EXPRESSION OF INTEREST
Source Water Protection Technical Help Program
Requisition Number CEOI EHS1800000001

Submitted by:

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ABBREVIATIONS

AST	aboveground storage tank
BPH	Bureau for Public Health
CPWS	community public water supply
DEP	Department of Environmental Protection
DHHR	Department of Health and Human Resources
DS	Downstream Strategies
EOI	Expression of Interest
GIS	geographic information system
GUDI	groundwater under the direct influence
MUB	Morgantown Utility Board
PSC	Public Service Commission
PSD	Public Service District
PSSC	potential source of significant contamination
SB	Senate Bill
SWIG	surface water influenced groundwater
SWPP	source water protection plan
WVAWC	West Virginia American Water Company
ZCC	zone of critical concern

1. INTRODUCTION

Downstream Strategies (DS) and its partner, Thrasher, submit this Expression of Interest (EOI) to assist community public water supply (CPWS) utilities in developing local source water protection programs to protect public health and safety (Source Water Protection Technical Help Program Requisition Number CEOI EHS1800000001).

DS and Thrasher are uniquely qualified to provide these services. We have completed nearly 50 source water protection plans (SWPPs) for utilities across West Virginia, including the "gold standard" SWPP for Morgantown Utility Board (MUB), which goes well above and beyond state requirements.

No other firm or team has our depth of experience with West Virginia SWPPs, established relationships with drinking water utilities across the state, and commitment to stakeholder engagement and community participation. DS President Evan Hansen has been intimately involved with source water protection efforts in West Virginia since 2014, when the Legislature passed Senate Bill (SB) 373 requiring these updated, comprehensive SWPPs. He provided key information to the Legislature while it was debating this bill, and he serves on the Public Water System Supply Study Commission, which provides annual recommendations to the Legislature regarding source water protection legislation. Other members of the DS/Thrasher project team also have considerable experience with source water protection planning and with West Virginia drinking water utilities. Our breadth of experience working on SWPPs and other engineering, water science, and water policy projects across West Virginia means that our team is poised to set the bar for excellence in writing new SWPPs.

1.1 Source water protection context in West Virginia

The 2014 Freedom Industries spill from an aboveground storage tank (AST) into the Elk River upstream from West Virginia American Water Company's (WVAWC's) intake contaminated the drinking water of approximately 300,000 West Virginians across nine counties. The legislative response, SB 373, passed unanimously and was signed by the governor. Among other things, it required updated, comprehensive SWPPs, and it created a new AST Act.

Figure 1: A Freedom Industries AST

As detailed further in Appendix A, SWPPs must include 12 components:

1. Contingency plan.
2. Ability to isolate or divert contaminated waters.
3. Ability to switch to an alternative intake.
4. Ability to close its water intake.
5. Certain operational information.
6. Available storage capacity.
7. Unaccounted for water.
8. Potential sources of significant contamination (PSSCs) within the zone of critical concern (ZCC).
9. Options to provide service if the primary intake is detrimentally affected.
10. Management plan.
11. Communications plan.
12. Early warning monitoring system.

The requirements in SB 373 are quite comprehensive and demand an interdisciplinary team to complete well. Engineering expertise is required to assess the technical and economic feasibility of options if the primary water source is contaminated. Geographic information system (GIS) skills are necessary to inventory PSSCs. Expertise in stakeholder involvement is needed to develop a management plan with community buy-in that is likely to be implemented. The DS/Thrasher team has strengths in all of these required skillsets, among others.

A total of 126 utilities completed their new SWPPs in 2016. These SWPPs represent a significant step forward in terms of safeguarding drinking water to protect human health and support West Virginia's economy.

However, these plans included only one surface water influenced groundwater (SWIG)[1] system.[2] SWPPs for the remaining SWIG systems were not initiated, pending the completion of studies performed by the U.S. Geologic Survey for the Department of Health and Human Resources (DHHR). Now that these studies have been completed and tools have been developed to help identify SWIG systems, DHHR is moving forward with SWPPs for the 19 SWIG systems included in this EOI.

Utilities across West Virginia provide services to vastly different customer bases and have access to vastly different resources. For example, the MUB and WVAWC-Kanawha Valley systems have large budgets and staffs, and they have the resources to go above and beyond the requirements of SB 373. In contrast, West Virginia is home to numerous small, rural drinking water utilities with small customer bases, small staffs, and limited resources and time to add any non-mandatory source water protection planning activities to their responsibilities. SB 373 placed an important yet unfunded mandate on these small utilities; DHHR's template and its efforts to fund consultants allow these small utilities to meet their SWPP obligations despite their limited resources.

[1] SWIG systems are not the same as groundwater under the direct influence (GUDI) systems. GUDI is a federal Safe Drinking Water Act guideline that has been used for years. SWIG is a new term that was included in SB 373, and it therefore has no direct counterpart in federal code. SB 373 requires SWPPs to be created for SWIG systems, and it does not mention GUDI systems.
[2] Parkersburg, due to its Ranney wells, was determined to be a SWIG.

2. QUALIFICATIONS AND EXPERIENCE

DS and Thrasher have worked together on numerous projects since 2014 and have completed almost 50 SWPPs for West Virginia water utilities.

DS is an environmental and economic development consulting firm with offices in Morgantown, Davis, and Alderson, West Virginia. We are considered ***the*** go-to source for objective, data-based analyses, plans, and actions that strengthen economies, sustain healthy environments, and build resilient communities. DS has a core belief in the importance of protecting the environment and linking economic development with natural resource stewardship. Source water protection fits squarely within this mission.

Our interdisciplinary staff of 16 works on a surprisingly diverse range of projects across West Virginia, Appalachia, and beyond. Most projects involve elements of environmental science, policy, and/or planning.

DS's water-related projects in West Virginia include SWPPs; the Pocahontas County Water Resources Management Plan; numerous watershed-based plans to allow Clean Water Act Section 319 funds to be spent on nonpoint source pollution control projects; and natural stream and wetland design, permitting, construction, and monitoring projects for the In-Lieu Fee Program and for a mitigation bank.

Elsewhere, DS created GIS-based fish habitat planning tools for large portions of the United States, provided litigation support and expert testimony on pollution issues in numerous states, and conducted an ecosystem services valuation and coastal spatial planning project in Barbados.

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Thrasher is West Virginia's largest privately-owned, multi-disciplinary firm and a leading firm in the Mid-Atlantic region. Thrasher's mission is to improve the communities where we live and work by driving infrastructure development.

With multi-disciplinary capabilities, Thrasher covers all the professional services needed to deliver successful projects to both public and private clientele. The firm's roots were planted in civil engineering and consulting services for public utility projects. Over the years, our success has allowed us to branch out, expanding our services to meet both the needs of our clients and the growing need for more responsive and effective solutions.

Meeting increasingly stringent water quality standards demands the experienced and dedicated water system specialists found at Thrasher. Since our very first water project over 30 years ago, there has always been a potable water project underway at Thrasher. These projects provide safe drinking water to towns, cities, and entire counties. The team at Thrasher is highly skilled and practiced in both conventional ground and surface treatment systems.

Whether identifying and recommending water sources, designing more efficient processes, integrating alternative energy sources, reducing water loss to acceptable levels, or restoring function to aged piping systems, our clients can count on Thrasher to find practical, low cost, environmentally friendly solutions to their supply needs.

2.1 Staff

The following team members will implement this project. CVs are provided in Appendix B and Appendix C.

Evan Hansen, President, Downstream Strategies. Evan Hansen founded Downstream Strategies in 1997. He explores resource and environmental problems and solutions in three areas: water, energy, and land. He manages interdisciplinary research teams, performs quantitative and qualitative policy and scientific analyses, provides litigation support and expert testimony, develops computer tools, and provides training. Mr. Hansen managed the development of MUB's SWPP and serves on the Public Water System Supply Study Commission, which provides recommendations to the Legislature on source water protection legislation.

Kendra Hatcher, Senior Environmental Scientist, Downstream Strategies. Kendra Hatcher is a senior scientist with eight years of experience in field sampling, scientific analysis, site assessment, and data management. She played key roles in writing SWPPs for MUB, the Wheeling Water Department, and numerous smaller utilities. Ms. Hatcher has completed a variety of projects, from source water protection planning to housing and business needs assessments. She has wide experience sampling a variety of environmental media, including water and soils, and has monitored extensively in areas impacted by Marcellus Shale gas development. She has also used GIS technologies for over 10 years to analyze and manage spatial data related to natural resources and the environment. She has experience organizing stakeholder meetings and implementing community surveys and assessing the results.

Joey James, Project Scientist, Downstream Strategies. Mr. James is a multi-disciplinary researcher specializing in sustainable economic development and planning for the new economy. He has professional experience in the public, non-profit, and private sectors and has worked extensively in source water protection, energy policy analyses, GIS development, economic modeling, environmental data analysis, and environmental outreach. Mr. James provided GIS and meeting facilitation services for source water protection planning for many small utilities and has played a key role in the development of the MUB Monitor and the inventories of PSSCs for MUB and numerous other utilities.

Jason Clingerman, Project Aquatic Ecologist, Downstream Strategies. Jason Clingerman has worked extensively in the field of natural resources science and management, including aquatic ecology, water quality assessment, and source water protection. He is experienced in performing aquatic surveys for fish, macroinvertebrates, habitat, and water quality, and in the management and analysis of large aquatic and water quality datasets. He frequently uses GIS for geographic and aquatic applications and takes on the role of project manager or technical lead in many projects. Mr. Clingerman has contributed extensively to source water protection planning projects with MUB and smaller West Virginia utilities.

Alyssa Hanna, Staff Botanist, Downstream Strategies. Alyssa Hanna uses botany, microbiology, plant ecology, and GIS principles to assist in planning, field data collection and analysis for stream and wetland restoration projects, invasive species control plans, and wetland delineation. She has over 16 years of experience with invasive plant species identification, research, and control and over 12 years of experience with GIS and geostatistical analysis. Ms. Hanna has worked for a variety of clients in public, non-profit, and academia and focused on education and outreach, botany and plant ecology, field data collection and analysis, and GIS.

Daniel Ferrell, Principal-in-Charge, Thrasher. Dan Ferrell, PE, is a tenured Project Manager with nearly 30 years of experience in project design and management within the public utility sector. Dan has worked on water system solutions throughout the Mid-Atlantic region. These projects have ranged from small water line extensions to new treatment plants and even emergency water system rehabilitations through FEMA. Dan's ability to understand his client's goals stems in part from his time serving as the Director of Public Works and City Engineer for the City of Bridgeport, West Virginia. During this time, he was responsible for water, sanitary sewer, and stormwater infrastructure for the growing city. Dan has taken that time spent as the client and translated it over to become a highly skilled engineering consultant.

Wm. Randy Watson, Project Manager, Thrasher. Randy Watson has been part of The Thrasher Group for over 30 years and has spent the vast majority of his career helping communities across West Virginia develop safe and sustainable water infrastructure. Mr. Watson has worked with countless clients to design new water systems from the ground up, in addition to thousands of miles of extensions. He specializes in challenging water loss projects and is able to pinpoint problem areas that drastically reduce unaccounted water usage. His combination of design ingenuity and knack for troubleshooting failing systems has allowed Mr. Watson to help several small municipalities that would otherwise not have been able to complete projects. Additionally, he has mastered the art of funding public utility projects through extensive agency research and practical application. He has helped fund some of the most critical and complex projects within the area. Today, Nr. Watson still works for his very first client from 1984. His ability to develop creative funding packages, paired with his strong relationships among the various funding authorities, ensures his clients are receiving the maximum dollars available for their projects.

Kylea Radcliff, Project Manager, Thrasher. Kylea Radcliff, EI, provides engineering solutions in water and wastewater applications. She is responsible for the development of projects and takes them from the preliminary engineering report stages to completion. Ms. Radcliff has written numerous engineering reports that have helped her clients secure funding to move these jobs to construction. She is also responsible for the design of water and wastewater projects and works closely with project managers to meet all of the client's needs. She began her career at Thrasher as a summer intern in the utility department. Since then, she has joined the firm full time and is serving as project manager for numerous projects from preliminary steps through closeout. She is dedicated to designing projects that meet her client's needs and improve their systems.

Eric Sherrard, Project Manager, Thrasher. Eric Sherrard, EI, joined Thrasher in 2009 and serves as a project engineer within the Utility Department. Mr. Sherrard assists in the planning and development of public water and wastewater projects for the firm. His responsibilities include the development of engineering reports and funding applications, creation of design documents, engineering during construction, and other engineering tasks. Mr. Sherrard also serves as a project manager for multiple public utility projects. Mr. Sherrard has experience in the design and construction of source water intakes, water line replacements and extension projects, and water storage tank construction and repair—and he is familiar with environmental and construction permitting requirements. He has been involved with the development of multi-phased projects during his time at Thrasher. Additionally, Mr. Sherrard has experience developing and utilizing GIS for public utilities.

Caitlyn Preast, Staff Engineer, Thrasher. Caitlyn Preast, EI, is a 2013 West Virginia University Institute of Technology graduate with a Bachelor of Science degree in Civil Engineering. While specializing in site development, she has also been involved in utility system and architecture projects. She joined Thrasher with practical experience as a professional engineer intern in the Facility Asset Management Department of Walt Disney Parks and Resorts. At Thrasher, Ms. Preast serves as a project engineer and has developed specific expertise supporting the development and implementation of source water protection plans, capital improvement plans, and water and sewer system improvements. Her attention to detail for submittal reviews makes her a key member of any team. Her skills with AutoCAD Civil 3D to assist site development grading, utility layouts and designs, and erosion and sediment control measures provide value to any project, as well as her proficiency in construction administration and project scheduling.

Logan Alastanos, Staff Engineer, Thrasher. Logan Alastanos helps with numerous water and sanitary sewer projects across West Virginia. Mr. Alastanos works with project managers and division leaders to prepare and review preliminary engineering reports, asset management plans, and various funding applications. His understanding of public utility infrastructure in West Virginia has enabled him to work with an array of funding and regulatory agencies to deliver technically sound projects within stringent budgets. As part of his duties, he spends much of his time providing design edits for the engineering staff and comparing desktop data to that collected in the field.

Eleni Brick, Staff Engineer Technician, Thrasher. Eleni Brick helps with numerous water, sanitary sewer, and stormwater projects across West Virginia. She works directly with Thrasher's team of engineers to prepare and review preliminary engineering reports, asset management plans, and various funding applications. Her understanding of public utility infrastructure in the Mountain State has enabled her to work with an array of funding and regulatory agencies to deliver technically sound projects within stringent budgets. As part of her duties, Ms. Brick spends much of her time providing detailed reports and analysis for the engineering staff.

2.2 Experience: Source water protection plan development

The DS/Thrasher team has vast experience collaborating with West Virginia utilities to develop SWPPs. More than one-third of West Virginia's recently approved SWPPs were written in whole or in part by DS and Thrasher.

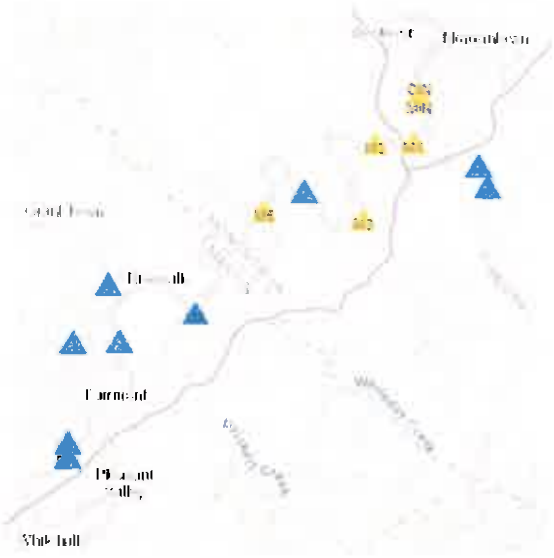
2.2.1 *MUB: A source water protection plan that went above and beyond the requirements*

DS has worked extensively with MUB on source water protection planning since 2014. DS collaborated with MUB to write its 2016 SWPP and is now updating that SWPP for submission in summer 2018. DS also continues to provide substantial technical support for MUB's ongoing source water protection activities.

MUB is relatively unique among West Virginia utilities because it has the resources and the desire to go above and beyond the SWPP requirements in SB 373. Examples of MUB's expansive program include watershed monitoring, the Cobun Creek Land Protection Program, the MUB Monitor, and an inventory of PSSCs outside of the ZCC. Brief descriptions of these unique components are presented to highlight our team's responsiveness to client needs and our proficiency with the SWPP process.

Watershed monitoring. The purpose of MUB's watershed monitoring program is to identify pollution problems upstream from MUB's intakes and to inform the selection of management strategies to address these problems promptly (See Figure 2, which illustrates these locations). The field measurements and laboratory analytical parameters have been selected to establish baseline conditions in the source waters for a variety of organic and inorganic contaminants. Sampling locations were initially selected based on stressors reasonably evaluated as having the potential to impact source water quality or surface water flow. A water quality sampling database is maintained and routinely evaluated to identify trends in quality and to establish a robust dataset for future comparison. Data gaps will be identified and incorporated into a dynamic and ongoing watershed monitoring program to develop a comprehensive baseline, conduct trend analysis, and target areas for improvement.

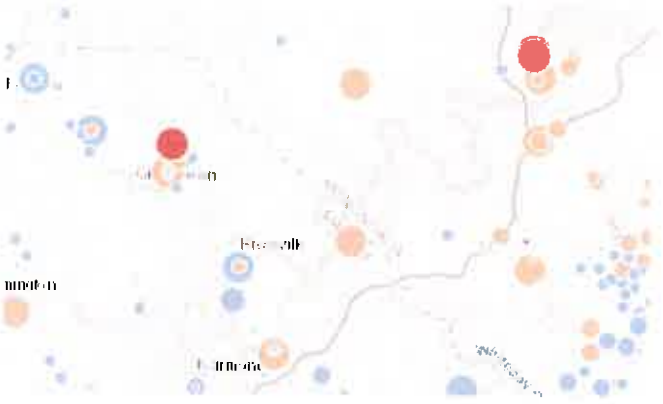
Figure 2: MUB's watershed monitoring locations



Cobun Creek Land Protection Program. MUB was recently awarded a Healthy Watersheds Grant to work with DS and the West Virginia Land Trust to create a land protection program and fund, with a focus on land upstream from MUB's new reservoir on Cobun Creek. The Cobun Creek watershed is largely undeveloped, and the headwaters remain ecologically intact. Given its proximity to the developing Morgantown metropolitan area, the Cobun Creek watershed and other less-developed catchments in the Upper Monongahela watershed face threats from industrial, commercial, and residential development. Land protection will help protect source water for MUB's Cobun Creek intake, and once the program is expanded, will also help protect source water for MUB's Monongahela River intake.

The MUB Monitor. The MUB Monitor forms the core of MUB's ongoing source water protection activities. It is a secure, online, GIS-based decision support system that provides tools to help MUB manage upstream threats and respond to spills. Figure 3 illustrates a portion of its map of ASTs, which are symbolized to identify their size and threat to MUB's intakes. Detailed information about ASTs and all other PSSCs are available in map and table form. A threat matrix allows MUB to prioritize AST threats based on the substance stored and the tank's distance to the intake and size. The spill response tool allows MUB to track spills in real time so that technicians can make informed decisions about closing intakes or other appropriate actions.

Figure 3: ASTs near MUB's intakes in the MUB Monitor



Inventory of PSSCs outside of the ZCC. The ZCC is the most critical planning area for source water protection because pollutants that reach a stream in this zone will be transported to the intake in five hours or less. The ZCC is specified as the relevant planning area for PSSC inventories in state code; however, DS worked with MUB to inventory all PSSCs within and outside of the ZCC. For the SWIG systems that are the focus of this EOI, conjunctive capture zones will be used instead of ZCCs.

2.2.2 *Other West Virginia systems that utilized the source water protection plan template*

DS and Thrasher have completed almost 50 other SWPPs for West Virginia drinking water systems. These systems are located in all parts of West Virginia, from the Northern Panhandle to the southern coalfields, and from the Eastern Panhandle to the Ohio River:

- Athens
- Berkeley Springs Water Works
- Big Bend Public Service District (PSD)
- Bluewell PSD
- Buffalo Creek PSD
- Burnsville Public Utility
- Central Hampshire County - Green Spring
- Flatwoods Canoe Run PSD
- Fort Gay Water Works
- Frankfort PSD
- Gilbert Water Works
- Glenville Utility
- Green Valley Glenwood PSD - Bulltail
- Green Valley Glenwood PSD - Glenwood
- Kenova Municipal Water
- Kermit Water Works
- Lincoln PSD
- Logan
- Logan County PSD - Greenville
- Logan County PSD - Northern
- Man Water Works
- Matewan Water Works
- McDowell County PSD - Bartley
- McDowell County PSD - Berwind
- Middlebourne Water Department
- Milton Water
- Mingo County PSD - Naugatuck
- Mountain Top PSD
- Oceana
- Paw Paw Water Works
- Pendleton County PSD - Upper Tract
- Piedmont Municipal Water Works
- Pineville Municipal
- Pocahontas Water System, Va
- Red Sulphur PSD
- Ripley Water Works
- Romney Water Department
- Shepherdstown PSD
- Sugar Creek PSD
- Timberline Four Season Resort
- Town of Harman
- Wayne Water
- Weirton Area Water Board
- West Hamlin Municipal Water
- Wheeling Water Department
- Williamson Utility Board

For these systems, we typically used DHHR's template. We tailored our work with these utilities to meet the specific requirements from SB 373, with the recognition that smaller utilities have limited time and resources to spend on source water protection activities. In projects for which DS took the lead in PSSC inventories, however, we ensured that source water protection team members considered the inclusion of PSSCs outside of the ZCC, so as not to exclude obvious threats that happened to fall outside of this zone.

2.2.3 *Lessons learned from our source water protection experience*

Through our experience going above and beyond the requirements of SB 373—as well as our experience developing plans using the template—we have learned valuable lessons that we will apply to this project.

As illustrated in Table 1 and Figure 4 and Figure 5, we are already proficient at accessing and mapping the conjunctive use areas and potential contaminant source data provided by DHHR through its West Virginia Source Water Protection Program Map Viewer. Our intimate understanding of these spatial datasets and their attributes is founded in our knowledge of how potential contaminant sources and PSSCs have been determined over time and the project team's years of experience working with these datasets and providing feedback to State agencies on their effectiveness. As illustrated in Table 1, PSSCs will be found in a wide variety of data tables for the 19 utilities included in this EOI.

DS is also very familiar with accessing and mapping the confidential AST data provided by DHHR through its West Virginia Source Water Protection Confidential Map Viewer. DS has conducted extensive toxicity research on chemicals stored in ASTs within the Monongahela watershed. This knowledge base will be utilized when reviewing potential contaminant sources with each water utility.

Another observation from our past projects is that successful source water protection planning requires effective communication and interactions with water system staff, board members, and the public. The project team is well versed in a wide array of techniques to foster involvement and include perspectives of citizens and stakeholders to enhance planning and decision-making. Employing these techniques will be essential to producing a well-vetted and high-quality plan.

In addition, through our previous source water protection projects, we have developed tools and techniques to help make these processes more efficient and cost-effective. For example, we have had success in bringing checklists of potential education/management strategies to meetings and facilitating discussions in which water system representatives, protection team members, and the public can efficiently decide which measures make the most sense for that particular system.

Table 1: Pre-collected PCS data

	Prot Area	EPA Fac	AML Point	AML High Walls	AML Prob Area	AML Poly	NPDES Fac	Non-Coal NPDES	Coal NPDES	LUST	Oil and Gas Well	Horiz Well Lat	Vol Rem	WV SWAP PSSC	Ohio PCS
Beech Bottom	√	√	√	√	√	√	√	√						√	
Benwood	√	√					√	√	√					√	
Belmont	√	√					√	√		√	√			√	
Follansbee	√	√			√	√	√	√	√	√	√		√	√	
Glen Dale	√	√					√	√		√			√	√	
Grandview Doolin	√	√					√	√			√			√	
Lubeck	√	√					√	√			√			√	
Mason-Crab Creek	√	√					√	√						√	
Mason- Lakin	√	√												√	
Mason-Letart	√	√					√	√			√			√	
McMechen	√	√					√	√			√			√	
Moundsville	√	√	√	√	√	√	√	√		√			√	√	
New Mart.	√	√					√	√		√	√	√		√	
Newell	√	√					√	√		√			√	√	
Tyler (Friendly)	√	√					√							√	
Paden City	√	√					√	√						√	
Wellsburg	√	√					√	√		√			√	√	√
Union Williams	√	√					√	√			√			√	
Vienna	√	√					√	√			√		√	√	

Figure 4: Example of SWAP-designated potential contaminant sources for Vienna

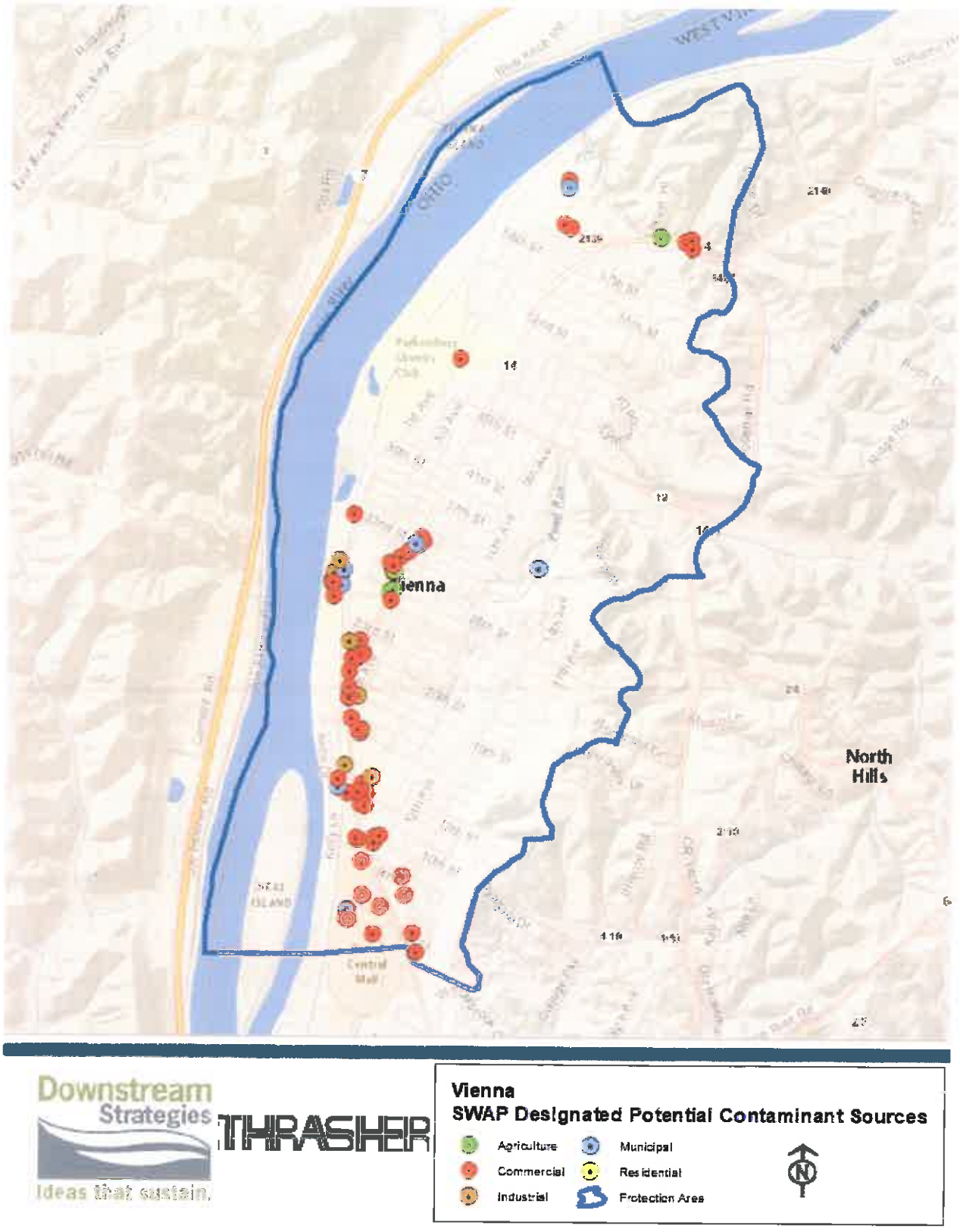
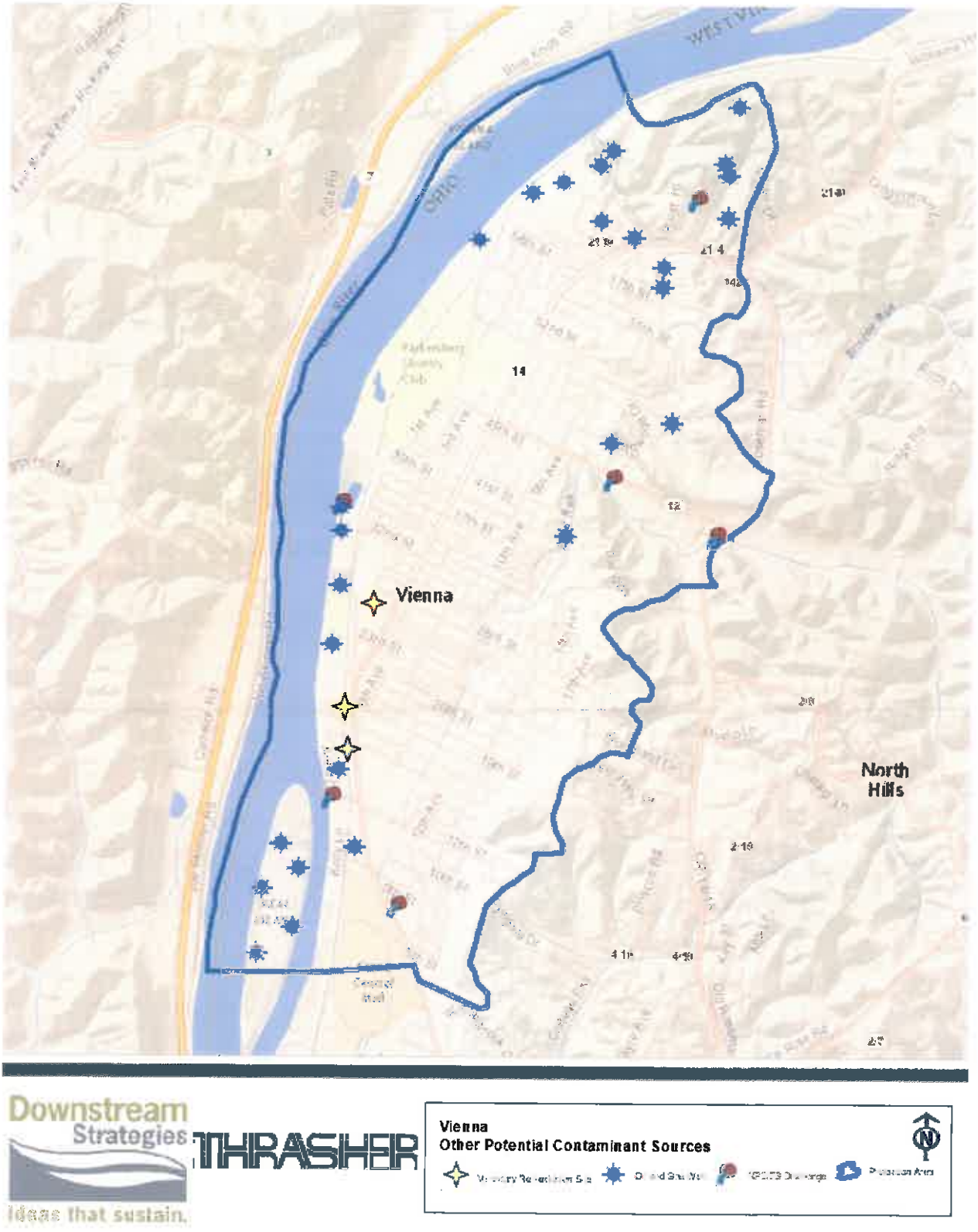


Figure 5: Example of other potential contaminant sources for Vienna



2.3 Experience: Other relevant projects

In addition to our experience in writing SWPPs, DS and Thrasher have worked on a wide variety of water science, policy, and engineering projects for state and local government entities, nonprofits, attorneys, and private companies. This experience sets us apart from other consultants because our source water protection planning work is conducted with a broad understanding of Safe Drinking Water Act, Clean Water Act, other federal and state laws and rules, and non-utility stakeholders that may be impacted by SWPPs.

2.3.1 *Downstream Strategies*

Source Water Protection Plan Implementation Guide

In collaboration with the West Virginia Rivers Coalition and with funding, in part, from the West Virginia Bureau for Public Health (BPH), DS created a SWPP Implementation Guide. This document provides information to utilities and watershed groups to encourage collaboration to achieve similar goals when SWPPs overlap with watershed-based plans. It also provides approaches and recommendations for public involvement in the implementation of both types of plans. Case studies of watersheds with both SWPPs and watershed-based plans are included to highlight similarities and opportunities for collaboration.

> *This guide demonstrates our ability to condense technical information into an easily-understood document and our proficiency with implementation of not just SWPPs, but also watershed-based plans.*

Conservation Easements as a Strategy for Drinking Water Protection, Lewisburg, West Virginia

DS worked with the West Virginia Land Trust to identify parcels of land that would be suitable for conservation easements and contribute to the protection of Lewisburg's drinking water source. This report outlines the process undertaken to prioritize parcels of land that have important natural qualities and those that have potential to contribute contaminants to the drinking water source, the Greenbrier River.

> *This project demonstrates our team's proficiency with GIS to engage in source water protection activities, as well as our ability to incorporate technical information into a process that involves local leaders and stakeholders. It also demonstrates our involvement in one specific SWPP implementation option: land conservation as a drinking water protection tool.*

Watershed-based Plans

DS worked closely with watershed associations, agencies, and stakeholders to complete numerous watershed-based plans across West Virginia. These plans allow incremental Section 319 funds to be spent in the watershed to clean up nonpoint sources of pollution, including acid mine drainage and bacteria from human waste and agriculture. The plans document the sources and causes of known impairments, estimate remediation costs (where possible), propose an implementation schedule for remediation, address technical and financial needs, and document an outreach and education program to aid with implementation.

> *These watershed-based plans demonstrate our team's success in facilitating meaningful collaborations with local entities and stakeholders on water planning issues across West Virginia.*

The Freedom Industries Spill: Lessons Learned and Needed Reforms

On January 9, 2014, the West Virginia Department of Environmental Protection (DEP) received an odor complaint about the Freedom Industries Etowah River Terminal site—a bulk storage distribution center holding thousands of gallons of chemicals along the Elk River, approximately 1.5 miles above the drinking water intake for WVAWC's treatment plant. MCHM and other chemicals were stored at the Freedom Industries site. This report outlines specific policy recommendations necessary to protect drinking water sources and prevent future chemical spills. It focuses on key issues, information gaps, and policy remedies as they relate to three environmental laws most relevant to the chemical spill: the Clean Water Act, Safe Drinking Water Act, and Emergency Planning and Community Right-to-Know Act.

Figure 6: Bulk water distribution after the Freedom Industries spill

This report demonstrates our longstanding involvement in source water protection activities and our understanding of the broader context within which SWPPs play a key role.

2.3.2 *Thrasher*

Statewide Comprehensive Planning Study

The West Virginia Water Development Authority and the Infrastructure and Jobs Development Council retained Thrasher as part of a team effort to prepare a Comprehensive Planning Study for the State of West Virginia that included the development of a GIS and to serve as a project prioritization and management tool to support their funding process. The project included data collection for every public water and sewer system in the state. As a team member, Thrasher was responsible for the collection of all raw data that would be developed into the statewide GIS. To gather the information required, Thrasher worked closely with stakeholders, including DEP, BPH, the Public Service Commission (PSC), municipal and private utilities, PSDs, county commissions, and Regional Planning and Development Councils. Similar to this proposed SWPP work, the major factor in data collection was the need for time from each utility to gather data. Thrasher developed a collection process to limit the time required from each utility and maximized the data collecting needs so that the overall project schedule could be met.

This study demonstrates our proficiency in data collection and GIS, as well as our familiarity with water systems across West Virginia.

Weirton Water Treatment and Distribution System

Water Treatment Plant Residuals Handling Project: Thrasher performed bench-scale and treatability testing, engineering design, construction document preparation, and construction management. The project included two filter backwash retention decant tanks, the addition of settlers to two existing circular clarifiers, a sludge thickener, the addition of tube settlers to two existing clarifiers, a plate and frame sludge press, and a sludge press building.

18" Emergency Water Line: In response to a water service disruption to customers in the City of Weirton brought on during system repairs, Water Board personnel and Thrasher worked together and determined that an additional line was necessary to prevent future water system disruptions. Thrasher "fast-tracked" the design phase of the project, which consisted of approximately 35 linear

feet of 18-inch ductile iron water pipe within the existing water treatment plant filter gallery and approximately 390 linear feet of pipe outside the water treatment plant.

East Bellview Street: This project consisted of the replacement of 600 linear feet of water line along East Bellview Street, which is in a highly populated residential area. Thrasher coordinated with City Council on the re-pavement of East Belleview, developed a traffic pattern with residents' safety in mind, and coordinated efforts with the West Virginia Division of Highways and other state agencies to complete the water line extension in a timely manner with limited water interruptions.

Belleview Elevated Water Storage Tank: The Weirton Area Water Board commissioned a hydraulic study of the entire water distribution system, which showed the existing 150,000-gallon Belleview Tank should be replaced with a 1 million-gallon tank to provide the minimum two-day storage required by BPH.

Water Treatment Plant Residuals Handling Project: This project included the design and construction management of a filter backwash retention decant tank, a sludge thickener, and a plate and frame sludge press building.

These Weirton projects demonstrate the breadth of our engineering experience and expertise related to drinking water systems.

2.4 References

In this section, we provide four references. References for any other projects mentioned above are available upon request.

2.4.1 *Morgantown Utility Board*

Tim Ball, General Manager, (304) 292-8443, tball@mub.org.

DS has worked extensively with MUB on source water protection planning since 2014. DS collaborated with MUB to write its 2016 SWPP and is now updating that SWPP for submission in 2018. DS also continues to provide substantial technical support for MUB's ongoing source water protection activities.

2.4.2 *West Virginia Rivers Coalition*

Angie Rosser, Executive Director, (304) 437-1274, arosser@wvrivers.org.

DS worked with the West Virginia Rivers Coalition to create a Source Water Protection Plan Implementation Guide to provide information to utilities and watershed groups about SWPPs and watershed-based plans. DS also worked with the West Virginia Rivers Coalition on the Freedom Industries report.

2.4.3 *City of Ripley*

Matt Anderson, Chief Operator, (304) 272-3482, ripleywastewater@suddenlinkmail.com.

Thrasher, with assistance from DS, completed a SWPP for the City of Ripley using the SWPP template that is to be used for SWPPs in this project.

2.4.4 *Corporation of Shepherdstown Water Department*

Frank Welch, Public Works Director. (304) 876-3322, fwelch@shepherdstown.us.

Thrasher completed a SWPP for the Corporation of Shepherdstown using the SWPP template that is to be used for SWPPs in this project.

3. TECHNICAL APPROACH

3.1 Team structure and project management

This project involves 19 CPWS systems along the Ohio River, split between the Northern Ohio and Central Ohio regions. While DS is the prime contractor for this project and will be the primary point of contact, DS and Thrasher will each take the lead on about half of these systems (See Figure 8 and Figure 9).

As illustrated in Figure 7, Evan Hansen will serve as the ***Source Water Protection Project Manager*** for this 19-system project.[3] Mr. Hansen will supervise all activities conducted by DS and Thrasher, in addition to serving as the primary point-of-contact for the Agency for technical project matters. Mr. Hansen will provide updates of project activities, discuss any problems encountered, approve reports, and provide projected invoice amounts. Mr. Hansen manages DS's source water protection work with MUB and led DS's effort in its previous collaboration with Thrasher to develop SWPPs across West Virginia. Mr. Hansen has an excellent track record for managing large, interdisciplinary teams and projects and ensuring their timely completion.

Kendra Hatcher at DS and Kylea Radcliff at Thrasher will serve ***Project Managers***, each focusing on the systems for which DS or Thrasher are taking the lead. They will provide project management services for technical project matters with the source water protection specialists and with the public water systems. Ms. Hatcher has managed and/or provided source water protection services for numerous SWPPs, including those for MUB, Wheeling, and the utilities for which DS and Thrasher previously collaborated. Ms. Radcliff has worked with numerous utilities throughout the state of West Virginia. She understands the importance of the reliability of a water provider and works closely with her clients to identify potential hazards and dangers. Ms. Radcliff has played integral roles in developing SWPPs for her clients.

Two additional senior staff at Thrasher will participate in this project. Dan Ferrell, a principal at Thrasher, will provide oversight of Thrasher staff, and Randy Watson will provide quality assurance/quality control.

The other DS and Thrasher employees shown in the organizational chart will serve as ***Source Water Protection Specialists***. Most of these team members have been integrally involved in DS's and Thrasher's previous source water protection projects, and they have experience in completing all aspects of the West Virginia SWPPs.

The personnel described in this EOI are the actual staff that will be assigned to conduct the work by DS and Thrasher. Requests for changes to this list of staff, if desired, will be filed with DHHR for prior approval.

We do not underestimate the challenge of completing 19 approved SWPPs within a year. In order to meet this challenge, DS and Thrasher will split the 19 systems in half—DS will take the lead in developing 10 plans, and Thrasher will take the lead for the other nine. As illustrated in Table 2, the managing entity will collect information for all aspects of the SWPP except those detailed in the following two paragraphs. The managing entity will also be the point of contact with the utility, schedule and facilitate meetings, and enter information into the template.

DS and Thrasher will play specific roles that take advantage of each firm's core strengths. For all SWPPs (including those managed by DS and by Thrasher), DS will be responsible for the initial GIS work to identify and map the conjunctive use areas and the PSSCs from existing databases. DS will also facilitate the identification of locally identified PSSCs, the prioritization of potential threats and management strategies, and the identification of education and outreach strategies. These tasks encompass four linked chapters in the template: Delineations, Potential Sources of Significant Contamination, Implementation Plan for Management and Outreach Strategies, and Education and Outreach Strategies.

[3] Mr. Hansen's contact information is included on the cover page.

For all SWPPs (including those managed by DS and by Thrasher), Thrasher will apply its engineering skills and be responsible for the single source feasibility study.

Figure 7: Organizational chart

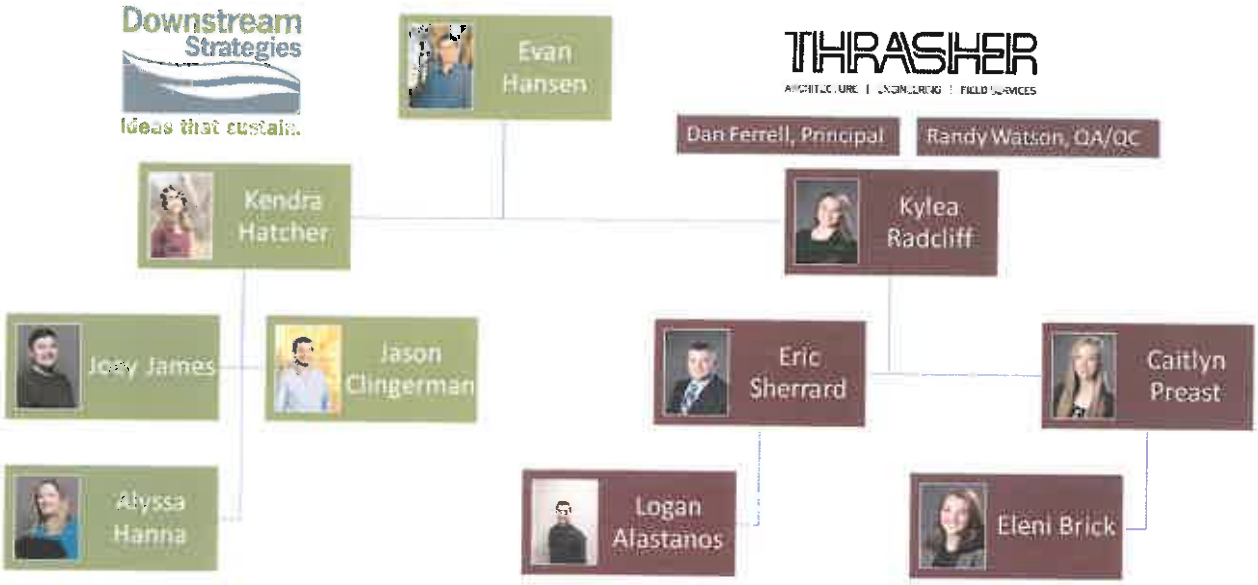


Table 2: Responsible party for each chapter of the template

Template chapter	Managing entity (DS or Thrasher)	DS	Thrasher
System information	√		
Water Treatment and Storage	√		
Delineations		√	
Protection Team	√		
Potential Sources of Significant Contamination		√	
Implementation Plan for Management and Outreach Strategies		√	
Education and Outreach Strategies		√	
Contingency Plan	√		
Single Source Feasibility Study			√
Communication Plan	√		

The project team will establish a regular schedule of bi-weekly project coordination meetings to ensure close coordination and good communication. Mr. Hansen, Ms. Hatcher, and Ms. Radcliff will attend all meetings, and other team members will attend as appropriate.

A standing agenda will include reviews of tasks completed so far, plans for the next two weeks, challenges/problems that need to be resolved, a review of the timeline, and administrative/invoicing/budget reviews.

Our team's collaborative and client-driven project management practices will help accelerate the plan development process, effectively share knowledge, and discover impediments early. It will result in well-vetted and high-quality plans that will meet or exceed BPH and the utilities' expectations.

Figure 8: Northern Ohio River systems

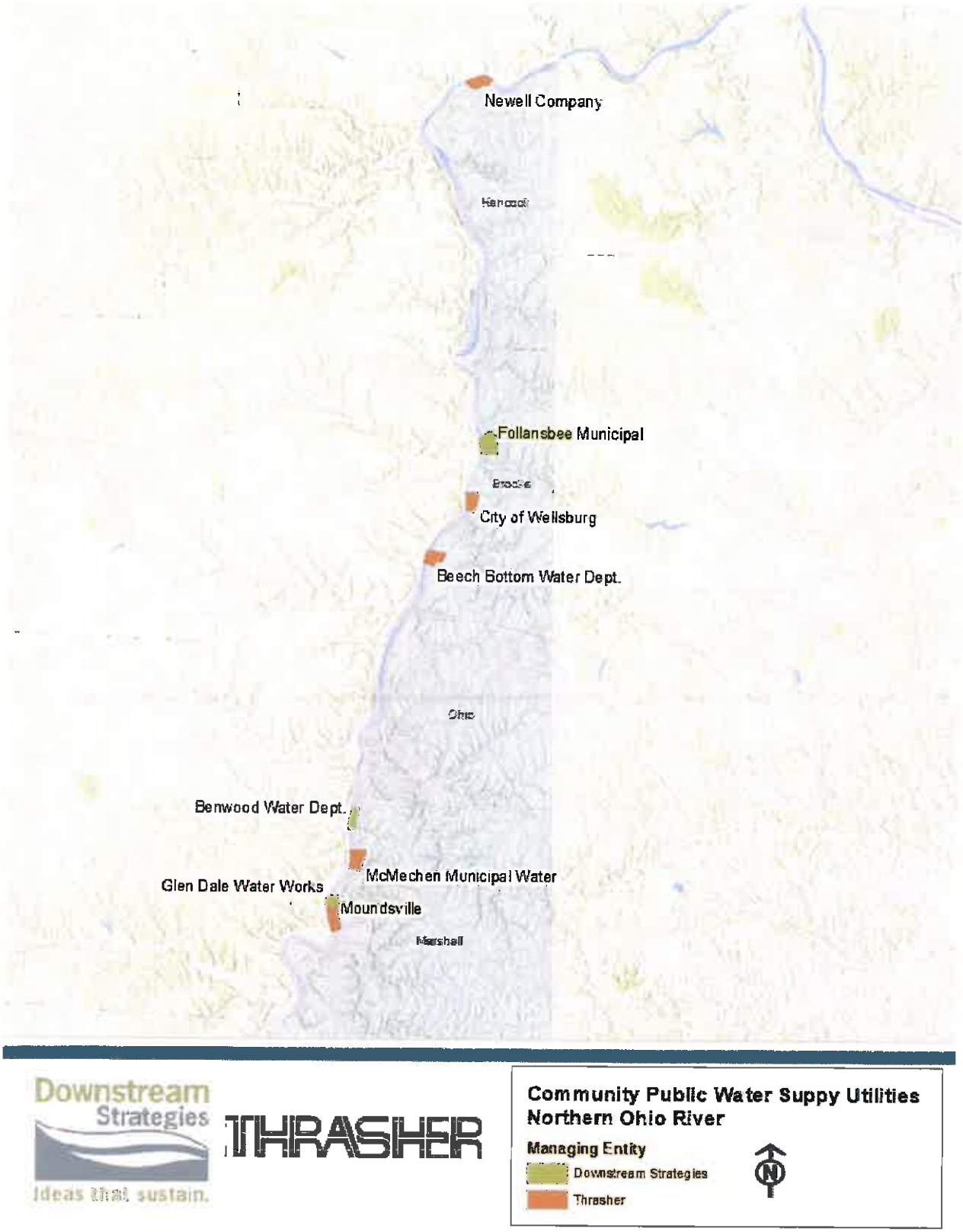


Figure 9: Central Ohio River systems

3.2 Scope of work

DHHR's EOI includes six broad goals/objectives for this project, each of which lists specific tasks. Here, we present a scope of work and task list that restates and reorganizes those found in the EOI, so as to better match the phases of work—and sequence of tasks—that we plan to take to complete this project.

3.2.1 *Phase 1: Complete preliminary tasks*

Task 1.1: Hold project kickoff meeting with DHHR. A project kickoff meeting will be held with DHHR to review and finalize this scope of work and timeline, to share contact information regarding the 19 utilities, and to convey any additional information that will make our team as efficient as possible. Mr. Hansen, Ms. Hatcher, and Ms. Radcliff will attend the meeting, which will be held in Charleston or by videoconference.

Task 1.2: Research regularly scheduled water system board meetings. To facilitate participation, we will conduct initiation meetings, protection team meetings, and public meetings in conjunction with regularly scheduled water system board meetings—to the extent possible. We will research these meeting dates ahead of time and tracking them on a shared calendar used by DS/Thrasher.

Task 1.3: Compile conjunctive capture zones. For each of the 19 systems, our team will compile available GIS data from DHHR's source water website that includes delineations of five-year conjunctive capture zones. All water sources for which DHHR has delineated conjunctive capture zones will be included.

Task 1.4: Compile initial set of PSSCs. For each of the 19 systems, we will compile available GIS data from DHHR's source water website that includes PSSCs located in and near each conjunctive capture zone.

3.2.2 *Phase 2: Conduct meetings to facilitate local involvement*

Task 2.1: Conduct project initiation meetings. We will conduct project initiation meetings for each of the 19 utilities. The meetings will serve as the formal beginning to each project. We will describe the source water protection program and the reason the project is being conducted. We will gather information about the area, establish points of contact, establish a project timeline, discuss anticipated outcomes, and answer questions. We will also come to these initiation meetings with initial lists and maps of PSSCs within the conjunctive capture zones, and we will facilitate a process to add or remove PSSCs. At these project initiation meetings, we will also introduce the management plan, the single source feasibility study, and the communications and contingency plans. This meeting will likely involve only CPWS utility staff (e.g., administrative contacts and operators); however, the utilities may invite additional stakeholders. We will provide 48 hours' notice to DHHR to allow DHHR officials to attend. To facilitate participation, we will strive to hold these meetings in conjunction with regularly scheduled water system board meetings.

Task 2.2: Conduct two source water protection team meetings. We will work with each of the 19 utilities to identify members of their source water protection teams. If needed, we will contact the required members and other potential members of the protection team and document if they are able to participate. We will then organize and facilitate two protection team meetings. We will follow all necessary public notice requirements. While it is essential that as many protection team members as possible attend, the utilities may invite additional stakeholders. At these meetings, we will present a draft SWPP and provide team members with the opportunity to review the plan and provide input. This draft SWPP will have many components: a draft PSSC map that includes the input provided at the project initiation meetings, a draft management plan, a draft single source feasibility study, a draft communication plan, a draft contingency plan, and drafts of other required components. All of these draft materials will be discussed and reviewed with meeting attendees. To facilitate participation, we will strive to hold these meetings in conjunction with regularly scheduled water system board meetings.

Task 2.3: Conduct one public meeting. We will also host one public meeting for each of the 19 utilities. The purpose of this meeting is to present the completed draft SWPP and explain the results, conclusions, and recommendations. This meeting will serve as a public forum or open house for the public to view and discuss the portions of the plan that are not considered confidential. We will provide 48 hours' notice to DHHR to allow DHHR officials to attend. To facilitate participation, we will strive to hold these meetings in conjunction with regularly scheduled water system board meetings. At this public meeting or shortly thereafter, we will seek final approval from the utility.

3.2.3 *Phase 3: Finalize the SWPPs*

Task 3.1: Complete the draft SWPP using the SWPP template. After completing the public meetings and receiving feedback from water system representatives, protection team members, and the public, and after getting final approval from the utility, we will complete the draft SWPP using the template. As summarized above in Section 3.1, the managing entity (either DS or Thrasher) will be responsible for completing the template for each of their SWPPs; however, DS and Thrasher will take the lead on their respective chapters.

Task 3.2: Submit draft SWPP to DHHR for review and approval. We will then submit the draft SWPP for each utility to DHHR for review and approval. Our timeline recognizes that DHHR may take up to 14 calendar days to review each draft SWPP. If necessary, we will make all required revisions.

Task 3.3: Submit final SWPP to DHHR. After approval of the draft SWPP for each utility by DHHR, we will provide an electronic and paper copy of the final SWPP to DHHR for each of the 19 systems.

Task 3.4: Submit the information obtained for the SWP plan development via the source water protection website. After the SWPP is completed, we will electronically submit the information obtained for the SWP plan development via the source water protection website.

3.2.4 *Steps for completion of the template chapters*

More specifically, the template chapters will be completed using the following steps:

- **System Information.** We will draft this chapter with known and publicly accessible information, confirm the information with utility representatives, and then finalize the chapter.
- **Water Treatment and Storage.** We will draft this chapter with known and publicly accessible information, confirm the information with utility representatives, and then finalize the chapter.
- **Delineations.** Delineations of five-year conjunctive capture zones will be downloaded from DHHR's source water website, and areas will be calculated using GIS.
- **Protection Team.** Potential Protection Team members will be identified in collaboration with utility representatives. If needed, we will contact the required members and other potential members of the protection team and document if they are able to participate. We will strive to include, at a minimum, emergency response personnel, local decision-makers, business and industry representatives, land owners (of land in the protection area), and additional concerned citizens.
- **Potential Sources of Significant Contamination.** Identification of PSSCs will begin with downloading SWAP-designated potential contaminant sources from the West Virginia Source Water Protection Program Map Viewer. We recognize that details regarding certain ASTs must remain confidential, and we will take appropriate steps to do so. We will make maps and lists of these sources for discussion at Protection Team meetings, at which members will provide feedback on which categories of sources are significant and should be labeled as PSSCs and whether additional local and regional sources, other than those that were originally downloaded, should be added. We will also facilitate a discussion through with the Protection Team prioritizes threats and management strategies.

- **Implementation Plan for Management and Outreach Strategies.** Building upon the prioritization of the Protection Team, we will facilitate a discussion of the implementation plan for management and outreach strategies. We will bring checklists of potential strategies to meetings and help Protection Team members efficiently decide which measures make the most sense for that particular system. A responsible Protection Team member, schedule, and cost will be assigned to each strategy.
- **Education and Outreach Strategies.** We will use the same method for education and outreach as we use for management and outreach. We will bring checklists of potential strategies to meetings and help Protection Team members efficiently decide which measures make the most sense for that particular system. A responsible Protection Team member, schedule, and cost will be assigned to each strategy.
- **Contingency Plan.** We will meet with utility representatives to collect the required information on water shortage response capabilities, generator capacity, future water supply needs, water loss information, and early warning system capabilities.
- **Single Source Feasibility Study.** We will begin the process by collecting known and publicly accessible information about the utility, nearby utilities, and potential nearby water sources. We will then confirm this information with utility representatives, collect any additional required information, and solicit feedback from the Protection Team regarding potential ideas regarding options for providing safe and reliable water. We will then evaluate the technical and economic feasibility of (1) building a secondary intake from a substantially different location or water source, (2) constructing additional raw water storage capacity and/or treated water storage capacity, (3) building interconnections with other plants or systems, and (4) other alternatives. We will analyze the comparative costs, risks, and benefits of implementing each of the alternatives that are determined to be technologically or economically feasible.
- **Communication Plan.** We will use the Communication Plan included as Appendix C in the template. We will start populating the plan using known and publicly accessible information, confirm the information with utility representatives, and then finalize the chapter.

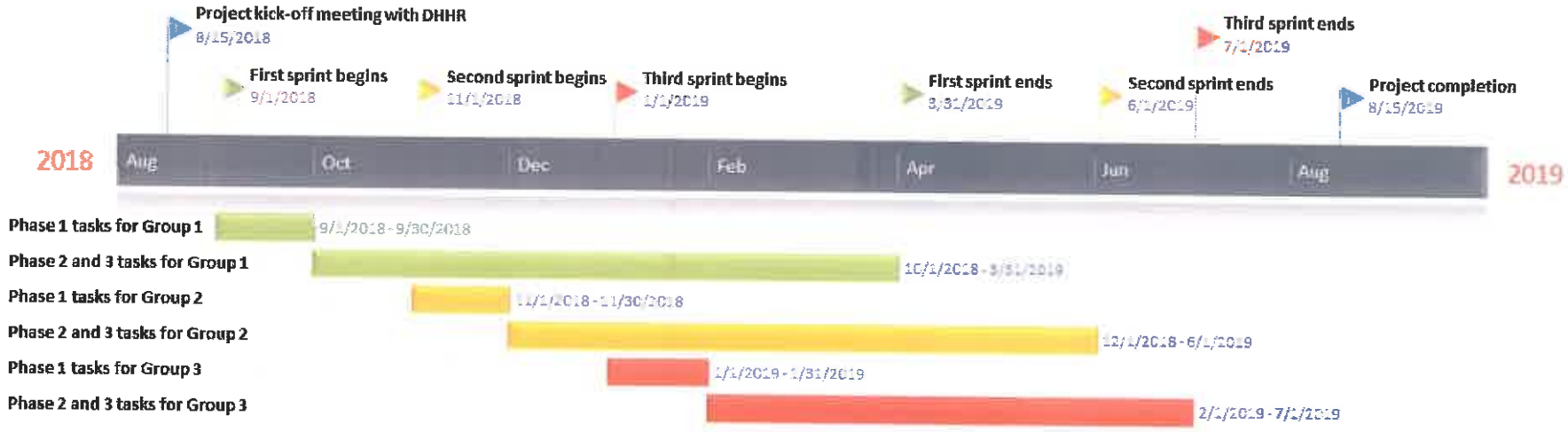
3.3 Timeline

The project team is confident it can complete the aforementioned tasks for the 19 CPWSs over a 12-month timeline. Figure 10 assumes a September 2018 start date, but the team is available to start sooner if preferred.

At the start of the project, we will separate the 19 utilities into three groups, informed by the timing of their regularly scheduled water system board meetings. Generally, work will be completed in three overlapping, but staggered, sprints. Each group's source water protection planning activities will be completed over a seven-month period. During the first month, the project team will complete the preliminary tasks identified in Phase 1 of the scope of work. In the second through seventh months, the project team will complete the tasks identified in Phases 2 and 3.

Figure 10 illustrates these three work sprints being completed over 11 months. This ensures that an extra month is set aside to address unexpected delays so that the project can still be completed within the required 12-month schedule.

Figure 10: Timeline



APPENDIX A: SOURCE WATER PROTECTION PLAN REQUIREMENTS IN WEST VIRGINIA CODE

According to West Virginia Code, SWPPs must include 13 components:[4]

1. **Contingency plan.** "A contingency plan that documents each public water utility's planned response to contamination of its public surface water supply source or its public surface water influenced groundwater supply source." (W.Va. Code §16-1-9c(b)(1))
2. **Ability to isolate or divert contaminated waters.** "An examination and analysis of the public water system's ability to isolate or divert contaminated waters from its surface water intake or groundwater supply, and the amount of raw water storage capacity for the public water system's plant." (W.Va. Code §16-1-9c(b)(2))
3. **Ability to switch to an alternative intake.** "An examination and analysis of the public water system's existing ability to switch to an alternative water source or intake in the event of contamination of its primary water source." (W.Va. Code §16-1-9c(b)(3))
4. **Ability to close its water intake.** "An analysis and examination of the public water system's existing ability to close its water intake in the event the system is advised that its primary water source has become contaminated due to a spill or release into a stream, and the duration of time it can keep that water intake closed without creating a public health emergency." (W.Va. Code §16-1-9c(b)(4))
5. **Certain operational information.** "The following operational information for each plant receiving water supplies from a surface water source: (A) The average number of hours the plant operates each day, and the maximum and minimum number of hours of operation in one day at that plant during the past year; and (B) The average quantities of water treated and produced by the plant per day, and the maximum and minimum quantities of water treated and produced at that plant in one day during the past year." (W.Va. Code §16-1-9c(b)(5))
6. **Available storage capacity.** "An analysis and examination of the public water system's existing available storage capacity on its system, how its available storage capacity compares to the public water system's normal daily usage, and whether the public water system's existing available storage capacity can be effectively utilized to minimize the threat of contamination to its system." (W.Va. Code §16-1-9c(b)(6))
7. **Unaccounted for water.** "The calculated level of unaccounted for water experienced by the public water system for each surface water intake, determined by comparing the measured quantities of water which are actually received and used by customers served by that water plant to the total quantities of water treated at the water plant over the past year. If the calculated ratio of those two figures is less than 85%, the public water system is to describe all of the measures it is actively taking to reduce the level of water loss experienced on its system." (W.Va. Code §16-1-9c(b)(7))
8. **PSSCs within the ZCC.** "A list of the potential sources of significant contamination contained within the zone of critical concern as provided by the Department of Environmental Protection, the Bureau for Public Health and the Division of Homeland Security and Emergency Management. The exact location of the contaminants within the zone of critical concern is not subject to public disclosure in response to a Freedom of Information Act request under article one, chapter twenty-nine-b of this code. However, the location, characteristics and approximate quantities of potential sources of significant contamination within the zone of critical concern shall be made known to one or more designees of the public water utility, and shall be maintained in a confidential manner by the public water utility. In the event of a chemical spill,

[4] Components 8 and 12 appear to be duplicates; therefore, we consider there to be 12, and not 13, components of the SWPP.

release or related emergency, information pertaining to any spill or release of contaminant shall be immediately disseminated to any emergency responders responding to the site of a spill or release, and the general public shall be promptly notified in the event of a chemical spill, release or related emergency." (W.Va. Code §16-1-9c(b)(8))

9. **Options to provide service if the primary intake is detrimentally affected.** "If the public water utility's water supply plant is served by a single-source intake to a surface water source of supply or a surface water influenced source of supply, the submitted plan shall also include an examination and analysis of the technical and economic feasibility of each of the following options to provide continued safe and reliable public water service in the event its primary source of supply is detrimentally affected by contamination, release, spill event or other reason: (A) Constructing or establishing a secondary or backup intake which would draw water supplies from a substantially different location or water source; (B) Constructing additional raw water storage capacity and/or treated water storage capacity, to provide at least two days of system storage, based on the plant's maximum level of production experienced within the past year; (C) Creating or constructing interconnections between the public water system with other plants on the public water utility system or another public water system, to allow the public water utility to receive its water from a different source of supply during a period its primary water supply becomes unavailable or unreliable due to contamination, release, spill event or other circumstance; (D) Any other alternative which is available to the public water utility to secure safe and reliable alternative supplies during a period its primary source of supply is unavailable or negatively impacted for an extended period; and (E) If one or more alternatives set forth in paragraphs (A) through (D) is determined to be technologically or economically feasible, the public water utility shall submit an analysis of the comparative costs, risks and benefits of implementing each of the described alternatives." (W.Va. Code §16-1-9c(b)(9))

10. **Management plan.** "A management plan that identifies specific activities that will be pursued by the public water utility, in cooperation and in concert with the bureau for public health, local health departments, local emergency responders, local emergency planning committee, and other state, county or local agencies and organizations to protect its source water supply from contamination, including but not limited to notification to and coordination with state and local government agencies whenever the use of its water supply is inadvisable or impaired, to conduct periodic surveys of the system, the adoption of best management practices, the purchase of property or development rights, conducting public education or the adoption of other management techniques recommended by the commissioner or included in the source water protection plan." (W.Va. Code §16-1-9c(b)(10))

11. **Communications plan.** "A communications plan that documents the manner in which the public water utility, working in concert with state and local emergency response agencies, shall notify the local health agencies and the public of the initial spill or contamination event and provide updated information related to any contamination or impairment of the source water supply or the system's drinking water supply, with an initial notification to the public to occur in any event no later than thirty minutes after the public water system becomes aware of the spill, release or potential contamination of the public water system." (W.Va. Code §16-1-9c(b)(11))

12. **PSSCs within the ZCC.** "A complete and comprehensive list of the potential sources of significant contamination contained within the zone of critical concern, based upon information which is directly provided or can otherwise be requested and obtained from the Department of Environmental Protection, the Bureau for Public Health, the Division of Homeland Security and Emergency Management, and other resources." (W.Va. Code §16-1-9c(b)(12))

13. **Early warning monitoring system.** "An examination of the technical and economic feasibility of implementing an early warning monitoring system." (W.Va. Code §16-1-9c(b)(13))

APPENDIX B: CVS FOR DOWNSTREAM STRATEGIES PROJECT TEAM MEMBERS

EVAN PAUL HANSEN

911 Greenbag Road
Morgantown, WV 26508
304/292-2450

Professional Profile

ehansen@downstreamstrategies.com

Downstream Strategies, LLC Morgantown, W.Va.
President, 1997-present

Clients include AECOM, American Society of Civil Engineers; Appalachian Center for the Economy and the Environment; Appalachian Mountain Advocates; Appalachian Regional Commission; Appalachian Stewardship Foundation; Association of State Wetland Managers; Atkins North America; Aurora Lights; Blue Heron Environmental Network; Blue Moon Fund; Boggs Environmental Consultants; Bowden Faulkner Citizens Protective Response; Campbells Creek Watershed Improvement Association; Canaan Valley Institute; Center for Economic Options; Center for Coalfield Justice; Center for Justice; Center for Watershed Protection; Central Appalachia Network; Central Hampshire Public Service District; Cheat River TMDL Stakeholder Group; City of Cumberland, Md.; Clean Water Network; Coal River Mountain Watch; Dominion Pipeline Monitoring Coalition; Earthjustice; Earthworks; Economic Development Research Group; Elk Headwaters Watershed Association; Friends of Blackwater; Friends of the Cheat; Garrett County, Md.; Greenbrier Valley Economic Development Corporation; Harpers Ferry Conservancy; Inter-American Development Bank; Jefferson County Planning Commission; Kent State University Center for Public Administration and Public Policy; Laurel Mountain/Fellowsville Area Clean Watershed Association; Laurel Run Community Watershed Association; Mary Reynolds Babcock Foundation; McDowell County Public Service District; Monongalia County Solid Waste Authority; Morgantown Utility Board; National Environmental Services Center; National Fish and Wildlife Foundation; National Parks Conservation Association; Natural Capital Investment Fund; Natural Resources Defense Council; Oceana; Ohio Valley Environmental Coalition; Pendleton County Public Service District; Plateau Action Network; Potomac Headwaters Resource Alliance; Prairie Rivers Network; Public Justice; Region VI Planning and Development Council; Robert & Patricia Switzer Foundation; Rockefeller Family Fund; Save the Tygart; Sierra Club; Solar Wind Storage; Stewards of the Potomac Highlands; Taylor Environmental Advocacy Membership; Tellus Institute/Stockholm Environment Institute-Boston; The Mountain Institute; The Nature Conservancy; Timberline Four Seasons Resort; Town of Harman; Trout Unlimited; US Department of Agriculture; US Department of Energy; US Environmental Protection Agency; University of Calif. Small Farm Center; University of Colorado Denver; University of Md. Francis King Carey School of Law, Environmental Law Clinic; Upper Guyandotte Watershed Association; W.Va. Center on Budget and Policy; W.Va. Conservation Agency; W.Va. Council of Trout Unlimited; W.Va. Department of Environmental Protection; W.Va. Highlands Conservancy; W.Va. Land Trust, W.Va. Public Service Commission Consumer Advocate Division; W.Va. Rivers Coalition; W.Va. Water Research Institute; W.Va. University Center for Energy and Sustainable Development; W.Va. University Industrial Assessment Center.

West Virginia Rivers Coalition (WVRC) Charleston, W.Va.
Science Advisor, 2000-present

Natural Heritage Institute (NHI) San Francisco, Calif.
Resource Scientist Assistant and Consultant, 1995-97

University of California Center for Biological Control Berkeley, Calif.
Graduate Student Research Assistant, 1995-97

Tellus Institute and Stockholm Environment Institute-Boston (SEI) Boston, Mass.
Research Analyst and Research Associate, 1988-95

Education

University of California, Berkeley Berkeley, Calif.
M.S. in Energy and Resources awarded 1997. The interdisciplinary Energy and Resources Group combines environmental science, public policy, economics, and engineering.

Massachusetts Institute of Technology Cambridge, Mass.
B.S. in Computer Science and Engineering awarded 1988.

Projects

Evan Hansen founded Downstream Strategies in 1997. He explores resource and environmental problems and solutions in three areas: water, energy, and land. He manages interdisciplinary research teams, performs quantitative and qualitative policy and scientific analyses, provides litigation support and expert testimony, develops computer tools, and provides training. Mr. Hansen managed the development of MUB's SWPP and serves on the Public Water System Supply Study Commission, which provides recommendations to the Legislature on source water protection legislation.

Policy and scientific analyses

Water resources and water quality

Wrote source water protection plans and implemented an ongoing source water protection program to protect drinking water intakes from contamination and to respond effectively if contamination should occur (Downstream Strategies, 2014-present, for Morgantown Utility Board. McDowell County PSD, Pendleton County PSD, Central Hampshire PSD, Town of Harman, and Timberline Four Seasons Resort).

Developing a Green Infrastructure Implementation Plan for Martinsburg, W.Va., to guide implementation of new stormwater management projects in an area with limited or no stormwater infrastructure (Downstream Strategies, 2018-present, for National Fish and Wildlife Foundation).

Assessed potential water quality issues associated with coal combustion residue disposal in South Africa (Downstream Strategies, 2017-18, for Earthjustice).

Assessed potential water quality issues associated with coal combustion residue disposal in Maryland (Downstream Strategies, 2017-18, for University of Md. Francis King Carey School of Law, Environmental Law Clinic).

Assessed potential impacts to surface water and groundwater from the construction of natural gas pipelines in West Virginia, Virginia, and North Carolina (Downstream Strategies, 2018, for Natural Resources Defense Council).

Investigated the use of Nationwide Permit 12 for the Atlantic Coast Pipeline in the Pittsburgh and Norfolk U.S. Army Corps of Engineers districts (Downstream Strategies, 2017, for Sierra Club).

Provided suggestions for public participation in the permitting processes for the proposed Atlantic Coast Pipeline in West Virginia (Downstream Strategies, 2016, for Dominion Pipeline Monitoring Coalition).

Supported an effort to integrate nature's values into coastal planning and management in Barbados, strengthen the capacity of the Coastal Zone Management Unit to map and value ecosystem services, and identify pathways for future coastal investment that incorporate climate impacts and the value of ecosystem services (Downstream Strategies, 2014-15, for Inter-American Development Bank).

Providing expert testimony and support for litigation and permit appeals related to the Clean Water Act, Surface Mining Control and Reclamation Act, Safe Drinking Water Act, and water quality issues (Downstream Strategies, 2004-present, for various clients).

Assessing water wells, streams, and soil for impacts from natural gas wells and coal mines (Downstream Strategies, 2009-present, for various individuals and attorneys).

Assessed water quality, quantity, access, and value across Appalachia to inform local officials in making development decisions that account for local water assets (Downstream Strategies, 2009-14, for Appalachian Regional Commission).

Wrote watershed-based plans for Muddy Creek and Pringle Run of the Cheat River to qualify the watersheds for 319 funds. These streams are impaired by acid mine drainage (Downstream Strategies, 2013-14, for Friends of the Cheat).

Conducted a preliminary assessment of sites that, if improperly managed, could contaminate West Virginia American Water's drinking water intake on the Elk River in Charleston (Downstream Strategies, 2014, for W.Va. Rivers Coalition and W.Va. Land Trust).

Provided policy recommendations necessary to protect drinking water sources and prevent future chemical spills, with a focus on key issues, information gaps, and policy remedies as they relate to the Clean Water Act, Safe Drinking Water Act, and Emergency Planning and Community Right-to-Know Act (Downstream Strategies, 2014, for W.Va. Rivers Coalition).

Calculated water footprint for Marcellus Shale gas development in West Virginia and Pennsylvania. Researched sources of water used for hydraulic fracturing and the quality, quantity, and disposition of flowback (Downstream Strategies, 2012-13, for Earthworks and Robert & Patricia Switzer Foundation).

Developed a new municipal separate storm sewer system (MS4) annual reporting form and MS4 in-lieu program guidance for the West Virginia Department of Environmental Protection (Downstream Strategies, 2011-13, for Center for Watershed Protection and W.Va. Department of Environmental Protection).

Reviewed cost estimates for acid mine drainage treatment systems at bond forfeiture sites (Downstream Strategies, 2012, for Appalachian Mountain Advocates).

Evaluated the economic impacts of failing drinking water, wastewater, and stormwater infrastructure (Downstream Strategies, 2011, for Economic Development Research Group and American Society of Civil Engineers).

Wrote watershed-based plan for Sandy Creek of the Tygart Valley River to qualify the watershed for 319 funds. Sandy Creek is impaired by acid mine drainage (Downstream Strategies, 2011-12, for Save the Tygart and W.Va. Department of Environmental Protection).

Wrote stakeholder- and science-driven comprehensive watershed plan for the Elk River headwaters, one of West Virginia's premier trout streams (Downstream Strategies, 2008-11, for local stakeholders).

Researched TMDL implementation tracking conducted by state agencies and recommended indicators for future evaluation of progress (Downstream Strategies, 2009-11, for Kent State University Center for Public Administration and Public Policy).

Helped write a comprehensive watershed plan for the New River, which quantified recreational use and estimated the impact of future development (Downstream Strategies, 2010-11, for National Parks Conservation Association and W.Va. Department of Environmental Protection).

Project advisor for Jefferson County Blue Ridge Community Area Plan's stakeholder visioning effort and engineering recommendations, including best management practices for steep slope development (Downstream Strategies, 2010, for Jefferson County Planning Commission).

Wrote watershed plan for metals impairments in Campbells Creek watershed of the Kanawha River (Downstream Strategies, 2010, for Campbells Creek Watershed Improvement Association and W.Va. Conservation Agency).

Conducted assessment of economic impacts of acid mine drainage remediation efforts in the North Branch Potomac River watershed (Downstream Strategies, 2010, for Garrett County, Md.).

Researched the potential of mine land reclamation for creating green jobs and diversifying the economy in Central Appalachia. (Downstream Strategies, 2010, for University of Colorado Denver).

Researched policies that promote or hinder the use of green infrastructure stormwater practices and worked with local government officials to implement green infrastructure (Downstream Strategies, 2009-10, for Region VI Planning and Development Council).

Wrote watershed-based plan for acid mine drainage and other pollutants for the Wolf Creek watershed (Downstream Strategies, 2009, for Plateau Action Network).

Researched factors that lead toward successful implementation of total maximum daily loads in West Virginia and Ohio (Downstream Strategies, 2007-08, with Kent State University Center for Public Administration and Public Policy, for US Environmental Protection Agency).

Analyzed sources of bacterial pollution in Pecks Run and provided recommendations for pollution reductions (Downstream Strategies, 2007-08, with WVRC, for W.Va. Department of Environmental Protection).

Worked with nonprofit organizations to ensure that ORSANCO maintains strong water quality standards for the Ohio River (Downstream Strategies, 2005-08, for WVRC).

Conducted technical analyses to support the development of new nutrient water quality criteria in W.Va. (Downstream Strategies, 2002-07, for WVRC).

Analyzed trace metals in acid mine drainage treatment sludge from a mine that has received coal combustion waste, and assessed downstream drinking water well quality (Downstream Strategies, 2007-8, for Laurel Mountain/Fellowsville Area Clean Watershed Association).

Calculated the local economic benefits of remediating abandoned mine drainage in the West Fork Susquehanna River watershed in Pennsylvania (Downstream Strategies, 2006-08, for Trout Unlimited).

Helped improve implementation of West Virginia's Municipal Separate Storm Sewer System (MS4) permits (Downstream Strategies, 2007-08, with W.Va. Water Research Institute, for US Environmental Protection Agency).

Provided expert testimony to the West Virginia Public Service Commission regarding stream and wetland impacts of a proposed transmission line (Downstream Strategies, 2007-08, for Laurel Run Community Watershed Association).

Ensured that permitting decisions on a new wastewater treatment plant will preserve native trout habitat in the Upper Elk River watershed (Downstream Strategies, 2005-06, for W.Va. Council of Trout Unlimited).

Wrote watershed-based plan for metals for the Upper Guyandotte watershed, so that the watershed will qualify for Clean Water Act 319 funds (Downstream Strategies, 2005-06, for Upper Guyandotte Watershed Association).

Wrote watershed-based plan for acid mine drainage for the Three Forks watershed, so that the watershed will qualify for Clean Water Act 319 funds (Downstream Strategies, 2005-06, for Save the Tygart).

Designed and implemented a telephone survey of residents and a mail survey of county leaders to help learn about the long-term community and watershed goals of residents of the Mid-Atlantic Highlands of Appalachia (Downstream Strategies, 2004-05, for Canaan Valley Institute).

Wrote watershed assessment for the Robinson Run watershed, which is impaired by acid mine drainage (Downstream Strategies, 2005, for Region VI Planning and Development Council).

Wrote watershed-based plan the North Fork Blackwater River watershed, which is impaired by acid mine drainage, so that the watershed will qualify for Clean Water Act 319 funds (Downstream Strategies, 2005, for Friends of Blackwater).

Assessed whether trace metals have been found in surface and groundwater downgradient from coal mining sites on which coal combustion waste has been disposed (Downstream Strategies, 2005).

Provided expert testimony on NPDES permits before the W.Va. Environmental Quality Board (Downstream Strategies, 2003-10, for Stewards of the Potomac Highlands, Blue Heron Environmental Network, and Bowden Faulkner Citizens Protective Response).

Provided expert testimony on coal mine permit before the W.Va. Surface Mine Board (Downstream Strategies, 2004-09, for WVRC, W.Va. Highlands Conservancy, Trout Unlimited, and Taylor County Environmental Advocacy Membership).

Wrote watershed-based plan for tributaries in the lower Cheat watershed impaired by acid mine drainage, bacteria, and sediment, so that the watershed will qualify for Clean Water Act 319 funds (Downstream Strategies, 2004-05, for Friends of the Cheat).

Compiled matrix of past and upcoming Clean Water Act and Safe Drinking Water Act regulations that affect small communities (Downstream Strategies, 2004-05, for National Environmental Services Center).

Drafted detailed technical comments on an NPDES permit for a wastewater treatment plant discharging into a major recreational river close to Harpers Ferry National Historical Park (Downstream Strategies, 2004, for Harpers Ferry Conservancy).

Provided technical assistance related to the acid mine drainage total maximum daily loads being developed for the Cheat River watershed. Managed a US Environmental Protection Agency pilot project and helped draft a water quality trading framework to implement the TMDL (Downstream Strategies, 1999-2004, for the Cheat River TMDL Stakeholder Group).

Created an instructional document to help local organizations assess state implementation of the Clean Water Act's antidegradation provisions (Downstream Strategies, 2001, for Clean Water Network).

Assessed progress made toward implementing the pollutant reduction goals set forth in the West Virginia's TMDLs (WVRC, 2001).

Edited white paper on computer modeling and TMDLs to help public interest organizations participate effectively in TMDL development (Downstream Strategies, 2001, for Clean Water Network).

Assessed US Environmental Protection Agency's process for generating new nutrient water quality criteria, and the application of their process to Nutrient Ecoregion XI, where West Virginia is located (Downstream Strategies, 2001, for WVRC).

Assessed a random set of West Virginia's NPDES water pollution control discharge permits, and the permitting process, based on a range of criteria. Provided recommendations to the state Department of Environmental Protection for improving public participation in the permitting process (WVRC, 2000-01).

Assessed total maximum daily loads developed by US Environmental Protection Agency for acid mine drainage in two West Virginia rivers (Downstream Strategies, 1998, for WVRC, Ohio Valley Environmental Coalition, and W.Va. Highlands Conservancy).

Assessed the data, assumptions, and computer model used by US Environmental Protection Agency to develop total maximum daily loads for fecal coliform in six rivers in the Potomac headwaters (Downstream Strategies, 1997, for Potomac Headwaters Resource Alliance and WVRC).

Helped establish a modeling unit to evaluate state-wide conjunctive use programs. The unit consists of environmental groups, water supply districts, and state and federal agencies with jurisdiction over water in California (NHI, 1995-97).

Analyzed global and national patterns of water supply, use, and scarcity (SEI, 1995).

Modeled water supply and demand in the tributaries to the Aral Sea to predict future water level decline (SEI, 1992).

Energy and climate change

Writing a handbook for state regulators and consultants regarding state 401 certification of federal 404 permits for natural gas pipelines (Downstream Strategies, 2017-present, for Association of State Wetland Managers).

Performing an economic analysis of a patented new technology to store hydrogen generated by solar and wind in underground chambers (Downstream Strategies, 2017-present, for Solar Wind Storage).

Assessing opportunities and policies for developing large-scale solar projects on degraded lands in West Virginia (Downstream Strategies, present, for The Nature Conservancy).

Analyzing economic resilience, documenting successful approaches to restructuring local economies, and compiling a set of strategies that can be implemented in communities throughout Appalachian Region impacted by the downturn of the coal industry. (Downstream Strategies, present, for Appalachian Regional Commission).

Quantified the prospects for large-scale solar development on degraded land in West Virginia (Downstream Strategies, 2016-17, for Appalachian Stewardship Foundation).

Assessed options for West Virginia to reduce greenhouse gas emissions from existing coal-fired power plants under the Clean Power Plan (Downstream Strategies, 2014-16, for W.Va. University Center for Energy and Sustainable Development and Appalachian Stewardship Foundation).

Helped compile a community greenhouse gas inventory, survey residences, and develop and implement a program to increase energy efficiency and reduce energy costs and greenhouse gas emissions for Morgantown, West Virginia (Downstream Strategies, 2013-16, for Appalachian Stewardship Foundation).

Facilitated the Mountain Maryland Energy Advisory Committee, a stakeholder group investigating energy opportunities in Garrett County (Downstream Strategies, 2013-15, for Garrett County, Md.).

Analyzed the potential uses and benefits of a new coal severance tax in Illinois (Downstream Strategies, 2015, for Prairie Rivers Network)

Advised a research project to assess the forest assets of Appalachia, including: quality, quantity, use, ownership patterns, and market and non-market valuation (Downstream Strategies, 2010-14, for the Appalachian Regional Commission).

Wrote white paper that explains the benefits of solar energy and provides an overview of state policies needed to expand its deployment in West Virginia (Downstream Strategies, 2013-14, for The Mountain Institute and Blue Moon Fund).

Oversaw energy audits for businesses across West Virginia (Downstream Strategies, 2011-14, for W.Va. University Industrial Assessment Center).

Conducted a comprehensive analysis of the numerous market and regulatory influences that impact demand for Central Appalachian coal and identified which of the region's coal-producing counties are most vulnerable (Downstream Strategies, 2012-13, for Blue Moon Fund).

Researched opportunities for renewable energy development across West Virginia and worked with local communities to implement these opportunities (Downstream Strategies, 2011-13, for The Mountain Institute and Blue Moon Fund).

Analyzed potential impacts of a proposed surface mine in Pennsylvania on neighboring properties (Downstream Strategies, 2012, for private client).

Helped research the impact of the coal industry on the Pennsylvania state budget, including the revenues, on-budget expenditures, tax expenditures, expenditures supporting coal-related employment, and legacy costs resulting from coal industry activity (Downstream Strategies, 2011-12, for Center for Coalfield Justice).

Helped research the impact of the coal industry on the state budgets for West Virginia, Tennessee, and Virginia, including the revenues, on-budget expenditures, tax expenditures, expenditures supporting coal-related employment, and legacy costs resulting from coal industry activity (Downstream Strategies and West Virginia Center on Budget and Policy, 2010-present, for the Blue Moon Fund, Mary Reynolds Babcock Foundation, Natural Resources Defense Council, Rockefeller Family Fund, Sierra Club, and University of Colorado Denver).

Researched market barriers to wind energy development in Central Appalachia and proposing strategies to overcome these barriers (Downstream Strategies, 2010-12, for The Mountain Institute and US Department of Energy).

Researched the challenges to future coal production in Central Appalachia due to increased competition from other coal-producing regions and sources of energy; the depletion of the most accessible, lowest-cost coal reserves; and environmental regulations (Downstream Strategies, 2010).

Compiled a variety of information to help guide the Central Appalachia Prosperity Project, an initiative to create a plan for the region's transition to a clean energy economy built on green jobs and industries, healthy communities, protection of natural resources, and restoration of assets that have been depleted or damaged by past activities (Downstream Strategies, 2009, for University of Colorado Denver).

Created Renewable Energy on Coal River Mountain theme, including maps, videos, and lesson plans, for the Journey Up Coal River Web site (Downstream Strategies, 2009, for Aurora Lights).

Calculated the financial costs and benefits and the local economic benefits of building an industrial wind farm versus a mountaintop removal mine on Coal River Mountain in West Virginia (Downstream Strategies, 2008, for Coal River Mountain Watch).

Compiled information on the use of greenhouse gas credits and renewable energy credits to help implement landfill gas-to-energy projects on small public landfills in West Virginia (Downstream Strategies, 2006-07, for The Mountain Institute).

Assessed the prospects for landfill gas-to-energy projects in West Virginia (Downstream Strategies, 2005-06, for The Mountain Institute).

Advised US Environmental Protection Agency on the development of a computer model and database for evaluating greenhouse gas emission scenarios based on the use of improved technologies (Downstream Strategies, 1998-2000, for the Air Pollution Prevention and Control Division of US Environmental Protection Agency).

Projected agricultural energy use in Zimbabwe, Sudan, Senegal, Tanzania, and Egypt (SEI, 1995).

Assessed the feasibility of a long-term transition toward a fossil-free energy future (SEI, 1993).

Modeled alternative future energy strategies for Zimbabwe and Zambia (SEI, 1993).

Agriculture and the environment

Identified barriers and proposed recommendations for the expansion of organic agriculture across the West Virginia, based on surveys and interviews of West Virginia farmers combined with economic, policy, and GIS analyses (Downstream Strategies, 2011-13, for US Department of Agriculture).

Quantified the environmental benefits of a poultry litter baling facility in the eastern panhandle of West Virginia (Downstream Strategies, 2012-13, for Blue Moon Fund).

Helped conduct a feasibility study for a poultry litter composting facility for the eastern panhandle of West Virginia, emphasizing potential economic benefit for farmers and environmental benefit of reduced nutrient run-off (Downstream Strategies, 2011-12, for Blue Moon Fund).

Helped conduct regional food system assessment for the Greenbrier Valley, West Virginia (Downstream Strategies, 2010-11, for Greenbrier Valley Economic Development Corporation).

Assisted the Tygart Valley Growers Association with understanding and influencing federal and state food safety policy (Downstream Strategies, 2011, for Center for Economic Options and Central Appalachia Network).

Analyzed trends in family and corporate ownership of livestock and poultry farms across the United States (Downstream Strategies, 2000, for Clean Water Network).

Advised US Department of Agriculture on opportunities to improve marketing assistance for small-scale farmers through a survey of small-scale produce farmers in the southeastern United States (Downstream Strategies, 1998-2000, for UC Small Farm Center).

Calculated nutrient uptake capacities on cropland and pasture and compared these capacities with nutrients generated by poultry in West Virginia's major poultry-producing region (Downstream Strategies, 1998-99, for Potomac Headwaters Resource Alliance and WVRC).

Assessed pest control strategies and information sources used by different groups of small-scale California farmers (MS Thesis, 1997).

Performed economic analyses of successful biological control programs (UC Center for Biological Control, 1996-97).

Other

Updating Garrett County, Md.'s comprehensive plan (Downstream Strategies, 2018-present, for Garrett County, Md.).

Developing a Blight Action Plan for vacant and dilapidated buildings (Downstream Strategies, 2018-present, for City of Cumberland).

Assessed future scenarios for Monongalia County, West Virginia to reduce the amount of trash sent to landfills by increasing recycling and composting or by building a gasification plant (Downstream Strategies, 2016-present, for Monongalia County Solid Waste Authority).

Tool development

Water resources and water quality

WEAP (Water Evaluation And Planning system). Used by nonprofit organizations, government agencies, and water supply districts to evaluate alternatives for meeting water supply, demand, and quality goals (SEI, 1991-95).

RESULTS (Registry of Equipment Suppliers of Treatment Technologies for Small Systems). Used by community officials, state regulators, and consulting engineers to learn about technologies in use at small drinking water systems across the United States. (Downstream Strategies, 1999-2000, for National Environmental Services Center).

BIB (NDWC Bibliographic Database). Used by technical assistants at NDWC to reference articles related to drinking water systems in small communities (Downstream Strategies, 1999-2000, for National Environmental Services Center).

Energy and greenhouse gases

LEAP and EDB (Long-range Energy Alternatives Planning system and the accompanying Environmental Database). Used by more than 100 institutions in over 30 countries to model long-term energy and environmental scenarios (SEI, 1990-95).

G2S2 (Greenhouse Gas Scenario System). Used by nonprofit organizations and government agencies to model current and future sources and sinks of greenhouse gases (SEI, 1993-95).

Other

PoleStar. Used by policy analysts to model alternative development strategies by assessing interactions between economic growth, resource use, lifestyle choice, and the environment (SEI, 1994).

P2/FINANCE (Pollution Prevention Financial Analysis and Cost Evaluation system). Used by the screen printing and metal finishing industries to weigh the profitability of pollution prevention investments (SEI, 1995).

Congressional Correspondence Database. Used to track correspondence with congressional representatives related to services provided by ESTD (Downstream Strategies, 1999, for National Environmental Services Center).

Training

Water resources and water quality

Conducted NPDES permit and TMDL training workshops for watershed organizations across West Virginia. Workshops include basic permitting issues, antidegradation, and stormwater (WVRC, 2000-10).

Co-led a general Clean Water Act training workshop for a watershed organization in Morgantown, W.Va. (WVRC, 2000).

Co-led a three-day integrated water resources planning and WEAP software training workshop for water planners at the Water Research Centre in Cairo, Egypt (SEI, 1994).

Trained analysts from the Beijing Municipal Environmental Protection Bureau, China (SEI, 1994).

Energy and greenhouse gases

Co-led a one-week integrated energy planning and LEAP software training workshop in Zimbabwe for energy planners from across sub-Saharan Africa (SEI, 1992).

Trained analysts from the Energy for Development Research Centre, Cape Town, South Africa and the national Departments of Energy in Zimbabwe, Zambia, and Tanzania (SEI, 1992-95).

Publications

Peer-reviewed articles

Hoornbeek J, Hansen E. Forthcoming. Integrated Water Resource Management (IWRM) in the United States: An Inquiry into the Role of Total Maximum Daily Loads (TMDLs). *International Journal of Water Governance.*

Hoornbeek J, Hansen E, Ringquist E, Carlson R. Forthcoming. Implementing water pollution policy in the United States: Total maximum daily loads and collaborative watershed management. *Society and Natural Resources.*

Collins, AR, Hansen, E, Hendryx, M. 2012. Wind versus coal: Comparing the local economic impacts of energy resource development in Appalachia. *Energy Policy*, 50:551-561.

Hansen E, Hereford A, McIlmoil, R. 2010. Orange water, green jobs. *Solutions*, 1(4):53-61.

Hansen E. 2007. Protecting West Virginia trout streams. *The West Virginia Public Affairs Reporter*. 24(3).

Dahlsten DL, Hansen EP, Zuparko RL, Norgaard RB. 1998. Biological control of the blue gum psyllid proves economically beneficial. *California Agriculture*, 52(1):35-40.

Raskin PD, Hansen E, Margolis RM. 1996. Water and sustainability: Global patterns and long-range problems. *Natural Resources Forum*, 20(1):1-15.

Raskin P, Hansen E, Zhu Z, Stavinsky D. 1992. Simulation of water supply and demand in the Aral Sea region. *Water International*, 17(2):55-67.

Book chapters

Heberling MT, Van Houtven G, Beaulieu S, Bruins RJF, Hansen E, Sergeant A, Thurston HW. 2009. Using conceptual models to communicate environmental changes. In: Thurston HW, Heberling MT, Schrecongost A (eds) Environmental economics for watershed restoration: 123-140.

Schrecongost A, Hansen E. 2009. Local economic benefits of restoring Deckers Creek: A preliminary analysis. In: Thurston HW, Heberling MT, Schrecongost A (eds) Environmental economics for watershed restoration: 141-159.

Conferences

Hansen E. 2018. The MUB Monitor: A Source Water Protection and Spill Response Tool. W.Va. University Institute of Water Security and Science Spring Conference, Morgantown, W.Va. Feb 21.

Hansen E. 2011. Overcoming barriers to wind development in Appalachian coal country. Oral presentation at Community Wind across America, Community and Small Wind Energy Conference, State College, Penn. Feb 8.

Hansen E. 2010. Total dissolved solids, conductivity, and narrative standards. Oral presentation at the W.Va. Water Conference, Morgantown, W.Va. Oct 7.

Hansen E. 2010. The future of coal mining and water quality in Central Appalachia. Oral presentation at the 5th Annual Mon River Summit. Morgantown, W.Va. Apr 19.

Hansen E. 2010. The future of coal mining and water quality in Central Appalachia. Oral presentation at Highland Problems and Downstream Connections: An Environmental Summit for the Mid-Atlantic Highlands. Davis, W.Va. Mar 7-9.

Hansen E, Wolfe A. 2009. Cleaning up abandoned mine drainage in the West Branch Susquehanna watershed: why it makes economic sense. Oral presentation at the Mid-Atlantic Stream Restoration Conference. Morgantown, W.Va. Nov 3-5.

Hansen E. 2009. The importance of water for economic and community development. Oral presentation at the Center for Advancement of Leadership Skills Southern Legislative Conference. Morgantown, W.Va. Oct 3-7.

Hoornbeek J, Hansen E, Ringquist E, Carlson R. 2009. Implementing total maximum daily loads (TMDLs): Understanding and fostering successful results. Oral presentation at the TMDL 2009: Combining Science and Management to Restore Impaired Waters Conference. Water Environment Foundation. Minneapolis, Minn. Aug 9-12.

Hoornbeek J, Hansen E, Carlson R. 2007. A new era of water pollution control: addressing water pollution through TMDLs. Paper presented at the AAPAM Fall Research Conference. Washington, D.C. Nov 8-10.

Hansen E. 2005. Friends of Deckers Creek. Oral presentation at the Revitalizing Highlands Communities Through Integrated Restoration Conference. Morgantown, W.Va. Oct 24-26.

Hansen E, Christ M, Fletcher J, Herd R, Petty JT, Ziemkiewicz P. 2003. Exploring trading to reduce impacts from acid mine drainage: Cheat River, West Virginia. Oral presentation at the National Forum on Water Quality Trading. US Environmental Protection Agency. Chicago. Jul 22-23.

Hansen E. 2001. Cheat River acid mine drainage TMDL case study: Increasing stakeholder confidence in computer models. Proceedings of the TMDL Science Issues Conference. Water Environment Federation and ASIWPCA. St. Louis. Mar 4-7.

Hansen E. 2000. A stakeholder perspective on Appalachian TMDLs. Oral presentation at the Appalachian Rivers III Conference. National Energy Technology Laboratory. Morgantown, W.Va. Oct 4-5.

Other reports

Hansen E, Fedorko E, James J, Varrato A. 2018. Future scenarios for Monongalia County's solid waste management system. Prepared for Monongalia County Solid Waste Authority. Jan 29.

Hansen E, Clingerman J, Betcher M. 2018. Impacts of Atlantic Coast Pipeline Stream Crossings within VMRC Jurisdiction. Downstream Strategies. Mar 15.

Hansen E, Clingerman J, Betcher M. 2018. Threats to Water Quality from Mountain Valley Pipeline and Atlantic Coast Pipeline Water Crossings in Virginia. Downstream Strategies. Feb 21.

Hansen E, Clingerman J, Betcher M. 2018. Impacts of Mountain Valley Pipeline Stream Crossings within the Jurisdiction of the Virginia Marine Resources Commission. Downstream Strategies. Jan 21.

Hansen E. 2017. The use of Nationwide Permit 12 for the Atlantic Coast Pipeline: Norfolk District. Downstream Strategies. Dec 19.

Hansen E. 2017. The use of Nationwide Permit 12 for the Atlantic Coast Pipeline: Pittsburgh District. Downstream Strategies. Dec 19.

James J, Hansen, E. 2017. Prospects for Large-scale Solar on Degraded Land in West Virginia. Downstream Strategies.

Hansen E, James J, Fedorko E. 2016. An Evaluation of Waste-to-energy Options for Monongalia County, West Virginia. Prepared for Monongalia County Solid Waste Authority. Aug 29.

Hansen, E, James J, Coleman J. 2016. Reducing greenhouse gas emissions through the Sustainable Morgantown Initiative. Downstream Strategies.

Van Nostrand, JM, Hansen E, James J. 2016. Expanding economic opportunities for West Virginia under the Clean Power Plan. W. Va. University College of Law Center for Energy & Sustainable Development and Downstream Strategies.

Hansen, E, James J, Coleman J. 2016. All of our eggs in one basket? An update on the decline of Central Appalachian coal and increasing budget woes in West Virginia. Downstream Strategies.

Van Nostrand, JM, Hansen E, Argetsinger, B, James J. 2015. The Clean Power Plan and West Virginia: Compliance options and new economic opportunities. W. Va. University College of Law Center for Energy & Sustainable Development and Downstream Strategies.

Hansen, E, James J. 2015. The Atlantic Coast Pipeline in West Virginia: Opportunities for public engagement regarding erosion and sedimentation. Downstream Strategies.

Hansen, E, James J. 2015. Opportunities for reducing commercial and residential greenhouse gas emissions in Morgantown, West Virginia. Downstream Strategies.

Hansen, E, Hatcher, K, Betcher, M, McIlmoil, R, Kass, A. 2015. Capturing resource wealth to invest in the future: Possible structures and potential benefits of an Illinois coal severance tax. Downstream Strategies and Center for Tax and Budget Accountability.

Hansen, E, Varrato, A, Simcoe, J. 2015. Mountain Maryland Energy Advisory Committee: Final report. Downstream Strategies.

Hansen, E, Betcher, M, Stround A, Rosser A. 2015. Aboveground storage tanks in West Virginia: A snapshot. Downstream Strategies and W. Va. Rivers Coalition.

Simcoe J, Gilmer B, Hansen E. 2014. Community greenhouse gas inventory for Morgantown, West Virginia. Downstream Strategies.

Sutch A, Simcoe J, Hansen E. 2014. Using solar PV to create economic opportunity and energy diversity in West Virginia: Five policy recommendations. The Mountain Institute and Downstream Strategies.

Hansen E, Gilmer B, Varrato A, Rosser A. 2014. Potential significant contaminant sources above West Virginia American Water's Charleston intake: A preliminary assessment. Downstream Strategies and W. Va. Rivers Coalition.

Hansen E, Glass M, Gilmer B, Rosser A. 2014. The Freedom Industries spill: Lessons learned and needed reforms. Downstream Strategies and West Virginia Rivers Coalition.

McIlmoil R, Hansen E, Askins N, Betcher M. 2013. The continuing decline in demand for Central Appalachian coal: Market and regulatory influences. Downstream Strategies.

Hansen E, Mulvaney D, and Betcher M. 2013. Water resource reporting and water footprint from Marcellus Shale development in West Virginia and Pennsylvania. Downstream Strategies and San Jose State University.

Farmer J, Peters C, Hansen E, Boettner F, Betcher M. 2013. Overcoming the market barriers to organic production in West Virginia. Downstream Strategies and Indiana University School of Public Health.

Hansen E, Glass M, Betcher M, Boettner F. 2013. Environmental benefits to the Chesapeake Bay of a poultry litter baling facility in the Eastern Panhandle of West Virginia. Downstream Strategies.

Bailey B, Hansen E, Groschner H, McIlmoil R, Hartz L, Shaver J, Hereford A. 2012. A windfall for coal country? Exploring the barriers to wind development in Appalachia. The Mountain Institute and Downstream Strategies.

Peters C, Hansen E, Clingerman J, Hereford A, Askins N. 2012. West Virginia food system: Opportunities and constrains in local food supply chains. Downstream Strategies.

Hartz L, Hansen E, Hereford A, Peters C, Askins N. 2012. Feasibility study: Poultry litter composting in the Potomac Valley Conservation District, West Virginia. Downstream Strategies.

Martin R, Petty T, Clingerman J, Boettner F, Letsinger S, Strager J, Hereford A, Hansen E. 2012. Midwest Fish Habitat Partnership fish habitat modeling results: Driftless Area Restoration Effort. Prepared for National Fish Habitat Partnership. Downstream Strategies, West Virginia University, and GeodataBasics.

Hansen E, Hereford A, Zegre S. 2012. Sandy Creek of the Tygart Valley River: Watershed-based plan. Downstream Strategies.

Center for Watershed Protection and Downstream Strategies. 2012. Guidance for developing an off-site stormwater compliance program in West Virginia. Prepared for W.Va. Department of Environmental Protection (DS authors: E Hansen and S Zegre.)

McIlmoil R, Hansen E, Betcher M, Hereford A, Clingerman J. 2012. The impact of coal on the Pennsylvania state budget. Downstream Strategies.

Economic Development Research Group and Downstream Strategies. 2011. Failure to act: the economic impact of current investment trends in water and wastewater treatment infrastructure. Prepared for American Society of Civil Engineers. (DS authors: E Hansen and A Hereford.)

Boettner F, Hansen E, Hereford A, Martin R, Zegre S. 2011. Elk Headwaters GIS analysis, data, and management system. Submitted to West Virginia Department of Environmental Protection. Downstream Strategies.

Hansen E, Zegre S, Hereford A. 2011. Elk headwaters watershed protection plan. Submitted to West Virginia Department of Environmental Protection. Downstream Strategies.

Hoornbeek J, Hansen E, Hereford A, Filla J, Satpathi S. 2011. Measuring water quality improvements: TMDL implementation progress, indicators, and tracking. Submitted to United States Environmental Protection Agency. Kent State University Center for Public Administration and Public Policy and Downstream Strategies.

Hansen E, Askins N. 2011. Water Pollution in Crafts Run and Robinson Run, Monongalia County, West Virginia. Downstream Strategies.

Hartz L, Hansen E, Cooper J. 2011. Statement of need: new processing facility. Prepared for Monongalia County Solid Waste Authority. Downstream Strategies.

Hansen E, Collins A, Zegre S, Hereford A. 2010. The benefits of acid mine drainage remediation on the North Branch Potomac River. Prepared for Md. State Water Quality Advisory Committee. Downstream Strategies.

Zegre S, Hansen E, Hereford A, Gergely, S. 2010. Blue Ridge Mountain communities area watershed plan: engineering report. Prepared for County Commission of Jefferson County, W.Va. Downstream Strategies.

Hansen E, Hereford A, Boettner F, Zegre S. 2010. Plants not pipes: promoting green infrastructure and its side benefits in Region VI. Prepared for Region VI Planning and Development Council. Downstream Strategies.

McIlmoil R, Hansen E, Boettner T, Miller P. 2010. The impact of coal on the West Virginia state budget. Downstream Strategies and W.Va. Center on Budget and Policy.

McIlmoil R, Hansen E, Boettner T. 2010. The impact of coal on the Tennessee state budget. Downstream Strategies and W.Va. Center on Budget and Policy.

McIlmoil R, Hansen E. 2010. The decline of Central Appalachian coal and the need for economic diversification. Thinking Downstream: White Paper #1. Downstream Strategies.

Boettner F, Hereford A, Hansen E, Merritt A, Burns D. 2009. Watershed-based plan: Muddy Creek of the Greenbrier River, West Virginia. Downstream Strategies.

McIlmoil R, Hansen E, Hereford A, Boettner F. 2009. Central Appalachia Prosperity Project: Existing research and information instructive for Appalachia; key stakeholder groups; federal, state, and local funds, programs, and policies that can help Appalachia transition toward a green economy; local, state, and regional agencies with influence over economic development and energy policy; and potential investors and project developers. Submitted to University of Colorado Denver School of Public Affairs. Downstream Strategies.

Hansen E, Boettner F, White T, Boettner T, Miller P. 2009. Taxing West Virginia's coal reserves: A primer. W.Va. Center on Budget & Policy and Downstream Strategies.

Hansen E, Hereford A, Boettner F, Christ M, Warren M. 2009. Watershed-based plan for the Wolf Creek watershed of the New River: From the headwaters to the mouth, Fayette County, West Virginia. Downstream Strategies.

Hansen E, Collins A, Hendryx M, Boettner F, Hereford A. 2008. The long-term economic benefits of wind versus mountaintop removal coal on Coal River Mountain, West Virginia. Downstream Strategies.

Hoornbeek J, Hansen E, Ringquist E, Carlson R. 2008. Implementing total maximum daily loads (TMDLs): Understanding and fostering successful results. Submitted to USEPA by Kent State University Center for Public Administration and Public Policy.

Hansen E, Boettner F. 2008. State of the watershed: Elk Headwaters, West Virginia. Downstream Strategies.

Hansen E, Boettner F, Schilz M, Webster A, Richter P, Schmidt L. 2008. Bacteria in the Pecks Run watershed Monitoring results and recommendations for action. WVRC in partnership with Downstream Strategies.

Hansen E, Collins A, Svetlik J, McClurg S, Shrecongost A, Stenger R, Schilz M, Boettner F. 2008. An economic benefit analysis for abandoned mine drainage remediation in the West Branch Susquehanna River Watershed, Pennsylvania. Downstream Strategies.

Hansen E, Schrecongost A, Hunter S, Herd R, Schilz M, Boettner F, Bassage D. 2008. West Virginia's Municipal Separate Storm Sewer System (MS4) NPDES Permit Program. Submitted to USEPA Region 3, Office of Water by W.Va. Water Research Institute, Downstream Strategies, and WVU Political Science Department.

Hansen E, Stenger R, Bailey B. 2007. Greenhouse gas offsets and renewable energy credits for landfill gas-to-energy projects in West Virginia. The Mountain Institute and Downstream Strategies.

Pavlick M, Hansen E, Christ M. 2006. Watershed assessment and draft plan for the Wolf Creek watershed of the New River: From the headwaters to the mouth, Fayette County, West Virginia. Downstream Strategies.

Hansen E, Schrecongost A, Bailey B, Morris A. 2006. The prospects for landfill gas-to-energy projects in West Virginia. The Mountain Institute and Downstream Strategies.

Pavlick M, Hansen E, Christ M. 2006. Watershed based plan for the Three Fork Creek watershed in the Tygart Valley River drainage, West Virginia. Downstream Strategies.

Pavlick M, Hansen E, Christ M. 2005. Watershed assessment for the Robinson Run watershed, Monongalia County, West Virginia. Downstream Strategies.

Pavlick M, Hansen E, Christ M. 2005. Watershed Based Plan for the North Fork Blackwater River watershed, West Virginia. Downstream Strategies.

Hansen E, Christ M. 2005. Water quality impacts of coal combustion waste disposal in two West Virginia coal mines. Downstream Strategies.

Pavlick M, Hansen E, Christ M. 2005. Watershed based plan for the lower Cheat River watershed: From river mile 43 at Rowlesburg, W.Va. to the West Virginia/Pennsylvania border, including all tributaries. Downstream Strategies.

Hansen E, Christ M, Fletcher J, Herd R, Petty JT, Ziemkiewicz P. 2004. The potential for water quality trading to help implement the Cheat watershed acid mine drainage total maximum daily load in West Virginia. Downstream Strategies.

Hansen E, Janes M. 2003. Coal mining and the Clean Water Act: Why regulated coal mines still pollute West Virginia's rivers and streams. WVRC.

Hansen E. 2001. Total maximum daily load implementation in West Virginia: A status report. WVRC.

Hansen E, Christ M. 2001. EPA's nutrient criteria recommendations and their application in Nutrient Ecoregion XI. WVRC.

Hansen E. 2001. Achieving balance: Improving public participation in West Virginia's NPDES permitting process. WVRC.

Hansen E. 1999. Poultry litter in the Potomac headwaters: How can we reach a long-term balance? Submitted to Potomac Headwaters Resource Alliance. In partnership with WVRC. Downstream Strategies.

Hansen E. 1998. A technical analysis of acid mine drainage total maximum daily loads for West Virginia's Buckhannon River and Tenmile Creek. WVRC, W.Va. Highlands Conservancy, and Ohio Valley Environmental Coalition.

Hansen E. 1997. Total maximum daily loads for fecal coliform in the Potomac headwaters of West Virginia: An assessment of the data, assumptions, and model. Potomac Headwaters Resource Alliance and WVRC.

Hansen E. 1997. Cultivating partnerships: Pest control and the use of integrated pest management on small farms in San Joaquin County, California. Unpublished M.S. Thesis. Energy and Resources Group, University of California-Berkeley.

Lazarus M, Hansen E, Hill D. 1995. Scenarios of energy and agriculture in Africa. SEI. Published as a chapter in: Best G, Karakezi S, Lazarus M. Future Energy Requirements for Africa's Agriculture. FAO.

Raskin P, Hansen E, Margolis R. 1995. Water and sustainability: A global outlook. SEI.

Lazarus M, Bartels C, Bernow S, Greber L, Hall J, Hansen E, Raskin P. 1993. Towards global energy security: The next energy transition. Tellus Institute. Published as: Greenpeace International. Towards a fossil free energy future. Greenpeace.

Talbot N, Hansen E. 1993. Zambia: Resuming the energy transition. SEI and Zambia Department of Energy.

Talbot N, Hansen E. 1993. Zimbabwe: Energy end-uses and end-use efficiency. SEI and Zimbabwe Department of Energy.

Awards

- Morgantown Human Rights Commission Don Spencer Human Rights Day Award, 2016
- W.Va. Environmental Council's Don Gasper Science in the Public Interest Award, 2014.
- W.Va. Watershed Network Guiding Light Award, 2005.
- Switzer Environmental Leadership Grant, 2000 and 2002.
- Switzer Environmental Fellowship, 1996.
- Tau Beta Pi and Eta Kappa Nu honorary fraternities, 1988.

Public Service

- Invited presentation to Atlantic Council Millennium Leadership Program, Millennium Fellowship Program 2017 West Virginia Study Tour (June 2017, Energy-Water Nexus in West Virginia).
- Invited presentation to the U.S. Department of State International Visitor Leadership Program (June 2017, State and Federal Energy Issues).
- Invited testimony to the U.S. Senate Environment and Public Works Committee (March 2014, Preventing Potential Chemical Threats and Improving Safety: Oversight of the President's Executive Order on Improving Chemical Facility Safety and Security).
- Invited presentation to the W.Va. Legislature Judiciary Committee (February 2014, Potential Significant Contaminant Sources above West Virginia American Water's Charleston Intake: A Preliminary Assessment).
- Invited presentations to W.Va. Legislature Joint Legislative Oversight Commission on State Water Resources (January 2014, The Freedom Industries Spill: Lessons Learned and Needed Reforms; October 2013, Water Footprint and Water Resource Reporting from Marcellus Shale Drilling and Hydraulic Fracturing in West Virginia and Pennsylvania).
- Invited presentation to W.Va. Legislature Joint House Judiciary/House Health and Human Resources Committees (January 2014, The Freedom Industries Spill: Lessons Learned and Needed Reforms).
- Invited speaker for W.Va. University Plant and Soil Sciences Club, W.Va. Geological and Economic Survey, W.Va. University Society of Environmental Professionals, W.Va. University Department of Public Administration, W.Va. University Pi Sigma Sigma Policy Studies Honorary, Oglebay Institute Living Green Lecture Series, Mountaineer Audubon Chapter, Friends of Deckers Creek, Yale School of Forestry and Environmental Studies, W.Va. Associated Press Legislative Lookahead, W.Va. University Institute for Public Affairs Local Government Leadership Academy, Robert and Patricia Switzer Foundation, Monongahela River Water Quality Forum, W.Va. University Fisheries Society, Downstream Alliance, Cheat Lake Environment and Recreation Association, W.Va. University Forestry Club, Tellus Institute, W.Va. Environmental Council, W.Va./Pa. Monongahela Area Watersheds Compact, and W.Va. Chapter of the Sierra Club.
- Morgantown Utility Board Technical Advisory Group, 2011.
- City of Morgantown City Manager's Green Team, 2007-10.
- W.Va. Environmental Quality Board Aluminum Study Review Team, 2002-03.
- W.Va. Environmental Quality Board/W.Va. Department of Environmental Protection Nutrient Criteria Committee, 2002-07.
- W.Va. Department of Environmental Protection Water Quality Trading Stakeholder Committee, 2002-04.
- Board of Directors of Read Aloud WV of Monongalia County, 2018-present
- Board of Directors of Spark! Imagination and Science Center, 2017-present.
- Board of Directors of Canaan Valley Institute, 2016-present.
- Board of Directors of Appalachian Headwaters, 2015-present.
- Board of Directors of Friends of Deckers Creek, 2000-10. President, 2002-10.
- Morgantown Utility Board Storm Water Utility Stakeholder Group, 2002.
- US Environmental Protection Agency Peer Review Committee of the acid mine drainage functions of the Watershed Analysis Risk Management Framework (WARMF) TMDL computer model, 2000.

- US Environmental Protection Agency Peer Review Committee of the WARMF TMDL computer model, 1999-2000.
- W.Va. Department of Environmental Protection Total Maximum Daily Load Steering Committee, 1999-2001.
- Guest lecturer for W.Va. University courses in Science and Public Policy, Fisheries Management, Conservation Biology, Environmental Systems, and Environmental Impact Assessment.

KENDRA LEE HATCHER

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Professional Profile

Downstream Strategies, LLC — Morgantown, W.Va.
Senior Environmental Scientist, May 2013-present

Clients include Appalachian Mountain Advocates, Blue Ridge Watershed Coalition, Clarksburg Veterans Administration Medical Center, City of Thomas, Doddridge County Commission, Dominion Pipeline Monitoring Coalition, Dominion Post, Earthjustice, Earthworks, Eastern Panhandle Conservation District, Friends of Deckers Creek, Friends of Deep Creek Lake, Friends of the Cheat,, Friends of the Hughes River Watershed Group, Garrett County, Md., Green Rivers, Morgantown Utility Board, National Fish and Wildlife Foundation, National Salvage and Service Corporation, Pocahontas County Commission Water Resources Task Force, Prairie Rivers Network, Public Justice, Refresh Appalachia, Sierra Club, Taylor Environmental Advocacy Membership, Trout Unlimited, Tennessee Clean Water Network, The Nature Conservancy, Thrasher Engineering, U.S. Fish and Wildlife, Wheeling Water Department, West Virginia Land Trust, West Virginia Rivers Coalition, Wetzel County Solid Waste Authority, and Woodlands Development Group.

Oregon State University, Dept. of Geosciences — Corvallis, Ore.
Faculty Research Assistant/Instructor, 2010- 2013
Database Manager, Transboundary Freshwater Dispute Database, 2009- 2010

Hatch Mott MacDonald — Morgantown, W.Va.
Geologist, 2005- 2008

West Virginia Geological and Economical Survey — Morgantown, W.Va.
Environmental Analyst, 2005- 2005

Education

Oregon State University — Corvallis, Ore.
M.S. in Geography awarded 2011.

West Virginia University — Morgantown, W. Va.
B.S. in Geology awarded 2004.

Kendra Hatcher is a senior scientist with eight years of experience in field sampling, scientific analysis, site assessment, and data management. She played key roles in writing SWPPs for MUB, the Wheeling Water Department, and numerous smaller utilities. Ms. Hatcher has completed a variety of projects, from source water protection planning to housing and business needs assessments. She has wide experience sampling a variety of environmental media, including water and soils, and has monitored extensively in areas impacted by Marcellus Shale gas development. She has also used GIS technologies for over 10 years to analyze and manage spatial data related to natural resources and the environment. She has experience organizing stakeholder meetings and implementing community surveys and assessing the results.

Water resources

Research

- Creating a source water protection plan implementation informational guide (Downstream Strategies, 2017, for West Virginia Rivers Coalition).
- Writing an informational guide for landowners about the potential impact of natural gas pipeline development on water resources (Downstream Strategies, 2016, for Dominion Pipeline Monitoring Coalition).
- Creating a source water protection public participation informational guide (Downstream Strategies, 2016, for West Virginia Rivers Coalition).
- Writing source water protection plans and implementing an ongoing source water protection program to protect drinking water intakes from contamination and to respond effectively if contamination should occur (Downstream Strategies, 2014-present, for Morgantown Utility Board, City of Weirton, and City of Wheeling).
- Writing watershed-based plans for Muddy Creek and Pringle Run of the Cheat River to qualify the watersheds for 319 funds. These streams are impaired by acid mine drainage (Downstream Strategies, 2013-14, for Friends of the Cheat).
- Developing and implementing a watershed monitoring program to protect source water for a major utility in north central West Virginia (Downstream Strategies, 2014, Morgantown Utility Board)
- Researching the sufficiency of federal Abandoned Mine Reclamation Fund distributions for fully reclaiming abandoned coal mines across Illinois (Downstream Strategies, 2013, for Prairie Rivers Network).
- Providing technical support for the preparation of an expert report and expert testimony for an appeal of a National Pollutant Discharge Elimination System permit for a wastewater treatment plant (Downstream Strategies, 2013, for Tennessee Clean Water Network).
- Providing technical support for the preparation of expert reports and expert testimony for litigation related to coal mines (Downstream Strategies, 2013, for Public Justice).
- Compared streamflow trends above and below dams in multiple sub-basins of the Columbia River basin (Oregon State University, 2012-2013).
- Used statistical analysis to compare streamflow, temperature, and precipitation trends at long-term ecological research sites across the United States (Oregon State University, 2010-2013).

Field work

- Designing sampling plan and collecting samples in support of legal cases (Downstream Strategies, 2014-present, for various clients).
- Designing and conducting source water monitoring for the North Fork of the Hughes River, West Virginia. Tasks also included creating a Quality Assurance Project Plan and completing a summary report for submittal to the West Virginia Department of Environmental Protection (Downstream Strategies, 2017-present, for Friends of the Hughes River Watershed Group).
- Designing and conducting source water monitoring for the Elks Run watershed, West Virginia. Tasks also included creating a Quality Assurance Project Plan and completing a summary report for submittal to the West Virginia Department of Environmental Protection (Downstream Strategies, 2017-2018, for Eastern Panhandle Conservation District).

- Designing a sampling plan and collecting samples related to water quality on Deep Creek Lake, Maryland (Downstream Strategies, 2016, for Friends of Deep Creek Lake).
- Designing and conducting source water monitoring for West Union, West Virginia (Downstream Strategies, 2014-present, for Doddridge County Commission).
- Collecting water samples for analysis of general chemistry, heavy metals, petroleum-related contaminants, bacteria, organics, and radiation by a certified laboratory (Downstream Strategies, 2013-present, for various clients).
- Assessed water wells and surface waters for impacts from natural gas wells and coal mines (Downstream Strategies, 2013-present, for various clients).
- Supervised work crews completing streamflow restoration project (Hatch Mott MacDonald, 2007-2008, for confidential client).
- Performed geomorphology assessments on stream channels in southwestern Pennsylvania (Hatch Mott MacDonald, 2005-2008, for confidential client).
- Monitored streamflow and collected water samples to establish baseline conditions and quantify impacts caused by underground longwall mining in southwestern Pennsylvania (Hatch Mott MacDonald, 2005-2008, for confidential client).
- Collected water samples from groundwater monitoring wells at industrial sites for analysis by a certified laboratory (Hatch Mott MacDonald, 2005-2008, for confidential client).

Environmental sampling

- Collecting soil and indoor dust samples in support of a legal case (Downstream Strategies, 2017-present, for confidential client).
- Conducted multiple Phase I ESAs for real-estate transactions associated with establishment of Conservation Easements at various tracts located throughout West Virginia (West Virginia Land Trust, 2016-2017).
- Completed a Phase II Environmental Site Assessment (Downstream Strategies, 2017, for City of Thomas)
- Creating a Sampling and Analysis Plan and Quality Assurance Project Plan for Phase II Environmental Site Assessments (Downstream Strategies, 2015-2016, for City of Thomas)
- Collecting lake sediment and macroinvertebrate samples for analysis of metals (Downstream Strategies, 2015, for Earthjustice).
- Creating soil sampling guidance document for Incremental Soil Sampling methodology for baseline soil sampling (Downstream Strategies, 2016, for Refresh Appalachia).
- Collecting indoor air quality samples (Downstream Strategies, 2013-present, for various clients).
- Collecting soil samples for analysis of general chemistry, heavy metals, and petroleum-related contaminants, by a certified laboratory (Downstream Strategies, 2013-present, for various clients).
- Conducted Bank Erosion Hazard Index surveys on Back Creek in Berkeley County, WV (Downstream Strategies, 2014, for Green Rivers).

GIS

- Mapping support for a variety of projects (Downstream Strategies, 2013-present, for various clients)
- Running spatially-explicit models of fish habitat quality and quantifying anthropogenic stress for watersheds for various regions, USA (Downstream Strategies, 2014, for US Fish and Wildlife Service).
- Creating maps and reported on spatial analysis of groundwater vulnerability, safe yield, and source water areas for county-wide water resources management plan (Downstream Strategies, 2013, for Pocahontas County Commission Water Resources Task Force).
- Compared topographical characteristics of watersheds in western Oregon to streamflow trends using spatial analysis (Oregon State University, 2012-2013).
- Calculated spatial statistics on population, climate, land use, and water discharge for international river basin datasets (Oregon State University, 2009-2010).
- Created maps and figures for multiple academic and NGO publications (Oregon State University, 2009-2010).
- Instructed undergraduate and graduate level introductory GIS lab courses (Oregon State University, 2008-2009).

- Created maps of mining-related impacts and mitigation activities for deliverables for client (Hatch Mott MacDonald, 2007-2008, for confidential client).
- Georeferenced and digitized mine maps for the Coal Bed Mapping Project (West Virginia Geological and Economical Survey, 2005).

Scientific analyses

- Writing a sampling data analysis and watershed summary document, Shenandoah River and tributaries in the Eastern Panhandle of West Virginia (Downstream Strategies, 2018, for Blue Ridge Watershed Coalition).
- Analysis of sampling data and contamination inputs in the Elks Run watershed, Eastern Panhandle of West Virginia (Downstream Strategies, 2017, for Eastern Panhandle Conservation District).
- Creating a scope of work to study the economic impact of shale gas development on tourism and related industries in Garrett County, Maryland (Downstream Strategies, 2016, for Garrett County).
- Analyzing economic benefits of abandoned mine reclamation in Pennsylvania (Downstream Strategies, 2016, for Trout Unlimited).
- Collecting and summarizing demographic data for multiple communities (Downstream Strategies, 2015, for confidential client).
- Conducting a housing and small business needs assessment for Tucker County (Downstream Strategies, 2015, for Woodlands Development Group).
- Compiling and presenting leachate water quality data and tonnage quantities for an assessment of regulations related to drill cuttings waste (Downstream Strategies, 2015, for Wetzel County Solid Waste Authority).

Database management

- Managing spatial and tabular dataset of water quality data (Downstream Strategies, 2014-present, for Morgantown Utility Board).
- Managed spatial and tabular dataset of international river basins (Oregon State University, 2009-2010).
- Managed spatial dataset of mining-related impacts and mitigation activities (Hatch Mott MacDonald, 2007-2008, for confidential client).

Publications

Peer-reviewed articles

Hatcher K, Jones JA. 2013. Climate and streamflow trends in major sub-basins of the Columbia River basins: contrasts above and below dams. *Atmosphere-Ocean* 20 p. doi: 10.1080/07055900.2013.808167

Jones JA, Creed I, Hatcher K, Warren R, Adams MB, Benson MH, Boose E, Brown WA, Campbell JL, Covich A, Clow DW, Dahm CN, Elder K, Ford CR, Grimm NB, Henshaw DL, Larson KL, Miles ES, Miles KM, Sebestyen SD, Spargo AT, Stone AB, Vose JM, and Williams MW. 2012. Ecosystem processes and human influences regulate streamflow response to climate change at long-term ecological research sites. *Bioscience* 62(4): 390-404.

Reports

Glass M, Hatcher K, Betcher M, Hansen, E. 2016. Guidance for Monitoring Effects of Gas Pipeline Development on Surface Water and Groundwater Supplies. Downstream Strategies.

Glass M, Hatcher K. 2014. Comments on Proposed Changes to the West Virginia Solid Waste Management Rule 33CSR1. Downstream Strategies.

Boettner F, Hatcher K, Carlson E, Betcher M, Collins A, Nkansah K, Stull R, Gaujot R. 2014. Tucker County, West Virginia Small Business and Housing Needs Assessment. Downstream Strategies.

Atkins N, Hatcher K. 2013. Taylor Environmental Advocacy Membership Water Quality Monitoring Project. Downstream Strategies.

Conferences

Dearforff L, Hansen E, Hatcher K. 2014. MS4: CWA Working in Your Watershed. Workshop at River Rally, Pittsburgh, Pa. May 30-June 2.

Hatcher K. 2010. Long-term trends in streamflow in large basins of western Oregon: disentangling climate change effects and land use legacies. Poster presentation at MTNCLIM 2010-Mountain Climate Research Conference, Blue River, Ore. June 7-10.

Presentations

- Ohio Valley Environmental Coalition, Community Organizing Summit, April 2018, presenting "Citizen's Guide to Fracking Permits in West Virginia."
- Presented source water protection plans at community meetings, various locations in West Virginia, 2015-2016.
- Garret County Commission, 2015-2016, presenting at various Commission meetings and hosting public meeting related to scope of work to study the economic impact of shale gas development on tourism and related industries in Garrett County, Maryland.
- West Virginia Rivers Coalition, April 13, 2016, webinar presentation on the source water protection plan implementation informational guide.
- West Virginia Rivers Coalition, 2015, multiple presentations related to the source water protection public participation informational guide.
- Doddridge County Watershed Association, March 28, 2015, presenting at Doddridge County Commission on water sampling results.
- Taylor Environmental Advocacy Membership, 2014-2015, presenting information for multiple public meetings.
- Woodlands Development Group, June 5, 2014, presenting information related to housing and business needs assessment for Tucker County, West Virginia.

Public Service

- Board member for Friends of Deckers Creek, 2015-present.
- Marys River Watershed Council Newton Creek Wetlands Field Day, spring 2009.
- Friends of the Cheat stream monitoring volunteer, summer 2005.

JOSEPH P. JAMES

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Professional Profile

Downstream Strategies, LLC Morgantown, W.Va.
Staff Scientist, 2014-2017
Project Scientist 2017-present

Clients include Appalachian Stewardship Foundation; Appalachian Voices; Dominion Pipeline Monitoring Coalition; Grayson Landcare; Hill, Peterson, Carper, Bee & Deitzler, PLLC; Solar Workgroup of Southwest Virginia; Morgantown Utility Board; Reclaiming Appalachia Coalition; The Nature Conservancy; The Thrasher Group; WVU College of Law Center for Energy and Sustainable Development.

The West Virginia Land Trust Morgantown, W.Va.
Natural Resources/GIS Consultant, 2014

West Virginia University Montane Forest Dynamics Laboratory Morgantown, W.Va.
Research Assistant, 2012-2014

Education

West Virginia University Morgantown, W.Va.
B.A. in Geography awarded 2014. Emphasis in natural resources, GIS, paleo-ecology, and environmental policy.

Projects

Mr. James is a multi-disciplinary researcher specializing in sustainable economic development and planning for the new economy. He has professional experience in the public, non-profit, and private sectors and has worked extensively in source water protection, energy policy analyses, GIS development, economic modeling, environmental data analysis, and environmental outreach. Mr. James provided GIS and meeting facilitation services for source water protection planning for many small utilities and has played a key role in the development of the MUB Monitor and the inventories of PSSCs for MUB and numerous other utilities.

Energy

- Profiled sites for commercial- and industrial-scale solar development in Virginia (Downstream Strategies, 2017, for the Solar Workgroup of Southwest Virginia)
- Quantified the amount of degraded land viable for large-scale solar development in West Virginia (Downstream Strategies, 2016-2017, for the Appalachian Stewardship Foundation).
- Explored waste-to-energy options and alternative solid waste disposal methods for Monongalia County, West Virginia (Downstream Strategies, 2016-present, for the Monongalia County Solid Waste Authority).
- Facilitated municipality-wide sustainability initiative that aims to reduce greenhouse gas emissions in the commercial and residential sectors (Downstream Strategies, 2015-2016, for Appalachian Stewardship Foundation).
- Explored opportunities for West Virginia to comply with proposed regulations on carbon dioxide emissions from existing coal-fired power plants (Downstream Strategies, 2014-2016, for WVU College of Law Center for Energy and Sustainable Development).
- Reviewed West Virginia best management practices for erosion and sediment control related to the proposed construction of a pipeline that would cross the central Allegheny Highlands and Blue Ridge Mountains (Downstream Strategies, 2015, for Dominion Pipeline Monitoring Coalition).

- Assessed the potential for residential and commercial energy efficiency measures and solar installations to reduce greenhouse gas emissions in Morgantown, West Virginia (Downstream Strategies, 2014-2015, for Appalachian Stewardship Foundation).

GIS

- Conceptualizing and developing a geospatial database of potential contaminant sources for use in source water protection and incident prevention management (Downstream Strategies, 2014-present, for Morgantown Utility Board).
- Created mobile GIS data collection applications to aid in the baseline inventory of potential significant contaminant sources (Downstream Strategies, 2014-2015, for Morgantown Utility Board and Thrasher Engineering).
- Developed maps documenting soil sampling activities related to the possible release of environmental contaminants following unconventional oil and gas well development (Downstream Strategies, 2015, for Hill, Peterson, Carper, Bee & Deitzler, PLLC).
- Mapped and analyzed Gulf restoration spending trends following the Deep Horizon oil spill, post-British Petroleum case settlement (Downstream Strategies, 2015 and 2017, for The Nature Conservancy).
- Designed a beta enterprise GIS system for an environmental non-profit working to internalize GIS functions (West Virginia Land Trust, 2014).
- Provided cartographic expertise and assisted in the drafting of a land management plan for the Elizabeth's Woods Nature Preserve in Monongalia County, West Virginia (West Virginia Land Trust, 2014).

Economic Development

- Planning for diverse development activities on abandoned mine lands in four Appalachian states (Downstream Strategies, 2017-present, for Reclaiming Appalachia Coalition).
- Utilized JEDI to model the potential economic impact of solar development in Southwest Virginia (Downstream Strategies, 2017, for Solar Workgroup of Southwest Virginia).
- Assisted in the development of a site- and funding-specific economic development strategy for Southwest Virginia (Downstream Strategies, 2016, for Appalachian Voices).
- Identified workforce development and funding strategies for an abattoir facility in Southwest Virginia (Downstream Strategies 2017, for Grayson Landcare).

Awards

- Magna cum laude, West Virginia University, 2014.
- Outstanding Service Award, First Hand Coffee Cooperative, 2014.
- Trevor and Sylvia Harris GIScience Award, West Virginia University, 2013- 2014.
- George Jackson Arts and Sciences Scholarship, West Virginia University, 2012-2014.

Publications

Hansen E, Fedorko E, James J, and A Varrato. 2018. Future Scenarios for Monongalia County's Solid Waste Management System. Prepared for the Monongalia County Solid Waste Authority. Downstream Strategies.

Shephard C, James J, Fedorko E, and R Bendick. 2017. Charting Restoration: Gulf Restoration Priorities and Funded Projects Seven Years After Deepwater Horizon. Downstream Strategies and The Nature Conservancy.

James J, and Hansen E. 2017. Capturing the Sun's Rays: An Economic Impact Assessment of Solar Development in Southwest Virginia. Prepared for the Solar Workgroup of Southwest Virginia. Downstream Strategies.

James J, and Hansen E. 2017. Prospects for Large-scale Solar on Degraded Land in West Virginia. Prepared for the Appalachian Stewardship Foundation. Downstream Strategies.

Hansen E, James J, and Fedorko F. 2016. An Assessment of Waste-to-energy Options for Monongalia County, West Virginia. Prepared for the Monongalia County Solid Waste Authority. Downstream Strategies.

Publications

Fedorko E, James J, Boettner F, Collins G, Scott J, Wells A, and M Wasson. 2016. Healing our Land, Growing our Future: Innovative Mine Reclamation in Southwest Virginia. Prepared for Appalachian Voices. Downstream Strategies.

Hansen E, James J, and E Fedorko. 2016. An Evaluation of Waste to Energy Options for Monongalia County, West Virginia. Prepared for the Monongalia County Solid Waste Authority. Downstream Strategies.

Hansen E, and James J. 2016. Reducing Greenhouse Gas Emissions through the Sustainable Morgantown Initiative. Prepared for the Appalachian Stewardship Foundation. Downstream Strategies.

Van Nostrand J, Hansen E, and J James. 2016. Expanding Economic Opportunities for West Virginia under the Clean Power Plan. Prepared for the Center for the Appalachian Stewardship Foundation. Downstream Strategies.

Hansen E, James J, and Coleman J. 2016. All of Our Eggs in One Basket? An Update on the Decline of Central Appalachian Coal and Increasing Budget Woes in West Virginia. Downstream Strategies.

Hansen E, and James J. 2015. The Atlantic Coast Pipeline in West Virginia: Opportunities for Public Engagement Regarding Erosion and Sedimentation. Prepared for the West Virginia Rivers Coalition and Dominion Pipeline Monitoring Coalition. Downstream Strategies.

Hansen E, and James J. 2015. Opportunities for Reducing Commercial and Residential Greenhouse Gas Emissions in Morgantown, West Virginia. Prepared for the Appalachian Stewardship Foundation. Downstream Strategies

Van Nostrand J, Hansen E, Argetsinger B, and James J. 2015. The Clean Power Plan and West Virginia: Compliance Options and New Economic Opportunities. Prepared for the Appalachian Stewardship Foundation. Downstream Strategies.

Shepard C, Gilmer B, DeQuattro J, Weis S, Blejwas A, and R Bendick. 2015. Charting Restoration: Gulf Restoration Priorities and Funded Projects Five Years After Deepwater Horizon. Downstream Strategies and The Nature Conservancy.

Van Nostrand J, Hansen E, Argetsinger B, Simcoe J, and J James. 2014. Carbon Dioxide Emission Reduction Opportunities for the West Virginia Power Sector. Prepared for the Appalachian Stewardship Foundation. Downstream Strategies and the WVU Law Center for Energy and Sustainable Development.

Public Service

- Chair, The Morgantown Municipal Green Team, 2014-2017
- Advisory Board Member, Solar United Neighborhoods of West Virginia, 2016-present
- Commissioner, Morgantown Board of Parks and Recreation Commissioners, 2017-present
- Board Member, The Shack Neighborhood House, 2017-present
- Advisory Board Member, The Tom's Run Nature Preserve, 2018-present

JASON WAYNE CLINGERMAN

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Professional profile

Downstream Strategies, LLC Morgantown, W.Va.
Project Aquatic Ecologist, 2011-Present

Clients include Appalachian Headwaters, Appalachian Mountain Advocates, Appalachian Regional Commission, Betsy and Stephen Lawson, Blue Moon Fund, Economic Development Research Group, Gentle, Turner, and Sexton, PLLC, Greenbrier Valley Economic Development Corporation, John and Petra Wood, Little Tennessee River Watershed Native Fish Habitat Partnership, Lisa and Raj Devineni, Midwest Fish Habitat Partnerships, Morgantown Utility Board, Natural Resource Defense Council, North Atlantic Landscape Conservation Cooperative, Pocahontas County Commission, Public Justice, P.C., Save the Tygart, Sierra Club, Susquehanna River Basin Commission, TEAM, Thrasher Engineering, US Department of Agriculture's National Institute of Food and Agriculture, US Fish and Wildlife Service, W.Va. Center on Budget and Policy, W.Va. Community Development Hub, and WV Highlands Conservancy,

IBM Fairmont, W.Va.
GIS Analyst, 2008-11

West Virginia University (WVU) Morgantown, W.Va.
Graduate Research Assistant, 2006-08; Teaching Assistant, 2007; Aquatic Field Technician, 2004

The Conservation Fund's Freshwater Institute Shepherdstown, W.Va.
Graduate Student Research Assistant, 2005

Education

West Virginia University Morgantown, W.Va.
M.S. in Wildlife and Fisheries Resources awarded 2008. Thesis: *Statewide analysis of brook trout population status and reach-scale conservation priorities in West Virginia watersheds.*
B.S. in Wildlife and Fisheries Resources awarded 2005.

Projects

Jason Clingerman has worked extensively in the field of natural resources science and management, including aquatic ecology, water quality assessment, and source water protection. He is experienced in performing aquatic surveys for fish, macroinvertebrates, habitat, and water quality, and in the management and analysis of large aquatic and water quality datasets. He frequently uses GIS for geographic and aquatic applications and takes on the role of project manager or technical lead in many projects. Mr. Clingerman has contributed extensively to source water protection planning projects with MUB and smaller West Virginia utilities.

Aquatic, fish, and water projects

Research

Created spatially-explicit models of fish habitat quality and quantifying anthropogenic stress for watersheds in the Midwest Region, USA (Downstream Strategies, 2011-present, for US Fish and Wildlife Service).

Modeled brook trout distributions within West Virginia utilizing classification and regression tree analyses and developed conservation priorities for that species based on validated model results (WVU, 2006-08).

Performed research on rainbow trout in an aquaculture setting. Specific research involved voluntary fish movement using elevated dissolved carbon dioxide levels (Freshwater Institute, 2005).

Aquatic field sampling

Sampled fish and macroinvertebrate communities in streams and lakes, including field identification of fish to species level and fish marking using visual implant elastomer tags (Downstream Strategies 2014-2016, WVU, 2004; 2006-07).

Sampled water quality and stream habitat parameters in small to medium sized streams, including the use of field water quality meters and test kits and pebble counts for habitat measurements (WVU, 2004; 2006-07).

GIS

Created interactive StoryMaps to convey scientific research to the interested public (Downstream Strategies 2016 – present, for multiple clients)

Coordinated the conceptualizing, developing, and deploying of a web-based decision support system for fisheries resources (Downstream Strategies, 2013-2015, for USFWS)

Created maps of solar radiation (Downstream Strategies, 2013)

Conducted aerial reviews of potential contaminant sources for sourcewater protection (Downstream Strategies, 2014-2015, for Morgantown Utility Board and Thrasher Engineering)

Created mapbooks/data driven pages of numerous aquatic model responses throughout the Midwest and Great Plains (Downstream Strategies, 2011 – present, for US Fish and Wildlife Service)

Created maps of renewable energy assets for the eastern US (Downstream Strategies, 2011, for WV Center on Budget and Policy).

Georeferenced outfall and instream monitoring locations for a surface mine in Tennessee. Delineated watersheds associated with outfall and monitoring locations, as well as created detailed maps of the hydrology of the study area (Downstream Strategies, 2011-2012, for Sierra Club).

Delineated and analyzed potential impacts of a proposed surface mine, including viewshed analyses (Downstream Strategies, 2012, for Lisa and Raj Devineni).

Created maps to visualize current trends and markets related to organic farming in West Virginia (Downstream Strategies, 2011-2012, for US Department of Agriculture, National Institute of Food and Agriculture).

Delineated watersheds associated with outfall locations (Downstream Strategies, 2011, for Appalachian Mountain Advocates).

Compiled and analyzed geospatial data related to food systems, climate, and geography in West Virginia (Downstream Strategies, 2011, for Greenbrier Valley Economic Development Corporation).

Prepared portfolio of over 50 maps detailing regional forest resources (Downstream Strategies, 2011, for Appalachian Regional Commission).

Georeferenced and vectorized abandoned mine land maps specifying problem areas within the Sandy Creek watershed in West Virginia (Downstream Strategies, 2011, for Save the Tygart).

Digitized historic National Oceanic and Atmospheric Administration shoreline maps. Georeferenced and vectorized scanned paper maps using ERDAS Imagine (including the AutoSync extension) and ArcMap (IBM, 2008-11).

Taught the laboratory section of RESM 493 (Introductory GIS for Natural Resources), including lecturing and providing one-on-one assistance to students (WVU, 2007).

Utilized GIS to obtain, extract, create, and manipulate large spatial datasets required for landscape-scale natural resource analyses (WVU, 2006-07).

Data compilation and database management

Managing several large databases containing watershed and stream habitat variables by utilizing Microsoft Access and Excel (Downstream Strategies, 2011-present, for US Fish and Wildlife Service).

Compiling data from multiple sources (spreadsheets, .pdf files, etc.) into functional, centralized spreadsheets and databases (Excel and Access). Utilizing filters and queries to extract relevant data in usable formats (Downstream Strategies, 2011-present, for various clients).

Publications

Peer-reviewed publications

Clingerman, J W, Merriam E R, Petty J T, Strager MP, Martin E. in review. Web-based spatial decision support systems for aquatic ecosystem conservation. Pages #–## in Multispecies and Watershed Approaches to Freshwater Fish Conservation.

Merriam E, Petty J T, Clingerman J W. in review. Restoration planning at the intersection of landscape and climate change: a case study with brook trout in the Chesapeake Bay watershed. Ecological Applications.

Clingerman J, Bebak J, Mazik P, Summerfelt S. 2007. Use of avoidance response of rainbow trout to carbon dioxide for fish self-transfer between tanks. *Aquacultural Engineering*, 37(3):234-51.

Other reports

Clingerman J, Betcher M, Hansen E. 2018. Threats to Groundwater from the Mountain Valley Pipeline and Mountain Valley Pipeline in Virginia. Prepared for Natural Resource Defense Council.

Hansen E, Clingerman J, Betcher M. 2018. Impacts of Atlantic Coast Pipeline Stream Crossings within VMRC Jurisdiction. Prepared for Natural Resource Defense Council.

Hansen E, Clingerman J, Betcher M. 2018. Threats to Water Quality from Mountain Valley Pipeline and Atlantic Coast Pipeline Water Crossings in Virginia. Prepared for Natural Resource Defense Council.

Hansen E, Clingerman J, Betcher M. 2018. Impacts of Mountain Valley Pipeline Stream Crossings within VMRC Jurisdiction. Prepared for Natural Resource Defense Council.

Clingerman J, Hansen E. 2017. Atlantic Coast Pipeline Sediment Modeling Methodology. Prepared for Appalachian Mountain Advocates.

Clingerman J, Hansen E. 2016. Mountain Valley Pipeline Sediment Modeling Methodology. Prepared for Appalachian Mountain Advocates.

Clingerman J, Petty T, Boettner F, Strager M. 2016. Lake Superior Brook Trout Conservation and Prioritization Report. Prepared for the Ashland Fish and Wildlife Conservation Office. Downstream Strategies and West Virginia University.

Clingerman J, Petty T, Boettner F. 2015. North Atlantic LCC Aquatic Habitat Assessment: Chesapeake Bay Watershed Brook Assessment: Using Decision Support Tools to Develop Priorities. Report submitted to the North Atlantic Landscape Conservation Cooperative Assessment Project. Downstream Strategies and West Virginia University.

Clingerman J, Petty T, Boettner F. 2015. North Atlantic LCC Aquatic Habitat Assessment: Chesapeake Bay Watershed Brook Trout Habitat and Climate Change Vulnerability Assessment. Final Report submitted to the North Atlantic Landscape Conservation Cooperative Assessment Project. Downstream Strategies and West Virginia University.

Clingerman J, Petty T, Boettner F. 2015. North Atlantic LCC Aquatic Habitat Assessment: Estuarine Fish Habitat Assessment: A General Framework and Winter Flounder Pilot Studies. Final Report submitted to the North Atlantic Landscape Conservation Cooperative Assessment Project. Downstream Strategies and West Virginia University.

Clingerman J, Petty T, Boettner F, Letsinger S, Strager J, Hansen E. 2015. Midwest Fish Habitat Partnership Fish Habitat Modeling Results: Great Lakes Basin Fish Habitat Partnership. Prepared for National Fish Habitat Partnership. Downstream Strategies, West Virginia University, and GeodataBasics.

Clingerman J, Petty T, Boettner F, Hansen E. 2014. Ohio River Basin Fish Habitat Partnership Habitat Modeling Results: Ohio River Basin Watershed Models. Prepared for the Ohio River Basin Fish Habitat Partnership. Downstream Strategies, West Virginia University, and GeodataBasics.

Clingerman J, Petty T, Boettner F, 2013. Case Study: Analysis of Scale on Boosted Regression Tree Fish Habitat Models. Downstream Strategies.

Petty T, Clingerman J, Boettner F, Letsinger S, Strager J, Hansen E. 2013. Midwest Fish Habitat Partnership fish habitat modeling results: Regional Assessment. Prepared for National Fish Habitat Partnership. Downstream Strategies, West Virginia University, and GeodataBasics.

Petty T, Clingerman J, Boettner F, Letsinger S, Strager J, Hansen E. 2013. Great Plains Fish Habitat Partnership fish habitat modeling results. Prepared for National Fish Habitat Partnership. Downstream Strategies, West Virginia University, and GeodataBasics.

Martin R, Petty T, Clingerman J, Boettner F, Letsinger S, Strager J, Hereford A, Hansen E. 2012-2013. Midwest Fish Habitat Partnership fish habitat modeling results: Driftless Area Restoration Effort, Ohio River Basin FHP, Southeast Aquatic Resource Partnership, Fishers and Farmers FHP, Great Lakes FHP, Midwest Glacial Lakes Partnership. Prepared for National Fish Habitat Partnership. Downstream Strategies, West Virginia University, and GeodataBasics.

McIlmoil R, Hansen E, Betcher M, Hereford A, Clingerman J. 2012. The impact of coal on the Pennsylvania state budget. 2012. Downstream Strategies.

McIlmoil R, Askins N, Clingerman J. 2012. The opportunities for distributed renewable energy in Kentucky. Downstream Strategies.

Hartz L, Boettner F, Clingerman J. 2011. Greenbrier Valley local food: the possibilities and potential. Prepared for Greenbrier Valley Economic Development Corporation. Downstream Strategies.

Clingerman J. 2008. Statewide analysis of brook trout (Salvelinus fontinalis) population status and reach-scale conservation priorities in West Virginia watersheds. Master's Thesis. WVU.

Keener L, Clingerman J. 2008. Trail natives: eastern brook trout. *Appalachian Trail Magazine* (May-June):44-5.

Clingerman J, Bebak-Williams J, Summerfelt S. 2006. Carbon dioxide avoidance response used to improve fish transfer and harvest. *Global Aquaculture Advocate*, 9(2):44-5.

Academic and professional conference presentations

Clingerman J, Boettner F, Petty T, Orr F. 2016. A Multi-Scale Web-Based Fish Habitat Decision Support Tool. Oral presentation at the Southern Division of the American Fisheries Society Spring Meeting, Wheeling, W.Va. Feb 15.

Clingerman J, Boettner F, Petty T, Orr F. 2016. A Multi-Scale Web-Based Fish Habitat Decision Support Tool. Poster presentation at the Association of Mid-Atlantic Aquatic Biologists Annual Meeting, Berkeley Springs, W.Va. Mar 1.

Clingerman, JW, Petty JT, Boettner F, Letsinger S, Strager J. 2012. GIS habitat modeling: Details of the boosted regression tree modeling process for the Midwest regional fish habitat assessment. Oral presentation at the Annual Meeting of the American Fisheries Society, St. Paul, MN. Aug 19-23.

Clingerman JW, Petty JT, Mazik P. 2008. Brook trout (Salvelinus fontinalis) population types and mapping statewide population status. Oral presentation at the Southern Division of American Fisheries Society Spring Meeting, Wheeling, W.Va. Feb 28-Mar 2.

Clingerman JW, Petty JT, Mazik P. 2007. GIS-based landscape model to predict brook trout distributions in West Virginia, Oral presentation at the Southeastern Association of Fish and Wildlife Agencies meeting, Charleston, W.Va. Nov 7-9.

Public service

USGS Cooperative Research Unit, Public Outreach Volunteer, 2007
Friends of Deckers Creek, Field Sampling Volunteer, 2004.

ALYSSA BROOKE HANNA

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Davis, WV 26260
304.906-7005
ahanna@downstreamstrategies.com

Professional Profile

Downstream Strategies, LLC — Davis, W.Va.
Staff Botanist, 2018-present

Clients and funders include Canaan Valley Institute, West Virginia Department of Environmental Protection, Ecosystem Investment Partners, U.S. Forest Service, Maryland Department of Natural Resources, U.S. Fish and Wildlife Service Southwestern Virginia Field Office

Canaan Valley Institute — Davis, W.Va.
Education Coordinator, 2014-2018

Appalachian Forest Heritage Area AmeriCorps — Elkins, W.Va.
US Fish & Wildlife West Virginia Field Office AmeriCorps, 2013-2014

AmeriCorps VISTA — Elkins, W.Va.
Davis a& Elkins College Service Learning AmeriCorps, 2012-2013

Berea College — Berea, Kent.
Instructor of Biology, 2010-2012

West Virginia University — Morgantown, W.Va.
Lecturer, 2010

West Virginia University — Morgantown, W.Va.
Graduate Teaching Assistant, 2004-2010

Education

West Virginia University — Morgantown, W.Va.
Graduate studies and research in Biology, ABD 2004-2010

Ohio Wesleyan University — Delaware, Ohio
B.A. Botany and Microbiology awarded 2004.

Projects

Alyssa Hanna uses botany, microbiology, plant ecology, and GIS principles to assist in planning, field data collection and analysis for stream and wetland restoration projects, invasive species control plans, and wetland delineation. She has over 16 years of experience with invasive plant species identification, research, and control and over 12 years of experience with GIS and geostatistical analysis. Ms. Hanna has worked for a variety of clients in public, non-profit, and academia and focused on education and outreach, botany and plant ecology, field data collection and analysis, and GIS.

Stream Restoration

Provided assistance with field data collection including surveying, wetland delineation, and habitat assessment on seven stream and wetland restoration projects (Canaan Valley Institute, 2014-2018, various clients; Downstream Strategies, LLC, 2018-present for various clients).

Managed or assisted with permitting for five stream restoration projects (Canaan Valley Institute, 2017-2018; Downstream Strategies, LLC, 2018-present, for various clients).

Wrote or assisted with writing as-built reports and annual monitoring reports for In-Lieu Fee and Mitigation Bank projects (Canaan valley Institute, 2017-2018; Downstream Strategies, 2018-present, for various clients.)

Used bioengineering to improve wetland habitat at the Kump Education Center (Appalachian Forest Heritage Area AmeriCorps, 2013-2014, for Kump Education Center).

Experienced with data collection and analysis of water chemistry and benthic macroinvertebrates as well as establishing and monitoring long-term plots including site characterization and baseline management (WVU, 2006-2009; Canaan Valley Institute, 2016-2018, for various clients; Downstream Strategies, LLC, 2018-present for various clients).

Conducting trainings in water quality sampling using chemistry and benthic macroinvertebrates for students and teachers (WVU, 2006-2009; Canaan Valley Institute, 2016-2017).

Invasive Species

Over fifteen years of experience with invasive plant species identification, research, and control. (Ohio Wesleyan University, 2002-2004; WVU, 2004-2010; Canaan Valley Institute, 2017-2018; Downstream Strategies, LLC, 2018-present).

Designed and implemented the Adaptive Management Plan for invasive species control of the Morgan Wetland In-Lieu Fee Program Wetland Mitigation Site (Canaan Valley Institute, 2016-2018; Downstream Strategies, LLC, 2018- present, for WV Department of Environmental Protection).

Designed and implemented the Adaptive Management Plan for the Tomlinson Run In-Lieu Fee Program Stream Restoration Project (Downstream Strategies, LLC, 2018- present, for WV Department of Environmental Protection).

Provided capacity building assistance for the Potomac Highlands Cooperative Weed and Pest Management Area including outreach materials and newsletters (Appalachian Forest Heritage Area AmeriCorps, 2013-2014).

Assisted with biological control efforts of purple loosestrife throughout Randolph and Upshur Counties, West Virginia (Appalachian Forest Heritage Area AmeriCorps, 2013-2014 for US Fish and Wildlife Service, and WV Division of Natural Resources).

Mentored a Berea College undergraduate student who studied the presence and locations of invasive species at Indian Fort Mountain and established monitoring plots (Berea College, 2011).

Knowledgeable of a variety of statistical software programs, including SAS JMP, S-PLUS, R, MATLAB, MINITAB, Microsoft Excel, and PASW Statistics, and adept in organizing and managing large datasets.

Performed demographic census on *Ailanthus altissima* individuals in five habitats over four years to determine environmental and population factors that influence population growth using matrix modeling (WVU, 2005-2009).

Examined the effects of allelopathy and competition with *A. altissima* on seedlings of *Liriodendron tulipifera* and *Robinia pseudoacacia* in a modified de Wit and additive design greenhouse study (WVU, 2005-2006).

Investigated the novel weapons hypothesis through the perspective of the native plant American ginseng. Seeds, seedlings, and adult ginseng plants were grown under the native allelopathic tree *Juglans nigra* and the invasive allelopathic tree *A. altissima* (WVU, 2007-2011).

Studied the distribution, encroachment, and photosynthetic rates of Alliaria petiolata in the Ohio Wesleyan University Kraus Nature Preserve (Ohio Wesleyan University, 2003-2004).

GIS

Experienced in creating maps to showcase wastewater and stream restoration project locations and details for proposals and reports (Canaan Valley Institute, 2016-2018)

Created maps of known locations and analyzed demographic information for state-wide, three-year datasets for northern long-eared bat (*Myotis septentrionalis*) and eastern small-footed bat (*Myotis leibii*) for US Fish and Wildlife Service West Virginia Field Office and West Virginia Division of Natural Resources. The northern long-eared bat maps and analysis were used to determine this species potential for listing as federally threatened species (Appalachian Forest Heritage Area AmeriCorps, 2014, for US Fish and Wildlife Service, and WV Division of Natural Resources).

Mapped and analyzed the distribution of *Ailanthus altissima* along roadway corridors across the Mid-Atlantic region (WVU, 2008-2010).

Mentored a Berea College undergraduate student to create a new hiking trail map for Indian Fort Mountain (Berea College, 2011).

Education and Outreach

Over fourteen years of experience as a professional educator working with K-adult students (WVU, 2004-2010; Berea College, 2010-2012; AmeriCorps VISTA, 2012-2013; Appalachian Forest Heritage Area AmeriCorps, 2013-2014, Canaan Valley Institute 2014-2018).

Collaborated on education opportunities with local schools and agencies such as NASA IV&V, Dominion Energy, Mountaineer Wind Energy Center, National Youth Science Foundation, Canaan Valley National Wildlife Refuge, The Nature Conservancy, United States Forest Service – Monongahela National Forest, West Virginia Division of Agriculture, West Virginia Division of Forestry, and West Virginia Division of Natural Resources (Canaan Valley Institute, 2014-2018, for various clients).

Developed and coordinated energy-focused inquiry-based learning activities with middle schools students in class and as a summer camp (Canaan Valley Institute, 2015-2016).

Worked independently to develop and present education and outreach materials on biological and environmental topics increasing awareness of ecological concerns (Appalachian Forest Heritage Area AmeriCorps, 2013-2014).

Engaged Davis & Elkins College students in community service activities where they served 590 hours, and provided assistance for faculty members interested in incorporating service-based learning into their curriculum. (AmeriCorps VISTA, 2012-2013).

Developed and implemented four courses for introductory students and upperclassmen on general biology, botany, and ecology. To achieve this, Ms. Hanna wrote lectures, developed classroom activities, created exams, and crafted laboratory and field activities to instill a solid foundation of biological knowledge, critical thinking skills, and problem-solving skills (Berea College, 2010-2012).

Supervised twelve student teaching assistants who aided in managing teaching laboratories (Berea College, 2010-2012).

Mentored a Berea College undergraduate student who studied the presence and locations of invasive species at Indian Fort Mountain and established monitoring plots. We also created a new hiking trail map for Indian Fort Mountain (Berea College, 2011).

Wrote and presented lectures, created exams, and developed classroom activities for two lecture courses geared toward non-biology majors that covered a wide range of topics from human physiology to ecology (WVU, 2010).

Prepared and presented laboratory lectures, provided student instruction, and graded laboratory reports for four different biology classes over twelve semesters (WVU, 2004-2010).

Assisted in mentoring and supervising four undergraduate summer conservation interns. In addition to assisting in field research, each intern developed and performed his/her own research project conducted over the summer (WVU, 2005-2006).

Mentored a West Virginia University undergraduate student who studied effects of *Ailanthus altissima* allelochemical compounds on germination of native tree seeds in field and greenhouse settings. (WVU, 2006).

Certifications / Memberships

Certifications
Certified Interpretive Guide – National Association for Interpretation, 2018-preesnt.
Certified Herbicide Applicator in West Virginia – WV Department of Agriculture, 2017-present.
Project WET Certified trainer – WV Department of Environmental Protection 2013- present.
Certified Master Naturalist – West Virginia Master Naturalist Program 2008-present.

Member
West Virginia Sustainable Schools Advisory Council, 2014-2017.
Tucker County Project Lead the Way Advisory Council, 2014-2017.
Tucker County STEM Network School Advisory Council, 2014-2017.
West Virginia Environmental Education Association Leadership Team, 2014-2016
Sigma Xi National Research Honorary, 2004-2012.
Phi Sigma Biological Sciences Honor Society, 2004.
Ecological Society of America, 2003-2012.
Association for Women in Science, 2001-2008.

Training completed

Project WET Certification, WV Department of Environmental Protection, 2013
Project Learning Tree Certification, WV Division of Forestry, 2013
First Aid/CPR training, American Red Cross, 2012
WVU Summer Institute on Undergraduate Science Education training, 2008
Grant Writing Course, WVU, 2007

Publications

Conferences

Hanna, A.B. 2016. Energy-focused inquiry-based learning: A study in methodology. Oral presentation presented at West Virginia Science Teachers Association Annual Meeting. Morgantown, West Virginia.

Hanna, A.B., Murphy E, and Carnell L. 2016. "Meet your new curriculum best friends: Project WET, Project WILD, and Project Learning Tree. Oral presentation presented at West Virginia Science Teachers Association Annual Meeting. Morgantown, West Virginia.

Fenwick-Judy, V. and Hanna A.B. 2015. Pathways to becoming a West Virginia Sustainable School. Oral presentation presented at West Virginia Science Teachers Association Annual Meeting. Flatwoods, West Virginia.

Fenwick-Judy, V. and Hanna A.B. 2014. The West Virginia Sustainable School Program. Oral presentation presented at West Virginia Science Teachers Association Annual Meeting. Daniels, West Virginia.

Webb, K.D. and Hanna, A.B. 2011. "Detection and mapping of invasive plant species and hiking trails at Indian Fort Mountain in Berea, KY." Poster presented at the Berea Undergraduate Research Symposium and at the Kentucky Academy of Sciences Annual Meeting.

Hanna, A.B. 2009. "Demographic modeling of the invasive tree, *Ailanthus altissima*" Oral presentation presented at the 94th Annual Meeting of the Ecological Society of America. Albuquerque NM.

Hanna, A.B. and McGraw, J.B. 2008. "The role of genetic variation and allelopathy in competitive effects of *Ailanthus altissima* on *Liriodendron tulipifera*." Oral presentation presented at the 93rd Annual Meeting of the Ecological Society of America. Milwaukee, WI.

Hanna, A.B. and McGraw, J.B. 2006. "The potential role of allelochemical compounds in altering of interspecific and intraspecific competitive effects in *Ailanthus altissima* and *Robinia pseudoacacia*." Oral presentation presented at the 91st Annual Meeting of the Ecological Society of America. Memphis, TN.

Hanna, A.B. and Anderson, L.J. 2004. "Demography and physiology of the invader Alliaria petiolata in a Central Ohio mesic forest." Poster presented at the 89th Annual Meeting of the Ecological Society of America. Portland, OR.

Hanna, A.B. and Anderson, L.J. 2003. "Invasion of *Alliaria petiolata* in a mesic forest in Central Ohio." Poster presented at the Invasive Plants in Natural and Managed Systems: Linking Science and Management in conjunction with the 7th International Conference on the Ecology and Management of Alien Plant Invasions. Fort Lauderdale, FL.

Other reports

Canaan Valley Institute. 2017. Gandy Creek In-Lieu Fee mitigation project as-built report. (Canaan Valley Institute Authors Newland, J, Hanna A, Saville J, Watson E.).

Canaan Valley Institute. 2017. Hillcrest Wildlife Management Area In-Lieu Fee mitigation project: Annual monitoring report –Year 1. (Canaan Valley Institute Authors Miller, T, Hanna A, Watson E.).

Canaan Valley Institute. 2017. Morgan Wetland In-Lieu Fee mitigation project: Annual monitoring report – Year 2. (Canaan Valley Institute Authors Miller, T, Hanna A, Postlethwait W).

Canaan Valley Institute. 2017. Nathaniel Mountain Wildlife Management Area In-Lieu Fee mitigation project: Annual monitoring report –Year 2. (Canaan Valley Institute Authors Miller, T, Hanna A, Postlethwait W.).

Canaan Valley Institute. 2017. Lower Dempsey Creek mitigation bank project: Annual monitoring report –Year 1. (Canaan Valley Institute Authors Miller, T, Hanna A, Postlethwait W, Watson E.)

Canaan Valley Institute. 2017. Hillcrest Wildlife Management Area In-Lieu Fee mitigation project as-built report. (Canaan Valley Institute Authors Miller, T, High K, Saville J, Watson E, Hanna A.).

Invited Academic and professional presentations

Hanna, A. 2016. "The Wonderful World of Wetlands!" Invited lecture presented at the Junior Conservation Camp by the West Virginia Youth Environmental Program at Canaan Valley, West Virginia.

Fenwick-Judy, V. and Hanna, A.B. 2016. Hosted Environmental Science Forum at the West Virginia Science Teachers Association Annual Meeting in Morgantown, West Virginia

Hanna, A. 2009. "Spatial analysis and demographic modeling of the invasive tree, *Ailanthus altissima*" Invited lecture at Ohio Wesleyan University

Hanna, A. 2006. "What foresters should know about *Alliaria petiolata*" Invited lecture presented at Invasives, Forest Health, and Productivity Seminar for foresters and land managers at Crummies Creek Tree Farm

Awards

- Davis & Elkins College Chapter of the National Society of Leadership and Success Award for Outstanding Service to Students, 2013.

Public Service

- New Historic Thomas Board President, 2018-present.
- New Historic Thomas Board Member, 2016-2017.
- Volunteer for Canaan Valley Wildlife Refuge, 2006-presnt.
- Volunteer for Friends of Blackwater, 2015- present.
- Canaan Valley Master Naturalist Course Presenter for Names, Identification, and Classification; Invasive Species; and Threatened and Endangered Species, 2009, 2013-present.
- Garlic Mustard Challenge Invasive Species Removal organizer (2008-2010, 2014) and volunteer (2013, 2014).

APPENDIX C: CVS FOR THRASHER PROJECT TEAM MEMBERS

Daniel Ferrell, PE
Principal-in-Charge

Dan Ferrell, PE, is a tenured Project Manager with nearly 30 years of experience in project design and management within the public utility sector. Dan has worked on water system solutions throughout the Mid-Atlantic region. These projects have ranged from small water line extensions to new treatment plants and even emergency water system rehabilitations through FEMA. Dan's ability to understand his client's goals stems in part from his time serving as the Director of Public Works and City Engineer for the City of Bridgeport, West Virginia. During this time, he was responsible for water, sanitary sewer, and stormwater infrastructure for the growing city. Dan has taken that time spent as the client and translated it over to become a highly skilled engineering consultant.

Education
Master of Science,
Civil Engineering
Old Dominion University

Bachelor of Science,
Civil Engineering
West Virginia University

Joined Thrasher
2004

Registrations
Professional Engineer:
West Virginia
Pennsylvania
Virginia

Registered Professional Engineer (PE)
States of West Virginia (#13462), Pennsylvania (#PE071143), and Virginia (#0402023968)

Certifications, Affiliations, and Trainings
West Virginia Municipal Water Quality Association
West Virginia Rural Water Association

Related Experience Includes:

- West Virginia Statewide Comprehensive Water Service Planning Study – State of West Virginia
- City of Ripley - Source Water Protection Plant
- Ripley Water Pressure Upgrade Project- Jackson County, West Virginia
- Capon Bridge Water System Improvements Project - Hampshire County, WV
- Charles Pointe Development United Hospital Center Water Project – Harrison County, WV

- City of Bridgeport Water System Upgrades - Harrison County, WV
- City of Mount Hope Water Tank Project – Fayette County, WV
- City of Romney Water Treatment Plant Secondary Power System - Hampshire County, West Virginia
- City of Richwood Water System Rehabilitation Project – Nicholas County, West Virginia
- Greater Harrison Public Service District Overall Water System Improvements- Harrison County, West
- Marshall County Public Service District No. 3 Water System Extension and Improvements- Marshall County, West Virginia
- Page-Kincaid Public Service District Water System Upgrades – Fayette County, West Virginia
- Paw Paw Route 19 Public Service District Water System Improvements Project - Marion/Monongalia Counties, West Virginia

Wm. Randy Watson
Project Manager

Randy Watson has been part of The Thrasher Group for over 30 years and has spent the vast majority of his career helping communities across West Virginia develop safe and sustainable water infrastructure. Mr. Watson has worked with countless clients to design new water systems from the ground up, in addition to thousands of miles of extensions. He specializes in challenging water loss projects and is able to pinpoint problem areas that drastically reduce unaccounted water usage. His combination of design ingenuity and knack for troubleshooting failing systems has allowed Mr. Watson to help several small municipalities that would otherwise not have been able to complete projects. Additionally, he has mastered the art of funding public utility projects through extensive agency research and practical application. He has helped fund some of the most critical and complex projects within the area. Today, Nr. Watson still works for his very first client from 1984. His ability to develop creative funding packages, paired with his strong relationships among the various funding authorities, ensures his clients are receiving the maximum dollars available for their projects.

Education
Bachelor of Science,
Mining Engineering Technology
Fairmont State University

Associate of Science,
Design and Drafting
Fairmont State University

Joined Thrasher
1984

Registrations
N/A

Certifications, Affiliations, and Trainings
American Water Works Association

Related Experience Includes:

- State of West Virginia Water Development Authority - Statewide Comprehensive Study for Water, Wastewater and Stormwater - Statewide, West Virginia
- Paden City Meadow Heights Water Line Replacement Project - Tyler and Wetzel Counties, West Virginia
- City of Cameron Water System Replacement - Marshall County, West Virginia
- Ellenboro-Lamberton Public Service District Water Extension Project – Ritchie County, West Virginia
- West Virginia Conservation Agency Tygart Valley District, Barbour County Water Resource Study – Barbour County, West Virginia

- Equitrans Water Line Extensions and Fire Suppression System - Wood County, West Virginia
- Grandview Doolin Public Service District Water Line Extension and Water System Improvements - Wetzel County, West Virginia
- Gilmer County Public Service District Water Line Extensions - Gilmer County, West Virginia
- Gilmer County Public Service District Route 5 Water Line Extension - Gilmer County, West Virginia
- Town of Bath (Berkeley Springs Water Works) Multi-Phase Water System Replacement Project - Morgan County, West Virginia
- Hastings Water Extensions and Fire Suppression System - Wetzel County, West Virginia
- Marshall County Public Service District Water System Improvements, Extensions, Storage Tanks, and Radio Read Meters – Marshall County, West Virginia
- Middlebourne Municipal Water Works, Water System Extension and Upgrades - Tyler County, West Virginia
- Town of Elizabeth Water System Extensions - Wirt County, West Virginia
- Town of Farmington Water Line Replacement - Marion County, West Virginia
- Town of Union Water Line Extension and Proposed Water Tank - Monroe County, West Virginia
- Town of Williamsport Phase II Water System Improvements - Washington County, Maryland
- Water Tanks and Fire Suppression at Leidy Station - Clinton County, Pennsylvania

Kylea Radcliff
Project Manager
Kylea Radcliff, EI, provides engineering solutions in water and wastewater applications. She is responsible for the development of projects and takes them from the preliminary engineering report stages to completion. Ms. Radcliff has written numerous engineering reports that have helped her clients secure funding to move these jobs to construction. She is also responsible for the design of water and wastewater projects and works closely with project managers to meet all of the client's needs. She began her career at Thrasher as a summer intern in the utility department. Since then, she has joined the firm full time and is serving as project manager for numerous projects from preliminary steps through closeout. She is dedicated to designing projects that meet her client's needs and improve their systems.

Education
Bachelor of Science,
Civil Engineering
West Virginia University

Joined Thrasher
2009

Registrations
Registered Engineer in Training
State of West Virginia [redacted]

Certifications, Affiliations, and Trainings
ACEC Waste and Storm Water Gold Award Winner

Related Experience Includes:
- Greater Harrison Public Service District Complete Water System Upgrades - Harrison County, West Virginia
- Greater Harrison County Public Service District Lost Creek Water Supply Replacement Project – Harrison County, West Virginia
- Hamrick Public Service District Water Line Extensions - Tucker County, West Virginia
- Hardy County Public Service District Baker Water Distribution System and Marvin Chapel Water System Extensions – Hardy County, West Virginia
- Sun Valley Public Service District Complete Water System Upgrades - Harrison County, West Virginia
- Town of Harman Water System Extension and Upgrades – Randolph County, West Virginia
- Town of Paw Paw Water System Upgrades and Extensions - Morgan County, West Virginia
- Town of Rowlesburg Water Line Extension to Etam and Macomber and 105,000 Gallon Storage Tank Project - Preston County, West Virginia

Eric Sherrard, EI
Project Engineer

Eric Sherrard, EI, joined Thrasher in 2009 and serves as a project engineer within the Utility Department. Mr. Sherrard assists in the planning and development of public water and wastewater projects for the firm. His responsibilities include the development of engineering reports and funding applications, creation of design documents, engineering during construction, and other engineering tasks. Mr. Sherrard also serves as a project manager for multiple public utility projects. Mr. Sherrard has experience in the design and construction of source water intakes, water line replacements and extension projects, and water storage tank construction and repair—and he is familiar with environmental and construction permitting requirements. He has been involved with the development of multi-phased projects during his time at Thrasher. Additionally, Mr. Sherrard has experience developing and utilizing GIS for public utilities.

Education
Bachelor of Science
Mechanical Engineering Technology
Fairmont State University

Coursework
Mechanical Engineering
Virginia Military Institute

Joined Thrasher
2009

Registrations
Registered Engineer in Training
State of West Virginia

Certifications, Affiliations, and Trainings
American Society of Mechanical Engineers
ACEC Waste and Storm Water First Place Award
Safe Land USA Training

Related Experience Includes:

- Regions I, II, VII and VIII Planning and Development Councils - Source Water Protection Plan Projects - 35 total utilities
- Birchfield Water Association Water System Improvements – Monongalia County, West Virginia
- Grandview Doolin Public Service District Water Line Extension and Water System Improvements - Wetzel County, West Virginia
- Kingwood Water Works Source Water Protection Contingency Plan – Preston County, West Virginia

- Lewis County Economic Development Council Water Line Extensions Project – Lewis County, West Virginia
- Malden Public Service District Sewer System Improvements Project – Kanawha County, West Virginia
- Marshall County Public Service District No. 3 Water System Extension and Improvements - Marshall County, West Virginia
- Preston County PSD No. 1 Source Water Protection Contingency Plan – Preston County, West Virginia
- River Road Public Service District Water System Improvements Project - Monongalia County, West Virginia
- Romney Secondary Power Source for Water System Project - Hampshire County, West Virginia
- Town of Burnsville Rt. 5 Water Line Extension and Water System Improvements Project- Braxton County, West Virginia
- Town of Capon Bridge Water System Improvements – Hampshire County, West Virginia
- Town of Rowlesburg Source Water Protection Contingency Plan – Preston County, West Virginia

Caitlyn Preast, EI
Project Engineer

Caitlyn Preast, EI, is a 2013 West Virginia University Institute of Technology graduate with a Bachelor of Science degree in Civil Engineering. While specializing in site development, she has also been involved in utility system and architecture projects. She joined Thrasher with practical experience as a professional engineer intern in the Facility Asset Management Department of Walt Disney Parks and Resorts. At Thrasher, Ms. Preast serves as a project engineer and has developed specific expertise supporting the development and implementation of source water protection plans, capital improvement plans, and water and sewer system improvements. Her attention to detail for submittal reviews makes her a key member of any team. Her skills with AutoCAD Civil 3D to assist site development grading, utility layouts and designs, and erosion and sediment control measures provide value to any project, as well as her proficiency in construction administration and project scheduling.

Education
Bachelor of Science,
Civil Engineering
West Virginia University Institute of Technology

Joined Thrasher:
2014

Registrations
Engineering Intern (EI)
State of West Virginia[redacted]

Certifications, Affiliations, and Trainings
N/A

Related Experience Includes:

- Buffalo Creek PSD Source Water Protection Plan
- City of Logan Water Source Water Protection Plan
- Fort Gay Water Works Source Water Protection Plan
- Gilbert Water Works Source Water Protection Plan
- Kenova Municipal Water Source Water Protection Plan
- Kermit Water Works Source Water Protection Plan
- Lincoln PSD Source Water Protection Plan
- Logan County Public Service District Source Water Protection Plan
- Man Water Works Source Water Protection Plan
- Matewan Water Works Source Water Protection Plan
- Milton Water Source Water Protection Plan
- Mingo County PSD Naugatuck Source Water Protection Plan
- Wayne Water Source Water Protection Plan

- West Hamlin Municipal Water Source Water Protection Plan
- Williamson Water Source Water Protection Plan

Logan Alastanos
Staff Engineer

Logan Alastanos helps with numerous water and sanitary sewer projects across West Virginia. Mr. Alastanos works with project managers and division leaders to prepare and review preliminary engineering reports, asset management plans, and various funding applications. His understanding of public utility infrastructure in West Virginia has enabled him to work with an array of funding and regulatory agencies to deliver technically sound projects within stringent budgets. As part of his duties, he spends much of his time providing design edits for the engineering staff and comparing desktop data to that collected in the field.

Education
Bachelor of Science,
Civil Engineering
West Virginia University

Joined Thrasher
2017

Registrations
N/A

Affiliations
Safeland
First Aid/CPR

Related Experience Includes:

- Turkey Run and Hoop Pole Run Road Water Line Extension
- Hardy County PSD Proposed Water Line Extensions and Improvement Project
- Paden City Water Improvements Project
- Doddridge County Athletic Complex Utilities
- Town of Rowlesburg Water Line Extension
- Sun Valley General Services

Eleni Brick
Staff Engineer Technician

Eleni Brick helps with numerous water, sanitary sewer, and stormwater projects across West Virginia. She works directly with Thrasher's team of engineers to prepare and review preliminary engineering reports, asset management plans, and various funding applications. Her understanding of public utility infrastructure in the Mountain State has enabled her to work with an array of funding and regulatory agencies to deliver technically sound projects within stringent budgets. As part of her duties, Ms. Brick spends much of her time providing detailed reports and analysis for the engineering staff.

Education
Bachelor of Science,
Applied Physics
West Virginia Wesleyan College

Joined Thrasher
2017

Registrations
N/A

Affiliations
American Water Works Association
West Virginia Water Environment Association

Related Experience Includes:

- Town of Monongah Water System Improvements, Marion County, WV
- Town of Elizabeth Water Line Extension Project, Wirt County, WV

APPENDIX D: REQUIRED FORMS

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: _____

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

[✓] Addendum No. 1	[ ] Addendum No. 6
[✓] Addendum No. 2	[ ] Addendum No. 7
[ ] Addendum No. 3	[ ] Addendum No. 8
[ ] Addendum No. 4	[ ] Addendum No. 9
[ ] Addendum No. 5	[ ] Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Downstream Strategies
Company

Authorized Signature

6/14/2018
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.
Revised 6/8/2012

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

President
(Name, Title)

Evan Hansen, President
(Printed Name and Title)

911 Greenbag Road, Morgantown, WV 26508
(Address)

(304) 291-8205 No fax number
(Phone Number) / (Fax Number)

ehansen@downstreamstrategies.com
(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Downstream Strategies
(Company)

President
(Authorized Signature) (Representative Name, Title)

Evan Hansen, President
(Printed Name and Title of Authorized Representative)

6/14/2018
(Date)

(304) 291-8205 No fax number
(Phone Number) (Fax Number)