P26031

TECHNICAL AND COST PROPOSAL: SEDIMENTATION MANAGEMENT FEASIBILITY STUDY – BLACKWATER RIVER & GILLS CREEK, SMITH MOUNTAIN LAKE, VA

31 March 2026

Prepared for:

TRI-COUNTY LAKES
ADMINISTRATIVE COMMISSION

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1.0 Introduction and ESI Background

Environmental Solutions & Innovations, Inc. (ESI) welcomes the opportunity to submit this proposal to the Tri-County Lakes Administrative Commission (TLAC) Sedimentation Task Force in response to the Request for Proposals for a Sedimentation Management Feasibility Study at the Blackwater River and Gills Creek sites within Smith Mountain Lake impoundment in South Central Virginia. ESI is a Women-Owned Small Business (WOSB) ecological and environmental consulting firm with more than 25 years of experience providing scientifically rigorous, regulatory-actionable deliverables to public, federal, and private sector clients across the eastern United States.

As authorities in natural and cultural resources, ESI seamlessly merges real-world field expertise, scientific acumen, and comprehensive knowledge of the regulatory framework to effectively integrate cultural and environmental values into the decision-making challenges facing local and state governments, federal agencies, and non-governmental organizations. ESI staff includes over 70 full-time and several additional part-time scientists with specialties ranging from animal ecology to stream and wetland science to landscape and habitat modeling and cultural resources. Most senior employees hold advanced degrees and are respected members of their professional communities. Others are accomplished academic scientists and regulatory experts who embarked on second careers with ESI following successful careers spanning decades in academia or with federal agencies.

ESI's project team for this pursuit combines senior-level expertise in hydrologic and hydraulic engineering, geomorphology, sediment transport modeling, erosion and sediment control design, and geospatial analysis. Dr. Shaun Kline, P.E., serves as Senior Principal and Project Manager, bringing direct experience in bathymetric field programs, sedimentation modeling, water quality assessment, and regulatory coordination with Virginia agencies including the Virginia Department of Environmental Quality (VDEQ). Chase Moretti, P.E., provides erosion and sediment control design and stream restoration expertise. The three members of the ESI GIS team, Adam Nolte, P.G, Ashley Huntley, and Hunter Pippin, delivers integrated geospatial analysis, sedimentation and erosion modeling, LiDAR data processing, bathymetric mapping, and cultural resource evaluation.

Additionally, ESI has a proven track record executing a variety of sedimentation analysis and even boasts its own ArcGIS Sediment Modeling toolbox developed in house by ESI’s GIS team. This toolbox makes complex sedimentation analysis and modeling much more efficient and produces results in a standardized, repeatable, documented, and proven way.

1.1 ESI Corporate Overview

Table 1. Corporate Information, TLAC Sedimentation Management Feasibility Study, Smith Mountain Lake, Virginia.

Item	Information
Company Name	Environmental Solutions & Innovations, Inc. (ESI)
Business Classification	Women-Owned Small Business (WOSB)
Years in Business	26+ years
Services	Ecological and environmental consulting, engineering, GIS, cultural resources, regulatory compliance
Geographic Coverage	Eastern United States
Point of Contact	Shaun W. Kline, Ph.D., P.E., Senior Principal & Project Manager
Email	skline@envsi.com
Office Phone	352.514.3340 (mobile)
SAM Status	Active (EUI: P1N7EBZLSY18)

1.2 Project Team Overview

Table 2. Project Team and Roles, TLAC Sedimentation Management Feasibility Study, Smith Mountain Lake, Virginia.

Name	Title / Role	License / Certification
Shaun W. Kline, Ph.D., P.E.	Senior Principal & Project Manager	P.E. (WV, VA); Ph.D. Geological Sciences, M.S. Coastal & Oceanographic Engineering; B.S. Civil Engineering
Chase R. Moretti, P.E.	Engineer — Erosion/Sediment Control & Stream Restoration	P.E. (MA, OH, PA, TN); NCEES Model Law Engineer
Adam M. Nolte, P.G .	GIS Analyst — Spatial Analysis & Sediment Modeling	P.G. (KY)
Andy Dobson	GIS Analyst — Community and Stakeholder Engagement	Ph.D. Biological Sciences
Brandon Yates	Environmental – Aquatics Group Manager	M.S. Biology, USFWS Federally Permitted Malacologist
Ashley Huntley	GIS Analyst — Cultural Resources & GIS	B.A. Landscape Archaeology; Certificates in Historic Preservation and GIS
Hunter Pippin	GIS Analyst — Environmental Resources & GIS	B.S., Environmental Science, Certificate in GIS

2.0 Technical Approach and Methodology

ESI will approach the Smith Mountain Lake Sedimentation Management Feasibility Study as an investigation structured to produce independent, directly comparable feasibility reports for the Blackwater River and Gills Creek sites while providing support in TLAC's final decision-making process for future actions. The technical approach is broken down across the six scope tasks identified in the Request for Proposal (RFP). Each task is discussed below with site-specific methodology, and deliverables are formatted to support future TLAC decision making and accompanying regulatory submittals and grant applications.

The Appalachian Power Company (APCO) 2021 Five-Year Sedimentation Survey Reports and the Princeton Hydro 2024 Blackwater River Sub-Watershed and Phytoplankton Assessment will be utilized as the primary existing data record that ESI will build upon in this new scope of work. The technical approach explicitly identifies where existing data is sufficient, where gaps must be addressed through potential additional field collection, and where analytical updates are required to support current regulatory and funding expectations.

2.1 Task 1 — Historic Data Review and Assessment

ESI will conduct a comprehensive desktop review of existing sedimentation data at both the Blackwater River and Gills Creek sites prior to initiating any field work. The desktop review phase establishes the analytical foundation for all subsequent tasks and directly produces the Desktop Data Review Assessment deliverable which includes Historic Data as outlined in the RFP.

2.1.1 Desktop Assessment

ESI will review and synthesize the following primary sources, which are specifically cited in the RFP as the existing record:

- APCO 2021 Five-Year Sedimentation Survey Reports (published 2023), primary bathymetric baseline for sediment accumulation quantification and identification of critical sedimentation zones
- Princeton Hydro Blackwater River Sub-Watershed and Phytoplankton Assessment (2024), upstream erosion sources, land use contributions, and nutrient/phytoplankton dynamics
- GIS mapping and historical shoreline data
- Virginia DEQ water quality datasets, nutrient loading, turbidity, and dissolved oxygen records for the project
- Smith Mountain Lake Association Water Quality Monitoring Program data

- Save Our Streams macroinvertebrate data for applicable tributary streams

In addition to above sources, ESI will submit data requests to the following agencies and programs for further data analysis and collection: USGS National Map; Bedford, Franklin, and Pittsylvania Counties GIS parcel and property data; Virginia Department of Transportation (VDOT); USDA Natural Resources Conservation Service (NRCS); and the Virginia Department of Historic Resources (DHR).

The Historic Data Review Assessment will document all resources reviewed, identify specific data gaps that require field-based collection or additional study, and provide recommendations for any supplemental studies determined necessary before site-level analysis can be completed. This assessment will be delivered as a standalone summary memorandum document prior to initiation of any field work.

2.2 Task 2 — Feasibility Study

The site assessment phase addresses both quantitative measurement of existing sediment conditions and comprehensive characterization of site physical attributes. All field work and analysis are conducted independently for the Blackwater River and Gills Creek sites, with results documented in separate feasibility study reports for each location.

2.2.1 Physical Site Characterization

To determine the Area of Investigation (AOI, Figure 1) for potential sources of sedimentation, watersheds for both the Blackwater River Site and the Gills Creek Site will be delineated using Digital Elevation Models (DEMs) derived from public LiDAR data. Then, areas upstream of lakes and ponds inside of the two watersheds will be removed from the AOI. This treatment is appropriate because sediments will drop out in those waterbodies and will not be routed into either the Blackwater River Site or the Gills Creek Site.

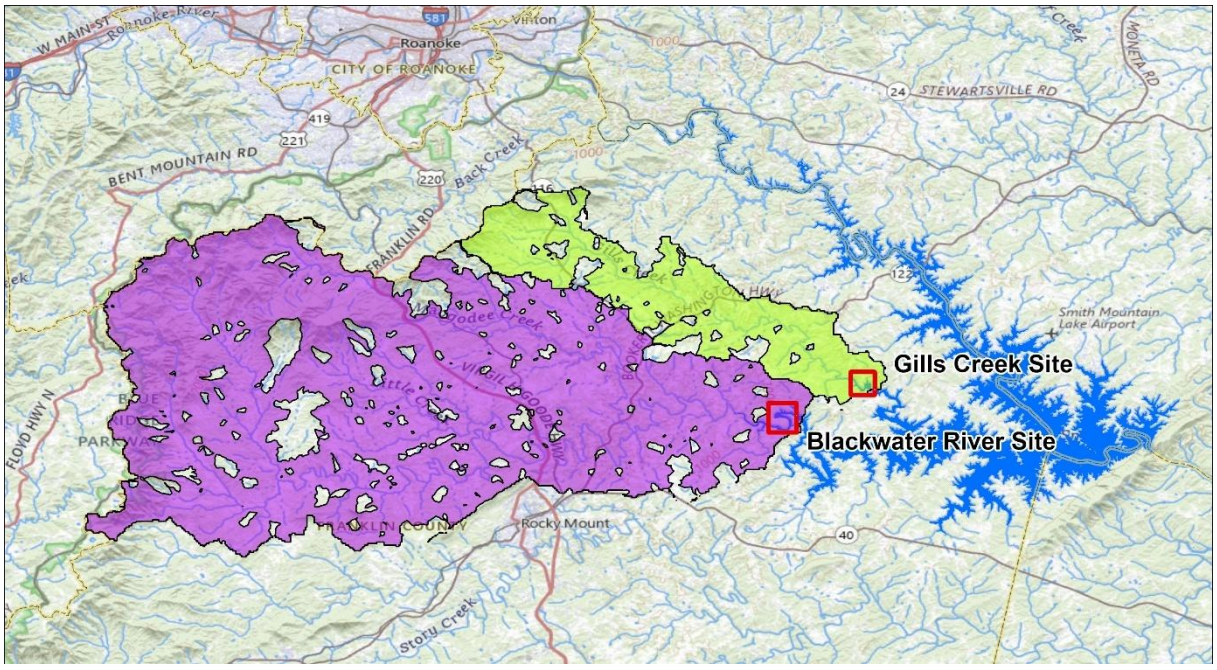


Figure 1. Anticipated Area of Investigation of the Gills Creek Site (green) & the Black Water River Site (purple).

P-Factor, or support practice factor, is used to evaluate the effectiveness and placement of proposed sediment best management practices (BMPs). For example, areas of land above a silt fence is credited with a P-Factor of 0.5, reducing the modeled soil loss from that area by 50%. Multiple scenarios are iteratively modeled to identify the combination of BMP types and locations with the greatest soil retention efficacy.

ESI will develop a complete physical description of each site using a combination of existing data from publicly available sources, LiDAR-derived terrain analysis, and field observations. Site characterization will also address the following attributes:

- Assessment of active erosion features including bank failures, gully systems, and upland sheet erosion via desktop and field observation in accordance with USACE, Norfolk District methods, guidelines and regulations.
- Characterization of bankside vegetation including canopy, shrub, and groundcover density; identification of invasive species (Japanese knotweed, kudzu, multiflora rose, and others relevant to Virginia riparian systems)
- Analysis of rare, threatened, and endangered species habitat assessment via a combination of desktop resources [i.e., US Fish and Wildlife Service (USFWS) IPaC and Virginia Department of Wildlife Resources (VDWR) natural heritage databases], and field reconnaissance.
- Assessment of potential archaeological resources via desktop review of Virginia Department of Historic Resources (DHR) Cultural Resource

Information System (CRIS) and topographic/landform analysis to identify areas with elevated archaeological sensitivity.

Inside the defined AOI as described above, summaries and maps will be prepared for geology, soil erodibility (K-factor), and soil type from gSSURGO and USGS data. Slope and aspect will be calculated from DEMs to guide determination of areas of high erosion potential.

2.2.2 Estimating Sediment Accumulation

ESI will estimate annual sediment loads at both sites using three methods: bathymetric, field water quality monitoring, and sedimentation modeling. The results of each of these three methodologies to estimate the annual soil load will be compared to validate and contextualize results, with particular focus on potential recent changes to the watersheds that may alter sediment accumulation rates in the coming decades.

2.2.2.1 Estimating Sediment Accumulation – Bathymetric Survey

First, a baseline bathymetric survey of each site area will be conducted. Survey transect spacing will be designed to achieve sufficient resolution to support annual sediment volume/rate calculations and production of contour maps at a scale appropriate for each site. Survey data will be processed and compared against available historical bathymetric data to quantify net sediment accumulation since the previous known survey. Two bathymetric surveys are proposed, one to describe the current condition and to serve as a pre-dredge survey. The second bathymetric survey is proposed post-dredge survey to estimate dredging completeness and to record the lake bottom for future analysis.

2.2.2.2 Estimating Sediment Accumulation – In Stream Monitoring

The second approach to measuring sediment loads involves installing water quality sondes on the Blackwater River and Gills Creek upstream of the influence of the lake. Both will be equipped to measure hourly water depth and turbidity. From the collected sonde data, ESI develops a rating curve to calculate stream flow. Sediment loads will be calculated by multiplying the measured average/median turbidity by the measured average/median stream flow. The sondes will be installed for at least one year to allow comparisons to the other methods and provide seasonal water flow/sedimentation data.

2.2.2.3 Estimating Sediment Accumulation – RUSLE2 Sediment Model

The third approach involves developing a RUSLE2 Sediment Loss Model to estimate the sediment load at the two sites by first calculating the sediment yield, utilizing the sediment delivery ratio. The sediment yield is then multiplied by the acreage of each site's watershed to calculate the modeled annual sediment load at each site for assumed present background conditions.

To model soil loss rates, sediment loads, sediment yields, and to identify erosion sources contributing to sedimentation, a GIS model of soil loss will be created in the AOI utilizing the Revised Universal Soil Loss Equation, Version 2 (RUSLE2). RUSLE2 calculates generalized annual estimates of erosion rates as sediment loss (A) utilizing the equation below.

$$A = R \times K \times LS \times C \times P$$

where R is the erosivity index, K is the soil erodibility factor, LS is the topographic factor (slope and slope length), C is the cover-management or land use factor, and P is the support practice factor.

P-Factor, or support practice factor, will be used to evaluate the effectiveness and placement of proposed sediment best management practices (BMPs). For example, areas of land above a silt fence could be credited with a P-Factor of 0.5, reducing the modeled soil loss from that area by 50%. Multiple scenarios are iteratively modeled to identify the combination of BMP types and locations with the greatest reduction of sediment loads entering both sites.

A raster of each factor will be prepared at the 1m resolution, then multiplied together cell by cell to create a composite soil loss raster at the 1m resolution. The soil loss raster is then used to calculate sediment loads, sediment yields, and modeled sedimentation rates at both the Blackwater River and Gills Creek site.

These calculations and analysis have already been scripted in Python by ESI staff and assembled into a ready-to-use Sediment Modeling Toolbox (Figure 2) simultaneously maximizing efficiency and accuracy. See Statement of Qualification (Appendix A) for more information regarding the Sediment Modeling Toolbox.

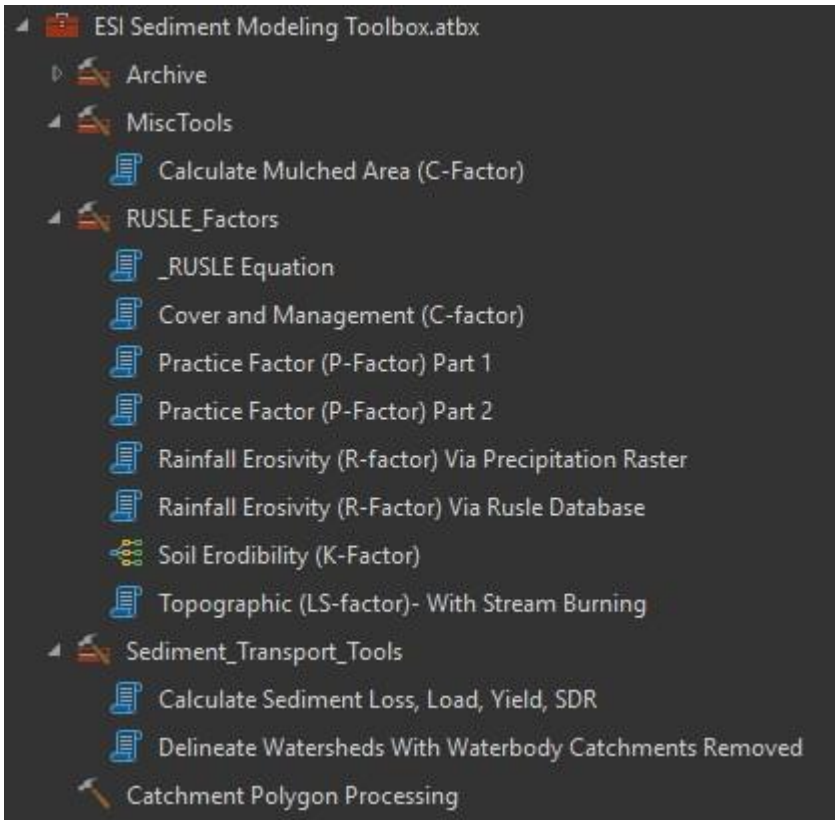


Figure 2. ESI's Sediment Modeling Toolbox.

2.2.3 Bathymetric Maps

Bathymetric maps will be prepared utilizing the methodology described in Section 2.2.2.1. This will be done for both the Gills Creek and Blackwater River Sites showing contours of the current lake bottom. The maps will include visual aids to understanding results of the survey and provide an

2.2.4 Erosion Source Assessment and Land Use

ESI proposes finding sources of high erosion utilizing two methods. First, the soil loss raster as calculated from the RUSLE2 equation can predict high areas of modeled erosion in the AOI. These areas can then be analyzed further to rank them based on size, total soil loss, and a field review conducted if needed.

Secondly, the Modified Bare Soil Index (MBI) will also be calculated in the Area of Investigation to assess areas of soil lacking vegetative cover. MBI will be calculated from Landsat-8 multi-spectral imagery at the 30m resolution. Areas with high MBI can be more susceptible to erosion due to lesser vegetative cover. Additionally, Landsat-8 imagery is collected every 16 days allowing for a temporal assessment of exposed soil.

Both the soil loss from RUSLE2 and MBI can be compared against land use from local zoning regulations, the National Land Cover Database (NLCD) and taxpayer parcel data. This will provide insights into which land uses or zonings are associated with sedimentation and can provide contact information of high erosion landowners to inform BMP's and public outreach decisions.

2.2.5 Mapping Sediment Accumulation & Proposed Interventions

GIS-based maps and models illustrating sediment accumulation, contributing land uses, and proposed intervention locations will be produced for each site. These products will be formatted for direct inclusion in permit applications and grant submittals in a later part of the process.

2.2.6 Water Quality Impact Assessment

ESI will evaluate the water quality impacts of current sedimentation accumulation at both sites, addressing nutrients, turbidity, and harmful algal bloom (HAB) potential. The assessment will synthesize existing datasets from the following sources:

- Virginia DEQ water quality monitoring records and Chesapeake Bay Program tributary data for the Blackwater River sub-watershed
- Smith Mountain Lake Association's Water Quality Monitoring Program data and 20-year averages.
- Virginia Save Our Streams macroinvertebrate potential data for tributary streams contributing to both sites
- Princeton Hydro 2024 phytoplankton assessment results for the Blackwater River arm

The water quality assessment will attempt to identify whether sedimentation is contributing to nutrient enrichment and HAB risk at either site. The extent to which ESI can contextualize the magnitude and sources of nutrients related to HAB potential is dependent on the statistical and physical quality of the provided data. The review of existing data will be a comprehensive compilation of historical information to establish baseline conditions, identify temporal and seasonal patterns, evaluate prior evidence of HAB, and define data gaps affecting subsequent evaluations. The historical datasets will be screened for completeness and coverage and compared to applicable Virginia DEQ protocols and/or guidance.

Using the data review compilation, ESI will develop a conceptual water quality model for each site to describe the principal source(s) and pathway(s) of sediment and nutrients into the system. The conceptual model will aim to contextualize sediment/nutrient delivery, tributary inflow(s), depositional tendencies, sediment resuspension potential, estimated residence time, and interactions between shallow and deeper water zones. Emphasis will be placed on understanding whether fine-grained sediment accumulation can be used as a proxy for overall transport patterns, as a source of nutrient release under low-oxygen conditions, and/or as a geomorphic

driver of poor circulation and high turbidity. The goal is to explain the primary mechanisms of sedimentation and nutrient introduction and circulation through the systems.

If ESI determines, based on the historic data review and the desktop analysis, that supplemental water quality monitoring sampling is necessary to complete the assessment at a standard sufficient for regulatory submission, a separate cost proposal for that monitoring effort will be provided in joint with applicable Virginia DEQ sampling protocols and methods. If needed, ESI anticipates a quarterly sampling on both sites for nutrients, turbidity, and a visual assessment for the presence of HABs.

The final deliverable for each site will include a summary of existing conditions and historical data/reports, identification of key system stressors and corresponding water quality components, discussion of data limitations, evaluation of likely water quality consequences related to proposed sediment removal methods, and recommendations regarding whether additional field sampling or modeling is needed to meet Virginia DEQ permit requirements so that TLAC can prioritize the next steps of the project with respect to funding, implementation, and permitting.

2.3 Task 3 — Analysis of Sediment Removal Methods

ESI will complete a feasibility-level evaluation of potential sediment removal methods for each site, with the objective of identifying the removal approaches that are determined to be implementable with respect to logistical, environmental, ecological, public use, regulatory, and cost factors. ESI will work with TLAC to establish the sediment removal objectives and limits (e.g., excavation caps) based on bathymetry, sediment distribution/thickness, navigation or use targets, adjacent land uses, environmental constraints, and access logistics. Rather than assuming that dredging is warranted across the entire depositional footprints of both sites, ESI will develop scenarios tied to re-establishing navigable depths, reopening hydraulic conveyance, and reducing nuisance shoaling in high-traveled areas. This approach will be more manageable long term for TLAC as it will focus on the areas most in need of sediment removal as opposed to prescribing the same treatment to the entire area.

The report for each site will provide a discussion of applicable removal technologies; a site-specific feasibility evaluation of each relevant method; identification of practical staging, dewatering, and disposal concepts; assessment of land- and water-based access; estimated sediment volumes; planning-level cost estimates including unit cost per cubic yard; and a recommended removal approach or shortlist of approaches for advancement into subsequent design, permitting, and funding discussions. This report will give TLAC a technically credible basis for selecting the most realistic sediment management pathway for each location.

2.3.1 Sediment Removal Methods

ESI anticipates that methods to be considered include conventional mechanical dredging from barge or platforms; long-reach excavator removals from shorelines or temporary pads; hydraulic dredging with slurry pumps to designated dewatering areas; low-impact excavations for shallow and/or sensitive areas; and targeted upstream sediment capture and/or cleanout where full dredging may be avoided. ESI will include assessment of the method's concept, required equipment and staffing, efficiency, cost, and time to perform. ESI will also include a description of anticipated disturbance and noise generation of each method, as these factors may be of particular importance to TLAC and residents to determine the preferred approach.

2.3.2 Staging, Dewatering, and Disposal

The feasibility analysis will also address logistical concerns such as staging, dewatering, and disposal, which often impact sediment removal projects. Dewatering options will be screened, including direct upland placements where practical, mechanical dewatering, temporary sediment basins, and geotextile tubes. Disposal pathways will be evaluated at a feasibility level based on anticipated sediment characteristics, dewatered material handling requirements, hauling distances, receiving-site needs, and probable regulatory considerations. The analysis will distinguish between concepts that are technically possible and those that are realistically implementable given access, cost, and community constraints/priorities.

2.3.3 Access Considerations

For each site and method, we will identify staging concepts, equipment mobilization routes, available shoreline or shoreline-adjacent work areas, and apparent limitations with respect to developed land, narrow/limited access, steep topography, landowner constraints, utility constraints, and/or lake conditions.

2.3.4 Sediment Volume Estimates and Removal Costs

Sediment removal quantity and cost estimating will be based on the best available bathymetric and topographic information, combined with field observations and any available sediment thickness data. We will develop order-of-magnitude estimates of removal volumes under the selected scenarios, recognizing that design-phase geotechnical verification would be required to refine actual quantities. Costs will be developed on a site-specific basis and expressed in forms useful to TLAC, including planning-level total cost and cost per cubic yard removed.

For comparison of alternatives, our team will apply a screening approach that considers at minimum constructability, potential permitting issues/delays, sediment compatibility, staging requirements, access complexity, short-term water quality impact, ecological disturbance, expected public use disruption, probable unit cost, maintenance implications, and overall suitability for the stated management objective. This matrix will support a transparent recommendation process and will allow TLAC to

understand not only which approach is preferred, but why other approaches are less favorable for a given site.

2.3.5 Bathymetric Measurements

As required by the RFP, we will also prepare bathymetric mapping products that support the removal-method analysis. Existing-condition maps will depict current contours and likely depositional features. Conceptual post-dredging maps will depict the approximate dredged template associated with each recommended scenario, including target elevations or depths, transitions to existing grades, and the spatial extent of proposed sediment removal. These figures will be used to communicate both volume implications and functional outcomes such as navigational improvement or conveyance restoration.

2.4 Task 4 — Prevention and Watershed Management Strategies

Sediment removal remedies present symptoms of past sediment discharges at the lake, but watershed management addresses causes upstream, to prevent ongoing adverse impacts. ESI will provide a fully integrated prevention and management strategy for both sites that identifies the most cost-effective upstream controls needed to achieve durable results.

2.4.1 Erosion Control Measures and BMPs

Based on the erosion source assessment from the sediment model and Bare Soil Index datasets developed in Task 2, ESI will identify and recommend priority erosion control areas for each contributing watershed. Recommendations will be organized by practice type and priority tier:

- Riparian buffer restoration with establishment of vegetated buffer zones along priority streambank erosion reaches, sized and located based on erosion source mapping and property ownership constraints.
- Agricultural and Livestock BMPs which includes outreach regarding rotational grazing, stocking rates, and feeding area siting.
- Sediment basins and forebays that will be evaluated for feasibility at tributary outflow points where concentrated flows enter the lake.
- Install or upgrade Stormwater Pollution Prevention Plans (SWPPP) contributing to Blackwater River and Gills Creek.
- Streambank stabilization measures that include bioengineering approaches for priority bank erosion sites identified during field reconnaissance, designed using ESI's natural channel design methodology based on Rosgen classification principles.

For each practice type, ESI will provide description and technical specifications, site-specific feasibility assessment, estimated cost, and estimated reduction in annual sediment loading to the receiving water. Lifespan estimates for recommended

management activities will be included based on published performance data and comparable installations.

ESI will develop an approach matrix that outlines the benefit of the highlighted sediment prevention and maintenance strategy. Along with developing a sequence of removal methods that work in conjunction with one another to satisfy the maintenance requirements for both sites. From a preliminary overview the most effective sediment prevention approach for preventing sediment accumulation on downstream watersheds in the Smith Mountain Lake system is a tiered system combining tributary sediment interception (forebays), upstream source control (stream and stormwater improvements), and shoreline stabilization. This integrated strategy reduces sediment loading at multiple points in the system and minimizes long-term reliance on large-scale dredging operations

2.4.2 Evaluation of Feasibility

2.4.2.1 Tributary Sediment Interception (Forebays and Sediment Traps)

Sediment forebays and traps provide a highly effective means of intercepting sediment at tributary inlets before it enters Smith Mountain Lake. These features are designed to reduce flow velocities and promote controlled deposition in accessible locations, allowing sediment to be removed through periodic maintenance dredging. Typical maintenance intervals range from approximately 3 to 10 years, depending on sediment loading rates, which will be measured from the sonde water quality data and estimated from the RUSLE2 sediment model. This will allow for both predictable and cost-efficient maintenance over the long term. While forebays do not address existing in-lake sediment accumulation, they significantly reduce future deposition and extend the lifespan of larger dredging efforts. With proper design and maintenance, these systems can function indefinitely as part of a long-term sediment management program.

2.4.2.2 Upstream Source Control (Stream & Stormwater Improvements)

Upstream source control measures reduce sediment generation within the watershed through streambank stabilization and stormwater management improvements. Stream restoration techniques, including bioengineering and grade control, stabilize eroding channels and can provide long-term performance on the order of 20+ years when properly designed and maintained. Complementary stormwater BMP retrofits such as bioretention systems, infiltration practices, and enhanced detention basins reduce runoff velocities and promote sediment settling, with typical lifespans of 10 to 20 years and routine maintenance requirements (e.g., sediment removal, vegetation management). These improvements can also be incorporated into the sediment model to estimate annual sediment load reduction to determine efficacy. Although these measures are distributed and incremental, they address sediment at its source and are critical for achieving sustained reductions in sediment loading to the lake system.

2.4.2.3 Shoreline Stabilization and Riparian Protection

Shoreline stabilization and riparian protection measures address localized erosion along the lake edge and prevent direct sediment inputs to Smith Mountain Lake. Stabilization approaches may include structural methods such as riprap, as well as bioengineered and living shoreline techniques that incorporate native vegetation. Structural measures typically provide a lifespan of 20 to 30 years or more, while vegetative systems may require periodic maintenance but offer self-sustaining benefits once established. Riparian buffers further enhance performance by filtering overland flow and reducing near-shore erosion. While the overall sediment reduction is localized compared to watershed-scale controls, these measures provide immediate, visible benefits and are well-suited for implementation in developed shoreline areas with strong stakeholder involvement.

2.4.3 Priority Land Conservation & Restoration

During review of the soil loss estimates from the RUSLE2 model and MBI data, ESI will review areas of high soil loss. Then, these areas will be evaluated

2.4.4 Cost-Benefit Analysis, Maintenance, and Lifespan

Where applicable, ESI will model the performance of the proposed sediment reduction strategy by creating a second sediment model where the reduction strategy will be included as the P-Factor of the RUSLE2 model. The sediment load from the background model can then be subtracted by the sediment load of the model with the proposed measures to determine how much sediment load was reduced due to the installation. Best Management Practices that cannot fit into the RUSLE2 model framework will be evaluated on a case-by-case basis to estimate soil load reduction.

Then, each proposed sediment reduction strategy will evaluated for long-term maintenance costs. For some reduction strategies, this will depend on soil loading estimates, which may also be modeled or measured to accurately anticipate maintenance frequency and ultimately costs.

Additionally, the lifespan of each sediment reduction strategy will vary and will be evaluated to determine the total sediment load reduction in the long-term.

2.5 Task 5 — Regulatory and Environmental Compliance Plan

Smith Mountain Lake is a Federal Energy Regulatory Commission (FERC)-licensed project operated by Appalachian Power Company (APCO). Any in-water sediment removal activity at either the Blackwater River or Gills Creek site will require a multi-agency permit sequence with FERC authorization. ESI's Regulatory and Environmental Compliance Plan will explain not only which permits are required, but the order in which they must be obtained, the criteria that must be met, and the environmental information that each application will need to contain.

2.5.1 Permit Matrix

ESI will identify and document all required permits and authorizations for sediment removal and prevention activities at each site. The following regulatory programs will be evaluated.

Table 3. Permit Matrix Outline, Smith Mountain Lake, Virginia.

Agency	Type of Permit or Consultation
U.S. Army Corps of Engineers (ACOE)	Section 404 permit (discharge of dredge or fill material) and Section 10 permit (work in navigable waters), evaluation of Nationwide Permit eligibility versus Individual Permit requirement based on sediment volume and site conditions.
Federal Energy Regulatory Commission (FERC)	Consultation with Appalachian Power Company under the FERC license for Smith Mountain Project, required for any in-water work within the licensed project boundary. (Pre-application meeting with Appalachian Power Company recommended prior to formal agency submissions.)
Virginia Department of Environmental Quality (VDEQ)	Section 401 Water Quality Certification; Virginia Pollutant Discharge Elimination System (VPDES) permit for dewatering discharges; Virginia Water Protection Permit (VWPP) for impacts to state waters.
Virginia Department of Wildlife Resources (WDWR)	Coordination for impacts to aquatic species and habitats; review of any activities during fish spawning periods.
Virginia State Historic Preservation Office (SHPO)	Section 106 consultation under the National Historic Preservation Act (NHPA); required for FERC-licensed projects and federally permitted activities; coordination initiated following archaeological resource potential assessment in Task 2.
Beford, Franklin, and Pittsylvania County Government	Land disturbance permits and erosion and sediment control plans required by Bedford, Franklin, and Pittsylvania Counties for upland work and staging areas.

The final Regulatory and Environmental Compliance Plan and related permitting matrix will refine the sequenced permitting timeline provided in Section 4 of this document and will include schedules for each site showing the anticipated order of agency contacts, pre-application meetings, application submissions, and expected review periods. Timelines will account for FERC coordination as a regulatory step and will identify milestones where funding applications can be submitted in advance of permit issuance.

2.5.2 Assessment of Environmental Impacts

ESI will assess the environmental impacts of sediment removal and disposal operations at each site, addressing direct impacts to aquatic habitat during removal, turbidity effects on water quality and aquatic species, impacts to rare, threatened, and endangered species habitats identified in Task 2, disposal site environmental conditions, and long-term ecological benefits of sediment removal on water quality and habitat function. Mitigation measures will be identified for all significant impact categories.

2.5.3 Permitting and Implementation Timeline

In coordination with local and federal agencies, ESI will develop an estimate and projected timeline identifying any potential permitting challenges, as well as the conditions required for project implementation. Project schedules may be subject to additional review by the agencies listed in the permit matrix. For an overview of the anticipated project timeline, please refer to the schedule provided in Section 3.0.

2.5.4 Contingency Planning

ESI will provide contingency plans for unanticipated issues during field investigation and removal operations. Specific contingency protocols will be developed for: archaeological discoveries or inadvertent effects on cultural resources, requiring suspension of work and coordination with Virginia SHPO; discovery of hazardous materials or contaminated sediments requiring additional characterization and specialized disposal; and significant project setbacks including adverse weather, equipment failure, or access complications that could affect the project schedule or cost estimate. Each contingency plan will identify the response protocol, responsible parties, regulatory notification requirements, and estimated cost and schedule impact.

2.6 Task 6 — Stakeholder Analysis and Funding Assessment

Long-term success of sedimentation management at Smith Mountain Lake will require coordinated engagement across a diverse stakeholder community, sustained funding, and partnership with Appalachian Power Company as the FERC license holder. ESI's stakeholder analysis and funding assessment is designed to give TLAC both a roadmap and a focused path to funding.

2.6.1 Stakeholder Identification and Engagement Strategy

ESI will collaborate with the TLAC Sedimentation Task Force to build a core stakeholder team including representatives from Franklin County, Smith Mountain Lake property owners, AEP Power, water quality and environmental organizations, commercial, agricultural, and fishing interests, recreation and tourism groups. Building a broad, engaged coalition with different perspectives regarding sedimentation issues will be critical to a successful outcome.

Once this stakeholder team forms, ESI will schedule a kick-off meeting to introduce the study, describe our sediment modeling and analysis methods, and present online GIS

mapping and engagement tools for sharing data and gathering community ideas throughout the project. ESI and the stakeholder team will establish a schedule for public meetings at key project milestones to build consensus around causes and impacts of stream sedimentation in Smith Mountain Lake, and potential mitigation strategies. Study findings will be presented at the final public meeting at project completion.

Critical to successful stream sedimentation management will be identifying data indicators to measure progress toward sediment reduction, and funding opportunities TLAC can use for sedimentation prevention projects, cost-benefit analyses for mitigation options, property owner outreach and education efforts, and long-term water quality assessments.

2.6.2 Funding Assessment

ESI will identify potential funding sources for both sediment removal and watershed management activities at the Blackwater River and Gills Creek sites. The funding assessment will focus on programs with the highest alignment to the study's findings and deliverable structure, including:

- U.S. Environmental Protection Agency (EPA) Clean Water Act Section 319 Nonpoint Source Program. Virginia's 319 grant program administered by VDEQ has a strong alignment with watershed management practices and water quality improvement objectives.
- Natural Resources Conservation Service (NRCS) Regional Conservation Partnership Program (RCPP) when applicable for agricultural erosion source control within contributing watersheds
- EPA Clean Water Act Section 604(b) Planning Grants are available for watershed-scale water quality planning consistent with the scope of this feasibility study.
- Virginia Resources Authority (VRA) and Virginia Clean Water Revolving Loan Fund has state-level financing mechanisms for qualifying water quality improvement projects.
- Community Development Block Grant (CDBG) and Economic Development Administration (EDA) programs are relevant to the community access and economic function dimensions of lake sedimentation.
- Public-private partnership opportunities with APCO. APCO's FERC license may include provisions for reservoir management contributions; partnership with APCO could leverage cost-sharing on shared-benefit improvements.

For each funding source identified, ESI will provide the program name and administering agency, eligible activities, application cycle, typical award range, and the specific feasibility study that would directly support the application. This structure gives TLAC's grant writers a funding path.

3.0 Estimated Project Schedule

ESI proposes a phased project schedule with an anticipated start date of May 4, 2026. The schedule is a schedule of data review, field investigation, analysis, and reporting, with any field work planned for late summer and fall 2026 to coordinate with favorable bathymetric survey conditions and Virginia regulatory requirements. The full scope can be delivered as a complete program or executed in phases consistent with TLAC's funding availability as described previously.

Table 4. Estimated Project Schedule and Milestones, TLAC Sedimentation Management Feasibility Study, Smith Mountain Lake, Virginia.

Task / Milestone	Initiation	Anticipated Completion
Project Kickoff and TLAC Coordination Meeting	May 2026 (after notification)	May 2026
Task 1: Data Review & Collection	May 2026	June 2026
Desktop Review Assessment Deliverable	May 2026	June 2026
Task 6: Stakeholder Analysis (concurrent with data review)	May 2026	July 2026
Task 2: Site Assessment Field Work (bathymetric survey, sediment quantification, erosion source and water quality assessment)	August 2026	August 2027
Task 2: GIS Mapping and Analysis (concurrent with field)	August 2026	November 2026
Task 3: Sediment Removal Methods Analysis	August 2027	March 2028
Task 4: Prevention & Watershed Management (Erosion control measures, BMPs, and cost-benefit analysis)	August 2027	March 2028
Task 5: Regulatory & Environmental Compliance Plan (Permit matrix, environmental impact assessment and contingency planning)	March 2028	June 2028
Draft Feasibility Study Reports (both sites)	August 2027	July 2028
TLAC Review Period	July 2028	September 2028
Final Feasibility Study Reports Delivered	October 2028	January 2029

Task / Milestone	Initiation	Anticipated Completion
Presentation to TLAC Sedimentation Task Force / Board	January 2029	January 2029

The schedule above is subject to change. A Phase 1 schedule which includes Task 1 (Data Review) and Task 6 (Stakeholder Analysis) would conclude with delivery of the Desktop Review Assessment by Summer 2026, consistent with the phased cost option presented. Field work timing is subject to VDEQ sampling protocol windows and APCO coordination for access to FERC-licensed project areas.

4.0 Project Team

ESI's project team is structured to provide senior engineering leadership on all technical deliverables, supported by an integrated GIS and environmental science team capable of handling spatial analysis, ecological assessment, and cultural resource components in-house without subconsultant involvement. All personnel listed below will be available for the duration of the project.

Shaun W. Kline, Ph.D., P.E. — Senior Principal and Project Manager

Dr. Kline serves as ESI's Vice President and leads the firm's hydrologic and hydraulic engineering program. His relevant expertise for the TLAC Sedimentation Feasibility Study includes hydrologic, hydraulic, geomorphologic and sediment transport numerical modeling; bathymetric field program design and data collection; and water quality assessment (nutrient loading quantification, algae biomass predictors, waste load allocation studies). Dr. Kline directed bathymetric survey programs and hydrothermal model development at Dominion Energy Virginia's Chesterfield Power Station in Chester, Virginia, including field monitoring coordination and submittal to VDEQ under a 316a thermal demonstration program. He also updated a sedimentation model using RUSLE2 methodology in a GIS platform for a multi-state linear project crossing Virginia and West Virginia, incorporating existing erosion and sediment control features and maintenance strategies. Dr. Kline is a registered Professional Engineer in multiple states including Virginia and West Virginia with a Ph.D. in Geological Sciences, M.S. in Coastal and Oceanographic Engineering, and B.S. in Civil Engineering from the University of Florida.

Education: Ph.D., Geological Sciences, University of Florida, 2013; M.S., Coastal and Oceanographic Engineering, University of Florida, 2009; B.S., Civil Engineering, University of Florida, 2006.

Licenses & Certifications: P.E. — CO, FL, KY, ME, NC, NV, OH, OR, PA, TX, WV, VA ; PEC/SafeLand Certification.

4.1 Jeremy Alberts, Ph.D —Principal, Water Quality

Dr. Alberts has served as technical lead for wildlife habitat, forest fragmentation, and sedimentation/aquatic resource assessments, and permitting for multiple large transmission line projects in Virginia and the surrounding states. He specializes in the analysis of landscape-scale impacts on aquatic systems and has extensive experience in fisheries research throughout the Ohio River Basin. Dr. Alberts is primarily involved in management of large-scale natural resource and environmental studies and has a sound understanding of the complexity of inter-agency communication and coordination. Dr. Alberts has over 15 years of experience in natural resources management and offers valuable ecological expertise that supports sound management and regulatory decisions. Dr. Alberts will be available for Project discussions, agency meetings, document review, and provide project pathway recommendations, as needed.

Education: Ph.D., Biological Sciences, University of Cincinnati, 2016; M.S., Environmental and Natural Resources, Ohio State University, 2012; B.S., Biology, Muskingum College, 2001.
Licenses & Certification: USFWS Endangered Species Act Section 7 Training, 2016; Kentucky and Virginia Crayfish Identification Training, 2016

4.2 Chase R. Moretti, P.E. — Engineer

Mr. Moretti is a Professional Engineer with specialized experience in erosion and sediment control design, stormwater BMP design and hydrologic analysis, and natural channel and stream restoration design. His direct relevance to this study includes preparation of site-specific erosion and sediment control plans for major linear infrastructure projects in Virginia and West Virginia, design of permanent stormwater management systems with hydrologic and hydraulic calculations, and stream restoration design incorporating geomorphic assessment, streambank stabilization, and in-stream structure design using natural channel design methodology. Mr. Moretti also completed Wildland Hydrology Restoration training under Dave Rosgen, P.H., Ph.D. in 2025 and 2026 completing the Basic Skills, Level I and Level II courses. These trainings provided advanced training in Rosgen classification and natural channel design directly applicable to the stream restoration component of this study's prevention and watershed management tasks.

Education: B.E., Civil and Environmental Engineering, Youngstown State University, 2019; Wildland Hydrology Basis Survey Skills, Seeley Lake, MT; Dave Rosgen, P.H., Ph.D., 2025
Wildland Hydrology Level I: Applied Fluvial Geomorphology, Ashville, NC; Dave Rosgen, P.H., Ph.D., 2026
Wildland Hydrology Level II: River Morphology and Applications, Ashville, NC; Dave Rosgen, P.H., Ph.D., 2026

Licenses & Certifications: P.E., MA (No. 60021), OH (PE.90094), PA (PE096997), TN (132172); NCEES Model Law Engineer (Record ID 19-973-17); Qualified Site Inspector, PADEP, 2025.

4.3 Adam M. Nolte, P.G. — GIS Project Lead Analyst

Mr. Nolte is a licensed Professional Geologist with more than 9 years of experience in GIS, covering topics in erosion modeling and sediment transport, GIS based watershed analysis, hydrogeology, and geohazard mapping. Additionally, he is skilled in coding in Python to automate workflows, conduct spatial modeling and analysis. Mr. Nolte, in conjunction with other ESI staff, developed ESI's Sediment Modeling ArcGIS Toolbox utilizing the Revised Universal Soil Loss Equation (RUSLE2) framework. This allows for quick, consistent analysis of soil loss, loads, yield, and delivery ratios for watersheds. Additionally, Mr. Nolte has also conducted LiDAR analysis to map geohazards, such as sinkholes and landslides, utilizing python, machine learning, and change detection.

Education: B.S., Geological Science, University of Kentucky, 2017.
Licenses & Certifications: P.G., KY (No. 275751)

4.4 Andy Dobson — GIS Analyst/ Stakeholder Outreach Specialist

Mr. Dobson is an AICP-credentialed urban planner and geospatial analyst with more than 25 years of experience supporting local governments in land-use planning, hazard mitigation, and data-driven decision-making. He specializes in GIS analysis, floodplain management, community engagement, and developing planning frameworks to address complex public issues.

His stakeholder engagement experience ranges from single-site developments to watershed-wide flood hazard mitigation studies, delivered through public hearings, workshops, and online meetings. Mr. Dobson is skilled in preparing summary recommendations and findings of fact, developing presentation materials, and creating geospatial information products for public and stakeholder use.

Education: M.P.A., Public Administration, Indiana University, 1999; B.S, B.U.P.D, Urban Planning, Ball State University, 1993
Licenses & Certification: American Institute of Certified Planners (AICP), Certified Floodplain Manager (CFM)

4.5 Brandon Yates — Aquatic Species Lead

Mr. Yates is a certified rescue diver, experienced freshwater mussel surveyor and is the ESI Aquatic Group Manager. Mr. Yates has experience encompassing 14 states and has experience spanning multiple disciplines of aquatic ecology including methods to track water quality and monitoring streambed sediment loads.

He fulfills multiple project responsibilities including project management, scheduling and logistics, equipment and watercraft maintenance, scientific collection, permit assistance, curation, and study plans.

Education: M.S. Biology, Morehead State University, 2017; B.S, Biology, Morehead State University, 2015
Licenses & Certifications: USFWS Federally Permitted Malacologist, New Jersey, New York, West Virginia & Ohio Mussel Surveyor, PADI Open Water and Rescue SCUBA Diver and Emergency Oxygen Provider. SDI/TDI Advanced and Nitrox SCUBA Diver.

4.6 Ashley Huntley — Cultural Resources GIS Analyst

Ms. Huntley is a GIS specialist with a B.A. in Landscape Archaeology from the University of Cincinnati and certificates in both Historic Preservation and GIS. Her dual expertise in cultural resource management and GIS makes her the appropriate lead for the archaeological resource potential assessment required in Task 2. Ms. Huntley has conducted Phase I, II, and III archaeological testing projects with responsibilities including literature reviews, data collection from State Historic Preservation Office (SHPO) websites, GIS mapping, and cultural resource reporting across 25 state, including Virginia and nearby states such as West Virginia, Kentucky, Ohio, Tennessnee, North Carolina, South Carolina, and Pennsylvania. Her SHPO data collection experience and familiarity with the Virginia DHR Cultural Resource Information System (CRIS) enables efficient desktop assessment of archaeological sensitivity at both sites. Her GIS capabilities include ArcGIS Desktop, ArcGIS Pro, Survey123, and creation and management of web-based GIS applications for field data dissemination.

Education: B.A., Landscape Archaeology, University of Cincinnati, 2018
Licenses & Certifications: Historic Preservation and Geographic Information Systems.

4.7 Hunter Pippin — GIS Analyst

Mr. Pippin is a GIS specialist with a B.S. in Environmental Science and a certificate in GIS from the University of Pittsburgh. He brings experience in mapping and modeling groundwater contamination, transport, and remediation as well as a proven track record in supporting environmental projects such as aquatic resource delineations, plant & animal surveys, and habitat assessments. He is adept at spatial data analysis, cartography, database management, and he aids in data communication and visualization through the development of custom web tools.

Education: B.S., Environmental Science, University of Pittsburgh, 2021
Licenses & Certifications: Geographic Information Systems Certificate.

5.0 Past Performance and References

ESI presents the following project references demonstrating ESI's directly relevant experience in hydrologic and hydraulic engineering, sedimentation assessment, bathymetric survey programs, water quality evaluation, and erosion and sediment control design in Virginia and comparable regulatory environments. Excerpts of samples from previous projects are found within Appendix C.

Sedimentation Model and Water Quality Impact Assessment, Confidential Client (2024-Ongoing)

ESI was tasked with modeling the impacts to streams and aquatic life due to sedimentation from construction of a proposed transmission pipeline project crossing both Virginia and North Carolina. A sediment transport model was developed using the RUSLE2 methodology adapted to GIS to quantify soil loss from upslope areas, estimate sediment yields within watersheds, and determine sediment loads delivered to outlet streams. Sediment load outputs were further analyzed using the National Hydrography Dataset Plus High Resolution (NHD Plus HR) to model annualized increases in turbidity (mg/L) associated with construction activities. These results identified sub-watersheds most likely to experience elevated sedimentation, providing critical insight into areas with heightened risk for aquatic life impacts.

See Statement of Qualification (Appendix A) for more information regarding the project. Figures associated with the project can be found in Work Samples (Appendix C).

Contact:
Josh Henry
412-713-0485

Revolution Pipeline, ETC Northeast Pipeline, LLC (2015-2020)

ESI provided engineering and environmental services supporting approximately 40 miles of natural gas pipeline and 15 miles of access roads, with emphasis on evaluating potential secondary environmental impacts and integrating regulatory requirements into project design. IFB and IFC plans were prepared along with ESCGP-2 permitting documents, restoration plans, hydrologic and hydraulic modeling, aquatic resource delineations, habitat assessments, and surveys for Rare, Threatened, and Endangered plants, bats, and birds.

ESI prepared IFB/IFC plan sets, Erosion and Sedimentation Pollution Control plans, Post-Construction Stormwater Management Plans, and permanent stormwater management designs. Secondary impact evaluations such as sedimentation risk,

hydrologic changes, and increased stormwater volumes were incorporated early to shape engineering solutions and minimize indirect effects.

See Statement of Qualification (Appendix A) for more information regarding the project. Figures associated with the project can be found in Work Samples (Appendix C).

Contact:
Tom Glisson
412-491-7464
tom.glisson@swca.com

Mountain Valley Pipeline, Mountain Valley Pipeline, LLC (2014-2019)

ESI was retained by Mountain Valley Pipeline LLC to provide protected-species consultations, surveys and impact analyses for the Project along the proposed route. ESI's scope on this project required extensive and intensive coordination with the U.S. Forest Service (USFS), U.S. Fish & Wildlife Service (USFWS), Federal Energy Regulatory Commission (FERC), state natural resource agencies, and, ultimately, multiple legal counsel. ESI's deliverables included production of multiple sedimentation models, a Biological Evaluation, a Biological Assessment, contribution to the Biological Opinion, contributions to the USFS Plan of Development (POD), contributions to the FERC Resource Reports, and preparation of responses to FERC data requests and public comments. The sedimentation model was iteratively revised based on sediment impacts to inform revised BMPs and species impact analysis.

ESI's scope included sedimentation analyses for both the Jefferson National Forest to assess water quality impacts associated with activities on Forest Service lands, and impact analysis to multiple federally endangered aquatic species across the entirety of the project, including the Roanoke Logperch within the Blackwater River drainage. The sedimentation analysis involved modeling load, transport and deposition from project activities, including construction, first year of restoration, and second year of restoration. Soil erosion was assessed at the watershed scale, utilizing the RUSLE2 methodology with deposition outputs modeled for each stream reach. Outputs were combined with species field survey data, existing distribution models and habitat suitability data to estimate impacts to individuals and the population overall as a result of proposed project activities.

See Statement of Qualification (Appendix A) for more information regarding the project. Figures associated with the project can be found in Work Samples (Appendix C).

Contact:
Megan Stahl
412-737-2587
Megan.Stahl@eqt.com

Muskingum Island Well Plugging Project, U.S. Fish and Wildlife Service

The U.S Fish and Wildlife Service (USFWS) Ohio River Islands National Wildlife Refuge (ORINWR) proposed plugging of 13 orphaned oil and gas wells on Muskingum Island near Marietta, Ohio. Eight of the wells were located on Muskingum Island and due to erosion of Muskingum Island right descending bank, five wells were in the Ohio River. With the, now, steep banks and orphaned well position in the river, plugging was only feasible via work barge. However, the orphan wells within the Ohio River were not in deep enough water and dredging was required to allow barge access and tombstone placement. ESI was retained by the USFWS-ORINWR to conduct mussel survey, complete formal Endangered Species Act Section 7 consultation, write an Environmental Assessment, and complete freshwater mussel salvage.

See Statement of Qualification (Appendix A) for more information regarding the project. Figures associated with the project are available upon request.

Contact:
Victor Elam
(620) 203-8514
victor_elam@fws.gov

Shannon Rebuilds Project, American Electric Power (AEP)

ESI supported a multi-component electric transmission infrastructure rebuild project consisting of four 138 kV line projects: Astor Extension, Groves Road–Shannon, Refugee–Shannon Road, and Bixby–Shannon. The program required comprehensive environmental permitting, floodplain compliance, and construction stormwater management planning across multiple jurisdictions in central Ohio.

ESI provided oversaw regulatory and technical services to facilitate project delivery and maintain compliance with federal, state, and local environmental requirements. The project involved linear utility impacts to jurisdictional waters, wetlands, and FEMA-designated floodplains, including a coordinated permitting and engineering approach.

See Statement of Qualification (Appendix A) for more information regarding the project. Figures associated with the project are available upon request.

Contact:
Tiffany Fritchley
tfritchley@aep.com

Bland Area Improvement 138 kV Transmission Line Rebuild, American Electric Power (AEP)

ESI provided environmental consulting services for American Electric Power for the Bland Area Improvements Transmission Line Rebuild Project, spanning approximately 26 miles across Virginia and West Virginia and crossing federal lands within the George Washington and Jefferson National Forests Infrastructure activities in forested and riparian landscapes can disturb soils, increase erosion, and deliver sediment to downstream waterways, potentially degrading aquatic habitats and threatening sensitive species. Project activities included early planning support, sensitive resource evaluations, multi-species surveys, agency coordination, and compliance with the National Environmental Policy Act (NEPA).

Work included a hydrologic and sedimentation assessment conducted using the Modified Universal Soil Loss Equation (MUSLE) to evaluate potential impacts on the Tennessee heelsplitter, a state-listed and U.S. Forest Service sensitive mussel species. Sedimentation is a major threat to the species. This analysis is required to address potential impacts on freshwater mussel species within geographic bounds of the water resource cumulative effects analysis area (i.e., the hydrologic area where sediment yields are measurable and/or significant).

See Statement of Qualification (Appendix A) for more information regarding the project. Figures associated with the project can be found in Work Samples (Appendix C).

Contact:
Rory Chisholm
rtchisholm@aep.com
540-562-7278

Multi-State & Multi-Species Habitat Conservation Plan (HCP), American Electric Power (AEP)

ESI conducted a study that highlights the integration of sediment management strategies into the development of a system-wide Habitat Conservation Plan (HCP) for American Electric Power, the nation’s largest transmission system operator, spanning an 11-state service region. The HCP describes conservation measures for 10 covered species including bats, birds, a snake, a butterfly, and a bumble bee, and articulates streamlined compliance for over 130 non-covered federally listed species. The plan incorporates adaptive management strategies, including erosion and sediment control measures, seasonal construction restrictions, and targeted mitigation, allowing site-specific flexibility while maintaining regional environmental compliance. This work demonstrates how proactive, system-wide planning can integrate sediment considerations into large-scale infrastructure programs.

See Statement of Qualification (Appendix A) for more information regarding the project. Figures associated with the project are available upon request.

Contact:
Mr. Andrew Turner
AJTurner@aep.com
918-218-4584

Sacrificial Anode Array Replacement Project, AECOM/Transco (2025-Ongoing)

ESI conducted a replacement of a sacrificial anode bed to support an existing natural gas pipeline within the Delaware River, a Rank 3 – State Threatened River due to the presence of state-threatened mussel species. Due to hurdles of the characteristics of the site and bathymetric analysis, ESI and their partner redesigned project efforts and negotiated survey scope changes with the New Jersey Department of Environmental Protection to accomplish project goals. ESI mussel surveyors encountered high mussel densities within the survey area including state-listed mussels. A modified survey plan was proposed by ESI and incorporated practical approaches while adhering to guidelines limiting mussel and sediment disturbance. The plan had practical approaches and implemented agency-approved solutions to unusual project challenges, ESI ensured client compliance and effectively averted costly project delays.

See Statement of Qualification (Appendix A) for more information regarding the project. Figures associated with the project can be found in Work Samples (Appendix C).

Contact:
Heather Brewster
Heather.Brewster@aecom.com

6.0 Costs and Assumptions/Limitations

6.1 Costs

Anticipated costs for each task are provided in Table 5. Regular invoices will be submitted for completed task work. No work that is considered a change in work scope or services is performed without written approval from TLAC in advance of the work being performed.

Table 5. Cost Breakdown Per Task.

Task	Total	Blackwater River	Gills Creek
Task 1. Data Review Collection			
Task 2. Site Assessment			
- *Optional Additional Water Quality Monitoring*			
Task 3. Analysis of Sediment Removal Techniques			
Task 4. Prevention & Watershed Management Strategies			
Task 5. Regulatory and Environmental Compliance Plan			
Task 6. Stakeholder Analysis and Funding Assessment			
Total			

**Totals do not include Optional Additional Water Quality Monitoring*

6.2 Assumptions/Limitations

ESI assumes the following in preparation of the above scope and costs:

- Scheduling of evaluations and field visits is dependent on landowners, agency requirements, and permit conditions.
- All costs are presented as Not-to-Exceed fixed fees; ESI will not bill beyond the amounts above for the stated scope without prior written authorization from TLAC.
- Bathymetric survey costs include equipment, field labor, and data processing; coordination with APCO for access to FERC-licensed project areas is included.
- GIS deliverables are provided in ESRI geodatabase and shapefile formats compatible with state and federal agency GIS systems; PDF map products are included at no additional cost.
- Travel, subsistence, and equipment expenses are included in the above cost estimates; no separate ODC billing will be applied.
- Site access is assumed to be obtainable through TLAC and APCO coordination at no cost to ESI; extraordinary access requirements will be treated as a change order.
- Sampling locations are sufficient and accessible across the study area.
- Channel and creek alignment do not undergo significant natural or human-induced changes during any study period.
- No other flooding hazards will be evaluated beyond the mechanisms noted above.
- Additional evaluations and/or calculations would incur additional fees.

- No engineering design, plans, permitting, or site visits are included in this scope.
- Desktop review of historical data and environmental resources may not accurately reflect all site conditions.
- Recommended sediment management strategies may be subject to permitting, environmental regulations, and stakeholder approval.
- Feasibility outcomes may be influenced by budgetary, logistical, or land ownership constraints.
- Costs do not include agency permit fees, laboratory testing of sediment samples beyond standard characterization, or geotechnical borings; these items will be identified and quoted separately if determined necessary during the historic data review phase.
- All other assumptions and limitations as described throughout the proposal.

7.0 Contacts at ESI

ESI appreciates the opportunity to propose on this project. Please do not hesitate to contact us if you have any questions. All communications should be directed to:

Mr. Shaun Kline, Ph.D., P.E.
Vice President
Environmental Solutions & Innovations, Inc.
1158 Dutilh Road
Mars, PA 16046

Phone: (513) 451-1777
Fax: (513) 451-3321
Cell: (352) 514-3340
E-mail: skline@.com

APPENDIX A:
ESI STATEMENT OF QUALIFICATIONS

Environmental Solutions & Innovations, Inc.

ESI

STATEMENT OF QUALIFICATIONS

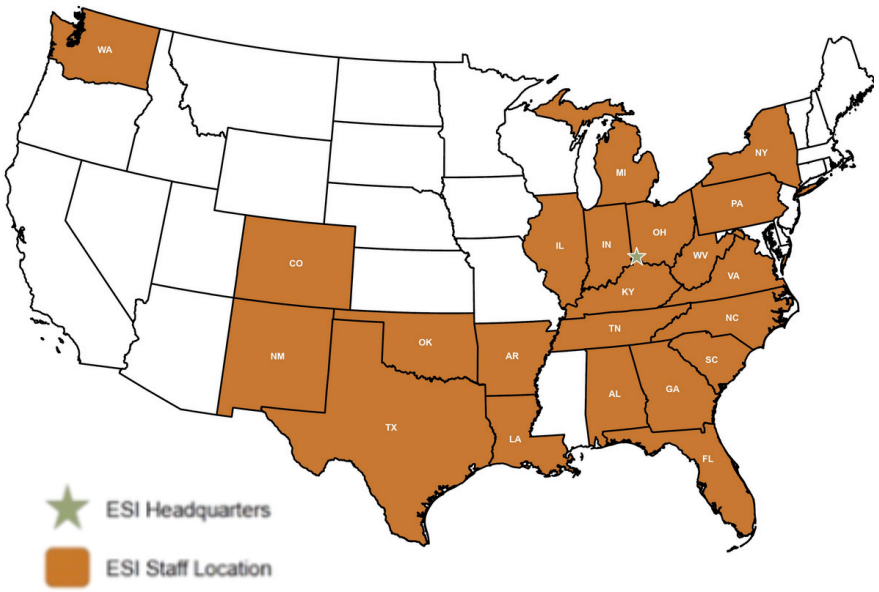
SEDIMENTATION MANAGEMENT SERVICES

PREPARED FOR

TRI-COUNTY LAKES
ADMINISTRATIVE COMMISSION

REAL SCIENCE. REAL SOLUTIONS.

WHERE WE ARE



ESI OVERVIEW

Environmental Solutions & Innovations, Inc. (ESI) is a certified Women-Owned Small Business (WOSB) with 25 years of experience and 75 professionals delivering integrated environmental, engineering and planning professional services. Our expert staff are united by a single mission to provide the highest quality integrated services to create a better, built environment.

Our team of dedicated experts seamlessly combines local, on-the-ground knowledge with exceptional, big-picture, analytical capabilities to provide our clients with workable, cost-effective solutions to modern problems. Our clients range from government entities to utilities to conservation partners.

ESI is a certified woman-owned small business.

ESI EXPERTISE

- Civil Engineering
- Sediment Modeling
- Watershed Management
- Aquatic Resources
- Land Use Planning
- Regulatory Compliance
- Protected Species
- Cultural Resources
- Geographic Information Systems
- Data Sciences
- Conservation & Restoration Planning
- Siting and Licensing
- Applied Ecological Research
- Construction Inspection

26 Years in Business

75+ Employees

35 States Served

Environmental Solutions & Innovations, Inc.
Corporate Headquarters
4525 Este Avenue, Cincinnati, OH 45232
T: 513-451-1777
WWW.ENVSI.COM

MARKETS WE SERVE

ENERGY

ESI's project permitting experience includes the full gamut of the energy market space across all types of generation (hydroelectric, wind, solar, natural gas, coal) and transmission (electric, HVDC, natural gas, LNG and liquid products). Exemplary bench depth, high technology adoption, and excellent communication allow us to provide industry setting field service capabilities on linear corridors.

GOVERNMENT AGENCIES

Project expertise within the public sector includes the US Army Corps of Engineers, the Federal Aviation Administration, USDA-Forest Service, US Fish & Wildlife Service and multiple state natural resource agencies, Federal Highway Administration and multiple state Departments of Transportation, the Federal Energy Regulatory Commission, and multiple local and municipal governments.

CONSERVATION

As a company originally founded by a wildlife biologist, conservation is deeply embedded within ESI's culture. These projects are typically applied research, "inventory," or public education oriented. The clients for these projects range from collaborative endeavors with universities to public grant-funding to non-governmental organizations.

PRIVATE DEVELOPMENT

We provide full project life-cycle environmental and engineering services for land development projects. These services include site selection and economic feasibility analysis, environmental property due diligence desktop and field assessments, conceptual grading and layouts, utility, landscaping, and lighting plans.

REAL SCIENCE. REAL SOLUTIONS.

ESI

SERVICES

Real Science. Real Solutions.

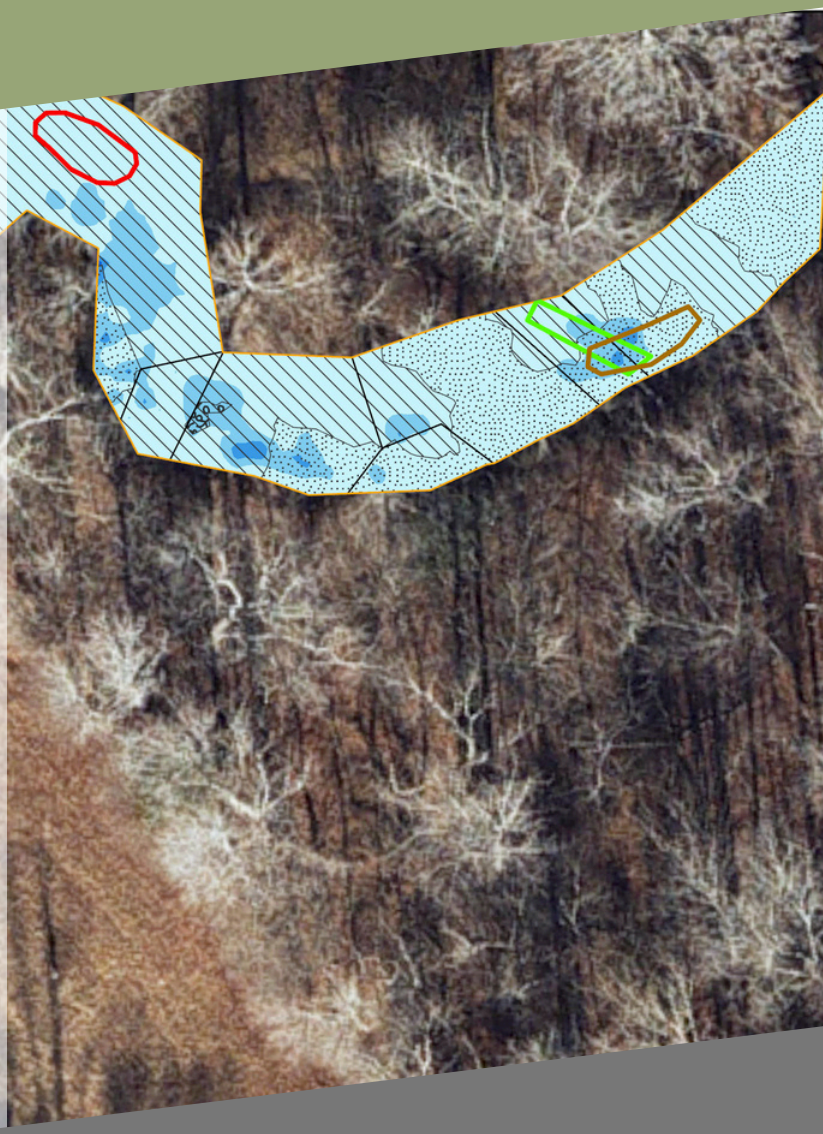
CIVIL ENGINEERING

- **Sedimentation Modeling**
- **Hydrologic Modeling**
- **Aquatic Resource Design**
- **Site Development Plans**
- **Erosion and Sediment Control Design**
- **Stormwater Design and Management Control Plans**
- **NPDES Permitting**
- **Utility Design**
- **Construction Plans & Administration**
- **Land Development Permitting**

The two core strengths of ESI's civil engineering team are site civil and water resources engineering. The site civil suite of capabilities entails planning, designing, permitting and construction support. These capabilities focus on cost effective strategies to efficiently meet regulatory compliance requirements. Our water resources strengths include understanding dynamic hydrologic systems, sometimes through complex modeling evaluations, and developing bespoke strategies to promote resiliency and mitigate risk.

Real Science. Real Solutions. ESI

GIS & DATA SCIENCE



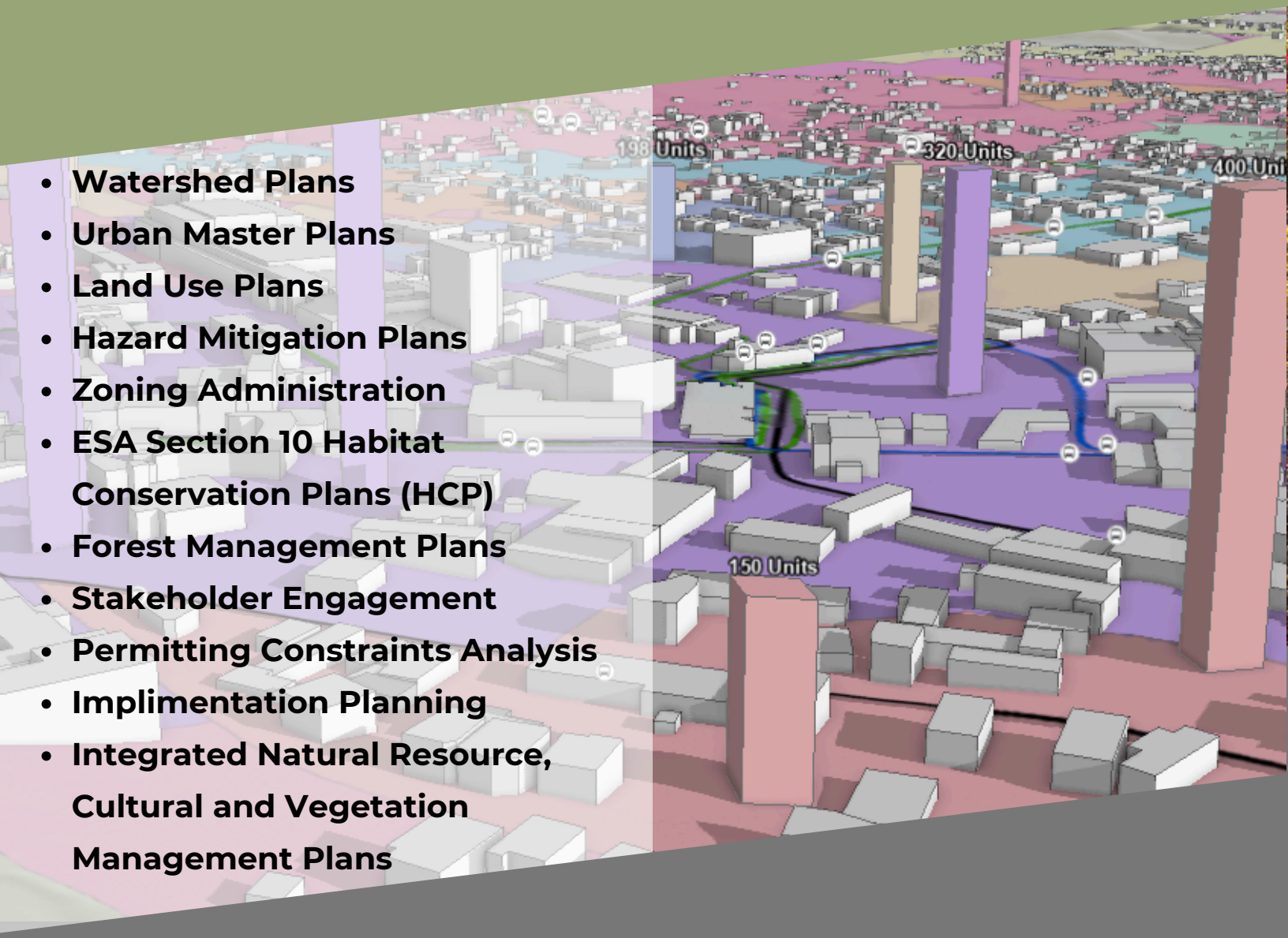
- **Cartographic Mapping**
- **Routing & Siting Analysis**
- **Species Distribution and Ecological Niche**
- **Cultural Resource Prediction**
- **Impact Mitigation Strategy Modeling**
- **Sedimentation Analyses**
- **Resource Equivalency Analysis**
- **Forest Fragmentation Analysis**
- **Flooding**
- **Meteorological Shifts**
- **Sea Level Rise**
- **Storm Surge and Wave Effects**

Twenty years ago, Geographic Information Systems were mostly used to produce maps (with data attached). Today, ESI combines the power of geo-relational databases, advanced statistics, and user-defined programs to leverage incredible models that describe and predict how nature behaves, and interacts with, the built environment. Likewise, modeling spans the disciplines of ecology, mathematics, coding, and civil engineering and utilizes dozens of programs including ESRI, R, Python, Argus, QUAL2K, MATLAB, FLO-2D Pro, Delft3D, HEC-RAS, HEC-HMS, and FLOW3D. These capabilities allow us to provide informed insights for our Clients, ensuring effective solutions are tailored to the unique challenges of each project.

Real Science. Real Solutions.

ESI

PLANNING



- **Watershed Plans**
- **Urban Master Plans**
- **Land Use Plans**
- **Hazard Mitigation Plans**
- **Zoning Administration**
- **ESA Section 10 Habitat Conservation Plans (HCP)**
- **Forest Management Plans**
- **Stakeholder Engagement**
- **Permitting Constraints Analysis**
- **Implimentation Planning**
- **Integrated Natural Resource, Cultural and Vegetation Management Plans**

ESI offers a wide range of planning services that integrate expertise from multiple disciplines into a structured decision-making framework to ensure mutual attainment of varied (and often competing) stakeholder objectives. Successful preparation of these documents requires deep knowledge of the ecological, cultural and/or built environments being affected, significant data science capabilities, intimate understanding of the overarching regulations, and strong communication and organizational skills. ESI has successfully prepared many planning documents for diverse clients, including government agencies and energy developers, addressing projects encompassing a few hundred acres to multi-state efforts. We work closely with clients to define objectives, identify constraints, assess impacts, and develop effective strategies for plan implementation.

Real Science. Real Solutions.

ESI

AQUATIC FIELD ECOLOGY

- **Freshwater Mussel Surveys**
- **Fish Community Surveys**
- **Larval Fish Identification**
- **Benthic Macroinvertebrate Surveys**
- **Water Quality Monitoring**
- **Aquatic Invasive Species Management**
- **Bathymetric Mapping**
- **Invasive Plant Species Management**
- **CWA § 316 (A)/(B) Studies**

ESI's field aquatic ecology team works in large and small watercourses for a diverse array of project types ranging pipelines to hydroelectric facilities to highways. The dive team undergoes annual re-training and physicals and meets all USACE safety requirements to work in large rivers, with fast currents and low visibility. The company has made significant investments in multiple boats, electro-shockers, dive gear, water quality, and other equipment to ensure the team has what they need to work safely and effectively no matter where the project takes them, from upstate New York to the Gulf south.

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TERRESTRIAL FIELD ECOLOGY

- **Bat Surveys**
  (Mist Net, Acoustic, Telemetry, Caves)
- **Large & Small Mammal Surveys**
- **Herpetofauna Surveys**
- **Crayfish Surveys**
- **Snail Surveys**
- **Migratory Bird Surveys**
- **Raptor Nest Surveys**
- **Pollinator Surveys**
- **Rare Plant Surveys**
- **Timber Stand Surveys**
- **Invasive Plant Surveys**
- **Habitat Suitability Surveys**

ESI was founded by a wildlife biologist and these roots show in the continuing outstanding strength of this service line. The wildlife biology Team includes dozens of field biologists with hundreds of collective years of experience. These individuals collectively hold USFWS Section 10(A) Recovery Permits for more than 30 federally listed species across a collective geographic range covering most of the United States. Additionally, these staff currently hold, or are qualified to hold, permits for equal numbers of state listed species. Be it diversity of species or scale of survey, our stellar team makes ESI the “go to” for both project proponents *and* other consultants, across the eastern US.

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WETLANDS AND WATERWAYS

- **Wetland and Stream Delineations**
- **CWA Section 404 & 401 Permits**
- **Isolated Wetlands Permits**
- **CWA Section 10**
- **Stream and Wetland Mitigation Design**
- **Post-Construction Restoration Monitoring**
- **Invasive Plant Species Management**

ESI undertakes significant investment annually to ensure all of our lead field delineators have the knowledge necessary to confidently make jurisdictional determination calls throughout the geographic footprint in which we work. Likewise, we have internally regionally-designated permitting specialists who serve as internal Technical Experts, providing advice, oversight and maintaining internal regional permit knowledge-bases. We have worked with nearly two dozen Districts and maintain strong, on-going with the regulators with which we interact on behalf of our Clients.

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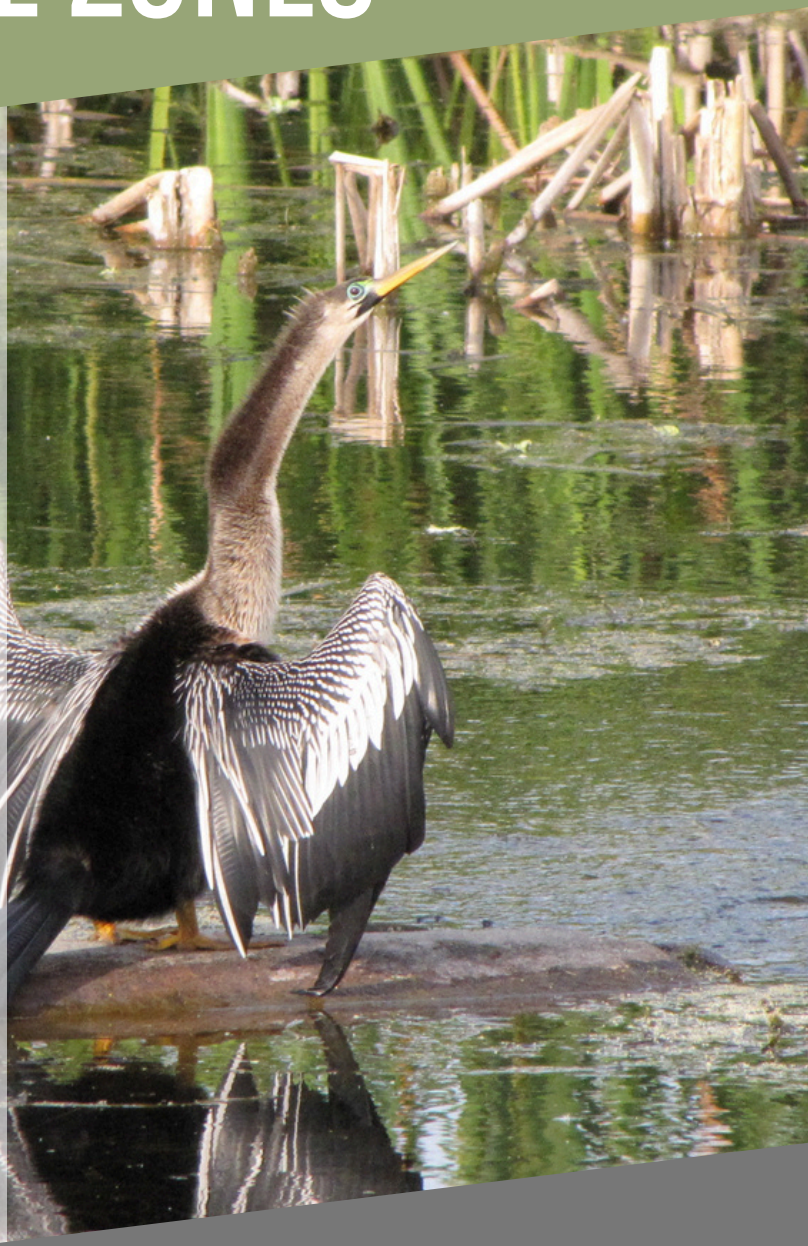
COASTAL ZONES



- **Seagrass Surveys**
- **Benthic Resource Surveys**
- **Water Quality Monitoring**
- **Marine Mammal Watch Plans**
- **CMZA Compliance - CPA, SPA & IL Permits**
- **Sea Level Rise Modeling**
- **Storm Surge and Wave Effects Evaluations**
- **Coastal Morphology and Shoreline Responses**
- **Coastal and Tidal Restoration Plans**
- **Shore Protection and Armoring**
- **Nearshore Remote Sensing and Monitoring**

ESI performs a full range of coastal science and engineering services to help utilities and infrastructure owners evaluate permit projects and adapt to dynamic coastal conditions. Our team conducts field resource evaluations, evaluates sea level rise, and conducts meteorological intensification, storm surge, and wave impact analyses to assess site resilience and inform design flood levels or long-term mitigation measures. We evaluate coastal morphology and shoreline response to natural and engineered changes and designs. ESI offers a continuum of coastal resilience solutions from engineered “gray” approaches such as shoreline armoring and flood protection structures to “green” and nature-based strategies like coastal and tidal restoration that are designed to provide reliable protection while enhancing long-term ecosystem health and function.

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CULTURAL RESOURCE MANAGEMENT

- **Desktop Studies**
- **Phase I Field Survey**
- **Phase II Field Survey**
- **Phase III Mitigation**
- **Architectural History**
- **SHPO Coordination**
- **Tribal Consultation**
- **Geophysical Survey**
- **Geomorphological Deep Testing**
- **Construction Monitoring**

With over 150 years of combined industry experience, ESI's Cultural Resource Program is committed to guiding our clients through the entire spectrum of regulatory requirements, offering everything from comprehensive desktop analyses to on-site fieldwork and innovative mitigation strategies. Over the last 5 years, ESI has completed 210 projects across two dozen states, annually surveying over 12,000 acres while documenting hundreds of cultural resources. With this experience, our deep understanding of the nuances within regulations, coupled with our ability to clearly communicate these complexities to clients, is what truly sets our cultural resource program apart.

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CONSTRUCTION INSPECTION

- **Erosion, Sediment, and Stormwater Compliance**
- **Horizontal Directional Drill (HDD) Oversight**
- **SWPPP Compliance Inspections and Reporting**
- **Wetland and Stream Monitoring**
- **Water Infiltration Testing**
- **Site Audits**
- **Restoration Monitoring**
- **Compliance Reporting**

ESI helps clients meet environmental compliance goals through customized inspection and monitoring services. Starting with a detailed consultation, we assess risks, review permits, and create tailored plans to reduce impact and ensure compliance. Our team supports a wide range of projects electrical transmission lines, pipelines, renewable energy sites, and other land developments. We also provide long-term support through ongoing site monitoring and regulatory tracking to keep projects on track and sustainable.

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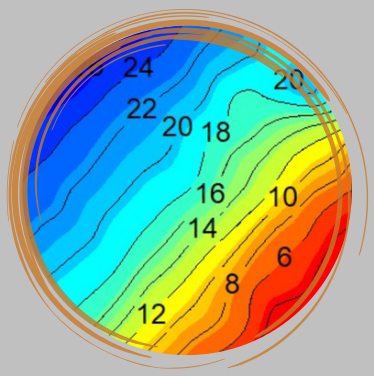
PROJECT ABSTRACTS



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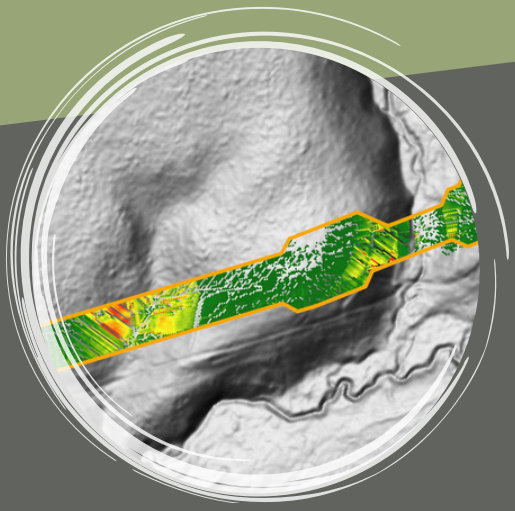
SEDIMENTATION MODEL AND WATER QUALITY IMPACT ASSESSMENT



Client: Confidential

Project Location: Virginia and North Carolina

Period of Performance: 2024 - Ongoing

ESI Scope: Water Quality and Endangered Species Act Regulatory Compliance

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The proposed project entails construction of underground infrastructure across approximately 26 miles in Virgina and 29 miles in North Carolina. ESI's role on the project was to assess impacts to 18 identified sensitive aquatic resources in the project vicinity. Streams were selected based on presence or likely presence of federally and state-listed aquatic species. The impact assessment was based on a combination of field survey and monitoring data collection and desktop modeling.

Sediment Transport Modeling

A sediment transport model was developed using the RUSLE2 methodology adapted to GIS to quantify soil loss from upslope areas, estimate sediment yields within watersheds, and determine sediment loads delivered to outlet streams. Sediment load outputs were further analyzed using the National Hydrography Dataset Plus High Resolution (NHD Plus HR) to model annualized increases in turbidity (mg/L) associated with construction activities. These results identified the sub-watersheds most likely to experience elevated sedimentation, providing critical insight into areas with heightened risk for aquatic life impacts.

Embeddedness & Sediment Deposition Surveys

As part of an overall Before-After-Control-Impact (BACI) methodology, detailed field habitat surveys were conducted at 34 discrete sites, located both within the project-impact area and "control sites" possessing similar characteristics but outside the impact area. Pre-construction surveys provided direct measurements of sediment composition, allowing for comparison of pre- and post-construction conditions. Likewise post-construction field surveys will provide field validation of modeled deposition and transport, improving the future accuracy of predicted habitat integrity impacts.

In stream Water Quality Modeling

Across 52 locations, ESI deployed in stream water quality loggers measuring turbidity, temperature, dissolved oxygen, conductivity, and pH. This high-frequency dataset captures real-time environmental variability contributing to the accuracy of the evaluated temporal habitat changes directly associated with project activities. Additionally, this turbidity data helps validate the sediment model and contextualize the modeled increase in sedimentation within the range of naturally occurring turbidity variability.

REVOLUTION PIPELINE

Client: ETC Northeast Pipeline, LLC

Project Location: Allegheny, Butler, Beaver, and Washington Counties, Pennsylvania

Period of Performance: 2015-2020

ESI Scope: IFB and IFC plans and ESCGP-2 permitting documents, aquatic resource delineations, and rare species surveys

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ESI provided engineering and environmental services supporting approximately 40 miles of natural gas pipeline and 15 miles of access roads, with emphasis on evaluating potential secondary environmental impacts and integrating regulatory requirements into project design.

Engineering Plans and Permitting

ESI prepared IFB/IFC plan sets, Erosion and Sedimentation Pollution Control plans for ESCGP-2 permitting, Post-Construction Stormwater Management Plans, and permanent stormwater management designs. Secondary impact evaluation factors (e.g., sedimentation risk, hydrologic changes, increased stormwater volumes) were incorporated early to shape engineering solutions and minimize indirect effects.

Stream restoration plans were developed around areas of impact by construction activities. Natural channel design principals were utilized to incorporate native materials into the bank stabilization techniques effectively reducing the sediment loading through the waterbody.

Advanced hydrologic and hydraulic evaluations were conducted for several Joint Permit Applications where areas to the floodway were being permanently impacted. These modifications within the floodway were modeled to ensure the proposed design caused no adverse impacts to downstream watercourses.

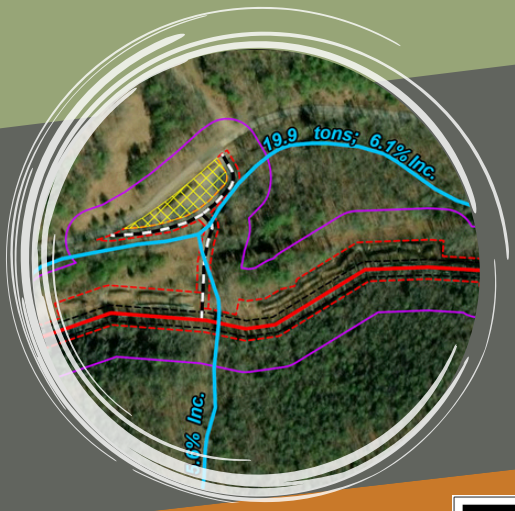
Streams and Wetlands

Aquatic resource delineations and permitting under PA Chapter 105 and USACE SPGP-4 evaluated how construction and operation might affect wetland function, hydrologic regimes, and sediment transport. General Permit #8 for temporary crossings, PAG-10 NPDES hydrostatic discharge coverage, and Section 404/10 authorizations for HDD under the Ohio River incorporated analysis of secondary impacts such as temporary flow disruption, bank disturbance, and aquatic organism movement.

Protected Species

Field surveys were conducted for bats, birds and plants. Regulatory documents included a Bat Conservation Plan and a Migratory Bird Protection and Enhancement Plan

MOUNTAIN VALLEY PIPELINE



Client: Mountain Valley Pipeline, LLC

Project Location: Virginia (6 counties) and West Virginia (11 counties)

Period of Performance: 2014- Ongoing

ESI Scope: Field Ecological Studies, Biological Assessment, Biological Evaluation, and NEPA Compliance

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Mountain Valley Pipeline (MVP) is an approximately 303-mile, 42-inch diameter interstate natural gas pipeline, originating in Wetzel County, West Virginia and extending to Pittsylvania County, Virginia. The pipeline traverses private and local, state and Federal public lands in 15 counties, in two states. ESI was retained to provide protected-species consultations, field surveys and impact analyses for the Project, including. ESI's scope included biological field surveys for bats, pollinators, avifauna, herpetofauna, plants, astacoids, unioniods and fish. This scope required extensive coordination with the U.S. Forest Service (USFS), U.S. Fish & Wildlife Service (USFWS), Federal Energy Regulatory Commission (FERC), state natural resource agencies, and, ultimately, multiple legal counsel.

Addressing water quality impacts was perhaps the most intensive aspect of the project as it required robust integration of literature review, field survey data, and data modeling, appropriately contextualized within the regulatory permitting framework. Field data collection included presence/absence, environmental DNA (eDNA) sampling, and habitat surveys (including substrate embeddedness via pebble counts) for four species of mussels and two species of fish.

Sedimentation analyses were completed for:

- the project crossing on the Jefferson National Forest to assess water quality impacts associated with activities on Forest Service lands;
- all project facilities to assess impacts to multiple federally endangered aquatic species, including the Roanoke Logperch within the Blackwater River drainage.

The sedimentation analysis involved modeling soil load, transport, and deposition resulting from project activities, including construction, first year of restoration, and second year of restoration. Soil erosion was assessed at the watershed scale, utilizing the RUSLE2 methodology with deposition outputs modeled for each stream reach. Sedimentation outputs were combined with species field survey data, existing distribution models and baseline habitat suitability data to estimate impacts to individuals and the species population overall as a result of proposed project activities.

ESI's deliverables included production of multiple sedimentation models, a Biological Evaluation, a Biological Assessment, contribution to the Biological Opinion, contributions to the USFS Plan of Development (POD), contributions to the FERC Resource Reports, and preparation of responses to FERC data requests and public comments. The sedimentation model was iteratively revised based on sediment impacts to inform revised BMPs and species impact analysis.

SHANNON REBUILD TRANMISSION LINE PROJECT

Client: American Electric Power

Project Location: Central Ohio

Period of Performance: 2021-2023

ESI Scope: Clean Water Act Section 404/401 Permitting, Floodplain Permitting & Hydraulic Analysis, Storm Water Pollution Prevention Plans

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ESI supported an electric transmission infrastructure rebuild project for American Electric Power consisting of four 138kV line projects: Astor Extension, Groves Road–Shannon, Refugee–Shannon Road, and Bixby–Shannon. The project required comprehensive environmental permitting, floodplain compliance, and construction stormwater management planning across multiple jurisdictions in central Ohio. ESI provided integrated regulatory and technical services to facilitate project delivery while maintaining compliance with federal, state, and local environmental requirements. The project involved linear utility impacts to jurisdictional waters, wetlands, and FEMA-designated floodplains, requiring a coordinated permitting and engineering approach.

Clean Water Act Section 404/401 Permitting

ESI completed Clean Water Act (CWA) Section 404/401 permitting for multiple project components involving impacts to Waters of the United States. Two transmission line segments required authorization under Nationwide Permit 57 (Electric Utility Line and Telecommunications Activities).

Floodplain Permitting & Hydraulic Analysis

Floodplain impacts were identified within three of the four project components, requiring coordination with local floodplain administrators and adherence to FEMA and local regulatory requirements.

Storm Water Pollution Prevention Plans

ESI developed comprehensive Storm Water Pollution Prevention Plans (SWP3s) for all project components to support NPDES permitting and construction-phase compliance. This effort included preparation of SWP3 narratives and detailed plan sets using client-provided design data in combination with LiDAR-based topography. ESI designed erosion and sediment control Best Management Practices (BMPs) in accordance with the Ohio EPA Rainwater and Land Development Manual, City of Columbus standards, and additional local requirements for Groveport and Reynoldsburg. Project-specific details and notes tailored to linear utility construction were developed using the BMPs. Given the nature of the work, permanent post-construction stormwater BMPs were not required, allowing the design to focus on temporary controls and site stabilization measures.

OHIO RIVER ISLANDS WELL PLUGGING PROJECT

Client: U.S. Fish and Wildlife Service

Project Location: Ohio RIver Islands National Wildlife Refuge, WV

Period of Performance: 2024-2025

ESI Scope: Field surveys, ESA and NEPA Compliance

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The U.S Fish and Wildlife Service (USFWS) Ohio River Islands National Wildlife Refuge (ORINWR) proposed plugging 13 orphaned oil and gas wells on Muskingum Island near Marietta, Ohio. Eight of the wells were located on Muskingum Island and, due to erosion of Muskingum Island right descending bank, five wells were in the Ohio River. Due to the, now, steep banks and the position of the orphaned wells within the river, plugging was only feasible via barge. However, the orphan wells within the Ohio River were not in deep enough water to accommodate the barge, thus requiring dredging to allow access for well plugging. ESI was retained by USFWS-ORINWR to conduct mussel survey and salvage, prepare a Biological Assessment via formal Endangered Species Act Section 7 consultation, and write an Environmental Assessment.

In 2024, ESI's big-river dive team completed mussel survey yielding collection of 6,111 live mussels comprising 25 species, including federally listed species. In total, 36 live, federally listed mussels representing six species, including fanshell (*Cyprogenia stegaria*, n=3), longsolid (*Fusconaia subrotunda*, n=2), pink mucket (*Lampsilis abrupta*, n=1), round hickorynut (*Obovaria subrotunda*, n=5), sheepnose (*Plethobasus cyphyus,* n=24), and clubshell (Pleurobema clava, n=1) were collected. Detection of live federally listed mussel species triggered formal consultation and necessitated developing a Biological Assessment. Further, in West Virginia all native mussels are protected and require relocation prior to project impacts.

Between fall 2024 and summer 2025, ESI prepared a Biological Assessment and assisted USFWS-ORINWR develop an Environmental Assessment. Both documents included analysis of project direct and in-direct effects, including dredging material transport and disposal. Analysis included take estimation of federally listed mussels detected during the 2024 survey and addressing species not detected. Affects analysis determined a May Affect- Like to Adversely Affect for all mussel species and No Effect for local terrestrial species. Environmental Assessment preparation included desktop review of previously recorded archaeological investigations and a probability model assessing the likelihood of cultural resources occurring within or near the project area.

BLAND AREA IMPROVEMENTS 138 KV TRANSMISSION LINE REBUILD

Client: American Electric Power (AEP)

Project Location: Bland and Wythe counties, Virginia; Mercer County, West Virginia

Period of Performance: 2015-2020

ESI Scope: Protected Species Regulatory Compliance

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ESI provided environmental consulting services for American Electric Power for the Bland Area Improvements Transmission Line Rebuild Project, spanning approximately 26 miles across Virginia and West Virginia and crossing federal lands within the George Washington and Jefferson National Forests. Infrastructure activities in forested and riparian landscapes can disturb soils, increase erosion, and deliver sediment to downstream waterways, potentially degrading aquatic habitats and threatening sensitive species. Project activities included early planning support, sensitive resource evaluations, multi-species surveys, agency coordination, and compliance with the National Environmental Policy Act.

Work included a hydrologic and sedimentation assessment conducted using the Modified Universal Soil Loss Equation (MUSLE) to evaluate potential impacts on the Tennessee heelsplitter, a state-listed and U.S. Forest Service sensitive mussel species. Sedimentation is a major threat to the species. This analysis is required to address potential impacts on freshwater mussel species within geographic bounds of the water resource cumulative effects analysis area (i.e., the hydrologic area where sediment yields are measurable and/or significant).

The method uses runoff estimates to simulate erosion and sediment yield instead of rainfall erosivity. The study area within the project contained all sub watersheds that intersected the forests and project. ESI selected specific sub watersheds with the intent to encompass all possible sediment effects downstream of the project area.

The MUSLE-based modeling quantified anticipated soil loss and sediment delivery, identifying high-risk disturbance areas where erosion could contribute to downstream sedimentation. These findings informed the development of targeted erosion and sediment control measures, optimized construction sequencing, and supported coordination with regulatory and resource agencies. The project addressed sediment-related risks to sensitive aquatic species. The results show how incorporating sedimentation analysis and targeted erosion with sediment control strategies into project planning can improve environmental factors, support regulatory compliance, and reduce any impacts incurred on aquatic resources.

MULTISPECIES HABITAT CONSERVATION PLAN

Client: American Electric Power

Project Location: Michigan, Indiana, Ohio, Kentucky, West Virginia, Virginia, Tennessee, Louisiana, Arkansas, Oklahoma, Texas

Period of Performance: 2015- Ongoing

ESI Scope: Habitat Conservation Plan

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American Electric Power (AEP) owns and operates the country's largest transmission system. Compliance with environmental laws is a core concept for AEP, but piecemeal compliance (i.e., project by project) with the Endangered Species Act (ESA) does not provide the opportunity for long term consideration of conservation needs in the context of AEP's long-term infrastructure needs. AEP's Habitat Conservation Plan (HCP) integrates the planning of construction and maintenance of transmission lines, substations, and access roads for ten species across an 11-state service region.

A draft HCP has been submitted, once finalized, the resulting Incidental Take Permit will cover construction and operations and maintenance activities for associated facilities. The plan addresses take of ten species including Indiana, northern long-eared, little brown, and tricolored bats; rusty-patched bumble bee, Mitchel's satyr butterfly, eastern Massasauga rattlesnake, whooping crane, golden-cheeked warbler, and red-cockaded woodpecker. A component of the HCP evaluates how future construction activities, predicted through spatial modeling of transmission expansion, may influence erosion potential and sediment delivery across diverse landscapes. These sediment dynamics are particularly relevant for species and habitats sensitive to changes in water quality and substrate conditions, where increased sedimentation can degrade habitat suitability, alter hydrologic connectivity, and reduce ecological function.

ESI serves as lead consultant on the team developing the HCP. In coordination with AEP, ESI developed the scope of the HCP including predicting future levels of covered activities. Models developed to predict the locations of future construction activities are combined with models of covered species distribution to develop an estimated amount of occupied habitat that will be impacted (i.e., a surrogate of take). The plan incorporates adaptive management strategies, including erosion and sediment control measures, seasonal construction restrictions, and targeted mitigation, allowing site-specific flexibility while maintaining regional environmental compliance. This work demonstrates how proactive, system-wide planning can integrate sediment considerations into large-scale infrastructure programs.

APPENDIX B:
ESI KEY STAFF RESUME

Shaun Kline, Ph.D., P.E.
Senior Principal & Project Manager

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EDUCATION

Ph.D., Geological Sciences, University of Florida, 2013

M.S., Coastal & Oceanographic Engineering, University of Florida, 2009

B.S., Civil Engineering, University of Florida, 2006

PROFESSIONAL CERTIFICATIONS

Professional Engineer (P.E.)

- Colorado (PE.0055749)
- Florida (82676)
- Maine (PE15736)
- Nebraska (E-18146)
- Nevada (27248)
- North Carolina (044918)
- Ohio (PE.84364)
- Oklahoma (31920)
- Oregon (95782PE)
- Pennsylvania (PE085658)
- Texas (134074)
- Virginia (402061678)
- West Virginia (23986)

NCEES Model Law Engineer (Record ID 17-130-48)

PEC/SafeLand Certification (PEC100690267)

QUALIFICATIONS AND EXPERIENCE

Dr. Kline is a civil/environmental engineer and earth scientist with over 20 years of experience in applied water resources and civil engineering. His experience includes managing, supervising, and performing site development design/permitting as well as hydrologic/hydraulic, sediment transport, and water quality evaluations. Dr. Kline is well versed in federal and state regulatory review processes, inspections, and audits, serving as subject matter expert and client representative.

PROJECTS

Mountain Valley Utility Line

West Virginia and Virginia — *Senior Engineer*

Updated sedimentation model using Revised Updated Soil Loss Equation 2 (RUSLE2) methodology in a Geographic and Information System (GIS) platform for a linear project traversing both states. Developed a simplified sediment transport model to predict anticipated excess deposition patterns as they relate to changes in streambed embeddedness and stream habitat impacts. Project included incorporation of existing (“as-built”) erosion and sediment control features and other maintenance strategies.

Southeast Supply Enhancement

Virginia and North Carolina — *Senior Engineer*

Technically oversaw development of a RUSLE/RUSLE2 sedimentation model for a linear project traversing both states. Project includes dynamic incorporation of proposed erosion and sediment controls to minimize anticipated sedimentation effects in Project streams and coordinating with sediment transport experts to determine potential impacts on stream habitat. Project is ongoing.

Confidential Power Station

New Hampshire — *Project Engineer*

Performed a thermal hydraulic evaluation with Computational Fluid Dynamics (CFD) software to determine the general configuration and extent of the discharge plume under low flow river conditions and varying meteorological conditions. Evaluated historical plant and river data to characterize plume impacts under different flow regimes and operational configurations. Developed cost estimate and construction schedule for potential modifications to the plant’s intake screens.

Calvert Cliffs Nuclear Power Plant

Maryland — *Project Engineer*

Performed a 316b hydraulic evaluation at CCNPP to determine flow patterns adjacent and under baffle wall near intake structure for different configurations of the baffle wall at both high and low tide flow regimes. Created a particle tracking method to better assess flow contributions throughout the water column. Modeling work supported the permit application.

Confidential Nuclear Power Station
Florida — *Project Engineer*

Evaluated effects of sea level rise on a closed cooling canal (CCS) system, including increased risk of perimeter berm overtopping during high tides and hurricanes; groundwater gradient changes; and increased extreme rainfall. Authored report including maps of highest vulnerable areas and recommendations for future countermeasures.

Surry Power Station
Virginia — *Lead Responsible Engineer*

Directed 316a demonstration update at SPS for submittal to Virginia Department of Environmental Quality (VDEQ). Work scope included development of a Computational Fluid Dynamics (CFD) model for thermal effects evaluation.

Flood Hazard Reevaluation Studies
Multiple States — *Project Manager/Lead Responsible Engineer*

Managed and technically oversaw external flood hazard reevaluations at over 30 nuclear power plant facilities (including NextEra Energy's Pt. Beach Nuclear Power Plant on Lake Michigan) in the U.S. including storm surge, tsunami, riverine, and extreme rainfall evaluations primarily using numerical modeling. Represented operators in regulatory audits/reviews to obtain successful approval of each study.

EPRI External Flooding Subject Matter Expert
Palo Alto, California — *Senior Engineer*

Performed quarterly subject matter expert reviews of current literature, databases and regulatory guidance related to external flooding at U.S. power plant facilities since 2018 for EPRI's member organizations. Specific focus areas included storm surge, tsunami, extreme rainfall, riverine flooding, dam breaks and ice jams.

Revolution Pipeline Stream Restoration and Sedimentation
Pennsylvania — *Senior Engineer*

Supported restoration design for sixteen streams totaling over 1,600 feet in length. Restoration was required due to impacts from a pipeline project in the southwestern portion of the state. Each impacted stream required a Joint Permit Application. Restoration plans for each stream included proposed grading (including use of live stakes and log check dams), erosion and sediment control layout, typical stream sections, and construction details/notes. Additionally, developed a state-approved procedure to monitor and evaluate potential sedimentation impacts on streams within or adjacent to the project corridor

Sofidel America Autumn II Plant Paper Manufacturing Facility
Inola, Oklahoma — *Lead Responsible Engineer*

Performed waste load allocation study of proposed facility discharge and Verdigris River using QUAL2K model and local/regional meteorological/hydraulic data. Determined minimum Dissolved Oxygen (DO) concentrations maintained during representative seasonal periods, which informed the permit limits imposed by Oklahoma Department of Environmental Quality (ODEQ).

Entergy Palisades Nuclear Power Plant
Covert, Michigan — *Project Engineer*

Authored the (r)(2) and (r)(8) reports for source water physical data and operational status, respectively, in support of the facility's 316b evaluation.

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Jeremy M. Alberts, Ph.D.
Principal
Water Quality

EDUCATION

Ph.D., Biological Sciences, University of Cincinnati, 2016

M.S., Environmental and Natural Resources, Ohio State University, 2012

MBA, West Virginia University, 2006

B.S., Biology, Muskingum College, 2001

PROFESSIONAL CERTIFICATIONS

USFWS Endangered Species Act Section 7 Training

Kentucky & Virginia crayfish identification workshop, Breaks Interstate Park

Maryland Crayfish Workshop

Ohio EPA Compliance Assistance Conference

PROFESSIONAL AFFILIATIONS

American Fisheries Society

Society for Freshwater Science

Ecological Society of America

QUALIFICATIONS AND EXPERIENCE

Dr. Alberts' experience includes oversight of ecological and environmental projects throughout the Central Appalachians. His specialties encompass hydrological and water quality monitoring and aquatic life and habitat assessments. Dr. Alberts' dissertation work examined interactions of physical and biological processes within stream and riparian ecosystems to identify factors impacting stream health. He specializes in the analysis of landscape-scale impacts on aquatic systems and has extensive experience in fisheries research throughout the Ohio River Basin. Dr. Alberts is primarily involved in management of large-scale natural resource and environmental studies and has a sound understanding of the complexity of inter-agency communication and coordination. Dr. Alberts has over 15 years of experience in natural resources management and offers valuable ecological expertise that supports sound management and regulatory decisions.

PROJECTS

Dominion, Atlantic Coast Pipeline

Virginia, West Virginia, and North Carolina — *Project Manager*

Analysis of sedimentation impacts on in-stream habitat for proposed 554-mile natural gas transmission mainline and associated laterals. Provided threatened and endangered species consultation support and oversaw timber rattlesnake monitoring.

Antero Midstream, Multiple Projects

West Virginia — *Project Manager*

Assessment of water withdrawal impacts on aquatic species in Tyler, Doddridge, and Wetzel Counties. Developed flow rating curves to identify curtailment thresholds for water withdrawal activities that would result in no impact to aquatic species.

CONE Midstream Partners Pipeline

West Virginia — *Project Manager*

Assessment of water withdrawal impacts on aquatic habitat in stream supporting federal listed mussel species in Tyler County.

Equitrans Midstream Partners, MVP Southgate Project

West Virginia and Virginia — *Project Manager*

Analysis of sedimentation impacts on in-stream habitat, completed Habitat Equivalency Analysis and restoration and mitigation plan to address project impacts on migratory bird habitat protected under the Migratory Bird Treaty Act for a 303-mile natural gas transmission line.

Laurel Mountain Production, Water Withdrawal Monitoring
Pennsylvania *Project Manager*

Freshwater mussel and streamflow monitoring associated with a temporary water withdrawal from the Allegheny River in Clarion County. Developed flow rating curves to identify curtailment thresholds for water withdrawal activities that would result in no impact to aquatic species.

EQT, Ohio Valley Connector Pipeline
Ohio and West Virginia *Biologist*

Assisted with mist netting and telemetry for endangered bats in Monroe County, Ohio and Marshall and Wetzel Counties, West Virginia. Used data in GIS environment to model risk for take associated with a change in the USFWS-mandated winter clearing window.

Appalachian Midstream Services, Battle Run-Wilson Pipeline
West Virginia *Project Manager*

Managed assessment of mussel habitat for a proposed 11.2-mile natural gas pipeline.

Columbia Gas, WB Xpress
Virginia and West Virginia *Project Manager*

Cheat Mountain salamander, timber rattlesnake, small mammal, bat, and plant surveys and monitoring concurrent with construction of approximately 29.2 miles of various diameter pipeline, modifications to seven existing compressor stations, construction of two new compressor stations, and uprating or restoring the maximum allowable operation pressure on various segments of the existing Line WB and Line VB natural gas transmission pipeline systems.

Access Midstream Services, Ford Crossing Upgrade
West Virginia *Project Manager*

Freshwater mussel habitat assessment for stream ford upgrade.

Consol Energy, Water Withdrawal Monitoring
West Virginia *Project Manager*

Freshwater mussel monitoring associated with temporary water withdrawal from South Fork Hughes River in Doddridge County. Developed flow-rating curves to identify curtailment thresholds for water withdrawal activities.

Consol Energy
West Virginia *Biologist*

Stream assessment in Hackers Creek associated with capping of well-head in Lewis County.

EQT, Temporary Water Withdrawal
West Virginia *Biologist*

Freshwater mussel monitoring and data analysis including development of flow-rating curves to identify curtailment thresholds for water withdrawal activities on North Fork Hughes River and Middle Island Creek in Doddridge County.

Private Landowner, Stream Modification
Kentucky *Biologist*

Aquatic resource delineation to calculate Ecological Integrity Index (EII) using the Eastern Kentucky Stream Assessment Protocol in Lewis County, Kentucky. Collected and identified macro-invertebrates (family level).

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Adam Nolte, P.G.
GIS Project Lead Analyst
Spatial Analysis &
Sedimentation Modeling

EDUCATION

B.S., Geological Science, University of Kentucky, 2017

PROFESSIONAL CERTIFICATIONS

Professional Geologist (KY)

PROFESSIONAL AFFILIATIONS

Kentucky Association of Mapping Professionals

SPECIALIZED TECHNOLOGY

ArcGIS; ArcGIS Experience Builder, ArcGIS Online; Arcpy, AutoCAD Civil 3D; Google Earth; LiDAR; Machine Learning; Pandas; Python

QUALIFICATIONS AND EXPERIENCE

Mr. Nolte is a professional geologist with over 9 years of experience applying Geographic Information Systems (GIS), geospatial data analysis, and CAD tools across renewable energy, utilities, siting, and environmental sectors. Skilled in utilizing python to support watershed analysis, sedimentation analysis, habitat analysis, automating PDF map production, and streamlining workflows. His background includes extensive work in erosion modeling, hydrogeology, and remote sensing, with proficiency in LiDAR data processing and machine learning applications to detect geohazards. Additionally, Mr. Nolte developed ESI's Sediment Modeling ArcGIS toolbox in order to automate the tedious process of sediment modeling.

PROJECTS

Sediment Transport Modeling, Confidential Client

Virginia, North Carolina — *GIS Analyst*

Developed watershed-scale sediment transport and erosion models utilizing RUSLE2 methodology adapted to a GIS approach. Modeled background, active construction, and restoration conditions for a multistate pipeline project using LiDAR, NLCD, SSURGO, and RUSLE2 climate datasets and operator BMPs. Estimated soil loss and turbidity impacts associated with project construction on nearby streams to aid in project permitting.

Sediment Modeling Toolbox, Internal Initiative

Internal — *GIS Analyst*

Development of ESI's Sediment Modeling Toolbox, including 11 python scripts parameterized for automation inside of ArcGIS Pro. This toolbox allows for the efficient calculation of each of the five factors associated with the Revised Universal Soil Loss Equation (RUSLE2) as well as additional scripts to calculate Sediment Loss, Load, Yield, and Delivery Ratio. This toolbox has since been utilized to help projects conduct timely analysis with trusted results.

Roanoke Logperch Habitat Assessment, Confidential Client

Virginia, North Carolina — *GIS Analyst*

Utilized LiDAR to delineate streams that are suitable for Roanoke Logperch Habitat in Virgina and North Carolina for a pipeline transmission The analysis calculated stream sinuosity and gradient using stream elevation changes. A Rosgen classification was applied to each stream based on the sinuosity and gradient to determine habitat suitability.

Utes's Ladies' Tresses Habitat Suitability Model, ONEOK

Oklahoma GIS Analyst

Conducted habitat assessment for Ute's Ladies' Tresses (*Spiranthes diluvialis*), a rare orchid species, along a pipeline corridor. Classified wetland and stream features within 300 feet of the centerline for Habitat Suitability using elevation, hydric soils, and canopy openness. Developed a spatial habitat suitability model integrating LiDAR and soil data to identify moist, well-drained loamy or sandy soils within the species' preferred elevation and pH range.

Critical Issues Analysis, Lumina Energy Storage LLC

Illinois *GIS Analyst*

Evaluated and summarized publicly available state and federal GIS data to identify environmental, cultural, biological, topographic and regulatory constraints for an Energy Storage Site. Report provided to client to aid in mitigating site development risks and identify regulatory requirements. Identified six federally threatened or endangered species and highlighted potential development issues such as prime farmland designation.

Herbicide-Based Vegetation Management, Dominion

Virginia and West Virginia *GIS Analyst*

Data collection for rare and invasive plant surveys supporting the project's herbicide-based vegetation management across 67.8 miles of electric transmission ROWs in the George Washington and Jefferson National Forests. Supported field implementation and documentation for Special Use Permit and NEPA compliance, contributing to environmental planning for foliar and stump/basal bark herbicide applications.

Wolf Road Solar 1 and 2, Greenkey Solar, Inc.

Ohio and Illinois *GIS Analyst*

Conducted a desktop analysis to assess potential aquatic resources across the 53-acre site. Field data collected for wetlands and streams were mapped using sub-meter GPS and classified by USACE guidelines. Produced shapefiles of delineated features, created regulatory-quality maps, and prepared geospatial components for No-Permit Required and Jurisdictional Determination packages to support agency submittals.

Parris Island Bat Surveys, U.S. Marine Corps (USMC)

South Carolina *GIS Analyst*

Spatial data analysis and mapping for species surveys and habitat use. Contributed to tracking bat demographics, identified roosting locations, and analyzed habitat preferences to inform biological assessments and management plans in alignment with the Endangered Species Act (ESA). GIS outputs supported the development of strategies to minimize human-bat conflicts, maintain access to training areas, and guide long-term habitat stewardship.

Copperas Creek Solar, Greenkey Solar, Inc.

Illinois *GIS Analyst*

Conducted spatial data review and integrated field-collected GPS data into a comprehensive geodatabase for regulatory mapping. Evaluated landscape features and public datasets to identify potential aquatic resources and hydrologic connections. Field-mapped wetlands and streams were delineated using USACE criteria, including Cowardin classification and OHWM indicators, and shapefiles were produced within seven days of survey completion.

Environmental Solutions & Innovations, Inc.
Real Science, Real Solutions

Andy Dobson, AICP, CPM
GIS Analyst
Stakeholder Outreach Specialist

EDUCATION

M.P.A., Public Affairs, Indiana University School of Public and Environmental Affairs, 1999

B.U.P.D./B.S., Urban Planning and Development, Ball State University College of Architecture and Planning, 1993

PROFESSIONAL CERTIFICATIONS

American Institute of Certified Planners (AICP), American Planning Association

Certified Floodplain Manager (CFM), Association of State Floodplain Managers

QUALIFICATIONS AND EXPERIENCE

Mr. Dobson is an urban planner and geospatial analyst with proven experience in land use planning, development regulation, floodplain management, ArcGIS applications, and public administration. He offers strong communication skills and is an adaptive problem solver, committed to delivering innovative solutions supporting resilient, sustainable communities. His expertise involves hazard mitigation planning, floodplain administration, water utility management, ESRI Utility Network development, FEMA RiskMAP application revisions, advancing long-range planning, data-driven research, and community organization efforts that shape policy and encourage sustainable growth.

PROJECTS

JXN Water, GIS and Utility Asset Management

Mississippi — *Senior Urban Planner*

Developed state-of-the-art geospatial water utility network revitalizing potable water service for 153,000 residents and driving process improvements, staff training, and innovative operational solutions.

Toho Water Authority, GIS and Utility Asset Management

Florida — *Senior Urban Planner*

Digitized and cataloged hundreds of legacy record drawings, updating GIS utility maps for a 160,000-customer water authority to improve accuracy, service reliability, and field operations in Osceola, St. Cloud, Poinciana, and parts of Orange and Polk counties.

Miami Conservancy District, Benefit Assessment

Ohio — *Senior Urban Planner*

Organized and validated cadastral, flood hazard, and critical facility data facilitating foundational framework for updating a regional property assessment system serving nine counties and hundreds of thousands of parcels

U.S. Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA)

Multi-state — *Senior Urban Planner*

Executed RiskMAP Discovery work in multiple FEMA regions (II, V, VII, IX, X), integrating community outreach and technical analysis to improve hazard mitigation planning. Engaged stakeholders through public hearings and targeted interviews, and used GIS mapping and analysis to rank stream study needs and identify floodplain management priorities across hundreds of communities.

Multiple Clients, Natural Hazard Mitigation Planning

Ohio and Kentucky — *Senior Urban Planner*

Researched and developed numerous Stafford Act multi-hazard mitigation initiatives, guiding communities toward stronger resilience and improved

hazard preparedness including University of Kentucky Hazard Mitigation Plan; City of Piqua Dam Safety Services; Wayne County Hazard Mitigation Plan; Clark County Hazard Mitigation Plan.

U.S. DHS, FEMA
Multi-state *Senior Urban Planner*

Developed high-quality geospatial data and mapping products for FEMA Rate Map revision applications (LOMR, CLOMR), including flood hazard extent analysis, cartographic updates, and database preparation. Collaborated with FEMA, state, and local agencies to deliver accurate, compliant flood risk products.

Hamilton County Planning + Development, Community COMPASS
Ohio *Senior Planner*

Developed Hamilton County's first comprehensive plan in nearly 40 years through a county-wide public engagement process that produced an overall long-range vision, goals, and implementation strategies to guide elected officials and civic leaders.

Hamilton County Planning + Development, First Suburbs Consortium of Southwest Ohio
Ohio *Senior Planner*

Countywide revitalization strategy for 25 jurisdictions, establishing redevelopment incentives, infrastructure investment priorities, and measurable performance indicators to direct reinvestment in older suburban communities.

Hamilton County Planning + Development, Bicycle Friendly Communities
Ohio *Senior Planner*

Created a regional coalition uniting Cincinnati and Hamilton County communities to advance safer streets, expand public education efforts, and develop long-range planning strategies encouraging widespread bicycle use for daily transportation.

Brandon L. Yates
Aquatic Species Lead

Environmental Solutions & Innovations, Inc.
Real Science, Real Solutions

EDUCATION

M.S. Biology, Morehead State University, 2017

B.S. Biology, Morehead State University, 2015

PROFESSIONAL CERTIFICATIONS

USFWS Federally Permitted Malacologist

New Jersey, New York, West Virginia & Ohio Mussel Surveyor

PADI Open Water and Rescue SCUBA Diver and Emergency Oxygen Provider

SDI/TDI Advanced and Nitrox SCUBA Diver

OHSA 40-hour HAZWOPER

OSHA 10-hour Construction and General Industry

Red Cross CPR Certification

NASBLA/U.S. Coast Guard Boaters Education Card

Transportation Worker Identification Credential

PROFESSIONAL AFFILIATIONS

American Fisheries Society – Kentucky Chapter

QUALIFICATIONS AND EXPERIENCE

Mr. Yates is a certified rescue diver, experienced freshwater mussel surveyor, and serves as ESI's Aquatic Group Manager, managing a variety of projects involving waterbodies ranging from small streams to large rivers. To date, Mr. Yates participated in more than 85 mussel surveys encompassing 14 states and encountered over 20,000 live mussels representing 76 species, including 18 federally protected species. He is a Qualified Mussel Surveyor throughout the Midwest, Great Lakes basin, and Atlantic Slope basins. Before embarking on professional pursuits, Mr. Yates studied ichthyology, learning methods to track water quality, characterize habitat for listed fishes, and collect benthic macroinvertebrates, and later learning to monitor streambed sediment loads (i.e., embeddedness) and identify freshwater mussels, thus offering experience spanning multiple disciplines of aquatic ecology. He fulfills multiple project-related responsibilities including project management, scheduling and logistics, equipment and watercraft maintenance, scientific collection permit assistance, curation, and proposal, study plan, and technical report writing. His expertise includes developing site-specific survey plans consistent with state and federal protocols for mussels, fish, and aquatic insects.

PROJECTS

EQT, Mountain Valley Pipeline

West Virginia and Virginia — *Field Supervisor*

Fish, mussel, sediment, and eDNA studies supporting a 304-mile natural gas pipeline crossing 11 counties in West Virginia and six counties in Virginia. Fish removals employed backpack electrofishing and seining techniques to relocate fish downstream of perennial stream crossings and limiting impacts resulting from dewatering events. Mussel studies included preconstruction presence/absence surveys for project environmental compliance and follow up relocation events immediately prior to construction. In support of fish and mussel survey work, eDNA samples were collected at 319 sites along 30 waterways as analyzed for federally listed taxa. Sediment studies evaluated stream embeddedness using the Burns, Skille, and King (BSK) method to evaluate sediment movement within a stream reach.

U.S. Army corps of Engineers – Rock Island District

Iowa — *Biologist*

Mussel survey for the Buffalo Dredged Material Management Program (DMMP) on the Mississippi River in Scott County to assess mussel habitat and abundance. Survey yielded 609 live individuals representing 18 species, including 1 live and 3 fresh deadshell federally endangered sheepnose mussel (*Plethobasus cyphyus*). Survey included assessment of non-indigenous zebra mussels and their impact on native fauna

U.S. Fish and Wildlife Service, Ohio River Island National Wildlife Refuge
West Virginia — *Project Manager/Biologist*

Freshwater mussel survey for an orphaned well plugging efforts on the Ohio River in Wood County. Survey yielded collection of 6,111 live mussels representing 25 species. Notably, multiple federally listed mussels were encountered, including the endangered sheepnose (*Plethobasus cyphyus*; *n*=24), fanshell (*Cyprogenia stegaria*, *n*=3), pink mucket (*Lampsilis abrupta*, *n*=1), clubshell (*Pleurobema clava*, *n*=1), and threatened longsolid (*Fusconaia subrotunda*, *n*=2) and round hickorynut (*Obovaria subrotunda*, *n*=5). Developed Biological Assessment as part of ESA compliance and an Environmental Assessment to comply with NEPA. Following Biological Opinion issuance, completed mussel salvage relocating 698 mussels upstream of the project.

U.S. Fish and Wildlife Service
Maryland — *Project Manager*

Fish surveys targeting the Maryland Darter (*Etheostoma sellare*) in the lower Susquehanna River and its tributaries in Cecil and Harford counties, Maryland. Surveys were completed via electrified benthic trawling and yielded eight state threatened Chesapeake logperch (*Percina bimaculata*) and seven shield darters (*Percina peltata*), considered rare in Maryland.

Williams Transcontinental Pipeline
New Jersey — *Project Manager*

Freshwater mussel survey for sacrificial anode bed replacement in the Delaware River, Camden County. Survey required extensive agency coordination and collaboration as the project's location required revision while investigators were onsite based on tidal-influenced water depth. Excessively high mussel density and New Jersey listed mussels presence required modification to survey methods concurrent with field work to accomplish survey goals while minimally disturbing native mussels. Surveys resulted in collection of 7,197 live mussels representing six species, including New Jersey state-threatened eastern pondmussel (*Sagittunio nasutus*, *n*=10), tidewater mucket (*Atlanticoncha ochracea*, *n*=81), and yellow lampmussel (*Lampsilis cariosa*, *n*=70). Managed all aspects of project, maintained open agency communication, and authored technical report.

CNX Midstream
West Virginia — *Project Manager/Biologist*

Freshwater mussel scoping survey in the Ohio River (designated a Group 3 at this location) for river-front development in Marshall County. Surveys comprised 24, 100-meter transects and yielded 457 live mussels representing 13 species. Managed all aspects of the project and served as a permitted biologist, diver, boat pilot, and dive supervisor.

PPL Electric Utilities
Pennsylvania — *Project Manager/Diver*

Mussel survey and salvage for construction of an approximately 1,900-foot causeway in the Susquehanna River near Harrisburg in Dauphin County. Efforts included relocation of over 1,000 live mussels. Managed all aspects of project, completed field work, and wrote technical reports.

West Virginia Division of Highways
West Virginia — *Project Manager/Biologist*

Freshwater mussel surveys for replacement of five non-contiguous storm sewer outfalls in the Kanawha River (Group 4), Kanawha County, West Virginia. Survey efforts yielded 1,805 live mussels representing 23 species, including 134 live federally threatened round hickorynut (Obovaria subrotunda).

Environmental Solutions & Innovations, Inc.
Real Science, Real Solutions

Ashley Huntley
GIS Analyst
Cultural Resources

EDUCATION

B.A., Landscape Archaeology, University of Cincinnati, 2018

CERTIFICATES AND TRAINING

Geographic Information Systems Certificate

Historic Preservation Certificate

PROFESSIONAL AFFILIATIONS

Society of American Archaeology

American Association of Geographers

Women in GIS

QUALIFICATIONS AND EXPERIENCE

Ms. Huntley serves as ESI's GIS & Data Science Group's CRM GIS Lead and GIS Specialist. She has combined eight years of archaeology and GIS experience. Ms. Huntley is responsible for creating, managing, and maintaining web-based apps, maps, viewers, and dashboards; creating, managing, and maintaining spatial data information; and maintaining quality control and standardizing cartographic application.

SELECTED PROJECTS

Croatan National Forest, Timber 101

North Carolina — *GIS Specialist*

Phase I archaeological survey comprising 2,176 acres and 34 site revisits on harvest stands in Craven County. Processed and analyzed LiDAR data, cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

Daniel Boone National Forest, Daniel Boone CMB FY24

Kentucky — *GIS Specialist*

Phase I archaeological survey comprising 1,018 acres in support of Section 106 compliance in Morgan and Rowan Counties. Processed and analyzed LiDAR data, cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

De Soto National Forest, Clara Timber Sale

Mississippi — *GIS Specialist*

Phase I archaeological survey comprising 1,314 acres and nine site revisits on harvest stands in Wayne County. Provided cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

Mark Twain National Forest, Blooming Rose

Missouri — *GIS Specialist*

Phase I archaeological survey comprising 4,797 acres and seven site revisits in support of Section 106 in Phelps and Pulaski Counties. Processed and analyzed LiDAR data, cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

Missouri Department of Transportation (DOT), I-70 Project
Missouri — *GIS Specialist*

Phase I cultural resource investigation for a highway improvement project (13.8 miles) in Boone and Callaway Counties. Provided cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

Allegheny National Forest, Porcupine Run and North Kane
Pennsylvania — *GIS Specialist*

Phase I archaeological survey of 2,675 acres in support of Section 106 compliance for timber harvesting, road construction, and large wood restoration in Jackson County. Provided cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

Atwell, LLC, Brookfield II Solar
Arkansas — *GIS Specialist*

Phase I archaeological survey of 4,818 acres and 20 site revisits in support of Section 106 compliance for construction and installation of solar panels in Warren and Forest counties. Provided cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

Confidential Client, Morgantown Connector
West Virginia — *GIS Specialist*

Phase I archaeological survey of 65 acres in support of Section 106 compliance for construction and installation of pipeline in Monongalia and Marion counties. Provided cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

American Electric Power, Nauvoo Ridge
West Virginia — *GIS Specialist*

Phase I archaeological survey of 195 acres in support of Section 106 compliance for construction of a transmission line and access roads required for accessing structures in Marshall County. Provided cultural and environmental background research, pre-plot sample loci per State guidelines, Field Maps creation, data management, and cartography for technical reports.

Hunter Pippin
GIS Analyst
Environmental Resources

Environmental Solutions & Innovations, Inc.
Real Science, Real Solutions

EDUCATION

B.S Environmental Science
GIS Certificate
University of Pittsburgh, 2021

SPECIALIZED SKILLS

GIS: ArcGIS Desktop, ArcGIS Online, Survey 123, ArcGIS Collector, Python

Other Software Experience: Microsoft Office, Microsoft Teams

QUALIFICATIONS AND EXPERIENCE

Mr. Pippin is a highly skilled GIS Analyst with over 5 years of experience in Geographic Information Systems (GIS). He is adept at spatial data analysis, cartography, and database management, with a proven track record of supporting environmental and conservation projects.

PROJECTS

Confidential Client. Passaic River Cleanup

New Jersey — *GIS Analyst*

Digitized historical site plans for responsible parties. Calculated impervious and pervious surface areas from historical and current aerial imagery to verify values used in the EPA's cost allocation framework. Researched and downloaded GIS data for combined sewer overflows (CSOs) and related sampling to assess each party's contribution to river contamination. Produced high-quality maps showing responsible parties, CSOs, nearby hydrologic features, and surface water/sediment sampling results.

Confidential Client. Nebraska Ordnance Plant

Nebraska — *GIS Analyst*

Reviewed and analyzed extraction and monitoring well data to track cleanup progress and calculate pounds of contaminants removed. Mosaicked historical imagery to evaluate changes in building footprints across the site. Digitized contamination plumes from historical reports and compared them to current plume depictions to identify monitoring well gaps and quantify total contaminated surface area.

Confidential Client. Various Projects

Pennsylvania — *GIS Analyst*

Georeferenced imagery and maps; digitized key features; managed geodatabases across projects; produced client-ready maps; analyzed data in Excel, MAROS, and GWSDAT; compiled legal/regulatory/scientific information; and edited technical reports.

Walden Clarke Run Solar

Pennsylvania — *GIS Analyst*

Reviewed U.S. Fish and Wildlife Service bat species range maps for the project area; constructed range buffers for the endangered Indiana bat (IBAT) and northern long-eared bat (NLEB); analyzed NLCD land cover within project areas and bat buffers to quantify potential take of protected wildlife; and produced high-quality maps and data tables summarizing the results.

Point Broadband

Virginia — *GIS Analyst*

Managed, processed, and mapped data for threatened and endangered and non-native plants, wetlands and waterways for the 46-mile project.

Old Hickory Solar – Renewable Energy
Geogia *GIS*

Processed field-collected data of rare, threatened, and/or endangered (RTE) plant species within an approximate 2,102-acre area under consideration for developing the Old Hickory Solar Project. Created map series displaying habitat potentially suitable for seven RTE plant species: pondberry, dwarf burhead, swamp buckthorn, American chaffseed, Carolina windflower, woodland poppy-mallow, and Florida senna. Potentially suitable habitat data for RTE species determined where presence/probable absence surveys are to be completed.

P66 Monarch CCAA
Utah, Wyoming, and Montana *GIS Analyst*

Description: Generated random sampling locations and digitized sampling plots along approximately 1,829 miles of adopted acres to support P66's conservation efforts in accordance with the party's Candidate Conservation Agreement with Assurances (CCAA). Compiled field-collected monarch butterfly data into a data table deliverable and created a map series of sampling locations for P66's annual report.

Curryland Solar – Renewable Energy
Pennsylvania *GIS Analyst*

Reviewed USFWS range areas of bat species in relation to the project area. Constructed bat range buffers for the endangered Indiana (IBAT) and northern long-eared bat (NLEB). Spatially analyzed NLCD data within project areas and bat range buffers to determine take of protected wildlife and produced high quality map products and data tables from analysis.

Curryland Solar – Renewable Energy
Alabama *GIS Analyst*

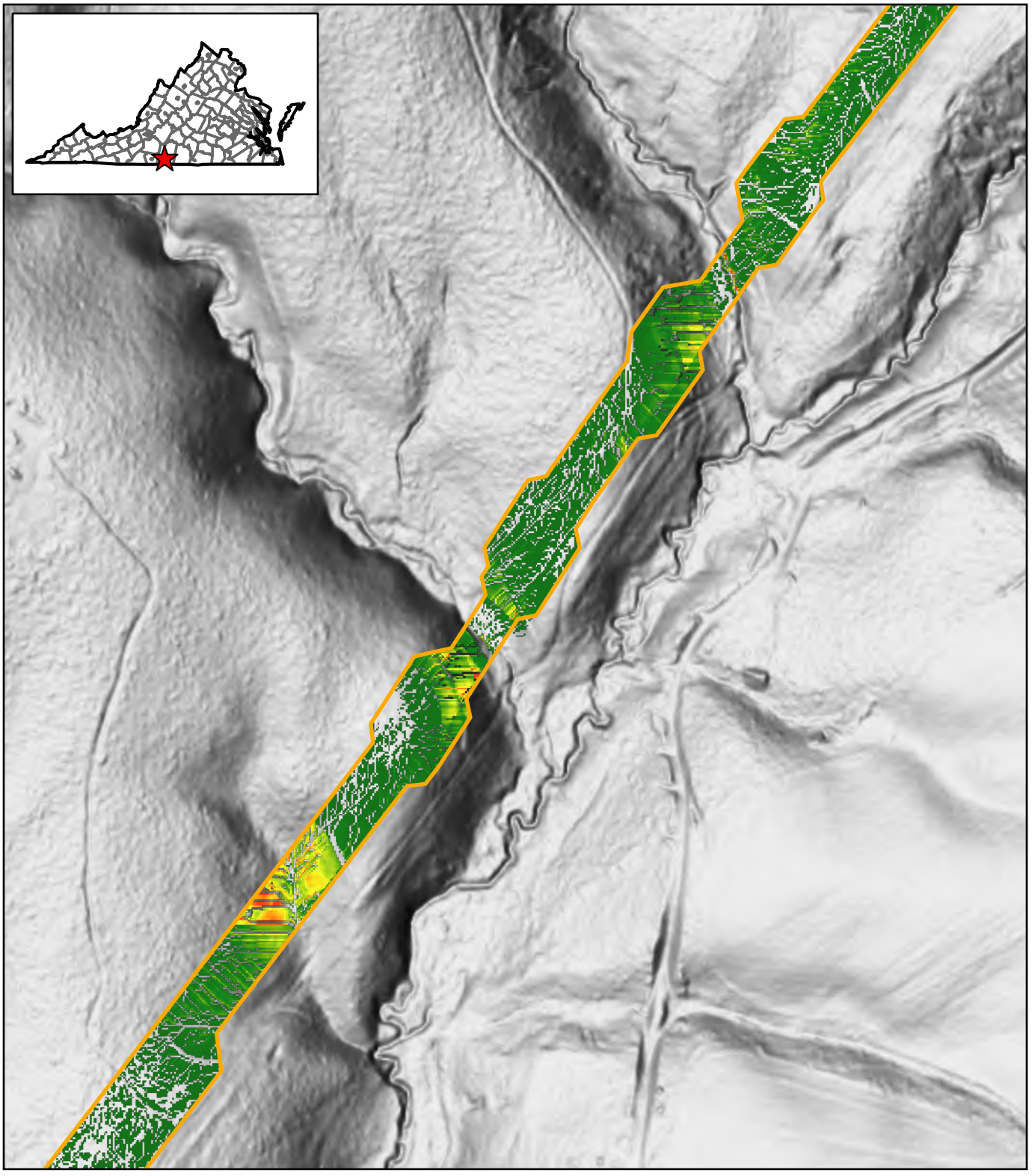
Managed, processed, and mapped data for threatened and endangered species habitat assessments, wetlands, and waterways for the 2,600-acre project.

Greenkey Solar. Various Projects
Pennsylvania, Illinois, Indiana, Ohio *GIS Analyst*

Managed, processed, and mapped data for wetlands, and waterways on multiple solar sites.

APPENDIX C:
ESI WORK SAMPLES

Sedimentation Model and Water Quality Impact Assessment,
Confidential Client
(2024-Ongoing)



Project Right of Way

Modeled Excess Soil Loss (tons/ac/yr)

0 100

N W E S

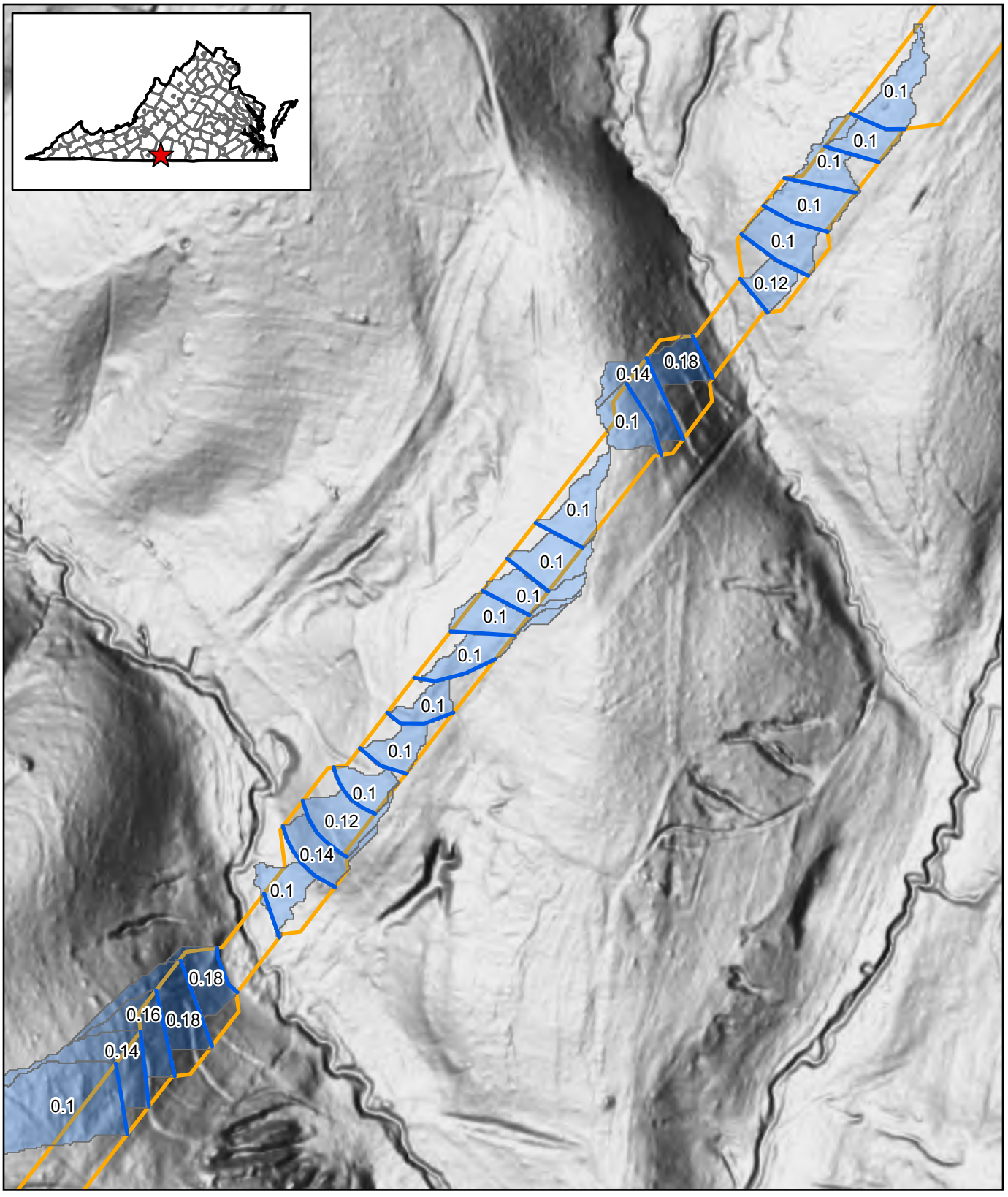
Figure 1. Modeled Annual Excess Soil Loss at 1m Resolution Associated with Project Construction.

Project No. 2302

0 250 500 Feet

Base Map: 3DEP LiDAR Hillshade

ESI ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.



Proposed Waterbar | Catchment of Proposed Waterbar with P-Factor

Project Right of Way

N

W E

S

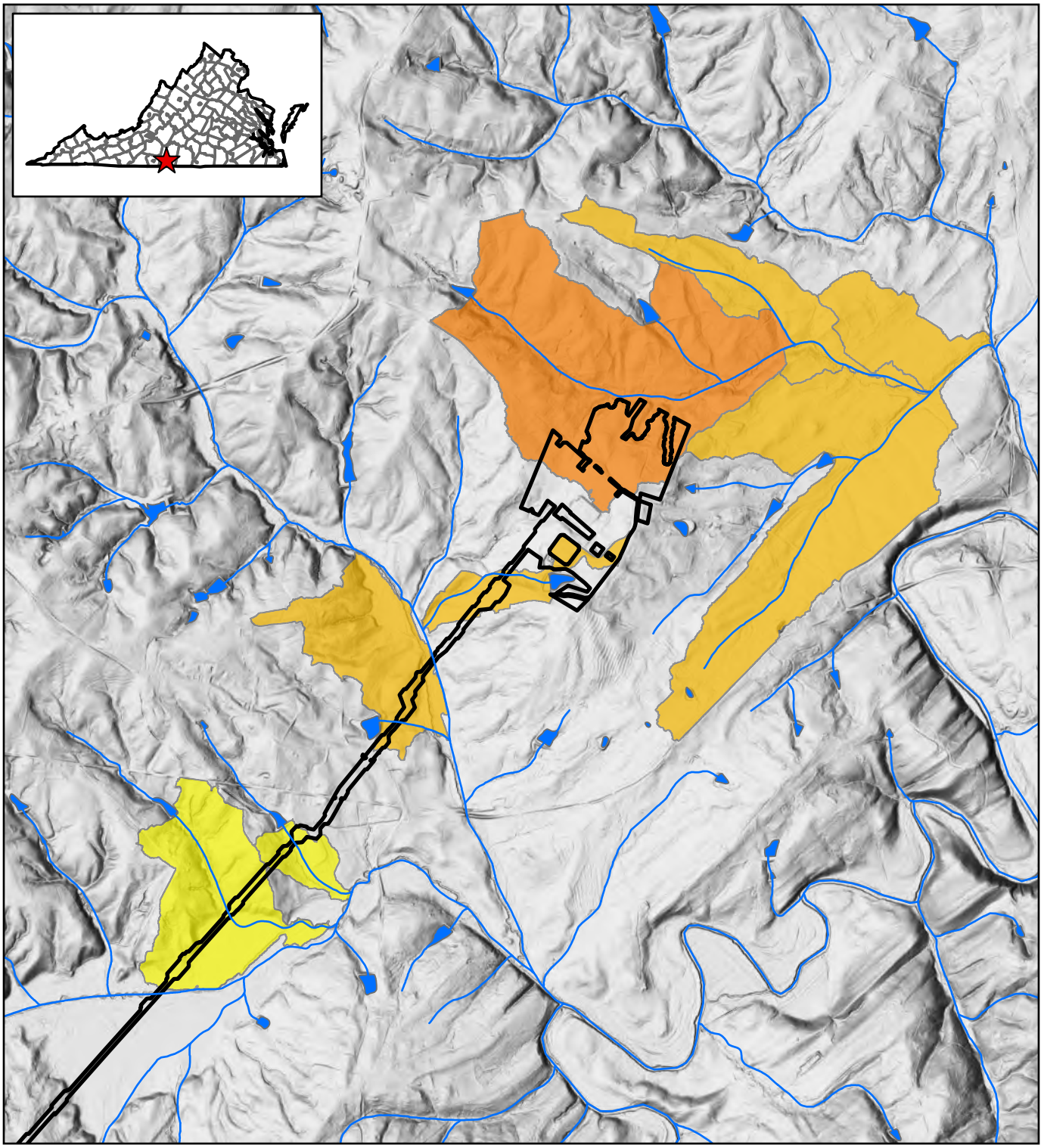
Figure 2. Select Proposed Waterbars and their Associated P-Factor Values.

Project No. 2302

0 250 500 Feet

Base Map: 3DEP LiDAR Hillshade

ESI ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.



N
W E
S

Figure 3. Modeled Increase in Turbidity Concentrations in Subcatchments Near Project ROW.

Project No. 2302

0 0.25 0.5 0.75 Mile

Base Map: 3DEP LiDAR Hillshade

ESI ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Revolution Pipeline,
ETC Northeast Pipeline, LLC
(2015-2020)

Map Key 2

Map Key 3

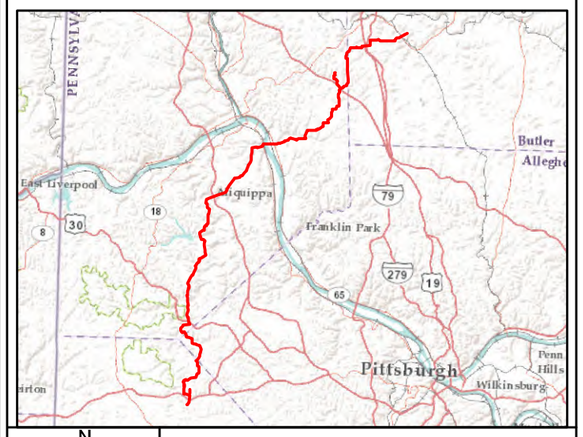
Map Key 4

Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

Map Key 1

Limits of Disturbance (LOD)

Map Key



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Feet

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Service Layer Credits: Sources: Esri, USGS, NOAA

ESI

ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Project No. 1277

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Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

Map Key 2

Limits of Disturbance (LOD)

Map Key Page

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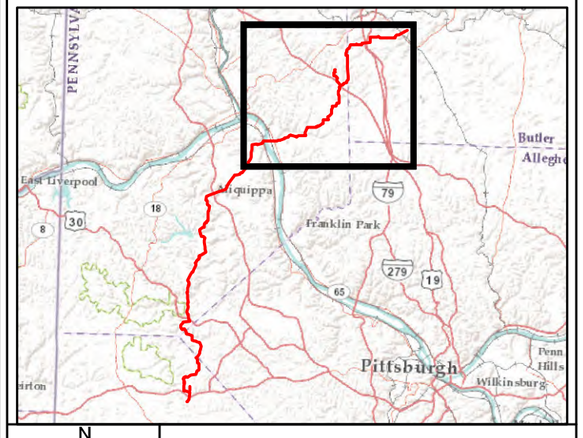
Feature



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Feet

0 5,000 10,000

Service Layer Credits: Sources: Esri, USGS, NOAA

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ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Project No. 1277

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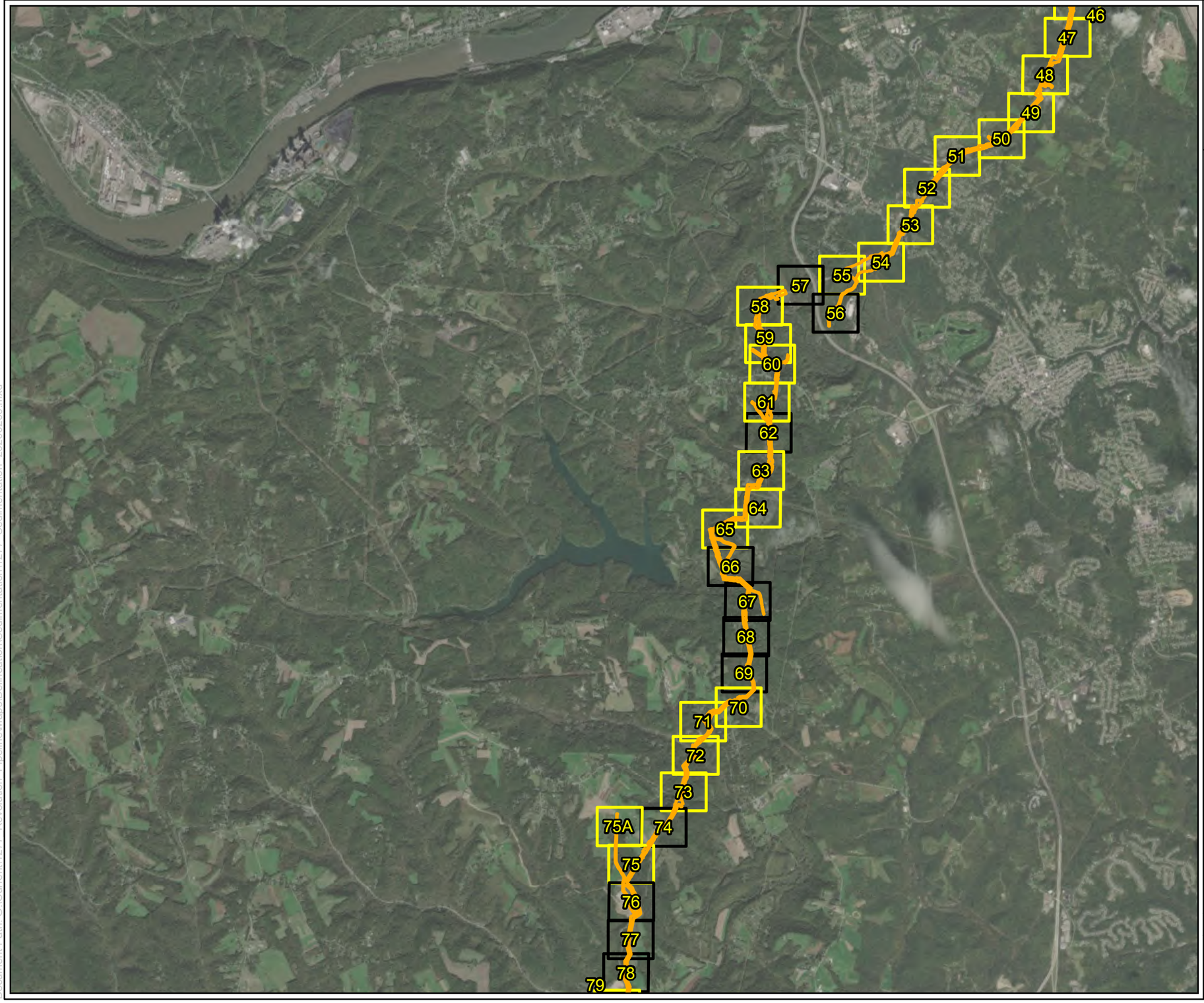


Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

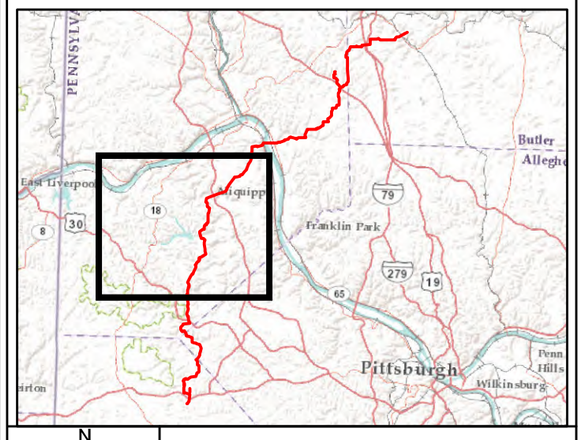
Map Key 3

Limits of Disturbance (LOD)

Map Key Page

No Feature

Feature



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Service Layer Credits: Sources: Esri, USGS, NOAA

ESI

ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Project No. 1277

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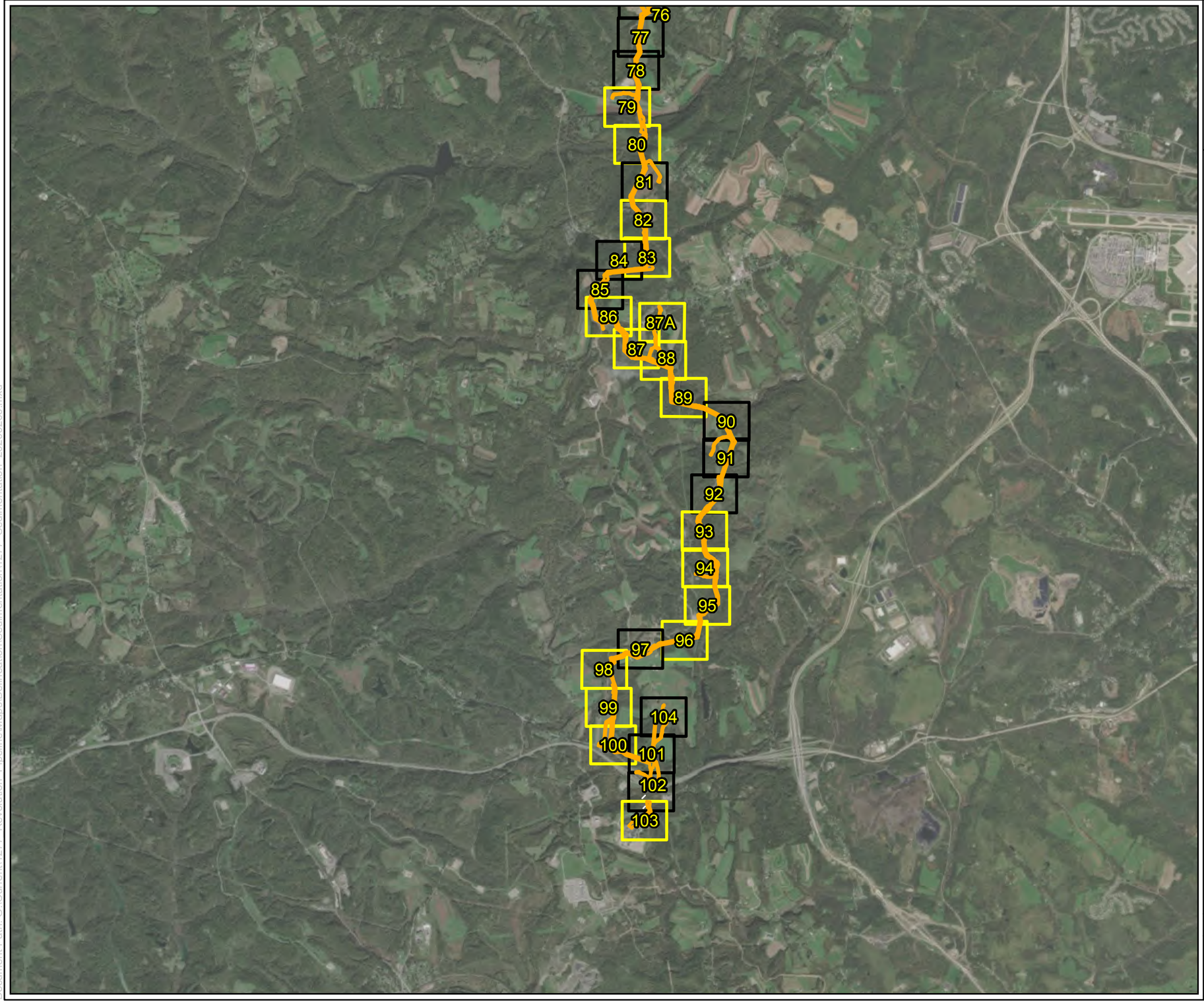


Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

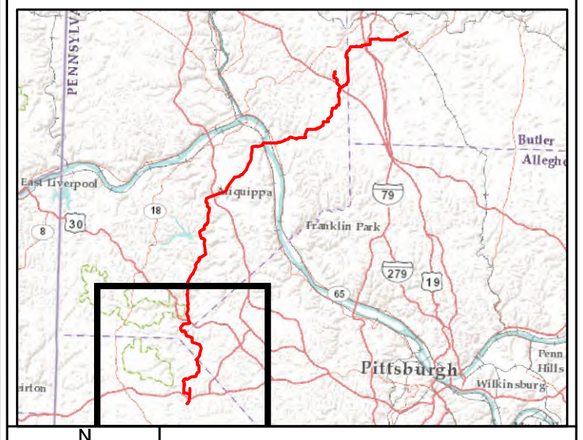
Map Key 4

Limits of Disturbance (LOD)

Map Key Page

No Feature

Feature



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Service Layer Credits: Sources: Esri, USGS, NOAA

ESI
ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.
Project No. 1277

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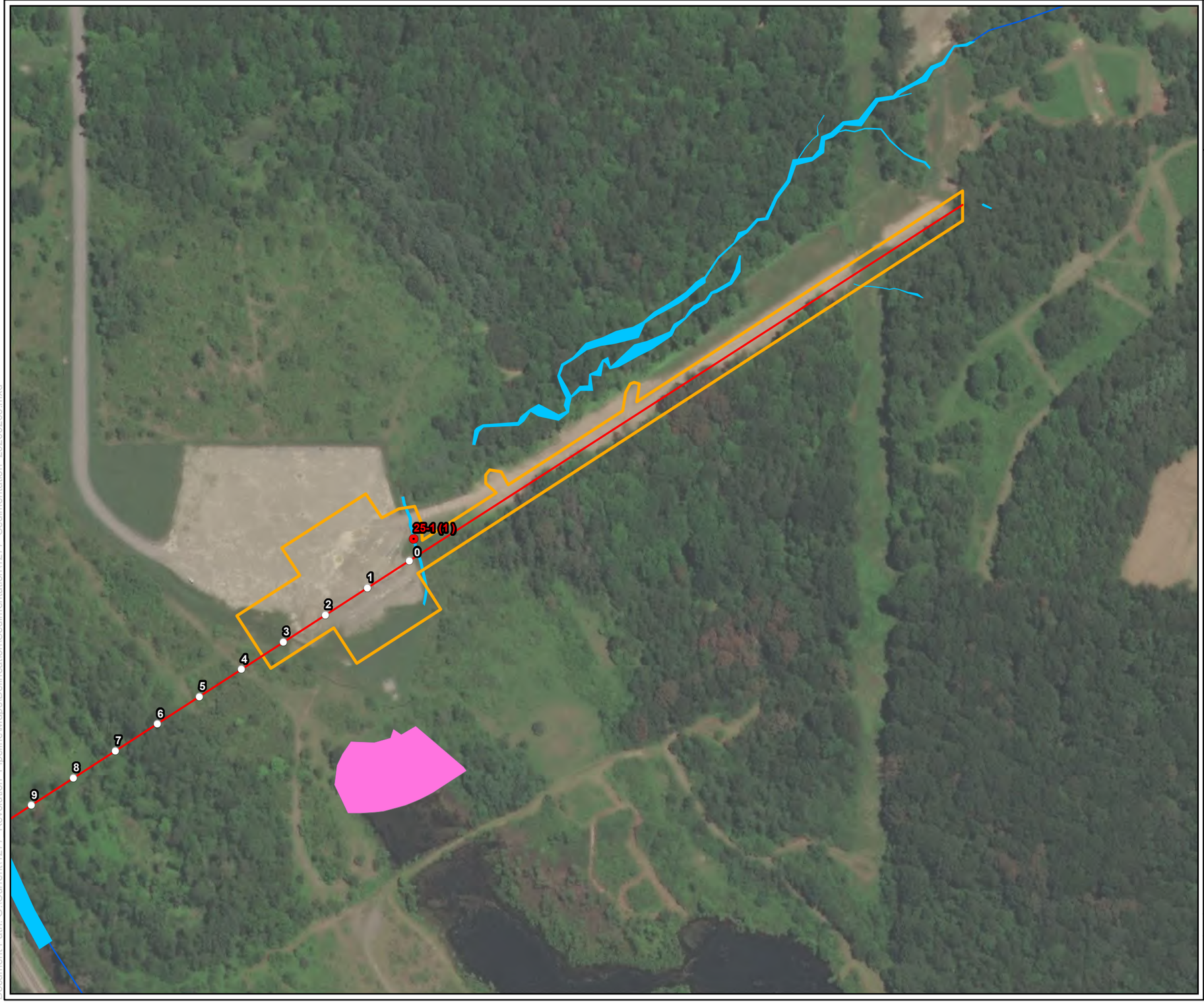
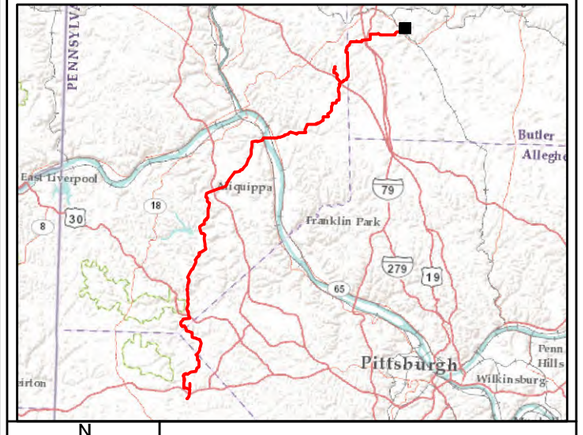
Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

Map 1 of 109

- Stationing
- Stream Crossing Location
- Field-Delineated Stream
- National Hydrography Dataset Stream
- Project Alignment
- Limits of Disturbance (LOD)
- Field-Delineated Pond





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Service Layer Credits: Sources: Esri, USGS, NOAA

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ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.
Project No. 1277

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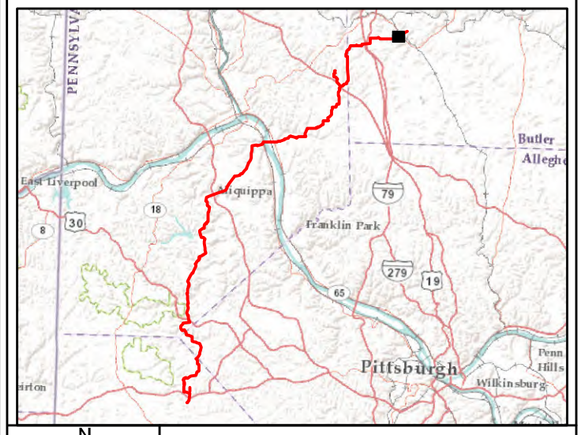
Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

Map 2 of 109

- Stationing
- Stream Crossing Location
- Upstream Reference Point
- Sedimentation Point
- Depositional Feature
- Field-Delineated Stream
- National Hydrography Dataset Stream
- Project Alignment
- Limits of Disturbance (LOD)



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ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.
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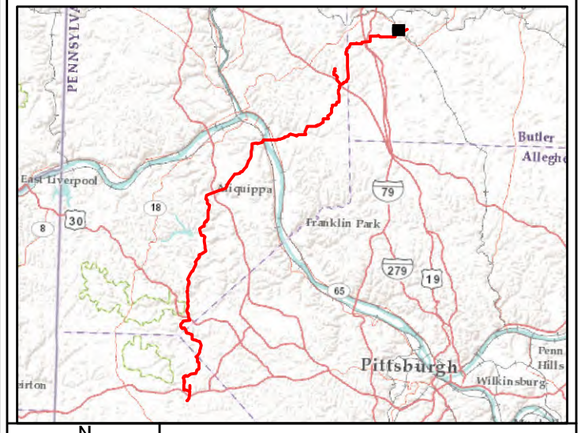
Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

Map 3 of 109

- Stationing
- Field-Delineated Stream
- National Hydrography Dataset Stream
- Project Alignment
- Limits of Disturbance (LOD)



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Service Layer Credits: Sources: Esri, USGS, NOAA

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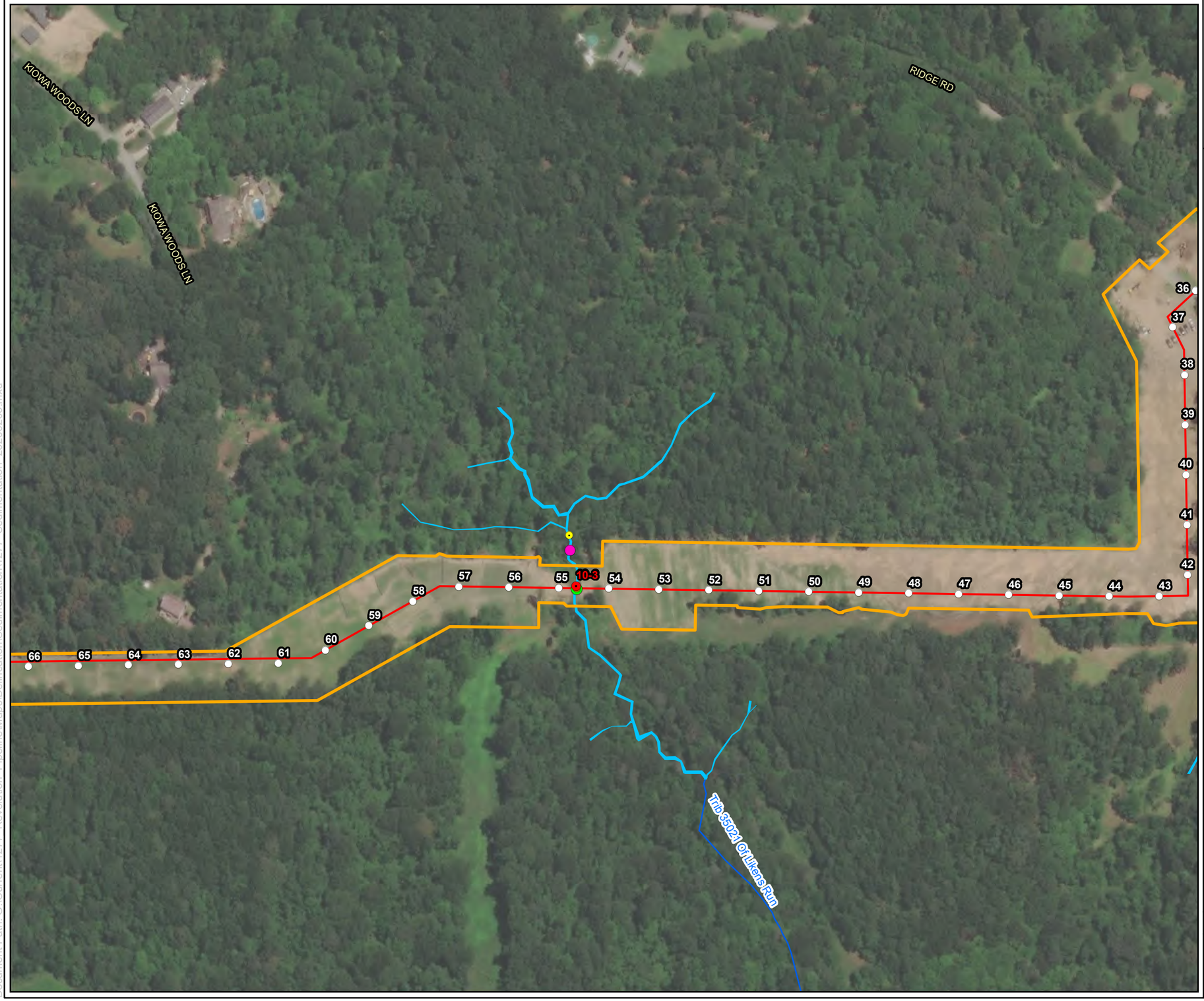
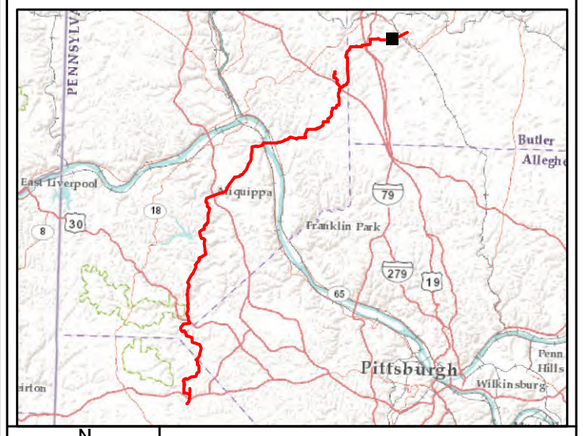
Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

Map 4 of 109

- Stationing
- Stream Crossing Location
- Upstream Reference Point
- Sedimentation Point
- Source of Sediment
- Depositional Feature
- Field-Delineated Stream
- National Hydrography Dataset Stream
- Project Alignment
- Limits of Disturbance (LOD)





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Service Layer Credits: Sources: Esri, USGS, NOAA

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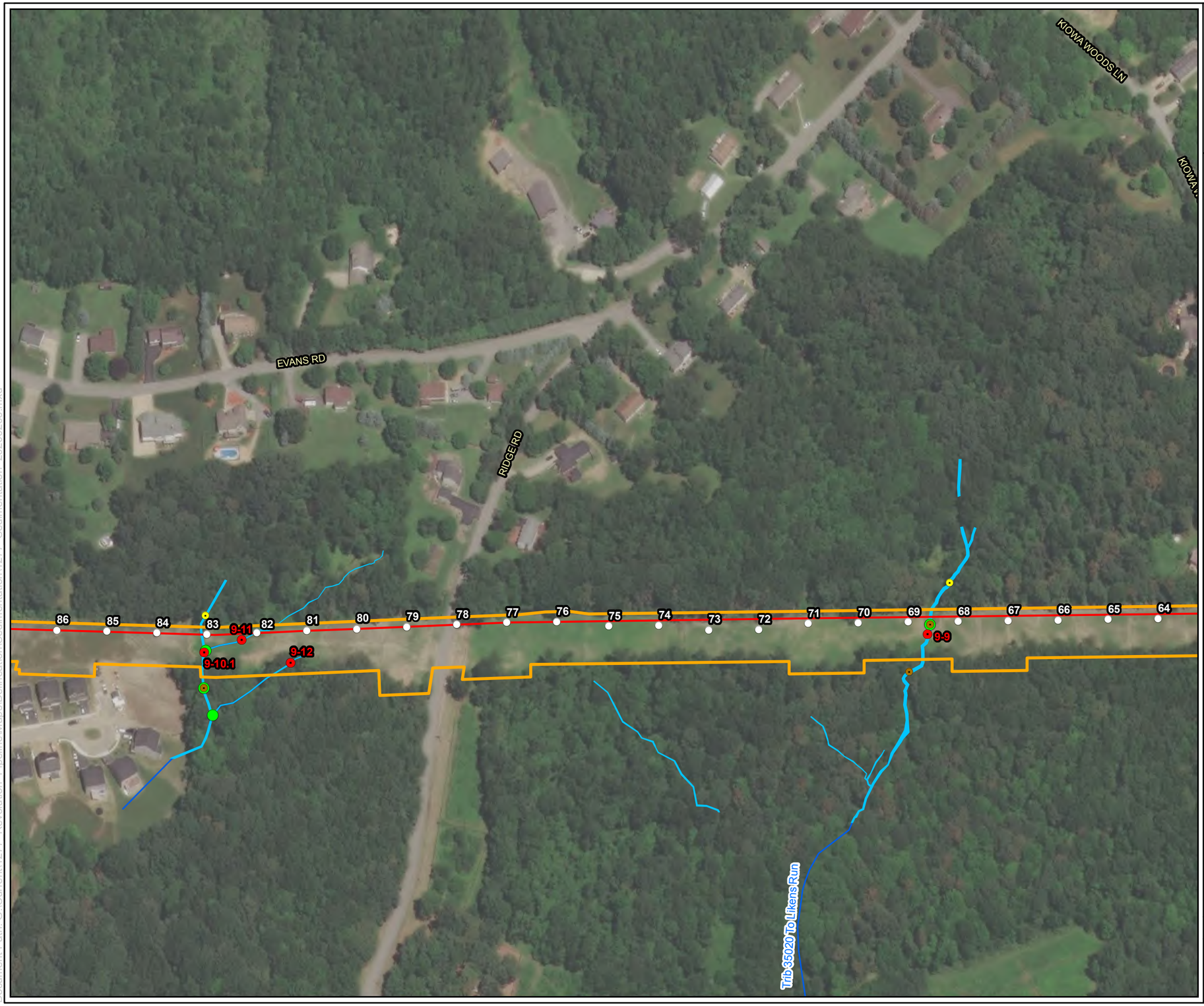
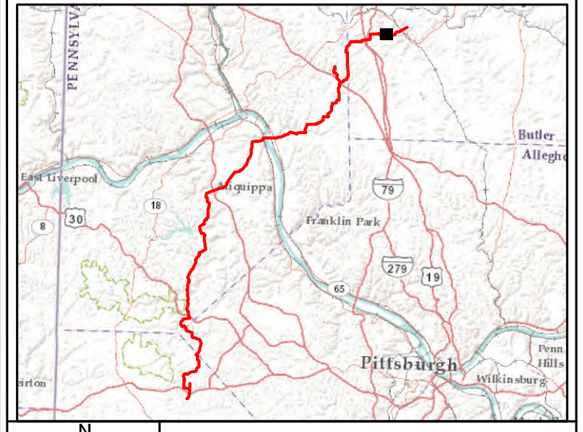
Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

Map 5 of 109

- Stationing
- Stream Crossing Location
- Upstream Reference Point
- Sedimentation Point
- Depositional Feature
- Field-Delineated Stream
- National Hydrography Dataset Stream
- Project Alignment
- Limits of Disturbance (LOD)





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Service Layer Credits: Sources: Esri, USGS, NOAA

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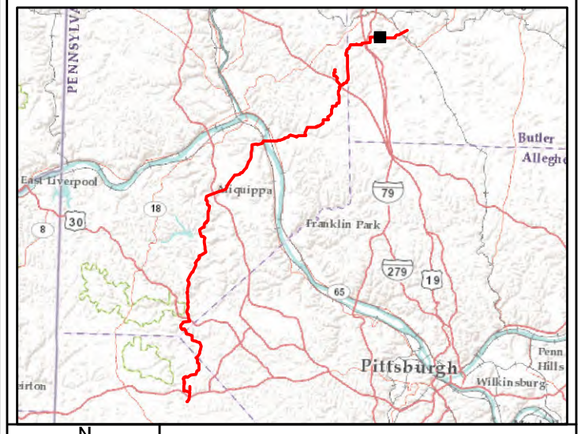
Downstream Sedimentation Analysis for the Revolution Pipeline Project in Butler, Beaver, Allegheny, and Washington Counties, Pennsylvania

Map 6 of 109

- Stationing
- Stream Crossing Location
- Upstream Reference Point
- Depositional Feature
- Field-Delineated Stream
- Project Alignment
- Limits of Disturbance (LOD)
- Field-Delineated Pond



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Service Layer Credits: Sources: Esri, USGS, NOAA

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Project No. 1277

Document Path: G:\Current\1277_Revolution_Pipeline\Maps\Delineation\Sedimentation\1277_Sedimentation_20200206.mxd

Mountain Valley Pipeline,
Mountain Valley Pipeline, LLC
(2014-2019)

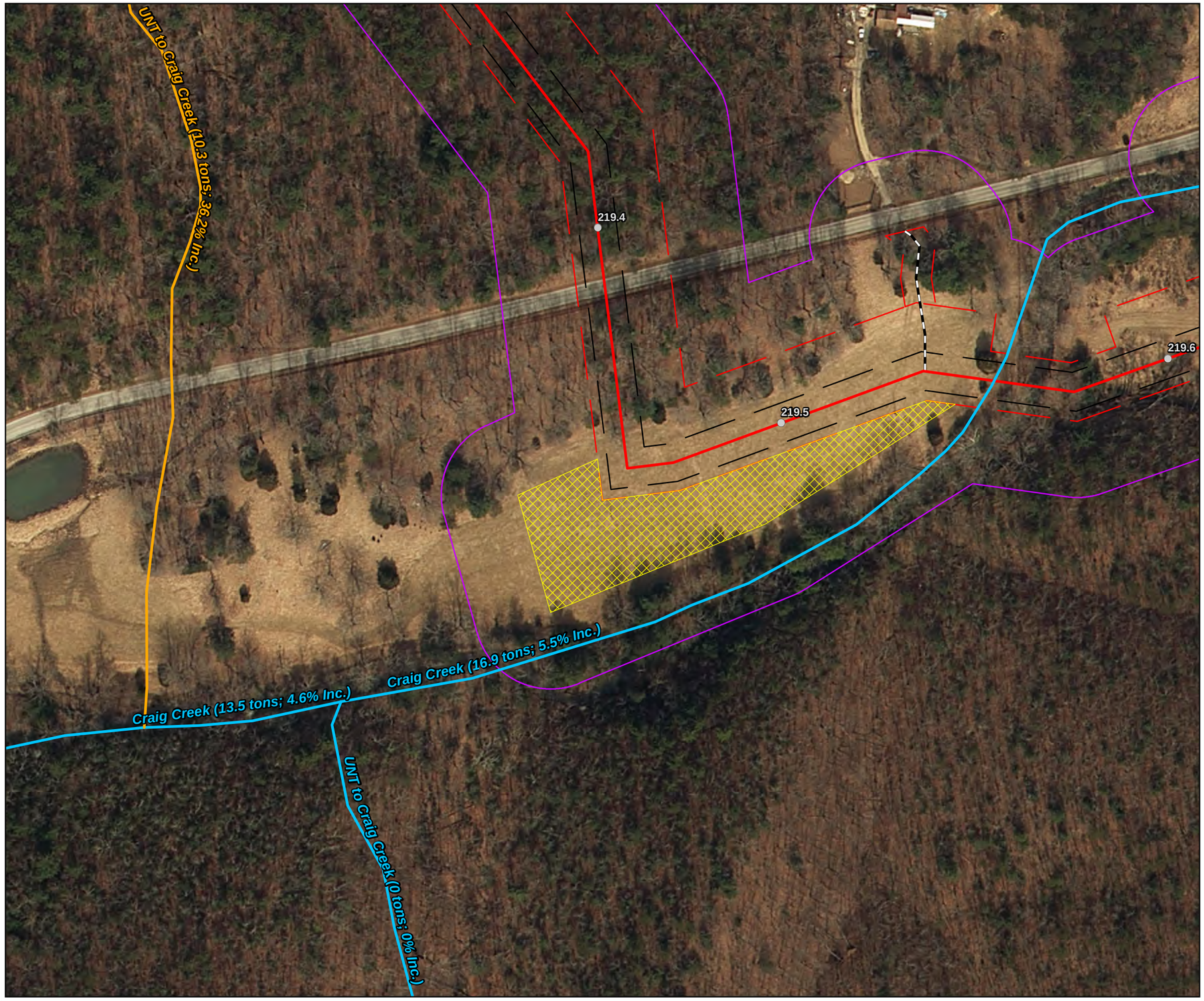
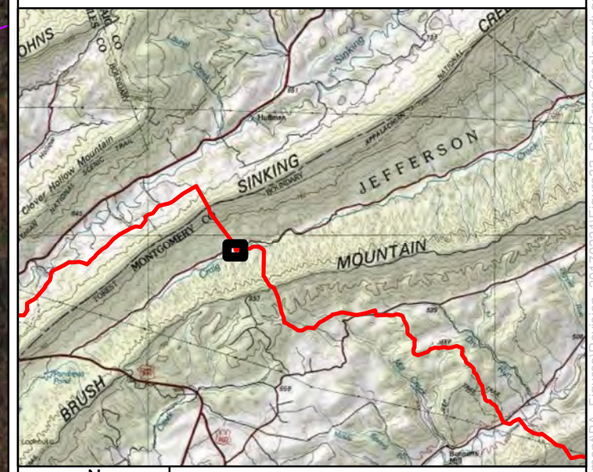


Figure 32. Detailed Action Area for sedimentation increases from the proposed Mountain Valley Pipeline in the vicinity of Craig Creek in Montgomery County, Virginia.

Map 1 of 3

- Milepost
- October 2016 Proposed Route (Revised)
- Access Road
- Stream
- Sediment Impact >10 Percent
- Permanent Easement Limits
- Workspace Limits
- Additional Temporary Workspace
- 100-foot (30.48-m) Limits of Disturbance Buffer



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Base Map: ESRI ArcGIS Web service - "World Imagery" accessed - 3/10/2017

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Project No. 593.25

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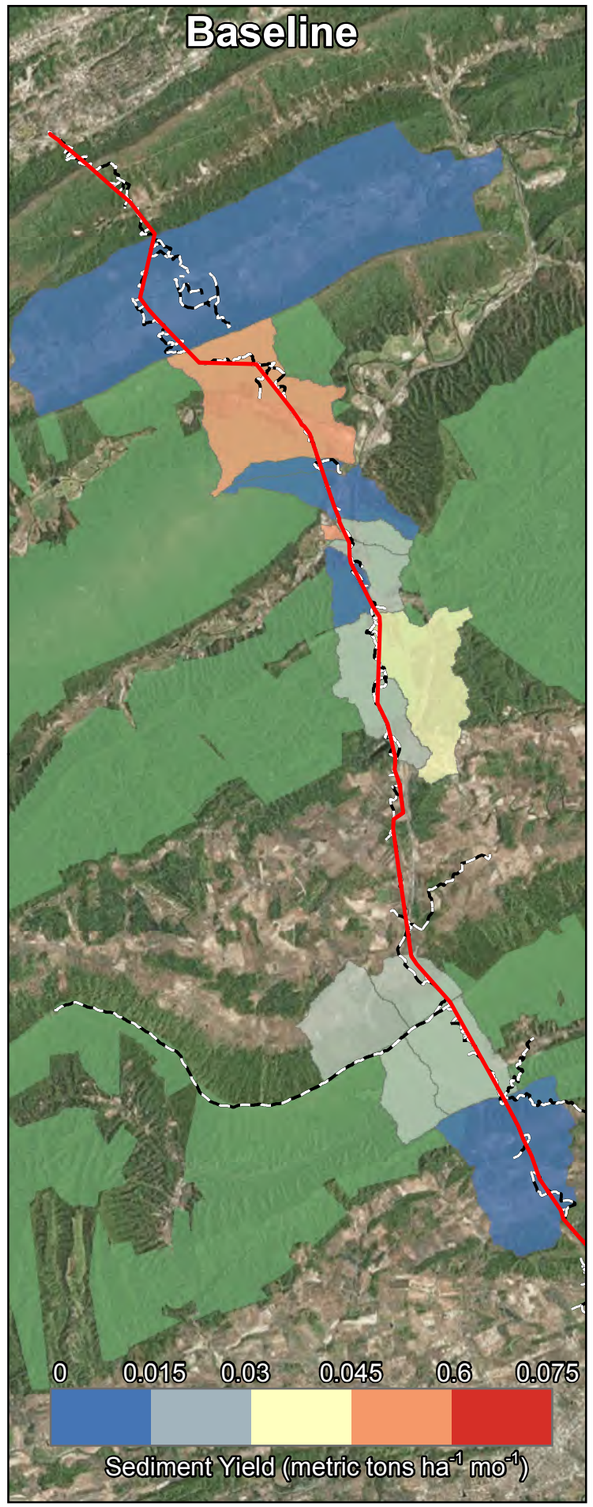
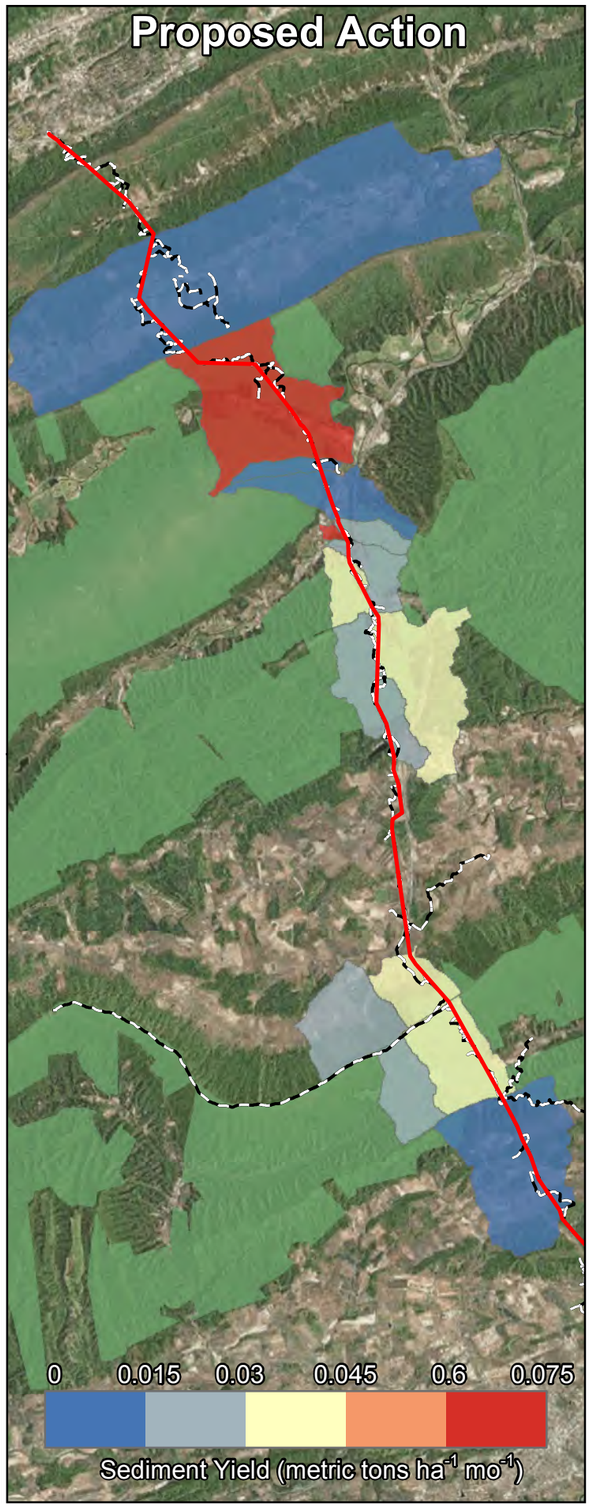
Bland Area Improvement 138 kV Transmission Line Rebuild, American Electric Power (AEP)





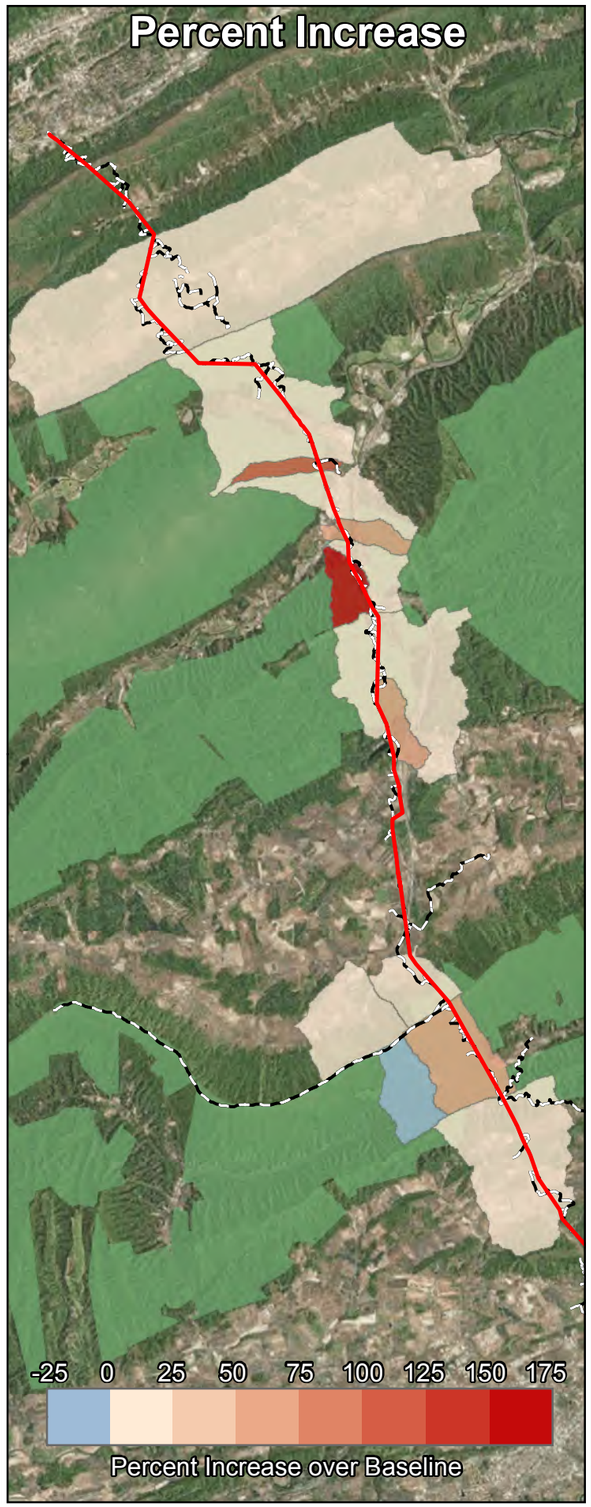
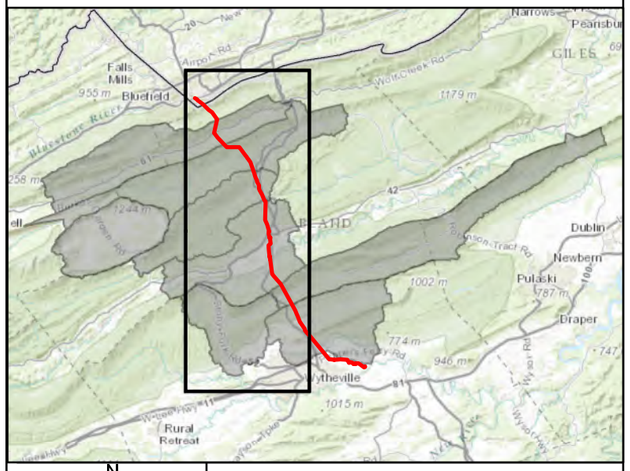


Figure 2. Predicted mean monthly sediment yield in 2017 for baseline and proposed action conditions for AEP's Bland Area Improvements 138kV Transmission Line Rebuild Project in the Jefferson National Forest.

Proposed 138kV Line

Proposed Access Road

National Forest



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Kilometers

Base Map: ESRI ArcGIS Web service - "World Imagery": Accessed - 3/14/2016

ESI

ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Project No. 555

Document Path: F:\projects\555\sedimentation\gis\mxd\555_figure2_sediment_yield.mxd

Sacrificial Anode Array Replacement Project,
AECOM/Transco (2025-Ongoing)

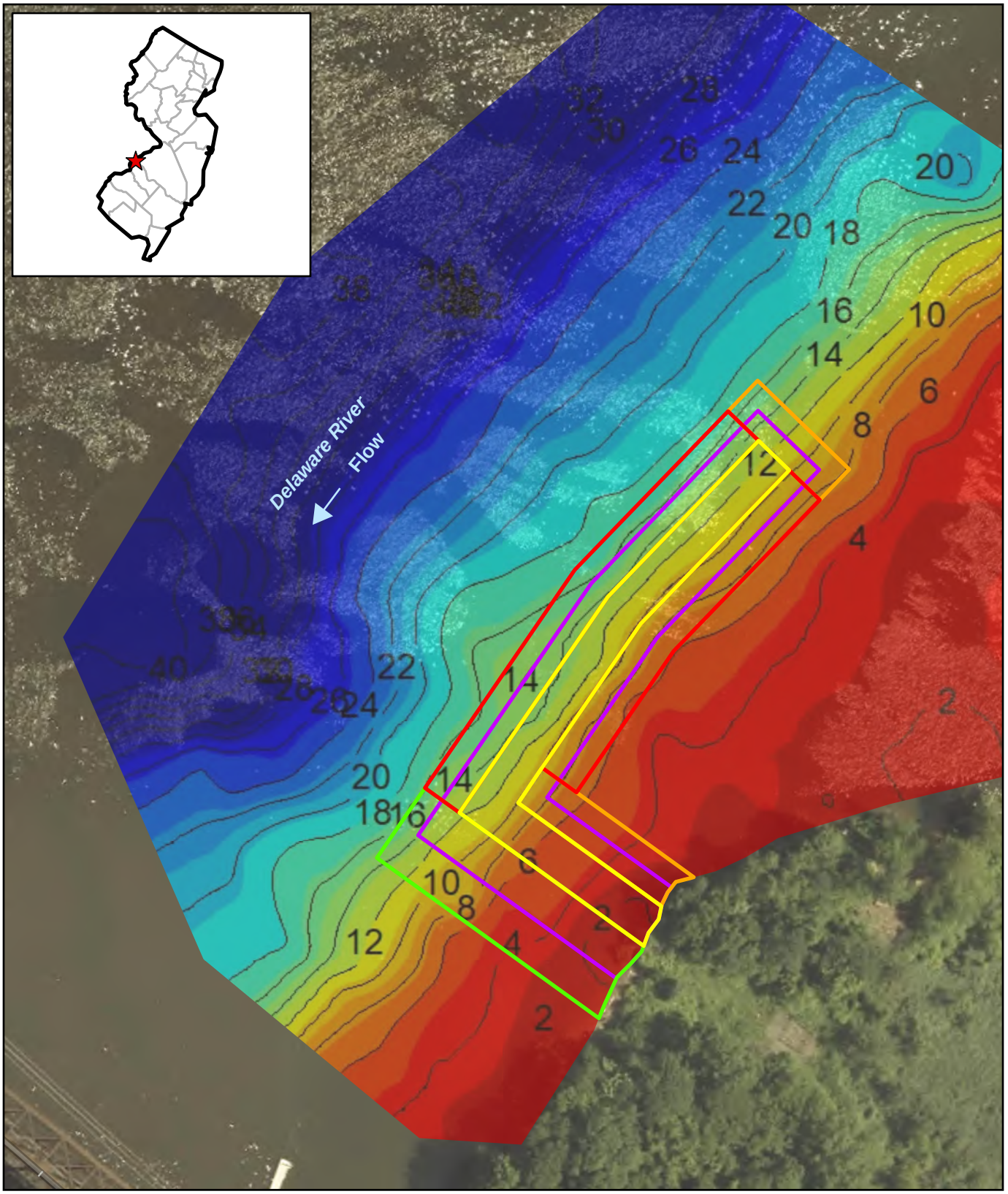

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Figure 2.1. Updated survey areas with current bathymetry mapping for the Sacrificial Anode Array Replacement Project in the Delaware River, Camden County, New Jersey.

Project No. 2571	0 20 40 Meters Base Map: NAIP Imagery	ESI ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.