
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)			CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)		
WVDEP Water Quality Indicators (General)			WVDEP Water Quality Indicators (General)			WVDEP Water Quality Indicators (General)			WVDEP Water Quality Indicators (General)			WVDEP Water Quality Indicators (General)		
Specific Conductivity			Specific Conductivity			Specific Conductivity			Specific Conductivity			Specific Conductivity		
pH			pH			pH			pH			pH		
DO			DO			DO			DO			DO		
Sub-Total			Sub-Total			Sub-Total			Sub-Total			Sub-Total		
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)			BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)		
WV Stream Condition Index (WVSCI)			WV Stream Condition Index (WVSCI)			WV Stream Condition Index (WVSCI)			WV Stream Condition Index (WVSCI)			WV Stream Condition Index (WVSCI)		
Sub-Total			Sub-Total			Sub-Total			Sub-Total			Sub-Total		
PART II - Index and Unit Score			PART II - Index and Unit Score			PART II - Index and Unit Score			PART II - Index and Unit Score			PART II - Index and Unit Score		
Index	Linear Feet	Unit Score	Index	Linear Feet	Unit Score	Index	Linear Feet	Unit Score	Index	Linear Feet	Unit Score	Index	Linear Feet	Unit Score
0.390	180	70.275	0	0	0	0	0	0	0	0	0	0.908333333	0	0

PART III - Impact Factors (See instruction page to insert default values for MITIGATION BANKING and ILF)			
Temporal Loss-Construction <i>*Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).</i>		Long-term Protection	
Years	0	% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
Sub-Total	0	0 + 5/10 Year Monitoring	101
Temporal Loss-Maturity <i>*Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).</i>		Sub-Total	
% Add. Mitigation	Temporal Loss-Maturity (Years)	0	
0%	0	0	
Sub-Total		0	

PART IV - Index to Unit Score Conversion			
Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.390416667	180	70.275	\$56,220.00

PART V - Comparison of Unit Scores and Projected Balance										
Final Unit Score (Debit) [No Net Loss Value]	70.275	Mitigation Existing Condition - Baseline (Credit)		Mitigation Projected at Five Years Post Completion (Credit)		Mitigation Projected at Ten Years Post Completion (Credit)		Mitigation Projected At Maturity (Credit)		
FINAL PROJECTED NET BALANCE				0		0		0		

Part VI - Mitigation Considerations (Incentives)									
Extent of Stream Restoration <i>*Note1: Reference the instructional handout to determine the correct Restoration Levels (below) for your project *Note2: Place an "X" in the appropriate category (only select one).</i>					Extended Upland Buffer Zone <i>*Note1: Reference instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below) *Note2: Enter the buffer width for each channel side (Left Bank and Right Bank) *Note3: Select the appropriate mitigation type</i>				
<input checked="" type="checkbox"/> Restoration Level 1					Buffer Width	Left Bank			
<input type="checkbox"/> Restoration Level 2						0-50	Preservation and Re-vegetation		
<input type="checkbox"/> Restoration Level 3						51-150	Preservation and Re-vegetation		
Compensatory Mitigation Plan incorporates HUC 12-based watershed approach? (Yes or No) <i>*Note: HUC 12-based watershed approach required to obtain Stream Restoration Incentive</i>						Right Bank			
y						0-50	Preservation and Re-vegetation		
						51-150	Preservation and Re-vegetation		
					Average Buffer Width/Side	0			
Site					Straight Preservation Ratio (v2.1, Sept 2015)				
Impact Unit Yield (Debit)					Final Mitigation Unit Yield				
70.275					#DIV/0!				
Mitigation Unit Yield (Credit)					#DIV/0!				
#DIV/0!									

FCI Calculator for the High-Gradient Headwater Streams in Appalachia

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-Gradient Headwater Streams and Low-Gradient Perennial Streams in Appalachia (Environmental Laboratory U.S. Army Corps of Engineers 2017).

Project Name: WV 14 26th Ave. - Blizzard Drive Widen, Add Lane

Location: Parkersburg, WV

Sampling Date: 8/6/2020

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number:

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.13
Biogeochemical Cycling	0.25
Habitat	0.20

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	33.50	0.28
V_{EMBED}	Average embeddedness of channel.	1.35	0.23
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.08	0.04
V_{BERO}	Total percent of eroded stream channel bank.	69.44	0.70
V_{LWD}	Number of down woody stems per 100 feet of stream.	2.22	0.28
V_{TDBH}	Average dbh of trees.	11.64	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.49	0.23
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	13.13	0.16
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.09	0.09

High-Gradient Headwater Streams in Appalachia Field Data Sheet and Calculator

Team: M. Kestner	Latitude/UTM Northing: 39.23212
Project Name: 26th Ave. - Blizzard Drive Widen, Add Lane	Longitude/UTM Easting: -81.540993
Location: Parkersburg, WV	Sampling Date: 8/6/2020
SAR Number: 	Reach Length (ft): 180
Stream Type: Intermittent Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 33.5 %

List the percent cover measurements at each point below:

30	15	20	55	60	45	25	35	30	20
----	----	----	----	----	----	----	----	----	----

2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 1.4

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

1	1	1	1	2	2	2	2	2	2
1	2	2	1	1	1	1	2	1	2
2	1	1	1	1	1	1	1	2	1
1	2	1	1	1	2	1	1	1	1

3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 0.08 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

0.00	0.00	0.00	0.00	6.00	8.00	10.00	3.00	2.00	5.00
4.00	1.00	0.10	0.08	0.12	0.08	0.15	0.08	0.08	0.08
0.08	0.10	0.08	0.08	0.08	0.08	0.20	0.08	0.08	0.08
0.08	0.08	0.08	0.20	0.00	0.08	0.08	0.08	0.08	0.08

4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 69 %

Left Bank: **50 ft** Right Bank: **75 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5 V_{LWD} Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. 2.2

Number of downed woody stems: **4**

6 V_{TDBH} Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. 11.6

List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:

Left Side				Right Side			
12	6			6	6		
24	4			6			
4	16			4			
6				24			
18				18			
24				4			
18				6			
4				18			
4				24			

7 V_{SNAG} Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated. 0.0

Left Side: **0** Right Side: **0**

8 V_{SSD} Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated. Not Used

Left Side: Right Side:

9	V _{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	0.49
Group 1 = 1.0		Group 2 (-1.0)	
<input checked="" type="checkbox"/>	<i>Acer rubrum</i>	<input type="checkbox"/>	<i>Magnolia tripetala</i>
<input checked="" type="checkbox"/>	<i>Acer saccharum</i>	<input type="checkbox"/>	<i>Nyssa sylvatica</i>
<input type="checkbox"/>	<i>Aesculus flava</i>	<input type="checkbox"/>	<i>Oxydendrum arboreum</i>
<input type="checkbox"/>	<i>Asimina triloba</i>	<input type="checkbox"/>	<i>Prunus serotina</i>
<input type="checkbox"/>	<i>Betula alleghaniensis</i>	<input type="checkbox"/>	<i>Quercus alba</i>
<input type="checkbox"/>	<i>Betula lenta</i>	<input type="checkbox"/>	<i>Quercus coccinea</i>
<input type="checkbox"/>	<i>Carya alba</i>	<input type="checkbox"/>	<i>Quercus imbricaria</i>
<input type="checkbox"/>	<i>Carya glabra</i>	<input type="checkbox"/>	<i>Quercus prinus</i>
<input type="checkbox"/>	<i>Carya ovalis</i>	<input type="checkbox"/>	<i>Quercus rubra</i>
<input type="checkbox"/>	<i>Carya ovata</i>	<input type="checkbox"/>	<i>Quercus velutina</i>
<input type="checkbox"/>	<i>Cornus florida</i>	<input type="checkbox"/>	<i>Sassafras albidum</i>
<input type="checkbox"/>	<i>Fagus grandifolia</i>	<input type="checkbox"/>	<i>Tilia americana</i>
<input type="checkbox"/>	<i>Fraxinus americana</i>	<input type="checkbox"/>	<i>Tsuga canadensis</i>
<input type="checkbox"/>	<i>Liriodendron tulipifera</i>	<input checked="" type="checkbox"/>	<i>Ulmus americana</i>
<input type="checkbox"/>	<i>Magnolia acuminata</i>		
3 Species in Group 1		2 Species in Group 2	

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	13.13 %																
		<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>30</td> <td>0</td> <td>25</td> <td>0</td> <td>0</td> <td>0</td> <td>30</td> <td>20</td> </tr> </table>	Left Side				Right Side				30	0	25	0	0	0	30	20	
Left Side				Right Side															
30	0	25	0	0	0	30	20												
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	0.09																																				
		<table border="1"> <thead> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not >100)</th> </tr> </thead> <tbody> <tr> <td>Residential districts, 1/4 - 1/3 ac (38% to 30% cover)</td> <td>0.1</td> <td>30</td> <td>30</td> </tr> <tr> <td>Impervious areas (parking lots, roofs, driveways, etc)</td> <td>0</td> <td>20</td> <td>50</td> </tr> <tr> <td>Open space (pasture, lawns, parks, etc.), grass cover <50%</td> <td>0.1</td> <td>10</td> <td>60</td> </tr> <tr> <td>Forest and native range (<50% ground cover)</td> <td>0.5</td> <td>10</td> <td>70</td> </tr> <tr> <td>Urban districts, Commercial and business (>70% cover)</td> <td>0</td> <td>30</td> <td>100</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Residential districts, 1/4 - 1/3 ac (38% to 30% cover)	0.1	30	30	Impervious areas (parking lots, roofs, driveways, etc)	0	20	50	Open space (pasture, lawns, parks, etc.), grass cover <50%	0.1	10	60	Forest and native range (<50% ground cover)	0.5	10	70	Urban districts, Commercial and business (>70% cover)	0	30	100													
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Summary			Notes:
Variable	Value	VSI	
V _{CCANOPY}	34 %	0.28	<div style="border: 1px solid red; padding: 5px;"> <p>Water Quality: Specific Conductivity: 0.37 ms/cm pH: 7.17 DO: 2.54 mg/L Temp: 28.72 C</p> </div>
V _{EMBED}	1.4	0.23	
V _{SUBSTRATE}	0.08 in	0.04	
V _{BERO}	69 %	0.70	
V _{LWD}	2.2	0.28	
V _{TDBH}	11.6	1.00	
V _{SNAG}	0.0	0.10	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	0.49	0.23	
V _{DETRITUS}	13.1 %	0.16	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	0.09	0.09	

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME _____	LOCATION _____	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT _____ LONG _____	RIVER BASIN _____	
STORET # _____	AGENCY _____	
INVESTIGATORS _____		
FORM COMPLETED BY _____	DATE _____ TIME _____ AM PM	REASON FOR SURVEY _____

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
Note: determine left or right side by facing downstream.																					
SCORE ___ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE ___ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE ___ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE ___ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE ___ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE ___ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			

Total Score _____