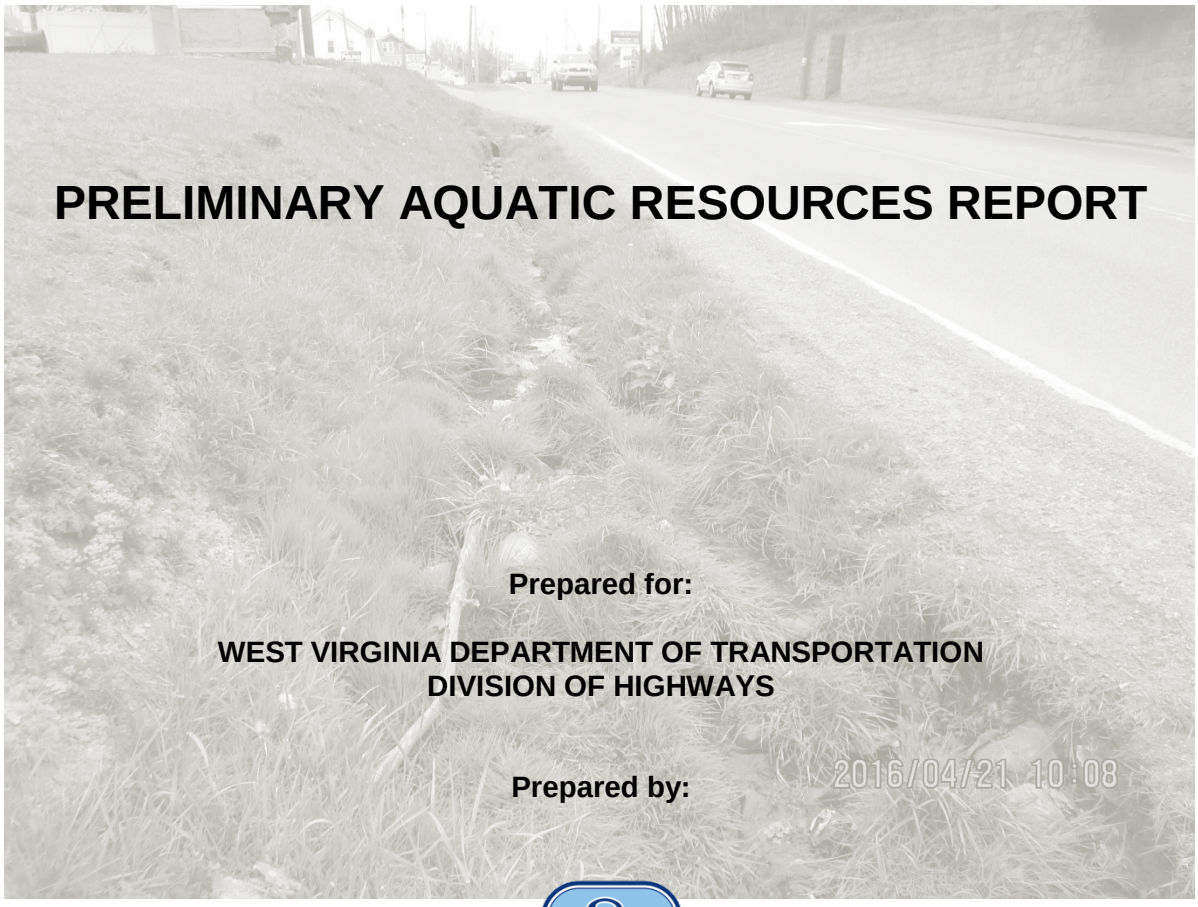
US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

STATE PROJECT NUMBER: X341-ZWA/Y-1.00 00
FEDERAL PROJECT NUMBER: STP-0019(419)D



PRELIMINARY AQUATIC RESOURCES REPORT

Prepared for:

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

Prepared by:

SKELLY and LOY, Inc.
Engineers-Consultants
Morgantown, WV

FEBRUARY 2018

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1.0 INTRODUCTION

This report presents the wetland delineation and stream assessment findings associated with the West Virginia Division of Highways (WVDOH) Beckley Z-Way Shady Spring to Beaver project. The report provides baseline data regarding project area aquatic resources and serves as a technical support document to assist the United States Army Corps of Engineers (USACE) in identifying jurisdictional waters of the US found within the project study area.

The project is located along US 19 between the towns of Beaver and Shady Spring in Raleigh County, West Virginia (Figure 1). The proposed project involves the widening of existing US 19 and placement of a third continuous turning lane. The northern terminus is located in Beaver at the intersection of US 19 and WV 307 (Airport Road). The southern terminus is located in Shady Spring in the general vicinity of the intersection of US 19 and WV-3 (Hinton Road). An off-line segment is located between Old Crow Road and WV 307 approximately 0.25 miles north of US 19. The project study area is approximately 4.4 miles in length and 290 feet wide. The project study area contains an area of approximately 162 acres. Land use features along the transportation corridor can be characterized as urban/developed and consist of predominately residential and commercial uses. Resources within the project study area were created, fragmented, and/or degraded as a result of urbanization and road development.

2.0 METHODOLOGIES

2.1 Palustrine Wetland Delineation Methodologies

The identification and delineation of palustrine wetland habitats were conducted through the review of existing information and field investigations. Existing information utilized included: the United States Geological Survey (USGS), Beckley, WV (USGS 2011[a]), Crab Orchard, WV (USGS 2011[b]), and Shady Spring, WV (USGS 2011[c]) 7.5 minute topographical quadrangles; United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Wetlands Mapper (USFWS 2016[a]); the Soils Data Mart for Raleigh County, West Virginia (United States Department of Agriculture, Natural Resource Conservation Service [USDA, NRCS] 2009); and the NRCS National Hydric Soils List (USDA, NRCS 2015).

The wetlands field investigation and delineation were conducted in accordance with the *Corps of Engineers Wetlands Delineation Manual* (USACE 1987); the *Regional Supplement to*

the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (USACE 2012[a]); Classification of Wetlands and Deepwater Habitats of the United States (Cowardin 1979); and Section 404 of the *Federal Clean Water Act*. Wetland findings information was recorded on a wetland determination data form amended specifically to the Eastern Mountains and Piedmont Region. Pertinent wetland information included dominant vegetation, Munsell soil color, hydric soil indicators, signs of hydrology, and types of disturbance (if applicable), and can be found on the data forms included in Appendix A. The wetland boundaries were surveyed utilizing mapping grade global positioning systems (GPS) equipment. GPS survey data were post processed and differentially corrected using Trimble GPS Pathfinder Office and digitally incorporated into ESRI ArcMap.

2.2 Streams Methodologies

The streams (rivers, streams, and drainage ditches) investigation included: the field inventory, classification, and delineation of stream resources; the baseline assessment of stream conditions; and a review of the regulatory protection status of streams found within the project study area.

2.2.1 Streams Field Inventory, Classification, and Delineation

The streams inventory, classification, and delineation included a review of the USGS Beckley, WV (USGS 2011[a]), Crab Orchard, WV (USGS 2011[b]), and Shady Spring, WV (USGS 2011[c]) 7.5 minute topographical quadrangles and the field inventory, classification, and delineation of open water systems. Open water limits were surveyed utilizing a mapping grade GPS unit and corrected survey data were digitally incorporated into ESRI ArcMap.

Streams were classified and delineated in accordance with West Virginia and USACE regulatory guidance. The following pertinent West Virginia and USACE stream classification definitions and guidance, and best professional judgment elements were used in boundary delineations:

- *West Virginia Code Title 46 Legislative Rules Environmental Quality Board Series 1 Requirements Governing Water Quality Standards*
- *Nationwide Permits, Conditions, District Engineer's Decision, Further Information and Definitions* (USACE 2012[b])

- *Exemptions for Construction or Maintenance of Irrigation Ditches and Maintenance of Drainage Ditches Under Section 404 of the Clean Water Act* [USACE 2007(b)]
- *Ordinary High Water Mark Identification* (USACE 2005) elements
- Best professional judgment elements used in stream boundary determinations:
    - Macroinvertebrate occurrence, abundance, and diversity;
    - Presence or signs of baseflow;
    - Amount, type, depth, width, embeddedness, relative position, and composition of stream substrate;
    - Stream bank and/or ordinary high water mark characteristics;
    - Presence of soil versus stream substrate; and
    - Presence of terrestrial vegetation within a channel.

2.2.2 Baseline Stream Condition Assessment

The West Virginia Stream and Wetland Valuation Metric (SWVM) Version 2.1 (West Virginia Interagency Review Team 2015) was used to assess baseline stream conditions for perennial, intermittent, and ephemeral streams. Output values originating from the SWVM model present the baseline condition of an individual perennial, intermittent, or ephemeral stream or section of a stream as an index score ranging from 0.0 to 1.0. An index score of 0.0 identifies a severely impaired stream while an index value of 1.0 identifies an unimpaired stream with high ecological quality. Index scores between 0.0 and 1.0 identify a stream reach that is between impaired and unimpaired.

The SWVM provides a means to quantify stream debits and mitigation criteria required for projects requiring a waterway encroachment permit. The product of a stream's site index score and linear feet of impact result in a SWVM unit score value that is the stream debit associated with a project. The calculation of the stream debit is outside of the current scope of this document. SWVM scores are presented in Table 5.

Biological, chemical, and physical assessment elements used by the SWVM to synthesize the index score include: stream macroinvertebrate composition data; water chemistry; and physical in-stream and adjacent riparian habitat characteristics. Methodologies used to assess the aforementioned SWVM elements are presented below.

Macroinvertebrate Composition

Macroinvertebrate sampling and processing were conducted in accordance with methodologies found within *A Stream Condition Index for West Virginia Wadeable Streams* (WVSCI) and addendum (Gerritson 2000 and 2010), *Rapid Bioassessment Protocols* (RBP) *for Use in Streams and Wadeable Rivers* (Barbour 1999), and the West Virginia Department of Environmental Protection (WVDEP) *Watershed Assessment Branch 2015 Standard Operating Procedures* (WVDEP 2015[a]).

Information derived from the macroinvertebrate bioassesment was aggregated into a stream condition index specific to West Virginia (WVSCI). The index includes six biological attributes (metrics) that rate structure and function of the bottom-dwelling macroinvertebrate assemblage and provide a measure of stream ecosystem. Index values range from 0 to 100. A high index score identifies a stream with high ecological quality while a low index score identifies a stream with low ecologic quality that is impaired (Table 1).

Table 1.
WVDEP WVSCI Scoring Summary

WVSCI Score Range	Stream Quality	Stream Impairment
100 – 78.01	Very Good	Not - Impaired
78.00 – 68.01	Good	
68.00 – 60.61	Gray Zone	Gray Zone
60.60 – 45.01	Slightly Impaired	Impaired
45.00 – 22.01	Moderately Impaired	
22.00 – 0.00	Severely Impaired	

[1]Source: WVDEP 2014.

The WVSCI field sampling was conducted within the mandated field sampling survey period (April 15 through October 15). To the best practical extent, intermittent and perennial streams were sampled. In circumstances in which stream segments could not be sampled in accordance with WVSCI sampling protocol, sampling was not conducted. The field sampling procedure requires: a depth sufficient enough to allow the placement of a kick-net and a total of one square meter of riffle habitat within a 328.1 feet length of stream channel; a water depth that exceeds the width of the lip of sampling net; and interstitial flow between pool habitat (WVDEP 2015[a]). The sampling of low gradient streams without riffle habitat is outside of the WVSCI scope.

Water Chemistry

Water chemistry parameters measured for perennial, intermittent, and ephemeral streams, as per the SWVM methodology requirements, include water temperature, dissolved oxygen, pH, and conductivity. Water temperature and dissolved oxygen were measured in the field with a YSI 55 handheld dissolved oxygen instrument. Conductivity and pH were measured in the field with a YSI 63 handheld pH and conductivity instrument. Instrument usage requires the probes to be completely submerged in flowing water. Therefore, field sampling was limited by on-site flow conditions found during field investigations. In circumstances in which water chemistry field sampling is not practical, the SWVM model assumes the water chemistry parameters are of good quality.

Physical Instream and Adjacent Riparian Habitat Assessments

Ephemeral, intermittent, and perennial stream reaches were assessed in accordance with the United States Environmental Protection Agency (EPA) high gradient streams visual-based habitat assessment found within RBP *for Use in Streams and Wadeable Rivers* (Barbour 1999). In addition to the EPA RBP, ephemeral, intermittent, and low-gradient perennial streams were also assessed in accordance with the *Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Headwater Streams and Low-Gradient Perennial Streams in Appalachia* (HGM) (USACE 2017).

The EPA high gradient streams visual-based habitat assessment evaluates 10 parameters associated with instream and riparian habitat features that influence water quality and aquatic communities. The features include the diversity and quality of stream substrate, channel morphology, bank structure, and riparian vegetation. The features are rated using a numerical scale of 0 to 20 within a 328.1 feet sample reach. Individual parameter scores are totaled to identify a final habitat ranking score for a stream reach. Final habitat ranking scores which are expressed at higher values correlate to optimal habitat characteristics. Scores with low values indicate that a stream reach exhibits suboptimal habitat characteristics. High gradient streams visual-based habitat assessment scores are used by SWVM to assess existing baseline in-stream and riparian habitat conditions.

The HGM assessment is a model that evaluates ten parameters and provides a functional capacity index (FCI) for hydrology, biochemical cycling, and habitat functions ranging from 0.0 to 1.0. The assessment method is only applicable to high-gradient ephemeral and intermittent, and low-gradient perennial stream reaches in the Appalachian region. The stream assessment reach included the stream channel and a 50-foot wide corridor (25 feet from either side of the channel) along the stream sample reach. The FCI is a measure of the functional capacity of an ecosystem relative to an established West Virginia and Eastern Kentucky standard reference site. A FCI of 1.0 indicates the sample reach functions at a level equal to the reference standard site. FCIs less than 1.0 indicate on-site ecologic circumstances are limiting a stream reach from functioning at a level equal to the reference standard site. The product of a stream sample reach's FCI and length are used to determine the functional capacity units (FCUs) of a stream sample reach. FCU is a measure used in determining project impacts, comparing project alternatives, determining mitigation requirements, and evaluating mitigation success.

2.2.3 Regulatory Protection Status of Streams

West Virginia Stream Use and Protection Status

Secondary sources were used to identify designated water use Category A (Water Supply, Public), Category B (Propagation and Maintenance of Fish and other Aquatic Life), Category C (Water Contact Recreation), Category D (Agriculture and Wildlife Uses), and Category E (Water Supply Industrial) waters. Additionally secondary source information used to identify waters provided Tier 1, 2, and 3 Anti-degradation Policy Water Protection.

Federal Protection Status

The National Wild and Scenic Rivers System (USFWS 2016[b]) web page was reviewed to determine if federally listed wild and scenic rivers are present within the project study area.

2.3 Waters of the US Assessment

The applicability of the waters of the US designation for the open waters found within the project study area were assessed in accordance with the non-amended 33 CFR 328.3 and guidance provided in the EPA and USACE *Clean Water Act Jurisdiction Memorandum Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States* (EPA and USACE 2008). The amended 33 CFR 328.3 was not used to delineate waters of the US because on October 9, 2015 the Sixth Circuit issued an order that stayed the amended 33 CFR 328.3 (effective date of August 28, 2015).

Waters of the US include traditional navigable waters, wetlands adjacent to traditional navigable waters, non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (typically three months), and wetlands that directly abut such tributaries. Waters requiring the USACE to perform a fact-specific evaluation to determine the presence of waters of the US include non-navigable tributaries that are not relatively permanent, wetlands adjacent to non-navigable tributaries that are not relatively permanent, and wetlands adjacent but do not directly abut a relatively permanent non-navigable tributary. Waters generally not defined or regulated as waters of the US include swales or erosional features (gullies, small washes characterized by low volume, infrequent, or short duration flow) and ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.

3.0 FINDINGS

The findings presented below are the result of investigations conducted March through April 2016 and the interpretation of USACE guidance specific to the identification of jurisdictional waters of the US. Site specific rationale is based upon what is considered normal, atypical, or disturbed under current conditions.

3.1 General Description of the Project Study Area

Three local watersheds (Left Fork, Little Beaver Creek, and Sand Branch) were identified within the project study area. Sand Branch is a local watershed to Little Beaver Creek sub-basin. Left Fork and Little Beaver Creek watersheds are sub-basins to Beaver Creek located outside of the project study area (Figure 2). All of the local watersheds are part of the

New River sub-watershed and the Kanawha River drainage basin. Located east of Shady Spring Mountain, the hillsides of the study area have been excavated for residential housing, commercial properties, industrial facilities, and transportation use. The study area intersects a series of headwater stream valleys, ridges, sloping hillsides, and a part of the Little Beaver Creek floodplain.

The dominant land uses within the project study area are mixed low-density residential and commercial properties. Urbanization has impacted resources through runoff, water quality, and riparian habitat degradation. The diverse transportation network (state, county, and local roads) and storm water drainage network have degraded streams due to fragmentation and channelization. Other land use and land cover include industrial facilities, deciduous forestland, and agriculture land. Historic mining in the vicinity has impacted water quality, and evidence of acid mine drainage (AMD) was observed throughout the project area. Resources were either created as a result of development or degraded through development. Headwater stream reaches were diverted/relocated, channelized, and piped; storm water discharge further degraded the biological, chemical, and physical function of the streams.

3.2 Wetland Findings

Secondary Source Soil and NWI Findings

Secondary research soil findings indicated the project study area contained six hydric soils (Atkins loam, warm, 0 to 3% slopes, frequently flooded [AtA]; Cotaco loam, 3 to 8% slopes [CtB]; Laidig channery loam, 3 to 15% slopes, rubbly [LaC]; Morehead silt loam, 0 to 3% slopes [MoA]; Philo-Pope complex, 0 to 3% slopes, occasionally flooded [PhA]; and Pope fine sandy loam, warm, 0 to 3% slopes, occasionally flooded [PoA]) (Figure 3). AtA was noted to occur on floodplains and terraces. CtB was noted to occur on stream terraces, ridges, terraces, and mountain slopes. LaC was noted to occur on floodplains, mountain slopes, and escarpments. MoA was noted to occur on terraces, stream terraces, mountain slopes, and ridges. PhA was noted to occur on floodplains, stream terraces, and terraces. PoA was noted to occur on floodplains.

The NWI mapping identified five NWI wetlands within the project study area (Figure 4). The NWI wetlands are classified as palustrine unconsolidated bottom permanently flooded dike/impounded (PUBHh) wetlands. All five were verified as wetlands or constructed ponds. Two were determined to be wetlands and met the three criteria (hydrology, hydrophytic

vegetation, and hydric soils) for delineation as wetland habitat. Three were determined to be constructed ponds and met criteria for palustrine open water habitat. The PUBHh wetland located at the northern extent of the study area on the Little Beaver Creek floodplain was identified as a field delineated wetland (WL26) and the PUBHh wetland west of US 19 near the southern extent of the study area was identified as a field delineated wetland (WL10). The PUBHh wetland in the vicinity of US 19 and Liberty gas station and the two PUBHh wetlands located at the southern extent of the project study area were confirmed to be constructed and maintained for use as ornamental ponds.

General Field Findings Summary

A total of 21 palustrine wetlands and four ponds were delineated within the project study area during on-site investigations conducted in March 2016. All of the wetlands and ponds were identified as waters of the US (Figure 5) (Table 2). Wetland findings are presented below. Wetland determination data forms, photographs, and upland data forms are located in the project's technical file.

Table 2.
Project Study Area Regulated Wetlands Summary

Wetland ID	Man-Induced or Disturbed	Vegetative Classification	Area (ac.)	Wetland Type	Watershed
Wetland Waters of the US					
WL01	Disturbed	100% PEM	0.004	Slope	Sand Branch
WL02	N/A	100% PEM	0.004	Slope	Little Beaver Creek
WL03	Disturbed	100% PEM	0.009	Slope	Sand Branch
WL04	Disturbed	40%PEM/60%PSS	0.025	Slope	Little Beaver Creek
WL05	N/A	40%PEM/20%PSS/40%PFO	0.146	Slope	Little Beaver Creek
WL07	N/A	20%PEM/20%PSS/60%PFO	0.335	Slope	Little Beaver Creek
WL08	N/A	100% PEM	0.074	Slope	Little Beaver Creek
WL09	Disturbed	100% PEM	0.005	Slope	Little Beaver Creek
WL10	Man-Induced	100% PEM	0.090	Slope	Little Beaver Creek
WL11	Man-Induced	100% PEM	0.635	Slope	Little Beaver Creek
WL12	N/A	80%PEM/20%PSS	0.061	Slope	Little Beaver Creek
WL13	N/A	100% PEM	0.031	Slope	Little Beaver Creek

Table 2 (continued).
Project Study Area Regulated Wetlands Summary

Wetland ID	Man-Induced or Disturbed	Vegetative Classification	Area (ac.)	Wetland Type	Watershed
WL14	N/A	100% PEM	0.006	Slope	Little Beaver Creek
WL15	N/A	100% PEM	0.006	Slope	Little Beaver Creek
WL18	Disturbed	30%PEM/70%PSS	0.042	Slope	Little Beaver Creek
WL19	Man-Induced	100% PEM	0.009	Slope	Sand Branch
WL21	Disturbed	100% PEM	0.005	Slope	Sand Branch
WL22	Man-Induced	100% PEM	0.003	Slope	Little Beaver Creek
WL23	Disturbed	100% PEM	0.027	Slope	Little Beaver Creek
WL24	Disturbed	100% PEM	0.011	Fringe	Little Beaver Creek
WL26	Man-Induced	100% POW	0.128	Depression	Little Beaver Creek
PND01	N/A	100% POW	0.146	N/A	Little Beaver Creek
PND02	N/A	100% POW	0.031	N/A	Left Fork
PND03	N/A	100% POW	0.149	N/A	Left Fork
PND04	N/A	100% POW	0.349	N/A	Little Beaver Creek
		Total	**2.331**		

3.2.1 Wetland Waters of the US

Twenty-one wetlands (Wetlands WL01 through WL05, WL07 through WL15, WL18, WL19, WL21 through WL24, and WL26) totaling 1.656 ac, were identified as wetland waters of the US. Ten wetlands (WL04, WL09, WL12, WL13, WL14, WL19, WL21, WL23, WL24, and WL26) were delineated entirely within the study area. Eleven wetlands (WL01, WL02, WL03, WL05, WL07, WL08, WL10, WL11, WL15, WL18, and WL22) extend beyond the project study area boundary. The wetlands were located in swales or adjacent to the project study area stream system and directly connected to a water of the US or drained to a water of the US *via* a drainage pattern and/or seepage outlet. Project study area wetlands are disturbed, degraded, and created from the residential and commercial development and located in swales fragmented by US 19. Nine wetlands (WL01, WL03, WL04, WL08, WL09, WL18, WL21, WL24, and WL23) were disturbed and degraded by development due to sewer installation, culvert installation, roadway influence, and active property maintenance. Five wetlands (WL10, WL11, WL19, WL22, and WL26) were created through development of the surrounding

transportation network and residential/commercial properties. Although project area wetlands met the three wetland criteria (hydrology, hydrophytic vegetation, and hydric soils), the land use and fragmented study area and transportation network have degraded and negatively impacted the majority.

Connectivity to a water of the US is assumed for five wetlands (Wetlands WL13, WL14, WL15, WL22, and WL26) that lacked a visible connection to waters of the US. It is assumed that wetland WL13 has a logical subsurface connection to a wetland outside of the project study area that directly discharged to Little Beaver Creek due to proximity. Wetlands WL14 and WL15 are assumed to have a subsurface hydrologic connection to Little Beaver Creek due to their proximity on an old hillslope cut approximately 10 feet from the creek. Located in a residential lawn, wetland WL22 is assumed to have a subsurface hydrologic connection to an unnamed tributary of Little Beaver Creek evidenced by seepage in a swale east of the wetland (connection is assumed under US 19). It is assumed wetland WL26 has a direct connection during flood events to a water of the US (Little Beaver Creek) due to its location on the Little Beaver Creek floodplain and subsurface hydrologic connection (high seasonal groundwater).

Seventeen wetlands (81%) are under 0.100 ac in area within the project study area. Three wetlands are between 0.100 ac and 0.400 ac within the project study area. Wetland WL11 is the most expansive wetland and encompassed 0.635 ac. Wetland WL11 is located in a parcel that was excavated for commercial property but was not developed. STR12-PER-SR01 flows into the wetland and portions of the flow have been diverted from a constructed drop box culvert inlet which has led to significant accumulation of deposits and organic materials in an alluvial manner. The excavated portion drains to a hillside portion of the wetland toward the northern extent that is undisturbed from the excavation. The diverted stream flow has flooded the excavated land and is dominated by cattails (*Typha latifolia*), wool grass (*Scirpus cyperninus*), and willowherb (*Epilobium sp.*). This portion of the wetland lacks A and B horizons from the excavation and has a thick layer of organic material. The northern portion of the wetland is undisturbed from the prior excavation.

Wetland vegetative habitats included palustrine emergent (PEM), palustrine forested (PFO), palustrine open water (POW), and palustrine scrub/shrub (PSS). The majority (71%) of the wetlands were PEM systems. Fifteen wetlands are PEM systems, three are PEM/PSS systems, two are PEM/PSS/PFO systems, and one is a POW

system. By area, PEM, PFO, POW, and PSS habitats represented 1.1158 ac, 0.2594 ac, 0.128 ac, and 0.1528 ac, respectively.

Nineteen (90%) of the wetlands were hydrogeomorphically classified as slope wetlands. One wetland (WL26) was classified as a depression system and one wetland (WL24) was identified as a fringe system.

Nineteen slope wetlands (WL01, WL02, WL03, WL04, WL05, WL07, WL08, WL09, WL10, WL11, WL12, WL13, WL14, WL15, WL18, WL19, WL21, WL22, and WL23) totaling 1.517 ac were identified within the project study area. The dominant sources of hydrology for the slope wetlands were groundwater, direct precipitation, and overland flow from the surrounding uplands. The slope wetlands were identified in forestland, residential properties, and along transportation corridors. Wetlands were typically located on hillslopes, stream corridors, drainage swales, and hillside seep zones.

One depression wetland (WL26), located on the Little Beaver Creek floodplain, was identified within the project study area totaling 0.128 ac. The depression wetland is a palustrine open water system with a minor shrub component (silky dogwood, smooth alder) which may have historically been a farm pond. The primary hydrology sources are groundwater and point source *via* a rubber hose outlet.

One fringe wetland (WL24) adjacent to a perennial unnamed tributary to Little Beaver Creek (STR03-PER) was identified within the project study area totaling 0.011 ac. The primary hydrology source for the fringe wetland is stream flood flow. The fringe wetland is located in a maintained residential property in the upper portion of the watershed. Portions of the wetland are actively mowed. The surrounding area is disturbed and fragmented by a house and car sales property.

3.2.2 Ponds

Four ornamental ponds (PND01 through PND04) totaling 0.675 acres were groundwater, stream and direct precipitation fed palustrine open water systems that were constructed and maintained with visible control features (vertical riser or culvert) observed. Located on-line in USGS swales, the four ponds were sourced by either a stream and/or wetland and had a direct outlet connection to waters of the US *via* a culvert. Parallel to US 19, the ponds were located in actively maintained residential properties. All ponds extended beyond the project study area boundary.

3.3 Streams Findings

3.3.1 Stream Reach Findings

A total of fifteen stream reaches were identified within the project study area during field investigations from March through April 2016. Nineteen stream assessment segments were established to assess these reaches. WVSCI sampling was conducted during the mandated field sampling survey period (April 15 through October 15). WVSCI sampling was conducted on stream assessments that displayed sufficient depth and velocity requirements to use a kick-net in riffle habitat in accordance with the sampling protocol. Stream assessments that could not be sampled according to the WVSCI protocol were not sampled.

Fifteen stream reaches totaling 3,920 feet of stream (3,437 feet of perennial, 458 feet of intermittent, and 25 feet of ephemeral) were identified within the project study area (Figure 5, Table 3, and Table 4).

Table 3.
Project Study Area Watershed Stream Habitat Summary

Watershed Identification	Stream Classification			Subtotal (ft.)
	Perennial (ft.)	Intermittent (ft.)	Ephemeral (ft.)	
Left Fork	0	0	25	25
Little Beaver Creek	2,474	302	0	2,776
Sand Branch	963	156	0	1,119
Total	**3,437**	**458**	**25**	**3,920**

Table 4.
Stream Segments Located within the Project Study Area

Stream Segment ID (Stream Name-Classification-Sample Reach Number [if applicable])	Classification and Length		
	Per. (ft.)	Int. (ft.)	Eph. (ft.)
Little Beaver Creek Watershed			
STR02-PER	103	--	--
STR03-PER	98	--	--
STR04-PER	35	--	--
STR05-PER-SR01	52	--	--

Table 4 (continued).
Stream Segments Located within the Project Study Area

Stream Segment ID (Stream Name-Classification-Sample Reach Number [if applicable])	Classification and Length		
	Per. (ft.)	Int. (ft.)	Eph. (ft.)
Little Beaver Creek Watershed			
STR05-PER-SR02	67	--	--
STR06-PER-SR01	160	--	--
STR06-PER-SR02	224	--	--
STR07-PER	267	--	--
STR08-PER	29	--	--
STR11-PER	71	--	--
STR12-PER-SR01	617	--	--
STR12-PER-SR02	62	--	--
STR13-PER (Mainstem Little Beaver Creek)	564	--	--
STR14-INT	--	302	--
STR17-PER	125	--	--
Sand Branch Watershed			
STR09-PER-SR01 (Mainstem Sand Branch)	439	--	--
STR09-PER-SR02 (Mainstem Sand Branch)	524	--	--
STR10-INT	--	156	--
Left Fork Watershed			
STR01-EPH	--	--	25

3.3.1.1 Stream Baseline Conditions

Nineteen stream assessment segments were established on fifteen stream reaches within the project study area during field investigations from March through April 2016. Table 5 provides a summary of the HGM, EPA RBP, water chemistry, and

WVSCI scores used to derive the SWVM index. A summary of SWVM index scores is presented in Table 6. Stream reach data forms and photographs are located in the project's technical file.

Table 5.
Stream Segment Baseline Findings

Stream Segment ID (Stream Name-Classification-Sample Reach Number [if applicable])	Classification	HGM Data				RBP Data		Water Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Specific Conductivity (µS)	WVSCI Score
		Hydrology	Bio. Chemistry	Habitat	HGM SWVM Subtotal	RBP Rating	RBP Score					
Little Beaver Creek Watershed												
STR02-PER	PER	--	--	--	--	Poor	39	11.3	6.67	10.28	39.5	--
STR03-PER	PER	--	--	--	--	Poor	58	12.2	6.28	4.54	89.2	--
STR04-PER	PER	--	--	--	--	Marginal	67	12.0	6.66	6.38	210.1	--
STR05-PER-SR01	PER	--	--	--	--	Marginal	67	11.2	7.23	10.18	29.6	--
STR05-PER-SR02	PER	--	--	--	--	Marginal	61	14.5	7.52	6.54	378.1	--
STR06-PER-SR01	PER	--	--	--	--	Suboptimal	117	10.8	6.79	12.76	75.3	27.18
STR06-PER-SR02	PER	--	--	--	--	Suboptimal	122	13.9	7.22	11.62	34.7	23.89
STR07-PER	PER	--	--	--	--	Marginal	107	15.6	7.22	9.74	222.2	--
STR08-PER	PER	--	--	--	--	Marginal	105	9.6	6.90	11.51	550.0	--
STR11-PER	PER	--	--	--	--	Marginal	74	12.7	7.01	9.42	400.0	--
STR12-PER-SR01	PER	--	--	--	--	Marginal	81	14.0	7.06	7.04	329.4	22.15
STR12-PER-SR02	PER	--	--	--	--	Marginal	107	13.5	7.55	9.53	71.1	--
STR13-PER (Mainstem Little Beaver Creek)	PER	--	--	--	--	Suboptimal	150	15.3	7.84	10.79	152.1	73.69
STR14-INT	INT	0.22	0.27	0.17	0.22	Marginal	77	--	--	--	--	--
STR17-PER	PER	--	--	--	--	Marginal	84	16.2	7.52	10.7	203.4	80.14
Sand Branch Watershed												
STR09-PER-SR01 (Mainstem Sand Branch)	PER	--	--	--	--	Marginal	85	13.3	7.33	10.96	193.1	46.52

Table 5 (continued).
Stream Segment Baseline Findings

Stream Segment ID (Stream Name-Classification-Sample Reach Number [if applicable])	Classification	HGM Data				RBP Data		Water Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Specific Conductivity (µS)	WVSCI Score
		Hydrology	Bio. Chemistry	Habitat	HGM SWVM Subtotal	RBP Rating	RBP Score					
Sand Branch Watershed												
STR09-PER-SR02 (Mainstem Sand Branch)	PER	--	--	--	--	Marginal	72	18.3	7.36	9.92	128.8	46.02
STR10-INT	INT	0.46	0.42	0.63	0.50	Marginal	65	--	--	--	--	--
Left Fork Watershed												
STR01-EPH	EPH	0.62	0.63	0.6	0.62	Marginal	51	--	--	--	--	--

WVSCI results are located in the project's technical file. Project study area streams are highly fragmented, culverted, channelized, and relocated due to the mixed rural suburban and commercial land use. Headwater streams fragmented by the transportation corridors have biological, physical, and water quality degradation from acid mine drainage, erosion, roadway runoff, siltation, disturbed substrate, channel relocation, and culverting. A majority of streams are located in residential and commercial properties that had disturbed riparian and instream conditions from mowed lawns, roadways, and parking lots while the minority are located in forested stream corridors with less visible resource degradation by anthropogenic causes. Stream stressors included fragmentation by state, county, and local roads, AMD influence, septic influence, and a network of storm water conveyances.

3.3.1.2 Stream Protection Status

None of the project study area streams were identified as Tier 3 or known B-2 – Trout waters (WV Code WV Code § 47CSR2, 2014). The entire length of Little Beaver Creek (STR13-PER) is provided Tier 1 protection on the 303(d) list under the West Virginia Anti-degradation Policy (WV Code § 60, 2012) for CNA-biological (conditions not allowable) and fecal coliform. Beaver Creek, located outside of the project study area, receives all flow from project area resources and is provided Tier 1 protection on the

303(d) list under the policy due to CNA- biological, fecal coliform, and iron impact to trout habitat. Left Fork and Sand Branch streams were not on the 303(d) list and are provided Tier 2 protection under the policy; the waters must be maintained at their existing high quality unless it is determined satisfactory by intergovernmental coordination. Unnamed tributaries to Little Beaver Creek are not specifically on the 303(d) list; however, during field investigations they appeared to be visibly degraded due to iron oxide, septic discharges, etc.

Stocked trout streams are not present within the project study area (WVDNR 2016), and trout species were not observed during field investigations. Project study area streams were not listed as federally protected National Wild and Scenic Rivers (USFWS 2016).

3.3.2 Ditch Findings

3.3.2.1 Non-regulated Ditches

There are 71 non-regulated waters identified within the project study area. The non-regulated waters included seventy-one ditches and are presented in Table 6.

Table 6.
Non-Regulated Ditches (Non-waters of the US) identified within the Project Study Area

Classification	Identification	No.	Location
Drainage Ditch	DD-004, DD-007, DD-010, DD-011, DD-012, DD-013, DD-014, DD-015, DD-016, DD-017, DD-018, DD-020, DD-021, DD-022, DD-023, DD-025, DD-026, DD-027, DD-030, DD-031, DD-032, DD-033, DD-034, DD-040, DD-042, DD-044, DD-050, DD-051, DD-052, DD-053, DD-054, DD-055, DD-056, DD-057, DD-059, DD-061, DD-063, DD-064, and DD-069	39	US 19
Drainage Ditch	DD-035, DD-041, DD-043, DD-048, and DD-068	5	Mathis Drive
Drainage Ditch	DD-065, DD-066, and DD-067	3	Excavated Hillside northwest of Old Crow Road
Drainage Ditch	DD-005 and DD-006	2	Carwash near intersection US 19 and WV 3
Drainage Ditch	DD-038 and DD-039	2	Argabrite Lane
Drainage Ditch	DD-045 and DD-046	2	Mulch and Soil Facility
Drainage Ditch	DD-001 and DD-071	2	Knolls Drive

Table 6 (continued).
Non-Regulated Ditches (Non-waters of the US) identified within the Project Study Area

Classification	Identification	No.	Location
Drainage Ditch	DD-002	1	Dollar General
Drainage Ditch	DD-003	1	Scales Road
Drainage Ditch	DD-008	1	Storage Units in Shady Spring
Drainage Ditch	DD-019	1	Revolution Tactical Property
Drainage Ditch	DD-024	1	Kimberly Court Apartments
Drainage Ditch	DD-028	1	Grandview Road (WV 307)
Drainage Ditch	DD-029	1	Florence Lane
Drainage Ditch	DD-036	1	Roach Fabrication Shop Property
Drainage Ditch	DD-037	1	Green River Garden Center & Landscaping
Drainage Ditch	DD-047	1	Trump Street
Drainage Ditch	DD-049	1	Dan Mont Vis Road
Drainage Ditch	DD-058	1	Old Crow Road
Drainage Ditch	DD-060	1	MCNB Bank Property
Drainage Ditch	DD-062	1	Link's Pennzoil Property
Drainage Ditch	DD-072	1	Price Lane
Drainage Ditch	DD-073	1	Log Cabin Road off Whispering Pine Drive
	Total	**71**	

Of the 71 non-regulated ditches, 55 were associated with state, county, or local roads, 13 ditches were associated with residential or commercial properties, and three were associated with an excavated hillside. Sixty-eight ditches were constructed storm water conveyance features. Three drainage ditches (DD-065, DD-066, and DD-067) were erosional gullies on an excavated hillside. Drainage ditches were identified as non-regulated waters for the following reasons:

- The ditches are not relocated stream channels;
- The ditches exclusively drain uplands and do not receive hydrology from groundwater or wetlands.

3.3.2.2 Regulated Ditches

There were two regulated ditches identified within the project study area (DD-009 and DD-070) and their locations are presented in Table 7.

Table 7.
Regulated Ditches (Waters of the US) Identified within the Project Study Area

Classification	Identification	No.	Size	Waters of the US Connection	Location
Drainage Ditch	DD-009	1	243 linear feet	STR03-PER	US 19
Drainage Ditch	DD-070	1	324 linear feet	STR09-PER-SR01	US 19
	Total	**2**			

Drainage ditch DD-009 is located parallel to US 19 and conveys discharge from wetland WL23 to a water of the US (STR03-PER). During the field investigation, discharge was observed from wetland WL23 as overland flow to ditch DD-009, which directly connected to a perennial stream (STR03-PER). A drop box choked with road wash and sediment was identified at the origin of the ditch and is logically assumed to outlet to wetland WL08 when properly maintained. At current conditions ditch DD-009 provides a hydrologic connection from wetland WL23 to a water of the US (STR03-PER).

Drainage ditch DD-070 is located parallel to US 19 and conveys discharge from wetland WL03 to a water of the US (STR09-PER-SR01). The ditch is culverted three times (under Mathis Drive, US 19, and parking lot) prior to directly connecting to a water of the US (STR09-PER-SR01) *via* an outlet pipe.

4.0 CONCLUSIONS

Twenty-one palustrine wetlands were delineated within the project study area. All were identified as regulated waters of the US *via* a direct connection to waters of the US, drained to a water of the US *via* a drainage pattern and/or seepage outlet, or had a logical subsurface hydrologic connection. Wetland habitat classification includes fifteen PEM systems, three PEM/PSS systems, two PEM/PSS/PFO systems, and one POW system. By area, PEM, PFO, POW, and PSS habitats represented 1.1158 ac, 0.2594 ac, 0.128 ac, and 0.1528 ac,

respectively. The hydrogeomorphic classification for the majority of the wetlands was slope wetlands (19); one fringe wetland and one depression wetland were also identified. Four ornamental ponds were inventoried within the project study area totaling 0.675 ac.

Nineteen stream assessment segments were identified on fifteen stream reaches within the project study area. Fifteen stream reaches totaling 3,920 feet of stream (3,437 feet of perennial, 458 feet of intermittent, and 25 feet of ephemeral) were identified within the project study area. All stream reaches within the project study area were identified as regulated waters of the US. Overall, stream quality and habitat were significantly impaired due to the fragmentation, channelization, and stream stressors (state, county, and local roads, AMD influence, septic influence, and a network of storm water conveyances) due to the surrounding mixed rural suburban and commercial land use. Streams within the Little Beaver Creek watershed are provided Tier 1 protection under the West Virginia Anti-degradation Policy. Streams within Left Fork and Sand Branch watersheds are provided Tier 2 protection under the West Virginia Anti-degradation Policy. None of the project study area streams were identified as Tier 3, known B-2 – Trout waters, or stocked trout waters.

Seventy-three storm water conveyance ditches were identified within the project study area. Seventy-one of the ditches were non-regulated waters of the US. Two of the ditches drained adjacent wetlands and were regulated waters of the US.

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LIST OF PREPARERS

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REFERENCES

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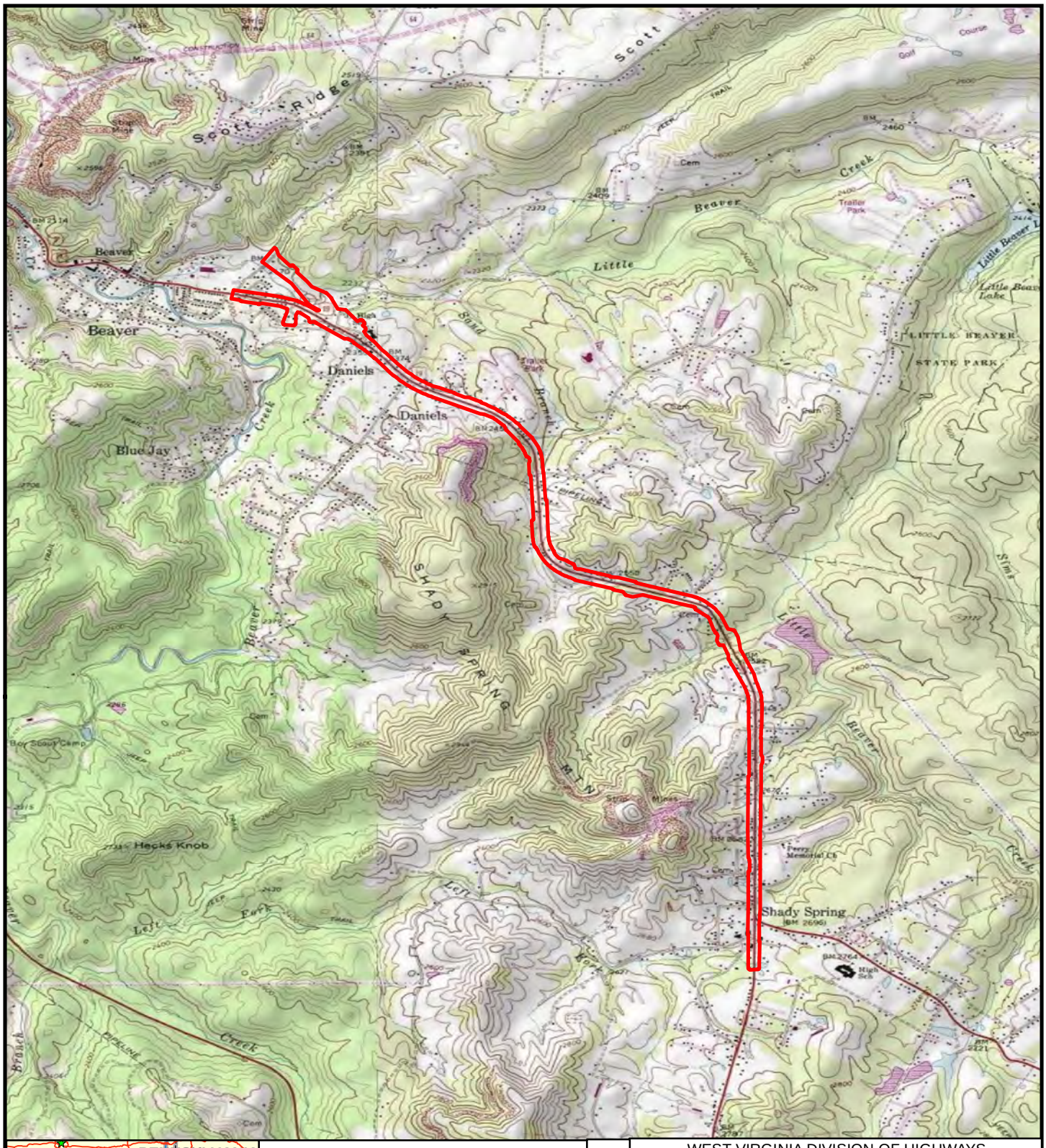
FIGURES



LEGEND

STUDY AREA

SOURCES: USGS QUAD. SHEETS - BECKLEY, WV 1978, CRAB ORCHARD AND SHADY SPRING, WV 1977

0 1,260m

0 3,500' 7,000'

N

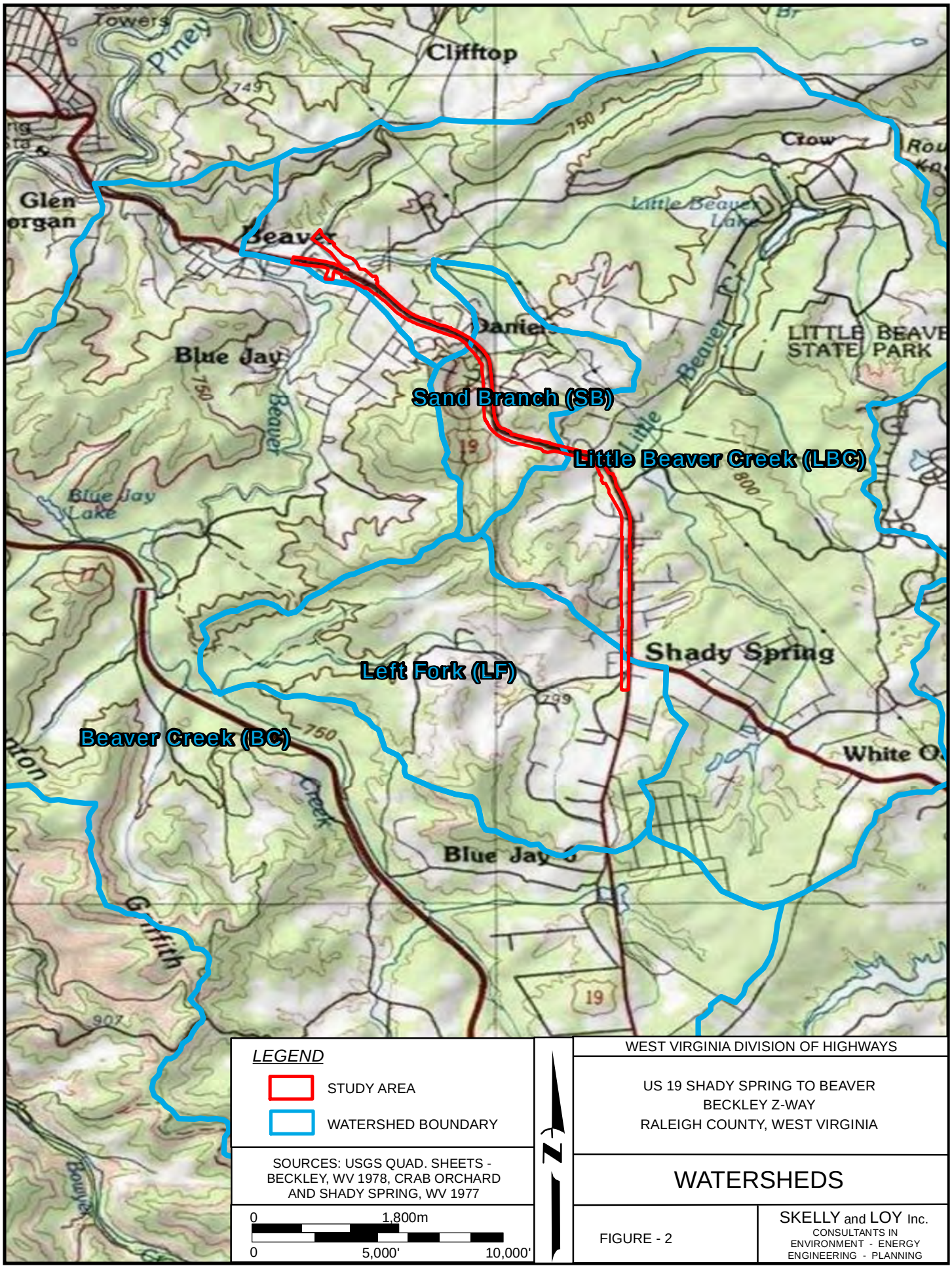
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

PROJECT LOCATION

FIGURE - 1

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

WATERSHEDS

FIGURE - 2

SKELLY and LOY Inc.
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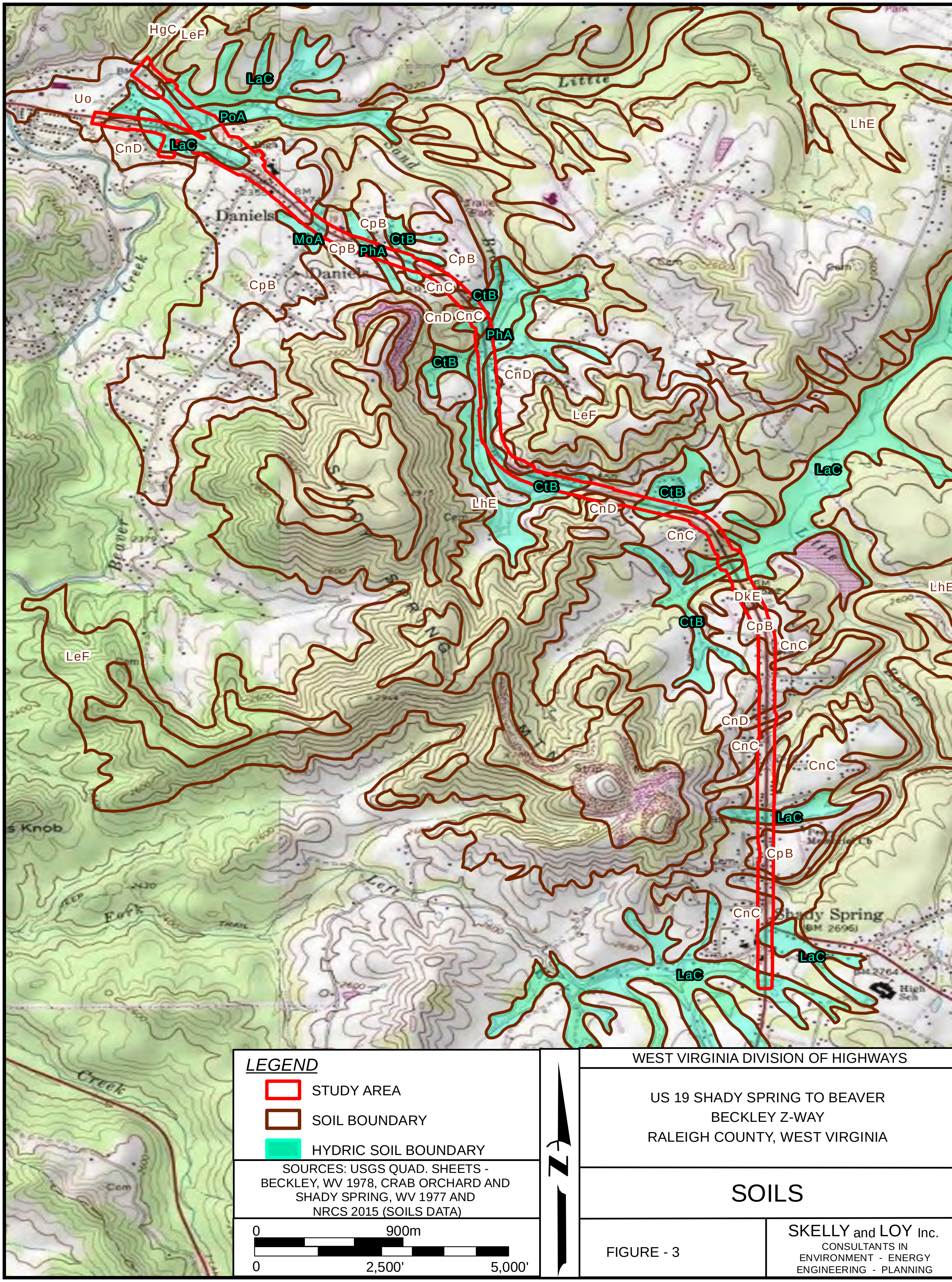
ENGINEERING - PLANNING



LEGEND

STUDY AREA

SOIL BOUNDARY

HYDRIC SOIL BOUNDARY

SOURCES: USGS QUAD. SHEETS - BECKLEY, WV 1978, CRAB ORCHARD AND SHADY SPRING, WV 1977 AND NRCS 2015 (SOILS DATA)

0 900m

0 2,500' 5,000'

N

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SOILS

FIGURE - 3

SKELLY and LOY Inc.
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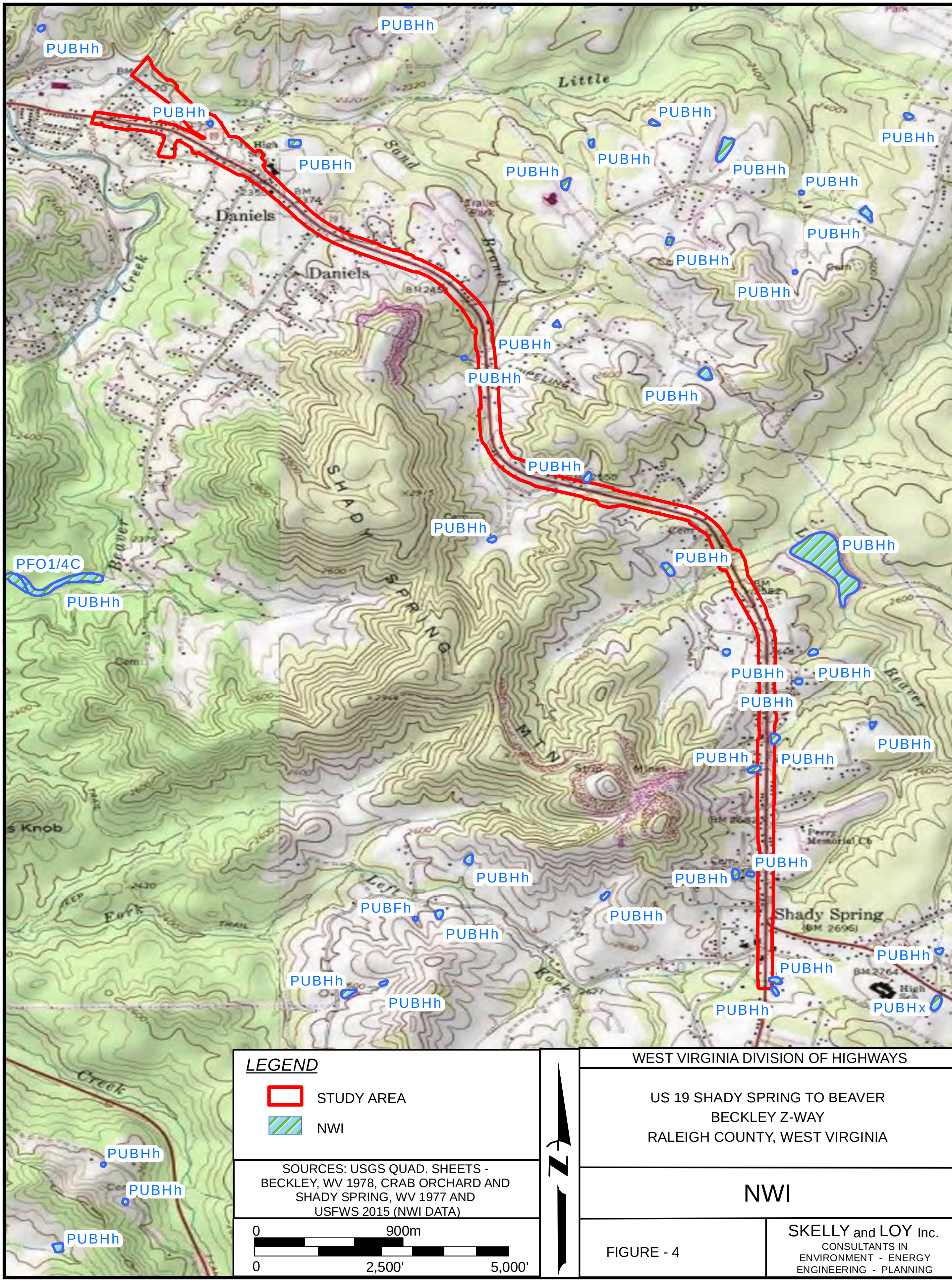

SOURCES: USGS QUAD. SHEETS - BECKLEY, WV 1978, CRAB ORCHARD AND SHADY SPRING, WV 1977 AND USFWS 2015 (NWI DATA)

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

NWI

FIGURE - 4

SKELLY and LOY Inc.
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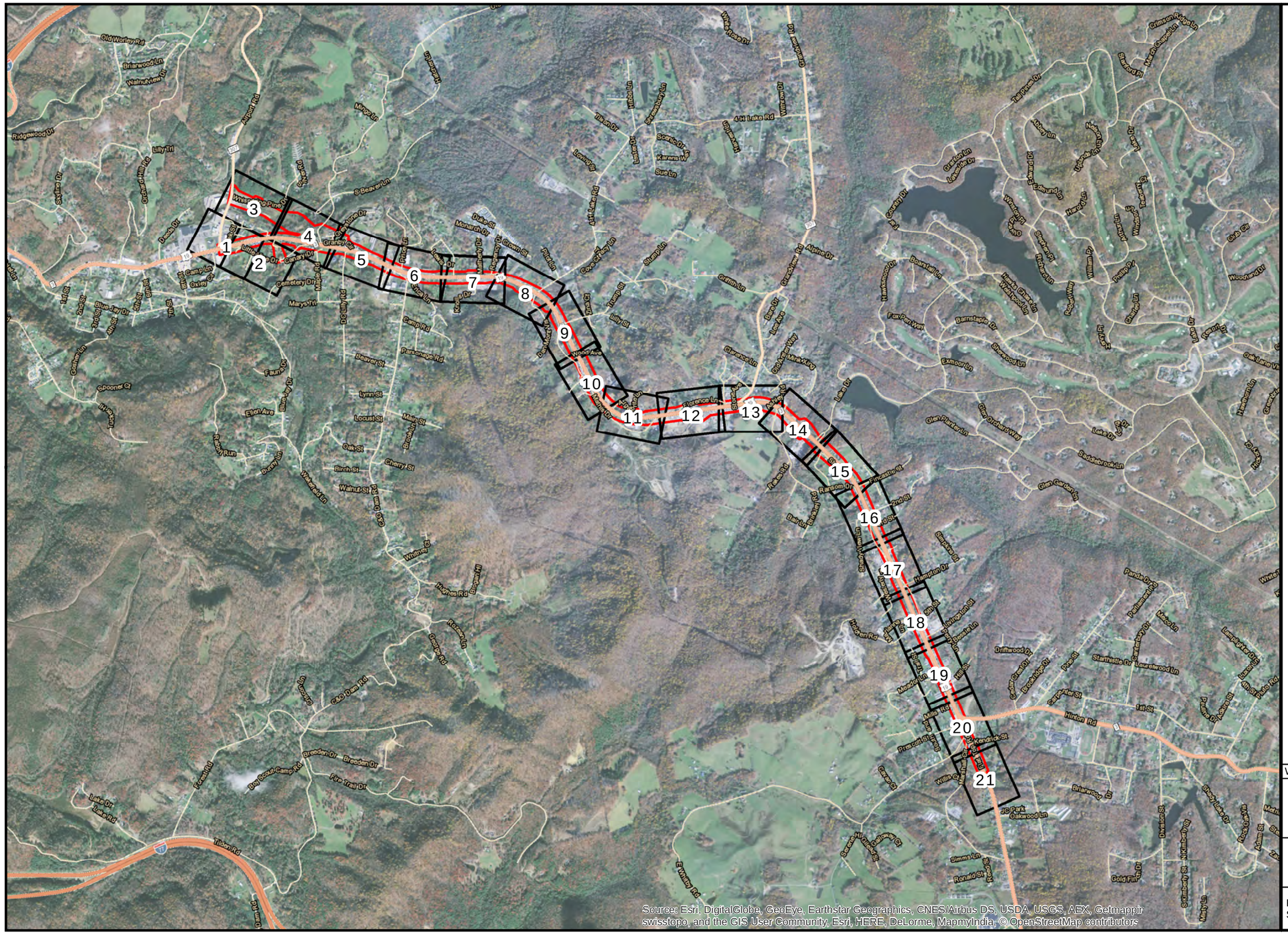
ENGINEERING - PLANNING



Legend

Study Area

Sheet Border

N

0 1,000 2,000 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET INDEX

SKELLY and LOY Inc.
CONSULTANTS IN
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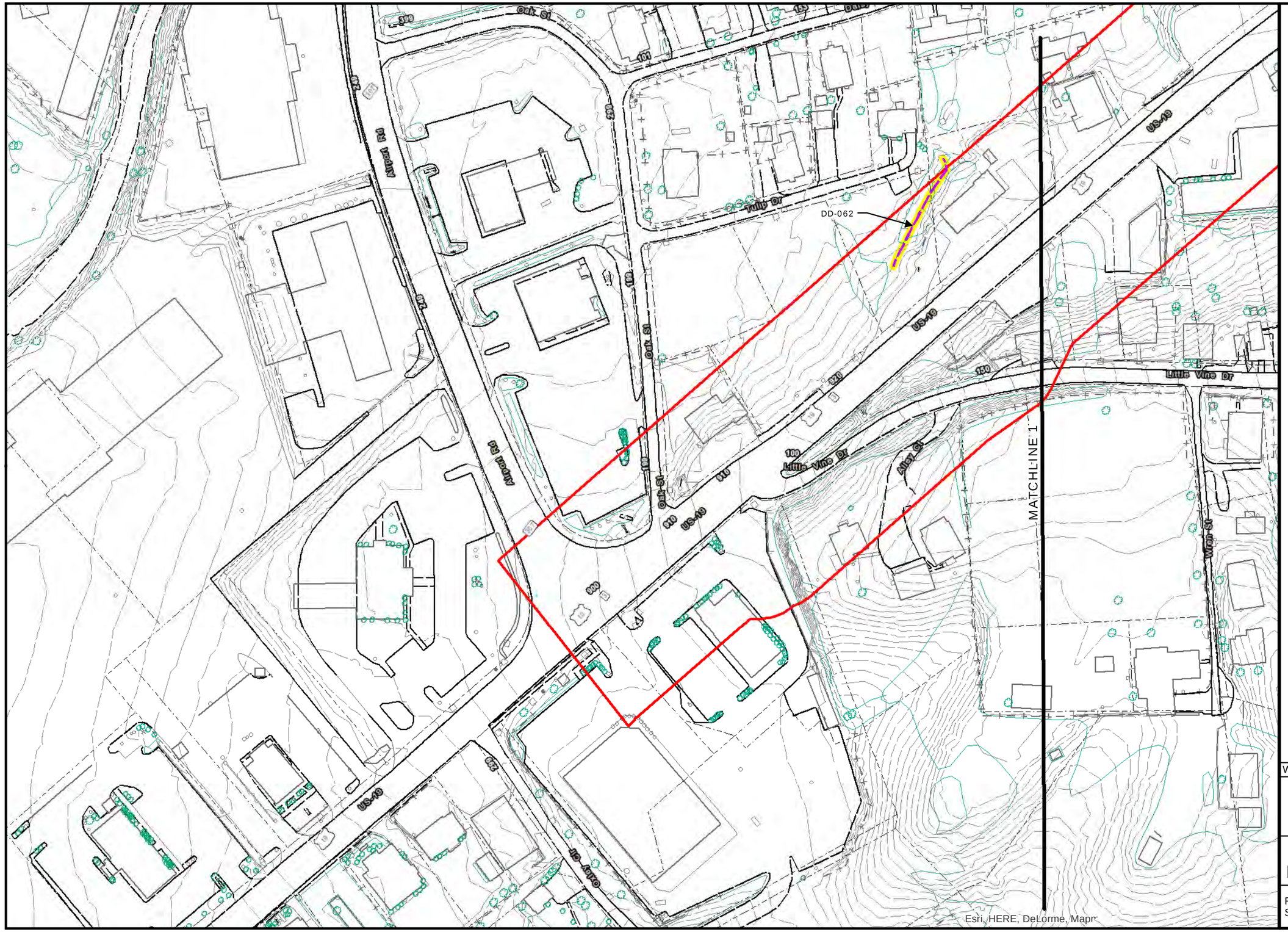
ENGINEERING - PLANNING



Legend

- Study Area
- Drainage Ditch
- Non-Waters of the US

N

0 50 100 Feet

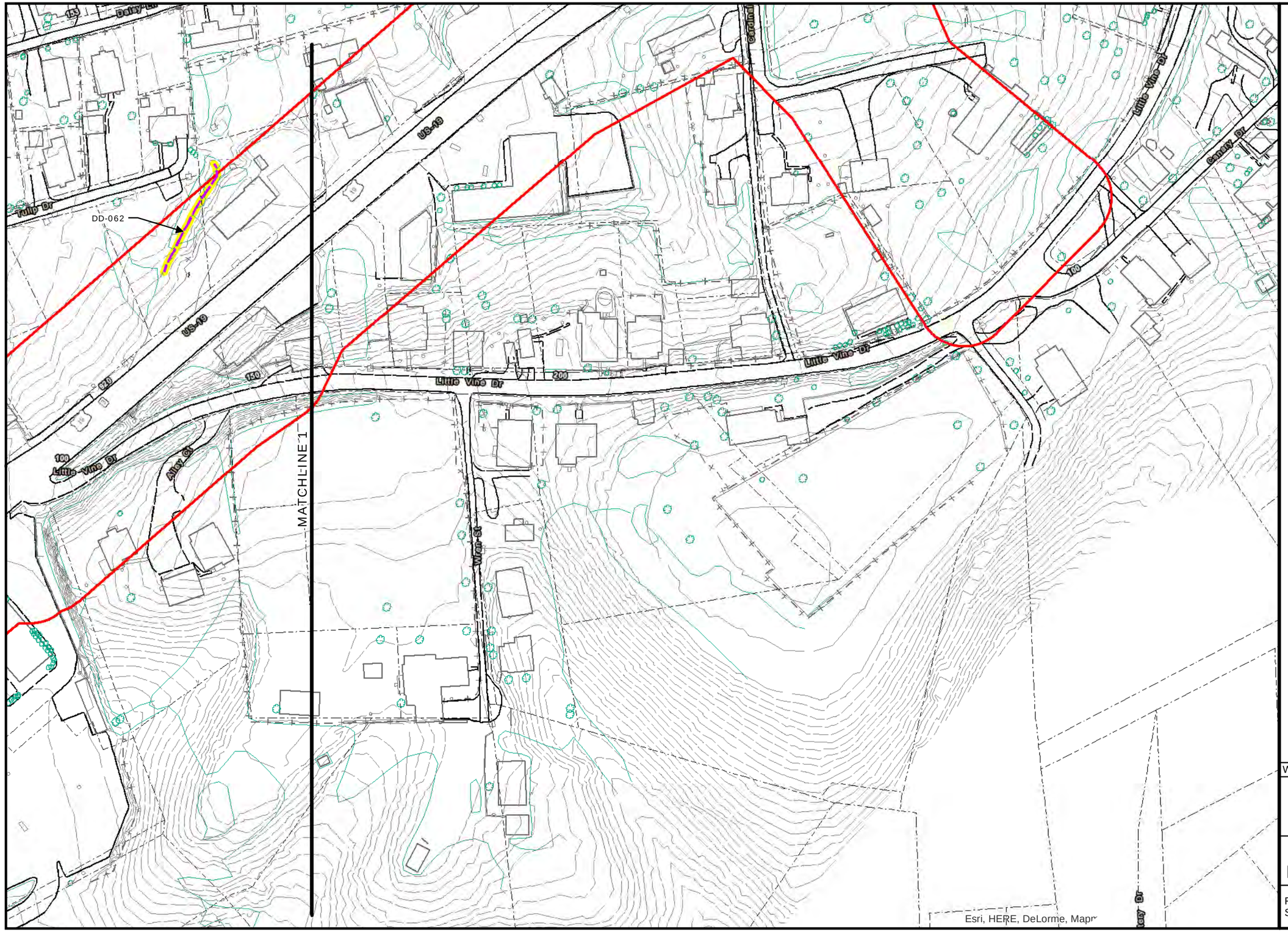
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 1 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Drainage Ditch
- Non-Waters of the US

N

0 50 100 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 2 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING

DD-073

DD-064

DD-063

STR17-PER

Whispering Pine Dr

Airport Rd

MATCHLINE 2

Legend

- Study Area
- Culvert
- Drainage Ditch
- Perennial Stream
- Non-Waters of the US

N

0 50 100 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

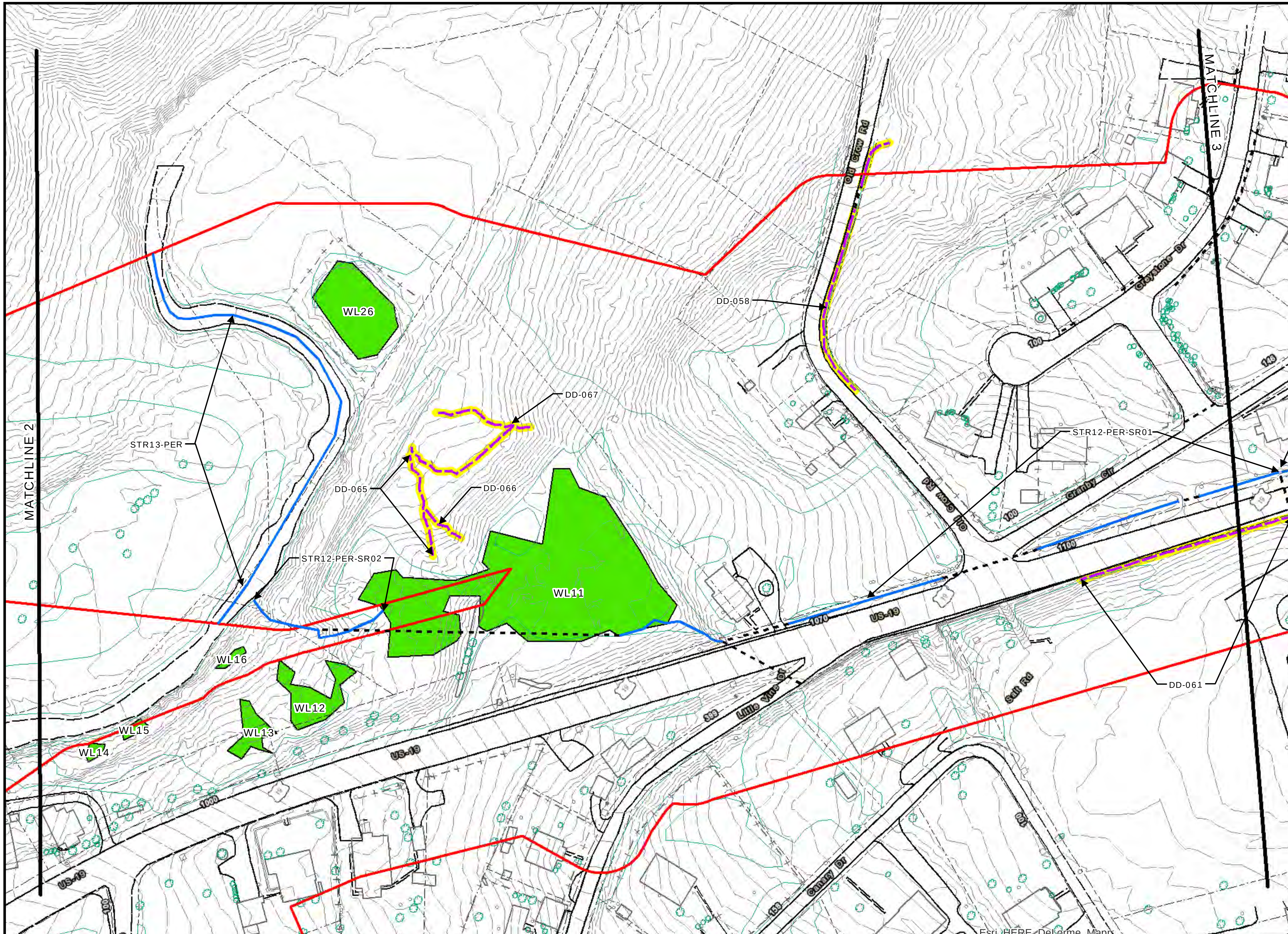
US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 3 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING

Esri, HERE, DeLorme, Mapr



Legend

- Study Area
- Culvert
- Drainage Ditch
- Intermittent Stream
- Perennial Stream
- Non-Waters of the US
- Wetland

0 50 100 Feet

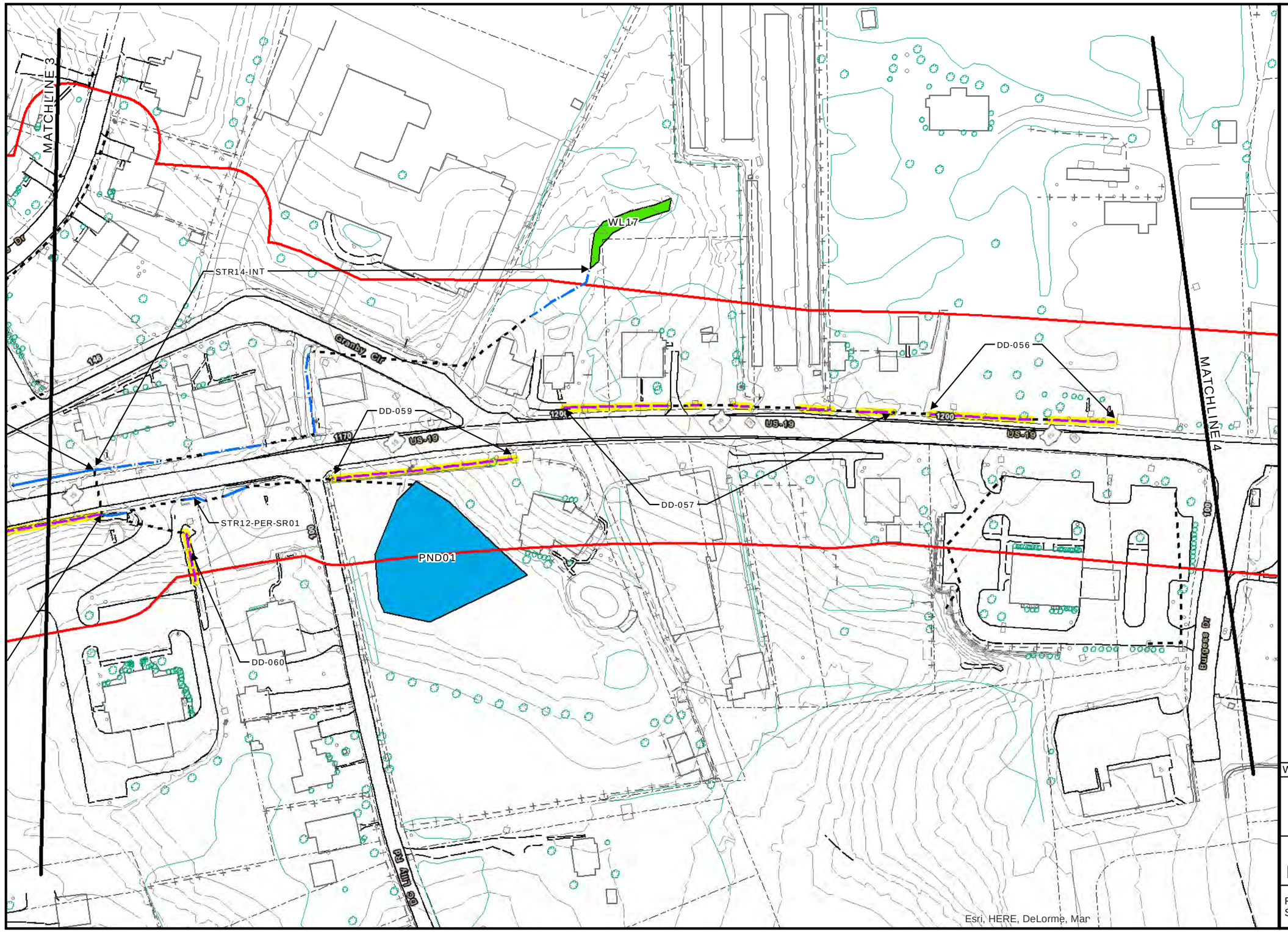
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 4 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Intermittent Stream
- Perennial Stream
- Non-Waters of the US
- Wetland
- Pond

N

0 50 100 Feet

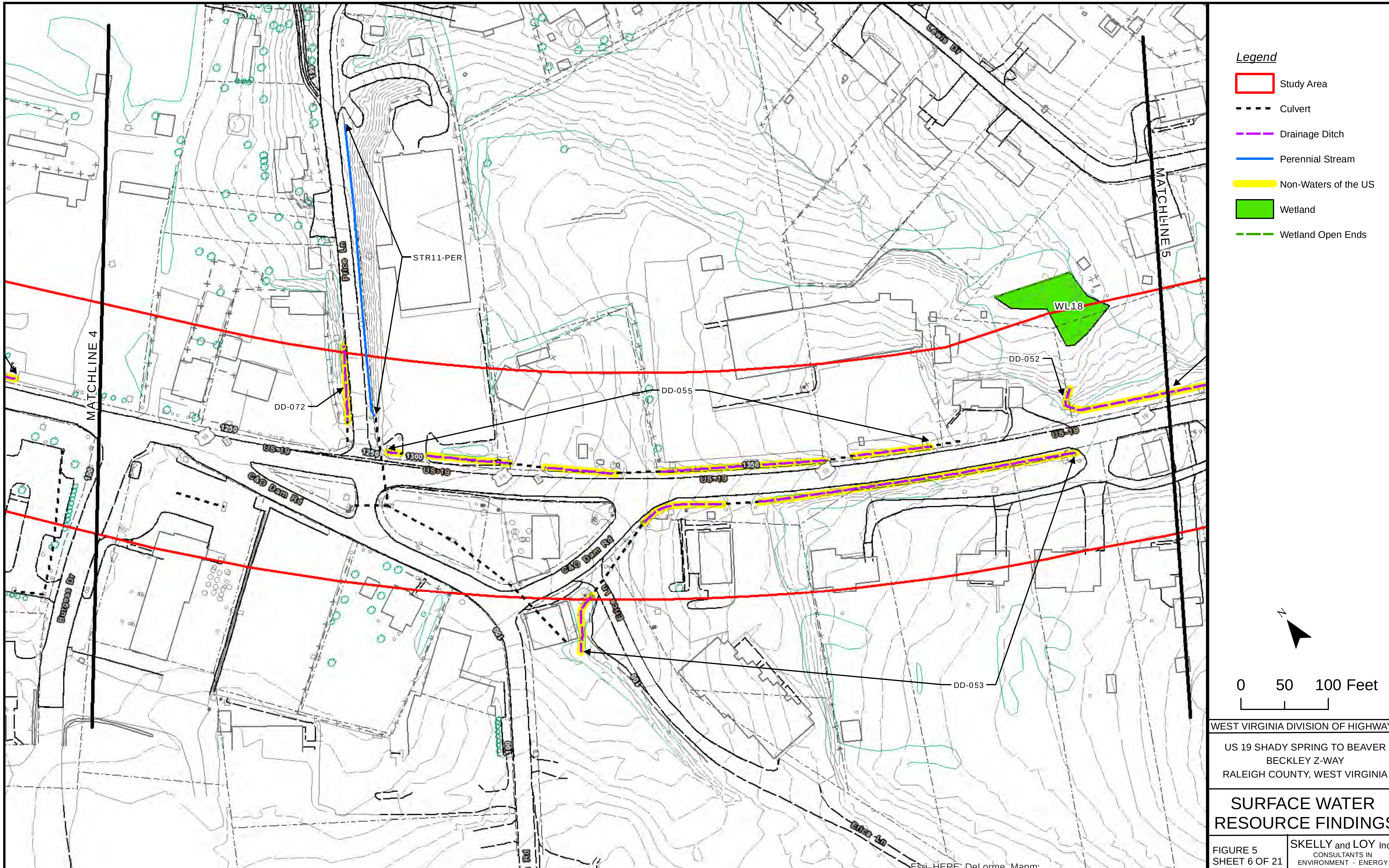
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 5 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



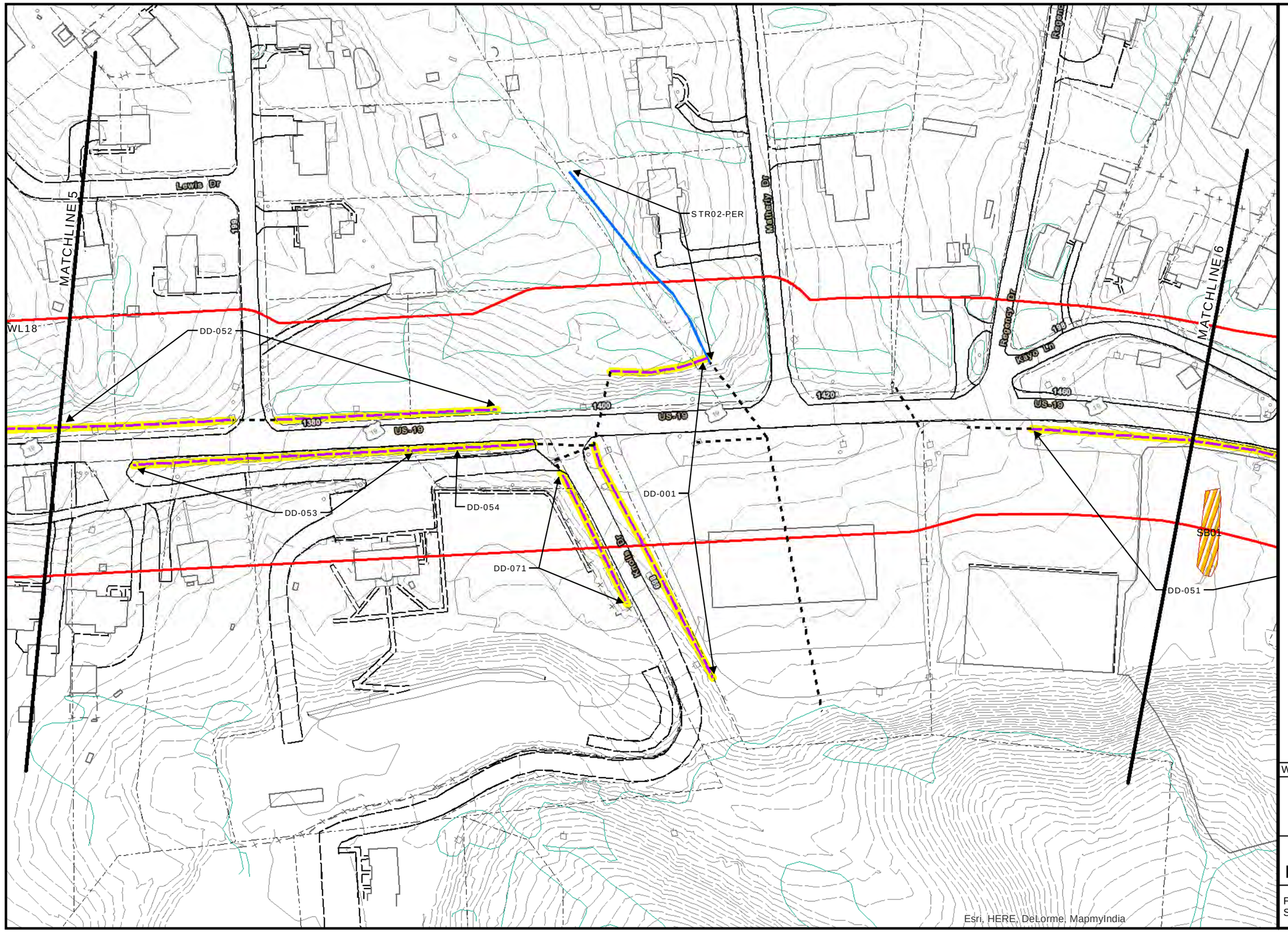
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 6 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Perennial Stream
- Non-Waters of the US
- Wetland
- Sediment Basin

N

0 50 100 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 7 OF 21

SKELLY and LOY Inc.
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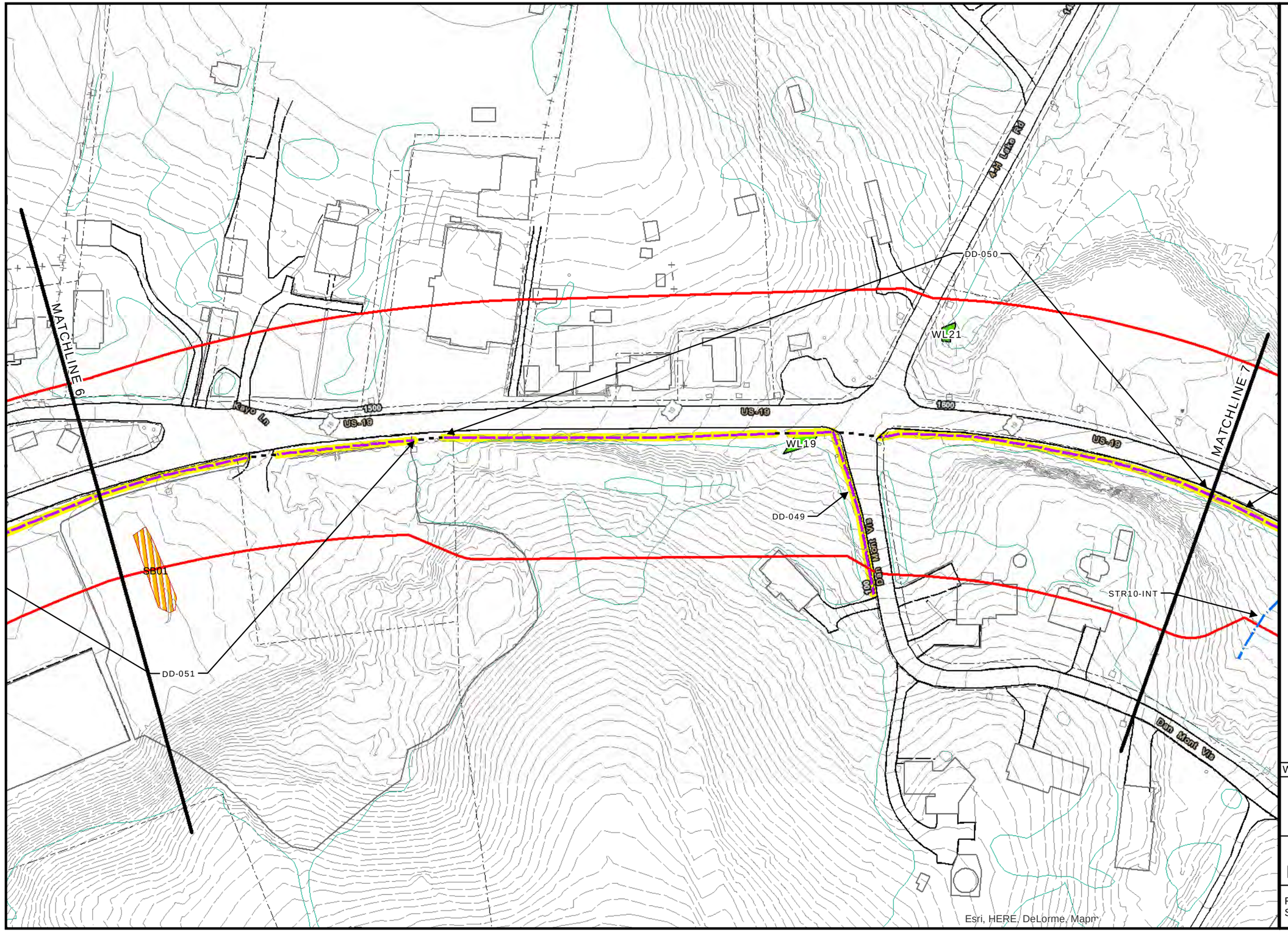
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Intermittent Stream
- Non-Waters of the US
- Wetland
- Sediment Basin

N

0 50 100 Feet

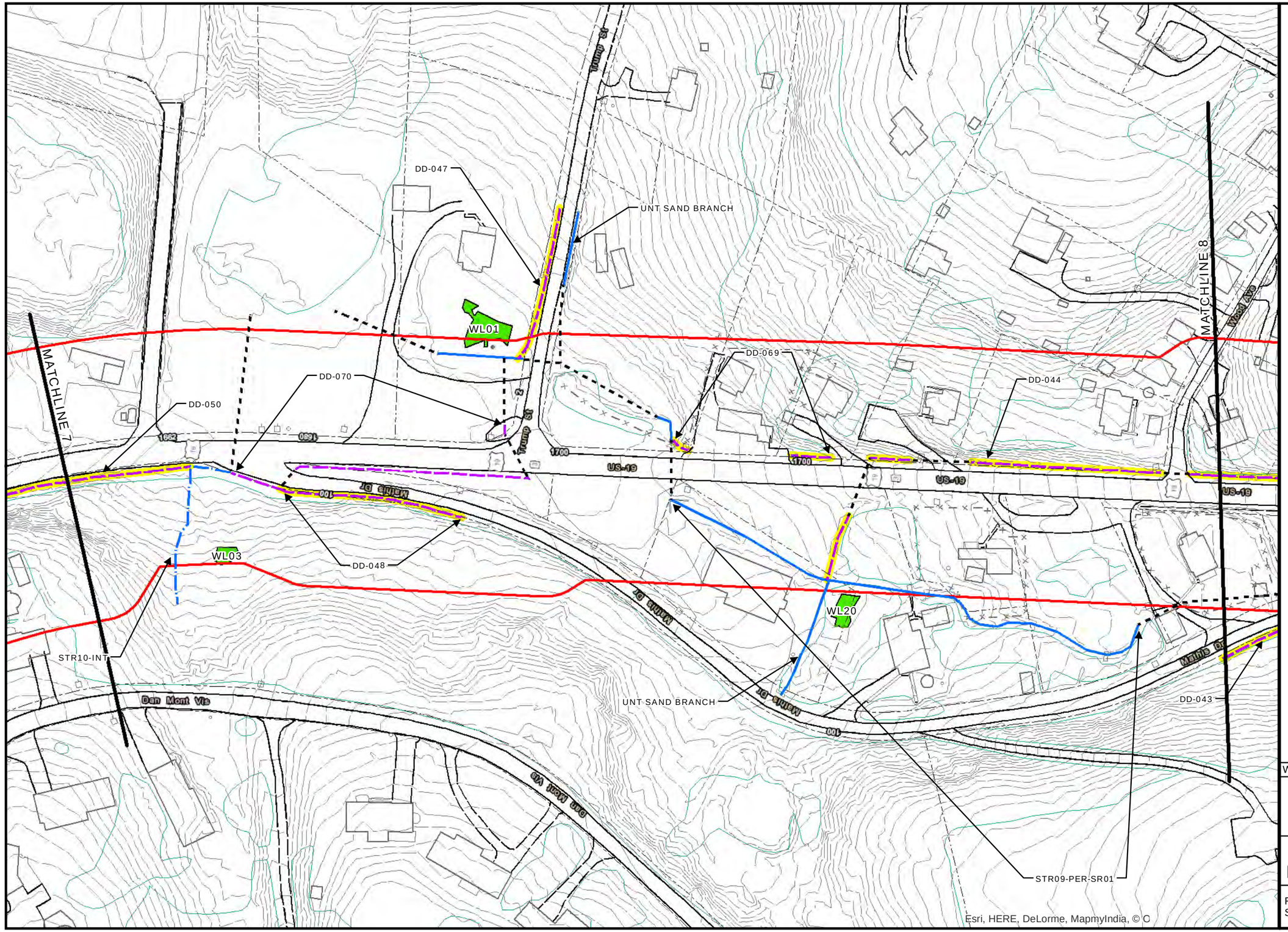
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 8 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Intermittent Stream
- Perennial Stream
- Non-Waters of the US
- Wetland
- Wetland Open Ends

N

0 50 100 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 9 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING

MATCHLINE 8

MATCHLINE 9

DD-044

DD-046

DD-045

DD-042

DD-068

DD-043

DD-043

STR09-PER-SR02

US-19

1800

300

Mathis Dr

Esri, HERE, DeLorme, MapmyIndia, © Ope

Legend

- Study Area
- Culvert
- Drainage Ditch
- Perennial Stream
- Non-Waters of the US

N

0 50 100 Feet

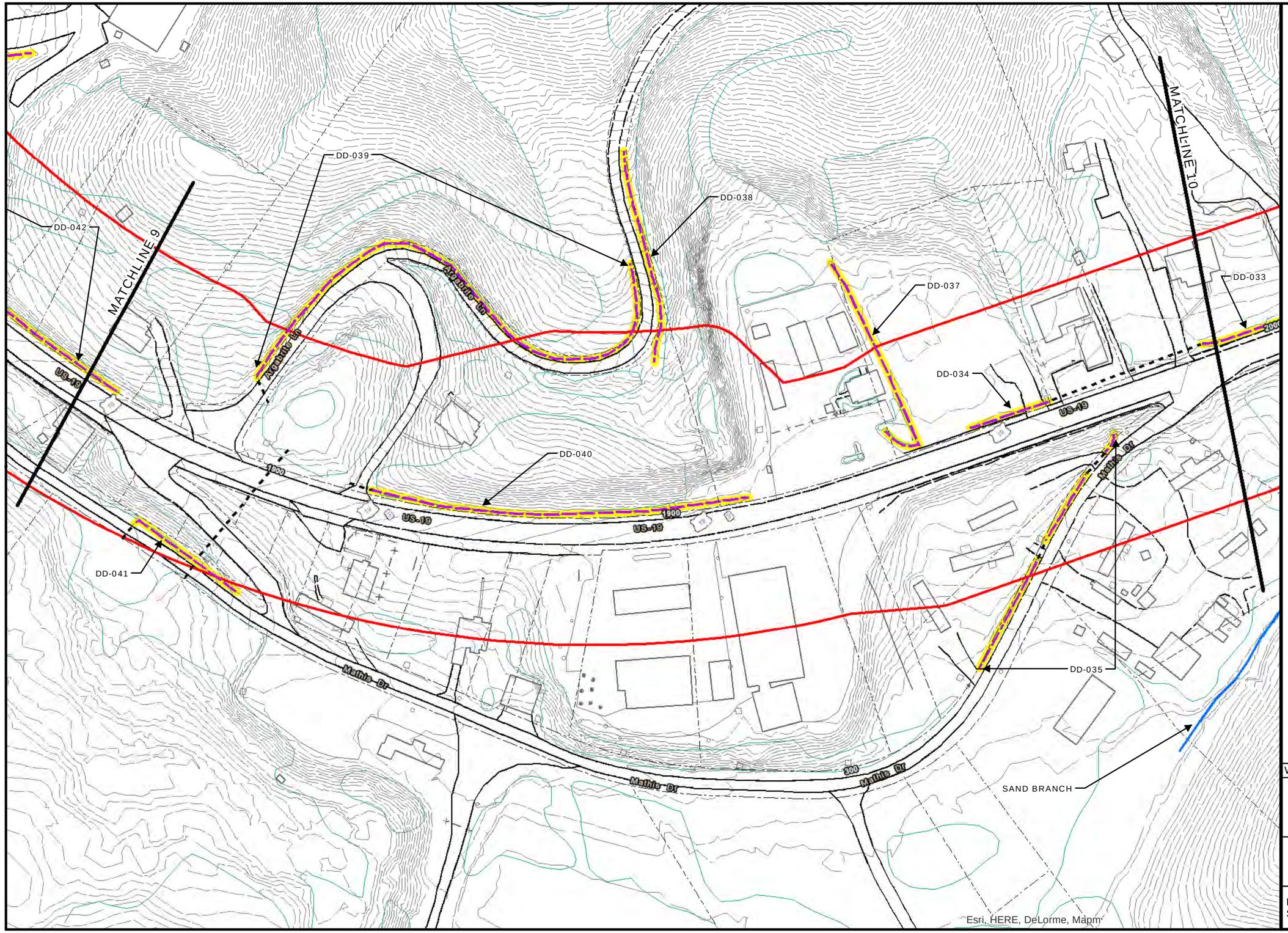
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 10 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Perennial Stream
- Non-Waters of the US

N

0 50 100 Feet

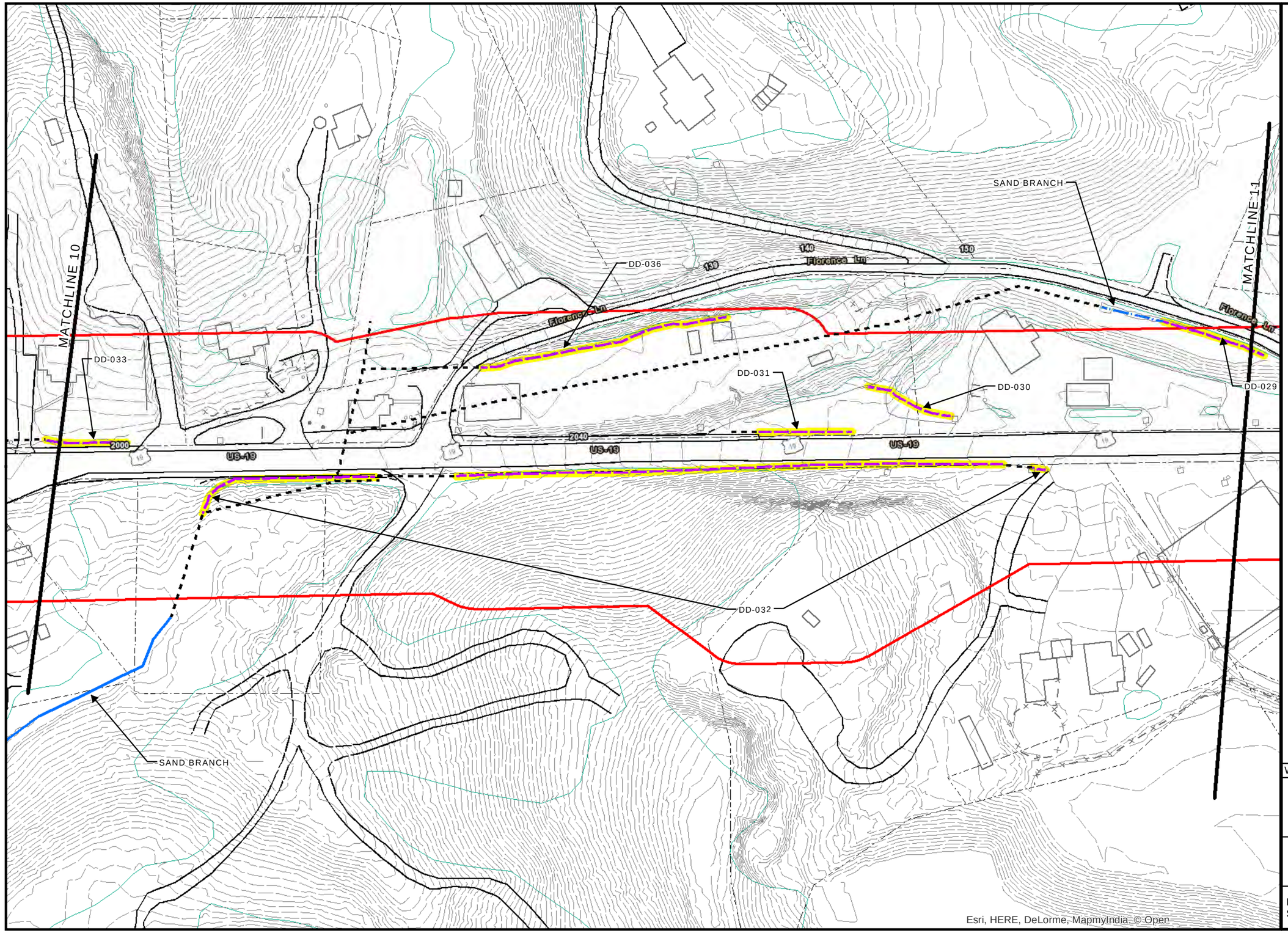
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 11 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Intermittent Stream
- Perennial Stream
- Non-Waters of the US

N

0 50 100 Feet

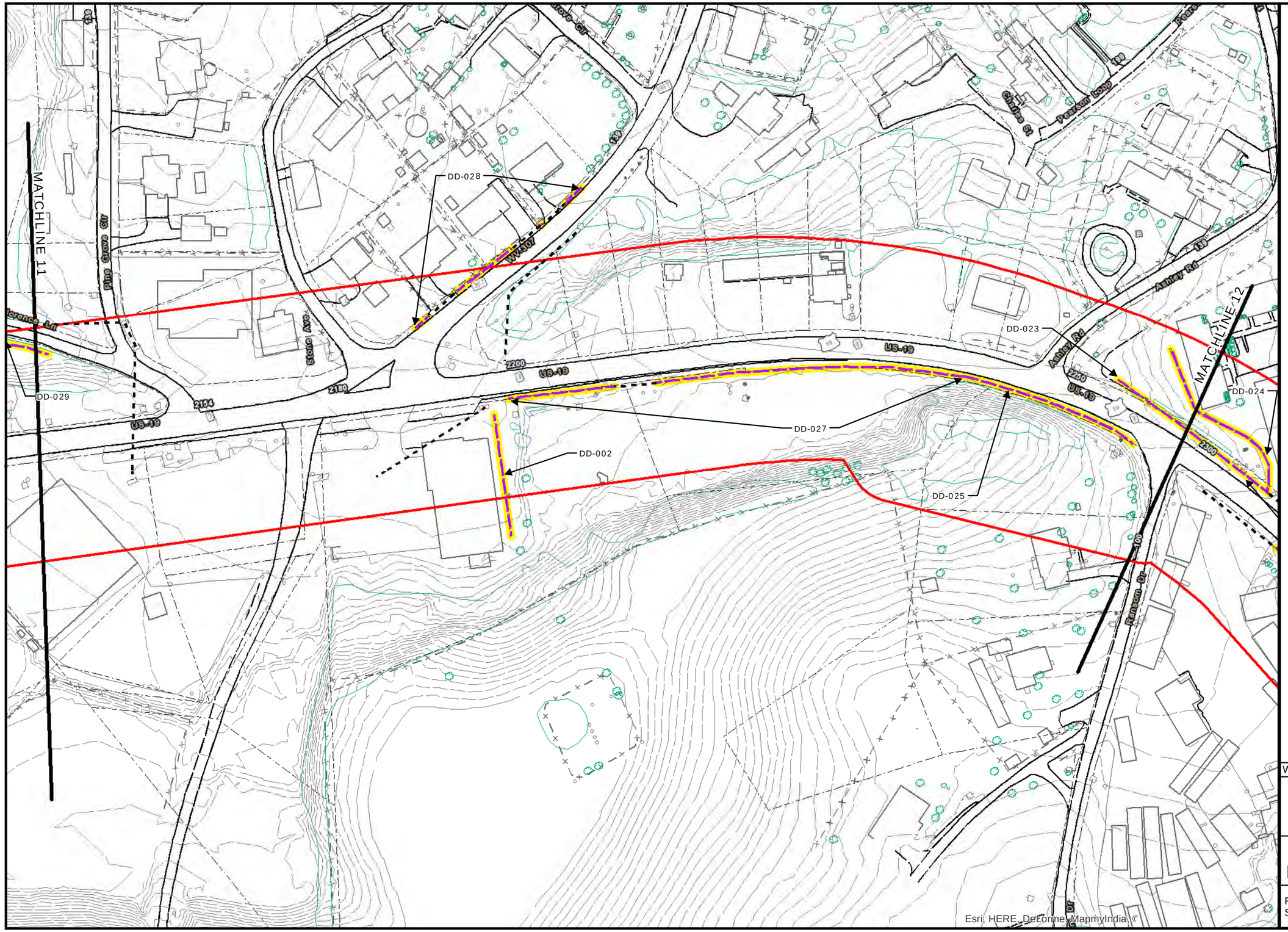
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 12 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Non-Waters of the US

N

0 50 100 Feet

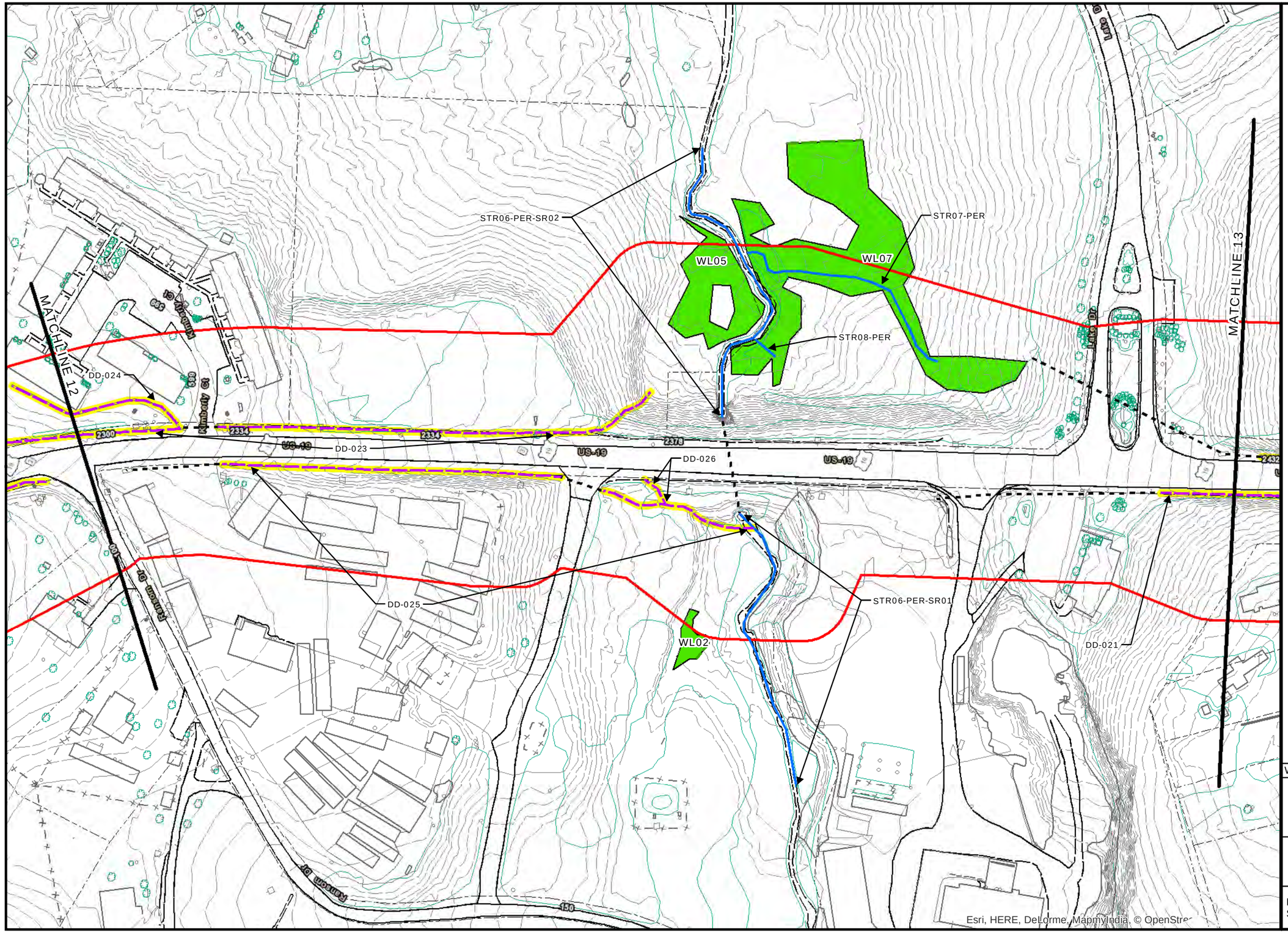
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 13 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Perennial Stream
- Non-Waters of the US
- Wetland
- Wetland Open Ends

N

0 50 100 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 14 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING

Legend

- Study Area
- Culvert
- Drainage Ditch
- Non-Waters of the US

N

0 50 100 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 15 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING

Legend

- Study Area
- Culvert
- Drainage Ditch
- Non-Waters of the US

N

0 50 100 Feet

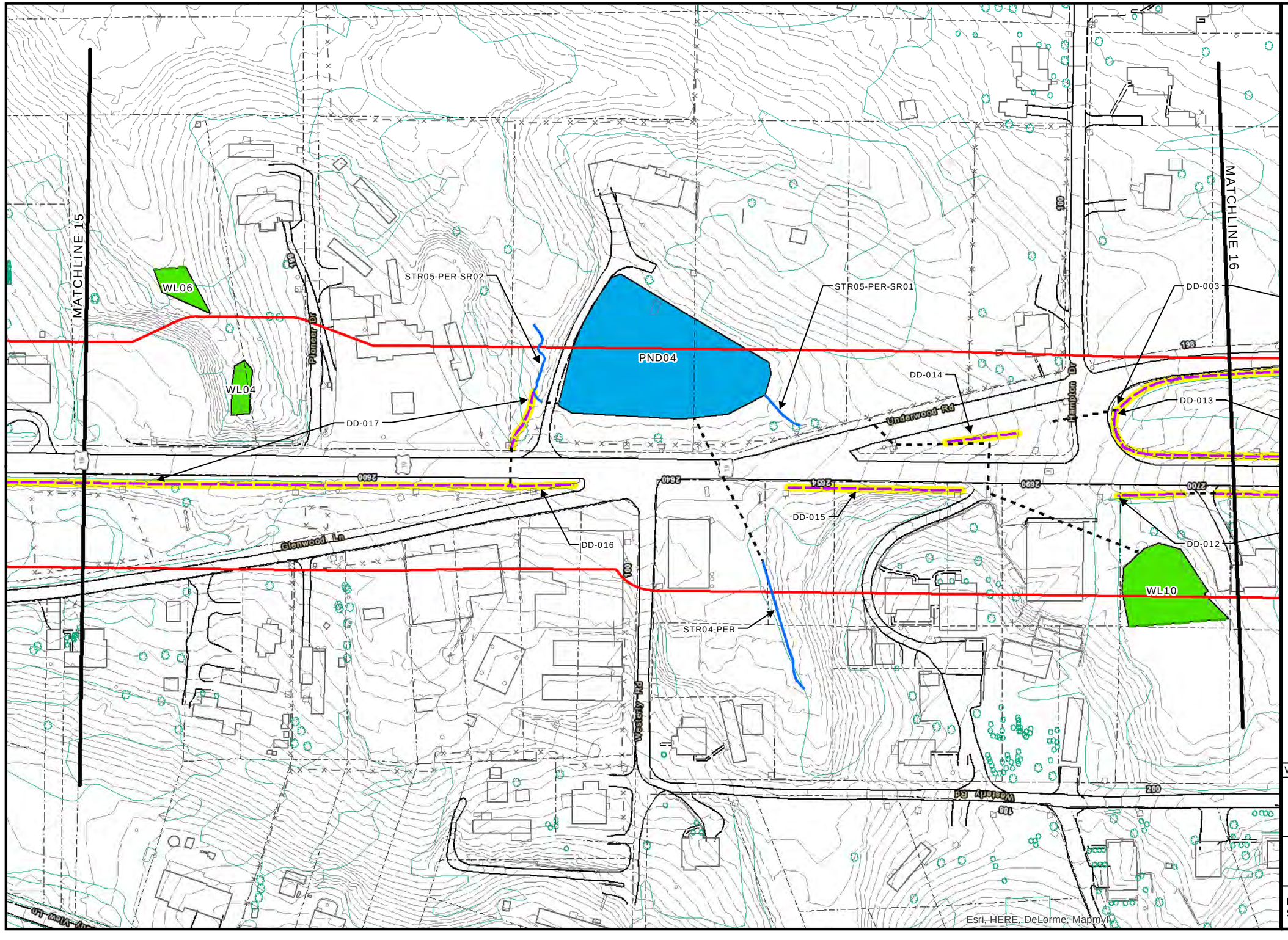
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 16 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Perennial Stream
- Non-Waters of the US
- Wetland
- Wetland Open Ends
- Pond

N

0 50 100 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 17 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING

MATCHLINE 16

MATCHLINE 17

DD-003

DD-013

DD-012

DD-011

DD-010

DD-009

STR03-PER

WL08

WL09

WL10

WL24

Scales Rd

Perry Ln

Livingston St

Esri, HERE, DeLorme, Mapmyl

Legend

- Study Area
- Culvert
- Drainage Ditch
- Perennial Stream
- Non-Waters of the US
- Wetland
- Wetland Open Ends

N

0 50 100 Feet

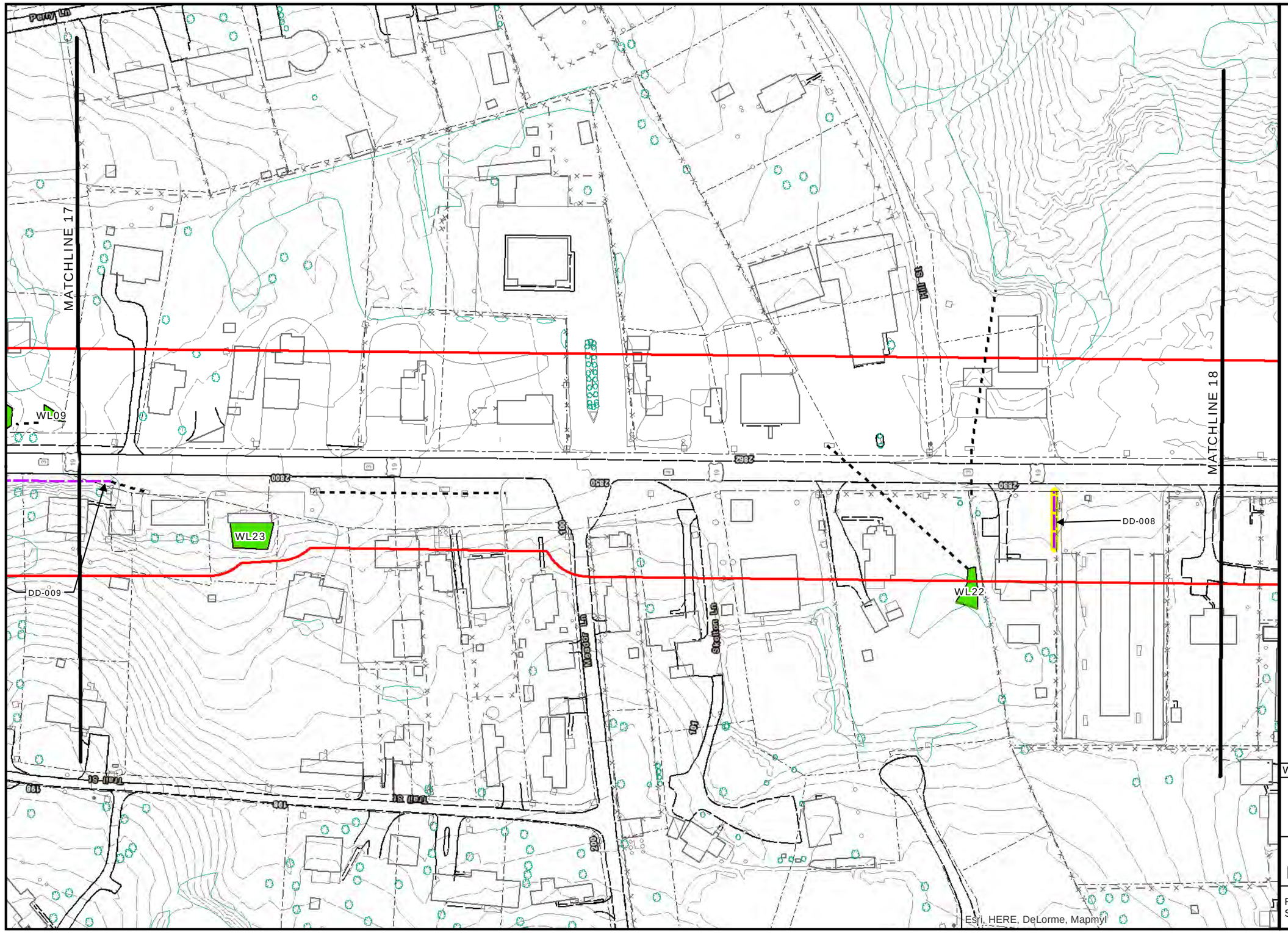
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 18 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Non-Waters of the US
- Wetland
- Wetland Open Ends

N

0 50 100 Feet

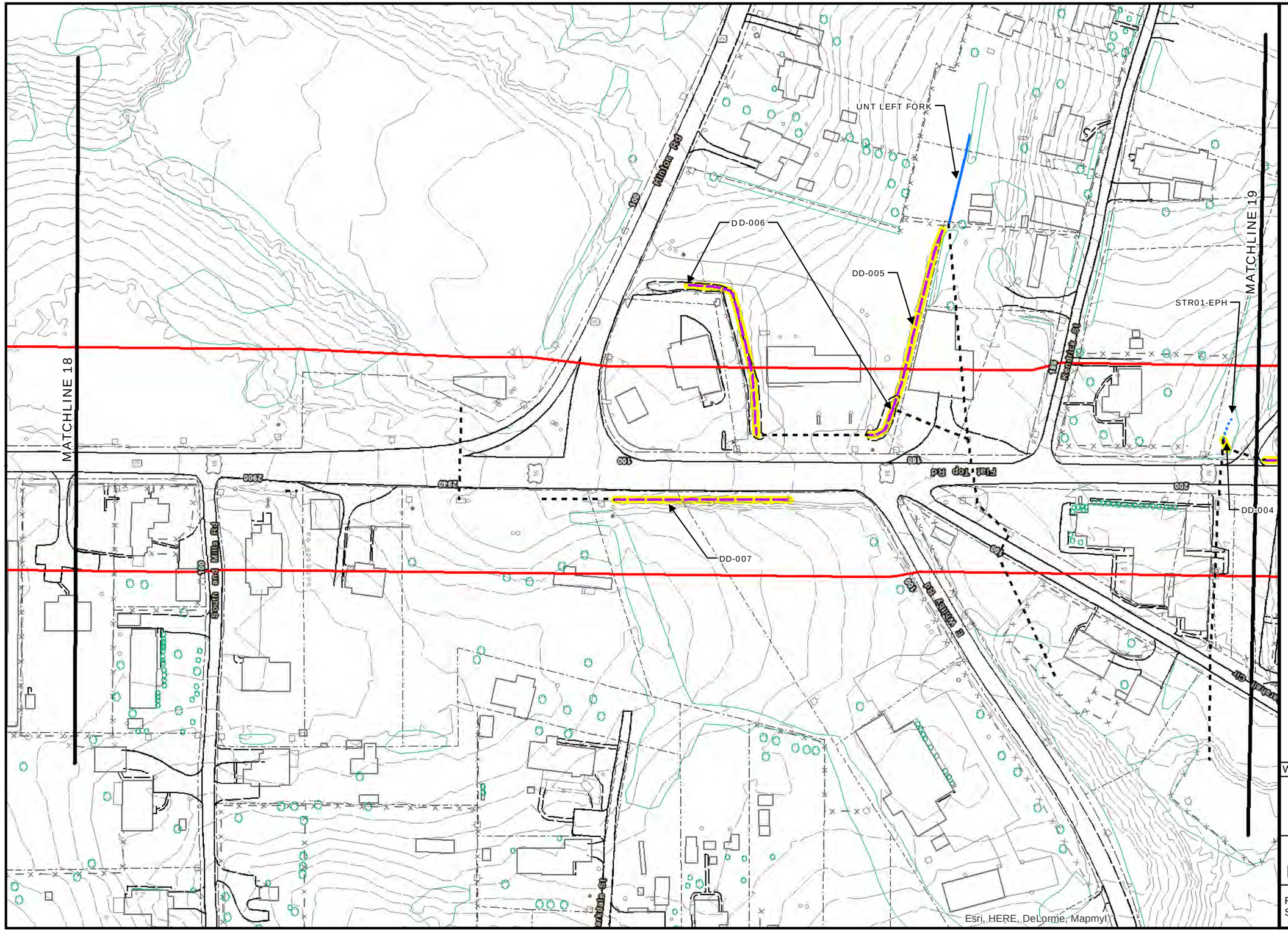
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 19 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN ENVIRONMENT - ENERGY ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Ephemeral Stream
- Perennial Stream
- Non-Waters of the US

N

0 50 100 Feet

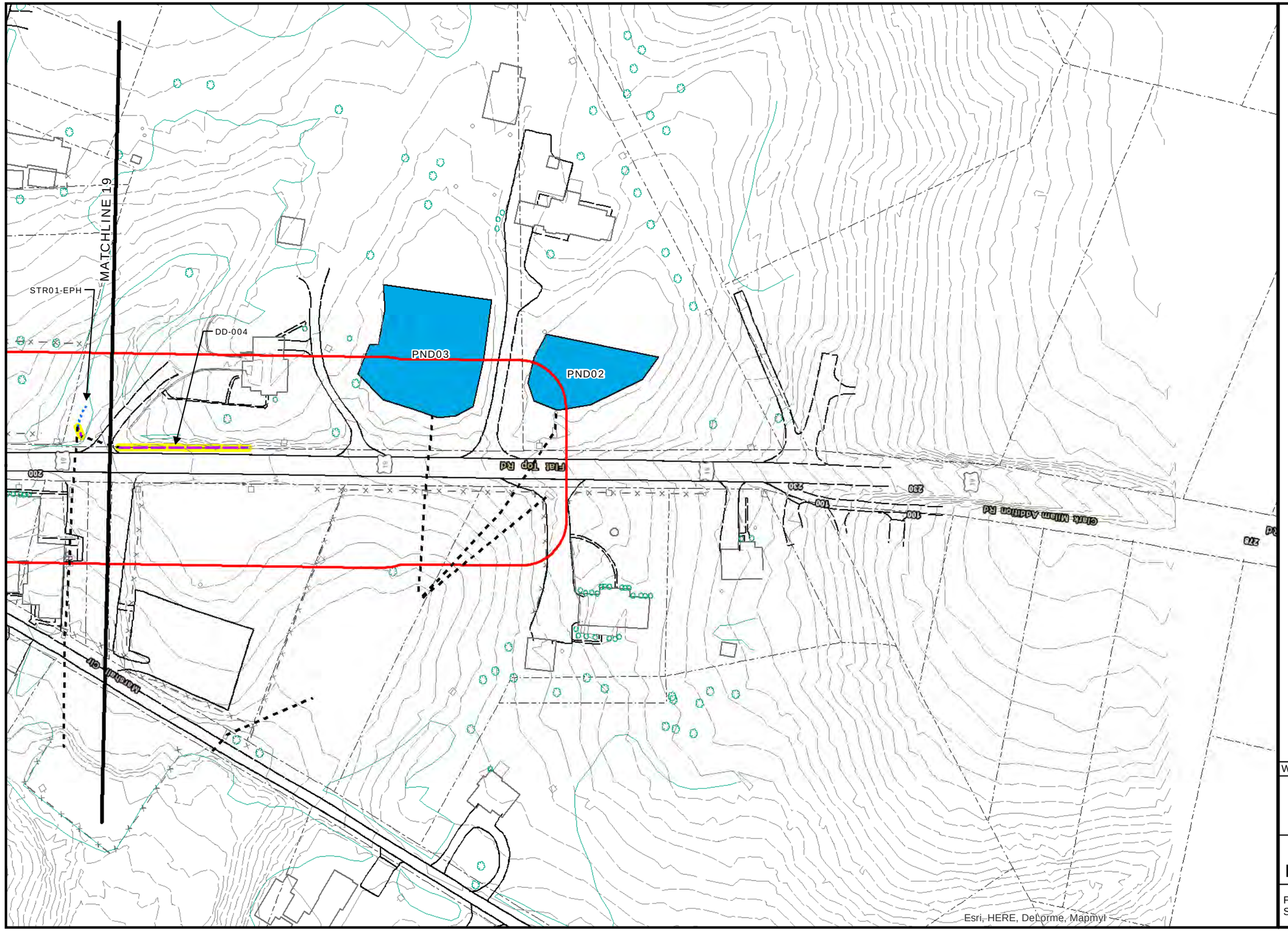
WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 20 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING



Legend

- Study Area
- Culvert
- Drainage Ditch
- Ephemeral Stream
- Non-Waters of the US
- Pond

N

0 50 100 Feet

WEST VIRGINIA DIVISION OF HIGHWAYS

US 19 SHADY SPRING TO BEAVER
BECKLEY Z-WAY
RALEIGH COUNTY, WEST VIRGINIA

SURFACE WATER RESOURCE FINDINGS

FIGURE 5
SHEET 21 OF 21

SKELLY and LOY Inc.
CONSULTANTS IN
ENVIRONMENT - ENERGY
ENGINEERING - PLANNING