



TETRA TECH

Jon C. Ludwig
Director

September 18, 2008

ORIGINAL

Ms. Roberta Wagner, Buyer
State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Subject: Expression of Interest to provide Architectural/Engineering services for the Source Water Protection Technical Help Program

West Virginia Vendor ID : 317151437

Dear Ms. Wagner:

Tetra Tech, Inc. is pleased to present the State of West Virginia, Department of Administration Purchasing Division (State) and the West Virginia Department of Health and Human Resources, Bureau of Public Health (DHHR BPH) our Expression of Interest (EOI) to provide Architectural/Engineering services to support the Source Water Protection Technical Help Program. This submittal includes one original plus 7 courtesy copies of our EOI. As requested, this EOI specifically addresses our qualifications, past performance on directly related projects, and our proposed technical approach and timeline.

Successfully completing this project will require very aggressive project schedules that progress simultaneously. Over the past 6 years, Tetra Tech has successfully demonstrated the ability to meet similar challenges for West Virginia Department of Environmental Protection, Division of Water and Waste Management (see attached reference letter).

The members of our team have extensive local knowledge and possess a breadth of experience, which ensures that each component of the source water protection process is conducted by staff with directly relevant experience. We have selected Buchart Horn, Inc., based in Charleston, WV as a teaming partner to provide support in the areas of field management activities, data collection and monitoring. We feel that our team can provide DHHR BPH with unmatched experience in all of the skill areas required for successful completion of Source Water Assessment Protection (SWAP) plans for each community public water supply encompassed in the St. Albans and Wheeling Districts.

Tetra Tech appreciates the opportunity to submit our qualifications for this project. If you should have any questions about the information provided, please feel to contact me at 414-0054, extension 101.

Sincerely,

Jon C. Ludwig

Director

RECEIVED

08 SEP 18 AM 11:55

PURCHASING DIVISION
STATE OF WV

Tetra Tech, Inc.

405 Capitol Street, Suite 608

Tel 304 414 0054 Fax 304 720 2334 www.tetrattech.com

GENERAL TERMS & CONDITIONS
REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)

1. Awards will be made in the best interest of the State of West Virginia.
2. The State may accept or reject in part, or in whole, any bid.
3. All quotations are governed by the *West Virginia Code* and the *Legislative Rules* of the Purchasing Division
4. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required \$125 fee.
5. All services performed or goods delivered under State Purchase Order/Contracts are to be continued for the term of the Purchase Order/Contracts, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods, this Purchase Order/Contract becomes void and of no effect after June 30.
6. Payment may only be made after the delivery and acceptance of goods or services.
7. Interest may be paid for late payment in accordance with the *West Virginia Code*.
8. Vendor preference will be granted upon written request in accordance with the *West Virginia Code*
9. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.
10. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.
11. The laws of the State of West Virginia and the *Legislative Rules* of the Purchasing Division shall govern all rights and duties under the Contract, including without limitation the validity of this Purchase Order/Contract.
12. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.
13. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, this Contract may be deemed null and void, and terminated without further order.
14. **HIPAA BUSINESS ASSOCIATE ADDENDUM:** The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, and available online at the Purchasing Division's web site (<http://www.state.wv.us/admin/purchase/vrc/hipaa.htm>) is hereby made part of the agreement. Provided that, the Agency meets the definition of a Cover Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.
15. **WEST VIRGINIA ALCOHOL & DRUG-FREE WORKPLACE ACT:** If this Contract constitutes a public improvement construction contract as set forth in Article 1D, Chapter 21 of the West Virginia Code ("The West Virginia Alcohol and Drug-Free Workplace Act"), then the following language shall hereby become part of this Contract: "The contractor and its subcontractors shall implement and maintain a written drug-free workplace policy in compliance with the West Virginia Alcohol and Drug-Free Workplace Act, as set forth in Article 1D, Chapter 21 of the West Virginia Code. The contractor and its subcontractors shall provide a sworn statement in writing, under the penalties of perjury, that they maintain a valid drug-free work place policy in compliance with the West Virginia and Drug-Free Workplace Act. It is understood and agreed that this Contract shall be cancelled by the awarding authority if the Contractor: 1) Fails to implement its drug-free workplace policy; 2) Fails to provide information regarding implementation of the contractor's drug-free workplace policy at the request of the public authority; or 3) Provides to the public authority false information regarding the contractor's drug-free workplace policy."

INSTRUCTIONS TO BIDDERS

1. Use the quotation forms provided by the Purchasing Division.
2. **SPECIFICATIONS:** Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder. Alternates offered by the bidder as **EQUAL** to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications.
3. Complete all sections of the quotation form.
4. Unit prices shall prevail in case of discrepancy.
5. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.
6. **BID SUBMISSION:** All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications: Department of Administration, Purchasing Division, 2019 Washington Street East, P.O. Box 50130, Charleston, WV 25305-0130



west virginia department of environmental protection

Division of Water and Waste Management
601 5th Street, S. E.
Charleston, WV 25304
Phone number: (304) 926-0495
Fax number: (304) 926-0496

Joe Manchin III, Governor
Randy C. Huffman, Cabinet Secretary
www.wvdep.org

September 17, 2008

To whom it may concern:

This letter serves as a recommendation for the utilization of Tetra Tech and Jon Ludwig for future water resources projects.

Tetra Tech has supported WVDEP's total maximum daily load (TMDL) development efforts over the past six years. The scope and magnitude of the TMDL program requires very aggressive project schedules that progress simultaneously. It is critical that these schedules are maintained because new, large projects begin each year, incrementally increasing the workload as the TMDL program cycles through five hydrologic groupings of West Virginia watersheds. The strong leadership of Tetra Tech's management team and the exceptional performance of their technical staff have provided WVDEP with high-quality and cost-effective products under past and existing contracts.

I have personally worked with Jon Ludwig since 2001, and I highly recommend the water resource management services of him and Tetra Tech.

Sincerely,

A handwritten signature in blue ink that reads "D. A. Montali".

David A. Montali
TMDL Program Manger



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER
 EHS90039

PAGE
 1

ADDRESS CORRESPONDENCE TO ATTENTION OF
 ROBERTA WAGNER
 304-558-0067

RFQ COPY
 TYPE NAME/ADDRESS HERE

Tetra Tech, Inc.
 405 Capitol Street, Suite 608
 Charleston, WV 25301

HEALTH AND HUMAN RESOURCES
 BPH ENVIRO HLTH SERVICES
 CAPITOL AND WASHINGTON STREETS
 1 DAVIS SQUARE, SUITE 200
 CHARLESTON, WV
 25301-1798 304-558-2981

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
08/05/2008				
BID OPENING DATE: 09/18/2008		BID OPENING TIME 01:30PM		

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	JB		906-00-00-001		
<p>ARCHITECT/ENGINEERING SERVICES, PROFESSIONAL</p> <p>EXPRESSION OF INTEREST (EOI) FROM QUALIFIED FIRMS TO PROVIDE ARCHITECTURAL/ENGINEERING SERVICES FOR THE SOURCE WATER PROTECTION TECHNICAL HELP PROGRAM (SWPTHP) AS DESCRIBED IN THE ATTACHED SPECIFICATIONS.</p> <p>A MANDATORY PRE-BID CONFERENCE WILL BE HELD ON 8/28/8 AT 9:00 A.M. AT THE DHHR/BUREAU FOR PUBLIC HEALTH, OFFICE OF ENVIRONMENTAL HEALTH SERVICES LOCATED AT ONE DAVIS SQUARE, SUITE 200, CHARLESTON, WV 25301-1798. FAILURE TO ATTEND THE MANDATORY PRE-BID CONFERENCE SHALL AUTOMATICALLY RESULT IN DISQUALIFICATION.</p> <p>EXHIBIT 3</p> <p>LIFE OF CONTRACT: THIS CONTRACT BECOMES EFFECTIVE ON AWARD OF CONTRACT AND EXTENDS FOR A PERIOD OF ONE (1) YEAR OR UNTIL SUCH "REASONABLE TIME" THEREAFTER AS IS NECESSARY TO OBTAIN A NEW CONTRACT OR RENEW THE</p>						

ORIGINAL

SIGNATURE		TELEPHONE		DATE
		304-414-0054		September 18, 2008
TITLE	FEIN	DUNS#	ADDRESS CHANGES TO BE NOTED ABOVE	
Director		198549560		

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

VENDOR OWING A DEBT TO THE STATE:

West Virginia Code §5A-3-10a provides that: No contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and the debt owed is an amount greater than one thousand dollars in the aggregate

PUBLIC IMPROVEMENT CONTRACTS & DRUG-FREE WORKPLACE ACT:

West Virginia Code §21-1D-5 provides that: Any solicitation for a public improvement construction contract shall require each vendor that submits a bid for the work to submit at the same time an affidavit that the vendor has a written plan for a drug-free workplace policy in compliance with Article 1D, Chapter 21 of the West Virginia Code. A public improvement construction contract may not be awarded to a vendor who does not have a written plan for a drug-free workplace policy in compliance with Article 1D, Chapter 21 of the West Virginia Code and who has not submitted that plan to the appropriate contracting authority in timely fashion. For a vendor who is a subcontractor, compliance with Section 5, Article 1D, Chapter 21 of the West Virginia Code may take place before their work on the public improvement is begun.

ANTITRUST:

In submitting a bid to any agency for the state of West Virginia, the bidder offers and agrees that if the bid is accepted the bidder will convey, sell, assign or transfer to the state of West Virginia all rights, title and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the state of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the state of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to the bidder.

I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership or person or entity submitting a bid for the same materials, supplies, equipment or services and is in all respects fair and without collusion or fraud. I further certify that I am authorized to sign the certification on behalf of the bidder or this bid

LICENSING:

Vendors must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agencies or political subdivision. Furthermore, the vendor must provide all necessary releases to obtain information to enable the Director or spending unit to verify that the vendor is licensed and in good standing with the above entities

CONFIDENTIALITY:

The vendor agrees that he or she will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the agency's policies, procedures and rules. Vendors should visit www.state.wv.us/admin/purchase/privacy for the Notice of Agency Confidentiality Policies.

Under penalty of law for false swearing (West Virginia Code §61-5-3), it is hereby certified that the vendor acknowledges the information in this said affidavit and is in compliance with the requirements as stated

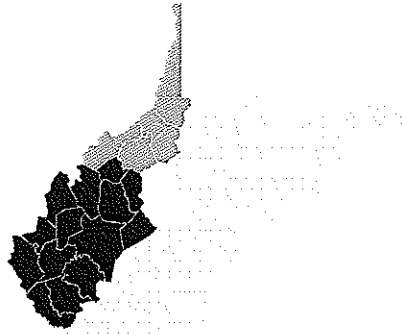
Vendor's Name: Tetra Tech, Inc.

Authorized Signature:  Date: September 15, 2008

Purchasing Affidavit (Revised 07/01/08)

ORIGINAL

1. Qualifications



Tetra Tech, Inc., is pleased to present our interest in pursuing architectural/engineering services with the West Virginia Department of Health and Human Resources, Bureau of Public Health (DHHR BPH). This package provides our qualifications to support the DHHR BPH in implementing the Source Water Protection Technical Help Program. The members of the proposed Tetra Tech team possess a breadth of experience, which ensures that each component of the source water protection process is conducted by staff with directly relevant experience. We feel we can provide DHHR BPH with unmatched experience in all of the skill areas required for successful completion of Source Water Assessment Protection (SWAP) plans for each community public water supply encompassed in the St. Albans and Wheeling Districts.

Our qualifications include:

- Local office in downtown Charleston, WV, across the street from the DHHR office with six regional water resources office locations with staff focused in all facets of water resources and potential contaminant source surveys.
- Extensive experience documenting and presenting potential sources of contamination throughout West Virginia watersheds.
- Experience with developing SWAP plans and drinking water vulnerability studies throughout the country.
- Extensive experience with public stakeholder facilitation and conducting training in all facets water resources management.
- Proposed staff who have consistently worked on key West Virginia projects for many years and can provide a high level of experience and continuity.
- Proposed staff who are adept at utilizing Microsoft Access and Arc 9.2 GIS utilizing them as primary tools for data storage, collection, and manipulation for other large West Virginia projects.
- Ability to provide local service as well as draw upon regional and national experts.

Tetra Tech is an environmental science and engineering firm. Founded in 1966, Tetra Tech and its subsidiaries have a staff of over 8,500 people representing over 40 scientific and engineering disciplines located in a nationwide network of 275 offices. Tetra Tech provides comprehensive engineering and consulting services focusing on innovative solutions to complex environmental problems. Tetra Tech is consistently ranked by the industry as a financially stable, top-quality environmental engineering firm. In 2008, the Engineering News-Record ranked Tetra Tech as #1 in Water for the fifth consecutive year. We were also ranked as #1 in Environmental Science and 6th overall in the "Top 200 Environmental Firms" in addition to several other Top 20 rankings. The broad technical expertise of the combined staff enables our individual offices to provide a tailored team of specialists to meet our clients' needs in a cost effective manner. Tetra Tech offers a full range of professional services related to water resources, surface and groundwater contaminant characterization, water quality modeling and analysis, environmental compliance, and remedial engineering. Tetra Tech can offer integrated services to clients combining all aspects of the project into one seamless team. We are always looking for ways to expand and enhance the field of water resources through unique applications, innovative tools and the integration of advancing technology.



Successfully completing this project will require very aggressive project schedules that progress simultaneously. Over the past 6 years, Tetra Tech has successfully demonstrated the ability to meet similar challenges by maintaining overall schedules and budgets while simultaneously managing **nine** large total maximum daily load (TMDL) projects for West Virginia Department of Environmental Protection (WVDEP). The local knowledge and experience gained from managing these projects as well as other large projects will be used to ensure that we have staff qualified to provide support across all of the technical service areas and to provide DHHR BPH with effective mechanisms for project tracking and management. Tetra Tech believes that every client's needs should be addressed on a project-by-project basis. This individual attention to clients and our production of the highest quality technical work are both demonstrated by our continued ability to successfully compete on contracts that are follow-on to work initially done by Tetra Tech.

Tetra Tech is proud of the outstanding business relationships we have formed with companies that have a proven ability to provide timely and excellent technical support to our projects. Because we have staff with expertise in all of the technical service areas, we are only anticipating the need to use subcontractor support for selected data gathering, monitoring, and field survey purposes. Buchart Horn, Inc., based in Charleston, WV, provides relevant experience in the areas of field management activities, data collection and monitoring, and assessments.

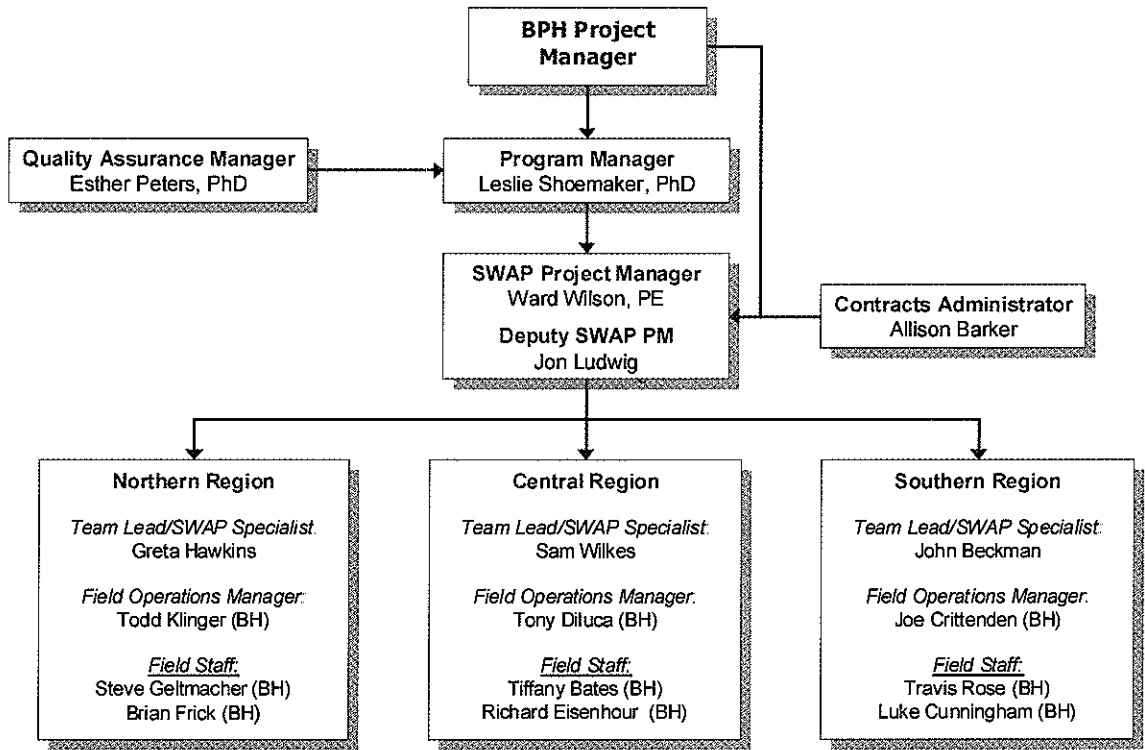
Buchart Horn, Inc., is one of the leading water resources planning and engineering firms in the Mid-Atlantic United States. For more than 61 years they have been performing engineering related to water treatment, storage and distribution, as well as hazardous waste remediation, environmental permitting, land reclamation and restoration, and myriad other services. With offices in Charleston and Morgantown, WV, and support locations in Pennsylvania, Maryland, and five other states, they are well suited to provide responsive service to DHHR. *Engineering News Record* ranks Buchart Horn among the top 200 environmental firms and the top 200 international design firms. With more than 330 professional and support personnel, they have the ability to meet the most aggressive schedule.

1.1. Project Management & Personnel

Tetra Tech will administer the proposed project from the Charleston, WV, office. Figure 1-1 shows the proposed program management organization. It features a core management team of dedicated senior managers who have clearly defined management roles to ensure timely, high-quality, cost-effective performance under the contract.

Furthermore, we can utilize our extensive technical expertise and resources from offices throughout the country (Fairfax, VA; Cleveland, OH; Atlanta, GA; Baltimore, MD; San Diego, CA; and Research Triangle Park, NC) to support the Source Water Protection Technical Help Program seamlessly and in an efficient, cost-effective manner.

To accomplish all of the tasks (public meetings, PCS survey, and reports) for each of the 60 community public water supply (CPWS) systems, we propose to separate the Wheeling and St Albans Districts into three geographic regions. A regional Team Leader (SWAP Specialist) will coordinate all tasks for each of the CPWS systems in their respective region so that all projects will run concurrently. The regional Team Leader will also work closely with the respective Field Operations Managers (Subcontractor Buchart Horn) on a daily basis to ensure that field operations and data collection proceed smoothly and efficiently.



Support Area Team Experts Available

Alternate Field Staff	Public Outreach	Hydrologists	GIS & Database Development	Technical Writers	BMP Planning
Jeffery Brittingham	Barry Toning	Roy Marroquin	Henry Manguerra, PhD	Christina Mellors	Trevor Clements
Nikolai Gurdian	Kimberly Brewer	David Skipp	John Zastrow	Kevin Kratt	Andrew Parker
Rachel Wiese	Trevor Clements	Mark Shupe	Sabu Paul PhD	Jessica Koenig	Tham Saravanapavan PE
		Larry Breckenridge		Teresa Rafi	Ward Wilson, PE
		Michael Kovacich		Herbert Brass, PhD	Clint Boschen
		Hua Zhang, PhD			

Figure 1-1. Organization of proposed Tetra Tech team.

1.1.1. Core Management Team

Based on the project’s scope and magnitude, it is critical that schedules are maintained to meet the objectives of the DHHR BPH and to stay within project budgets. This will not only require exceptional performance from key technical staff, but will rely on the strong leadership provided by our core management team. In the past, the stability and continuity of our management team has led to timely, high-quality, and cost-effective performance.

The roles of the key personnel presented below include the Program Manager, SWAP Project Manager, Deputy SWAP Project Manager, QA Manager, and SWAP Specialists (regional Team Leaders). This Core Management Team will maintain overall responsibility for the day-to-day activities of our technical staff, whose skills and availability greatly exceed that necessary to support the BPH. The relevant experience and skills of each of the key personnel are described below and resumes for all staff are included in Appendix A.



Leslie Shoemaker, PhD – Program Manager

Dr. Shoemaker will provide contractual oversight for this contract, ensure that adequate staff and resources are dedicated, and provide technical review and direction to maintain quality and consistency of performance. She will work closely with the management team to allocate resources and identify work teams for performance of specific projects. As a Vice President with Tetra Tech, Dr. Shoemaker has the authority to dedicate resources as needed to this contract. Dr. Shoemaker has worked for Tetra Tech for over 15 years, continuously supporting watershed assessment and management, point and nonpoint source analysis, and model development and application.

Dr. Shoemaker has over 20 years experience in the analysis of watershed and ecosystems and development of integrated modeling systems. Dr. Shoemaker has directed numerous multi-disciplinary watershed management studies and has provided planning, facilitation, and modeling for reservoir protection projects. She has provided technical and programmatic support to all phases of water resources programs, from guidance development, technical reviews, to national model training and facilitation. Dr. Shoemaker supported the development of early GIS-model linkages using ARC/INFO and she helped formulate the initial design and development of the BASINS modeling system in the 1990s. Dr. Shoemaker currently oversees the development of the next generation integrated modeling system, the USEPA TMDL Toolbox. Dr. Shoemaker is the principal investigator for research and development of an innovative system to locate, size and optimize best management practice (BMP) strategies. She is lead author of the USEPA Compendium of Tools for Watershed Assessment and TMDL Development, developed for USEPA to support informed review and selection of modeling tools. Dr. Shoemaker manages Tetra Tech's Water Resources Center, which includes over 75 specialists in modeling, water quality assessment, and systems development throughout the United States.

Ward Wilson, PE – SWAP Project Manager

Mr. Wilson will provide the local point of contact for DHHR BPH and will coordinate all technical activities under this contract. He will work closely with the Program Manager and Deputy SWAP Project Manager and maintain communication between all parties. Mr. Wilson is a water resources engineer with over 15 years of experience in providing technical and management aspects of consulting engineering practice. He has been a registered Professional Engineer in WV since 1991 and specializes in watershed management, particularly wet-weather water quality management and sustainable water resource management techniques. He is proficient in applying GIS to manage large datasets in water resources projects. Mr. Wilson's multi-disciplinary scientific perspective compliments experience in engineering design; construction and operation of stormwater management systems; municipal and industrial wastewater treatment; and groundwater and soil remediation. Mr. Wilson has managed the contracting, staff, budget, and schedule for large projects and multi-disciplinary programs.

Jon Ludwig – Deputy SWAP Project Manager

Mr. Ludwig is the director of the Charleston, WV, office of Tetra Tech and will coordinate closely with Mr. Wilson and the DHHR BPH project managers to ensure that projects are meeting all technical and schedule objectives. Mr. Ludwig is a senior environmental scientist with over 10 years experience providing technical and management support to federal, state, regional, and private clients in the areas of water resource, watershed and water quality assessment, watershed modeling, and TMDL development. Currently, he serves as project manager for the existing TMDL contract with WVDEP DWWM that includes the development of TMDLs for total iron, total manganese, dissolved aluminum, pH, selenium, fecal coliform bacteria, and biological impairments throughout the state of West Virginia. Mr. Ludwig also has extensive experience implementing various hydrologic and water quality models and has played an instrumental role in the technical development of the Mining Data Analysis System (MDAS), a GIS-

based dynamic watershed tool that has been customized for watershed assessment and TMDL development efforts in West Virginia. Additionally, he has reviewed National Pollutant Discharge Elimination System (NPDES) permits and assessed measures taken to model the effects of discharge to stream systems. He has conducted a series of training courses to support USEPA and various states (WV, PA, KY, AZ) in modeling and watershed management development.

Greta Hawkins – SWAP Specialist, Northern Region Team Lead

Ms. Hawkins will coordinate all activities (public meeting, PCS surveys, and reports) located in the northern region. She will coordinate with the Field Operations Manager (Subcontractor Buchart Horn) on a daily basis to ensure that field operations and data collection proceed smoothly and efficiently. She will work closely with the SWAP PM and Deputy SWAP PM to maintain project timelines and budgets. Ms. Hawkins is an environmental scientist with over 8 years of experience supporting federal, state and local clients in water resources and watershed planning. She currently performs computer modeling, including Geographic Information System (GIS) analyses, to determine Total Maximum Daily Loads (TMDLs) for surface waters in West Virginia, Pennsylvania and Santa Barbara County, California. Ms. Hawkins has over 5 years of experience working on wetland delineation/permitting and watershed planning. She has analyzed GIS data for watershed planning in the Carolinas, and utilized GIS and HEC-HMS to model water quantity effects from development in Carolina watersheds. She also has conducted water quality sampling on reservoirs and streams, as well as stream assessments for watershed planning. Ms. Hawkins is also trained to conduct endangered species surveys and wetland determinations and delineations.

Sam Wilkes – SWAP Specialist, Central Region Team Lead

Mr. Wilkes will coordinate all activities (public meeting, PCS surveys, and reports) located in the central region. He will coordinate with the Field Operations Manager (Subcontractor Buchart Horn) on a daily basis to ensure that field operations and data collection proceed smoothly and efficiently. He will work closely with the SWAP PM and Deputy SWAP PM to maintain project timelines and budgets. Mr. Wilkes is an environmental scientist with over 12 years of experience providing technical support in watershed management and the development of TMDLs. His responsibilities include watershed data management, organization of the biological stressor identification process, modeling, and assisting with the development of various TMDLs (iron, aluminum, manganese, selenium, chloride, pH, fecal coliform, acid deposition, and sediment) for the state of West Virginia. Mr. Wilkes is experienced with contaminant source identification, stakeholder meeting facilitation, report preparation, and proficient in data management and GIS manipulations of large data sets.

John Beckman – SWAP Specialist, Southern Region Team Lead

Mr. Beckman will coordinate all activities (public meeting, PCS surveys, and reports) located in the central region. He will coordinate with the Field Operations Manager (Subcontractor Buchart Horn) on a daily basis to ensure that field operations and data collection proceed smoothly and efficiently. Mr. Beckman is an environmental scientist specializing in watershed planning, TMDL development and natural resources inventory. He has 11 years of professional experience performing scientific research, analysis, and wide scale field surveys. Mr. Beckman currently supports TMDL development efforts for the WVDEP. His duties include data management, GIS analysis, water quality modeling, technical writing, field investigations, and public outreach support. Mr. Beckman works with WVDEP staff as well as other state and federal agencies to develop the most recent and accurate watershed data necessary to build TMDL models for metals, sediment, acid deposition, and fecal coliform.



Esther Peters – Quality Assurance Manager

Dr. Peters will report directly to Tetra Tech's Program Manager and will be responsible for all QA activities for the contract. She has developed office-wide quality assurance program and quality systems and tools to meet quality assurance requirements of diverse contracts. Dr. Peters is an aquatic toxicologist and pathobiologist with more than 25 years of experience in aquatic biology and extensive project management experience. She has participated in contaminant and biota monitoring programs in temperate estuarine and coastal marine environments, as well as tropical coral reef ecosystems. Her expertise includes research on the effects of exposures to xenobiotics and other environmental stressors on a variety of invertebrates and fish in both field and laboratory studies. She has performed extensive work on the comparative histopathology of invertebrates and fish, particularly carcinogenesis, as well as the relationships between adverse environmental conditions and diseases caused by pathogens and parasites. Dr. Peters has participated in the development and review of research projects for testing the toxicity and carcinogenicity of chemicals and in human health and ecological risk assessments. Dr. Peters has also examined human health risks from consumption of chemically contaminated finfish and shellfish. Dr. Peters is a member of the American Society for Quality.

Allison Barker, Tetra Tech Contract Administration

Ms. Barker will report to the Program Manager and will be responsible for financial reports, contract administration, and cost control. She serves as the Contract Administrator. Ms. Barker is the Contracts Group Manager and a senior contract administrator. She has several years of contracts experience covering the full spectrum of contractual activities from proposal preparation through contract close out. She has been extensively involved in the following areas: proposal preparation; negotiating and managing all levels and types of federal and private sector contracts and subcontracts; all aspects of financial reporting; interfacing with contracting officers; supervising and training junior personnel; and drafting contracts, subcontracts, consultant agreements and teaming agreements. She has a thorough knowledge of the Federal Acquisition Regulation (FAR) and currently has her Certified Federal Contracts Manager (CFCM) certification.

1.1.2. Other Key Staff

Table 1-1 summarizes the qualifications of the key staff identified for supporting this project. This table includes all the required fields identified in the Expression of Interest (i.e., titles, education, and work experience). For each of the selected staff, their relevant experience in SWAP, any related experience and associated skills are identified. Focused resumes for the proposed staff are also provided in Appendix A of this proposal.



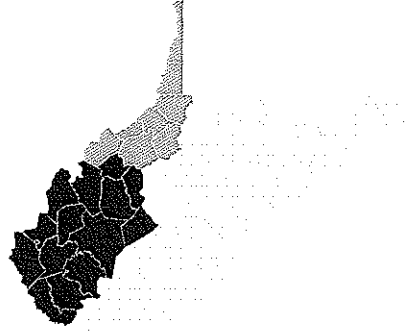
Table 1-1. Summary of Relevant Experience of the Proposed Tetra Tech Team

Staff	Proposed Role	Highest Degree	Total Years of Experience	WV Project Experience	Public Meeting Planning & Stakeholder Facilitation	Leading Large Projects w/concurrent Tasks	GIS (ArcGIS 9.2), CADD & Data Management (MS ACCESS)	Field Investigation & Contaminant Source Identification	Potential Contaminant Source Documentation	BMP Identification & Planning	SWAP & Watershed Management Plans	Site Specific Investigations & Reports
Tetra Tech, Inc.												
Leslie Shoemaker	Program Manager	PhD	23	●	●	●	●	●	●	●	●	●
Ward Wilson, PE	SWAP Project Manager	MS	20	●	●	●	●	●	●	●	●	●
Jon Ludwig	Deputy SWAP Project Manager	MS	11	●	●	●	●	●	●	●	●	●
John Beckman	SWAP Specialist	MEM	11	●	●	●	●	●	●	●	●	●
Greta Hawkins	SWAP Specialist	MEM	8	●	●	●	●	●	●	●	●	●
Sam Wilkes	SWAP Specialist	MS	12	●	●	●	●	●	●	●	●	●
Clint Boschen	BMP Planning Specialist	MS	13	●	●	●	●	●	●	●	●	●
Herbert Brass	Technical Writer	PhD	32				●	●	●		●	●
Larry Breckenridge	Hydrologist	MS	12				●	●	●		●	●
Kimberly Brewer	Public Outreach Specialist	MRP	22	●	●	●	●		●	●	●	●
Jeff Brittingham	Field Staff	BS	7	●			●	●	●			●
Trevor Clements	BMP Planning Specialist	MEM	25		●	●	●	●	●	●	●	●
Nikolai Gurdian	Field Staff	BS	6	●			●					●
Jessica Koenig	Technical Writer	BA	12	●	●	●	●	●	●	●	●	●
Michael Kovacich	Hydrologist	MS	14				●	●	●		●	●
Kevin Kratt	Technical Writer	MEM	13		●	●	●	●	●		●	●
Henry Manguerra	GIS/Data Management Expert	PhD	17	●		●	●		●	●		●
Roy Marroquin	Hydrologist	BS	24				●	●	●	●	●	●
Chris Mellors	Technical Writer	MS	12	●	●	●	●	●	●		●	●
Andrew Parker	BMP Planning Specialist	ME	12	●	●	●	●	●	●	●	●	●
Sabu Paul	GIS/Data Management Expert	PhD	7	●		●	●		●	●		●
Esther Peters	Quality Assurance Manager	PhD	31			●	●					
Teresa Rafi	Technical Writer	MS	12	●	●	●	●	●	●	●	●	●
Tham Saravanapavan, PE	BMP Planning Specialist	ME	15	●			●	●	●	●	●	●



Staff	Proposed Role	Highest Degree	Total Years of Experience	WV Project Experience	Public Meeting Planning & Stakeholder Facilitation	Leading Large Projects w/concurrent Tasks	GIS (ArcGIS 9.2), CADD & Data Management (MS ACCESS)	Field Investigation & Contaminant Source Identification	Potential Contaminant Source Documentation	BMP Identification & Planning	SWAP & Watershed Management Plans	Site Specific Investigations & Reports
Mark Shupe	Hydrologist	MS	21				●	●	●	●	●	●
David Skipp	Hydrologist	MS	30				●	●	●	●	●	●
Barry Toning	Public Outreach Specialist	MA	27	●	●	●	●	●	●	●	●	●
Rachel Wiese	Field Staff	BS	2	●			●	●	●			
John Zastrow	GIS/Data Management Expert	MS	11	●		●	●					●
Hua Zhang	Hydrologist	PhD	5	●		●	●	●	●	●	●	●
Buchart Horn, Inc.												
Tiffany Bates	Field Staff	BS	1	●				●	●			●
Joe Crittenden	Field Operations Manager	-	31	●			●	●	●			●
Luke Cunningham	Field Staff	BS	3	●				●	●			●
Tony Diluca	Field Operations Manager	AS	18	●			●	●	●			●
Richard Eisenhower	Field Staff	-	7	●				●	●			●
Brian Frick	Field Staff	BS	4	●				●	●			●
Steve Geltmacher	Field Staff	BS	3	●				●	●			●
Todd Klinger	Field Operations Manager	BS	28	●			●	●	●			●
Travis Rose	Field Staff	BS	9	●				●	●			●

2. Past Performance



Described in this section is Tetra Tech's experience in supporting West Virginia and many other states in water resources areas such as: watershed assessment, total maximum daily loads (TMDL) development, contaminant identification, and water quality studies. Tetra Tech has supported West Virginia in TMDL development since 1997 through pilot studies, training, methods development, and watershed studies throughout the state. West Virginia's program has grown into a national leader by integrating large-scale programmatic watershed management concepts with fine-scale, highly technical methodologies that produce "implementable" TMDLs in a cost-effective manner. Tetra Tech is privileged to have supported West Virginia throughout this program evolution, and we look forward to supporting DHHR BPH and the community public water supply (CPWS) systems as their source water protection programs continue to grow towards successful implementation and watershed planning

The West Virginia and national experience shown here are only a few of the projects of key Tetra Tech staff listed in Section 1. We have proposed more than 30 staff, composed of key staff experienced in source water and watershed protection to specialized experts that have worked on projects in West Virginia and numerous other states throughout the country. The experience presented below is particularly relevant to the Source Water Protection Technical Help Program because it demonstrates the level of support we offer to all of our clients, including WVDEP. The example projects listed below show the breadth of experience and dedication to delivering quality products that can be easily implemented.

As the projects listed below demonstrate, Tetra Tech and Buchart Horn staff has the experience and ability to conduct all the required tasks to complete the source water assessments, potential contaminant source surveys, data management, stakeholder involvement meetings, management plans, contingency plans, and final site reports for 60 CPWS systems within the one year timeframe.

As specified in the DHHR EOI Section 4.1.2 Past Performance Section, Tetra Tech has not been penalized by or paid liquidated damages within the past three years.

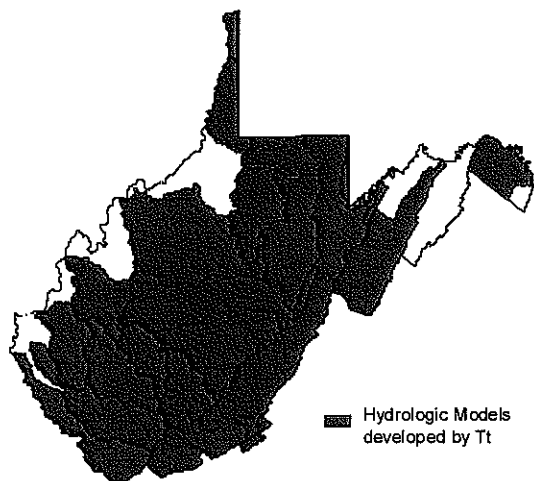


West Virginia Department of Environmental Protection TMDL Support

Client Contact: Dave Montali, West Virginia Department of Environmental Protection, Division of Water and Waste Management, 601 57th St. SE, Charleston, WV 25304, (304) 926-0499 x1063

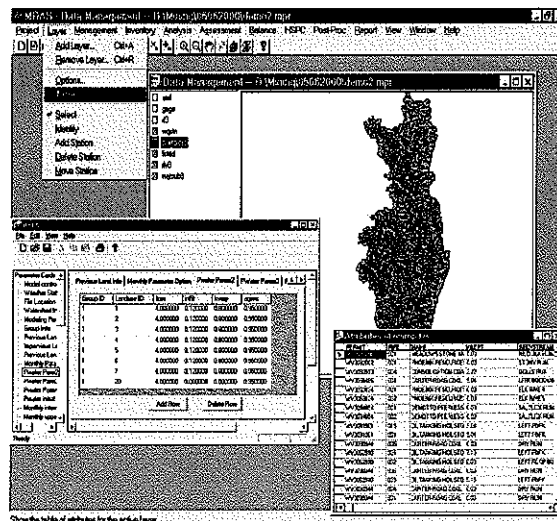
Project Dates: November 2003 to present

Tetra Tech is recognized as a nationwide leader in hydraulic and hydrological analyses for hydraulic features and infrastructure planning, design, and construction. In addition, Tetra Tech offers specialized experience and technical competence in hydraulic, hydrodynamic, watershed, storm water, groundwater, and water quality modeling; data collection and analysis; environmental analysis and compliance; and stream and lake restoration. This nationwide expertise coupled with extensive experience gained through developing over 3,200 TMDLs throughout the state provides Tetra Tech with a thorough understanding of the dynamic hydrologic, hydraulic, and water quality processes associated with source water protection in West Virginia.

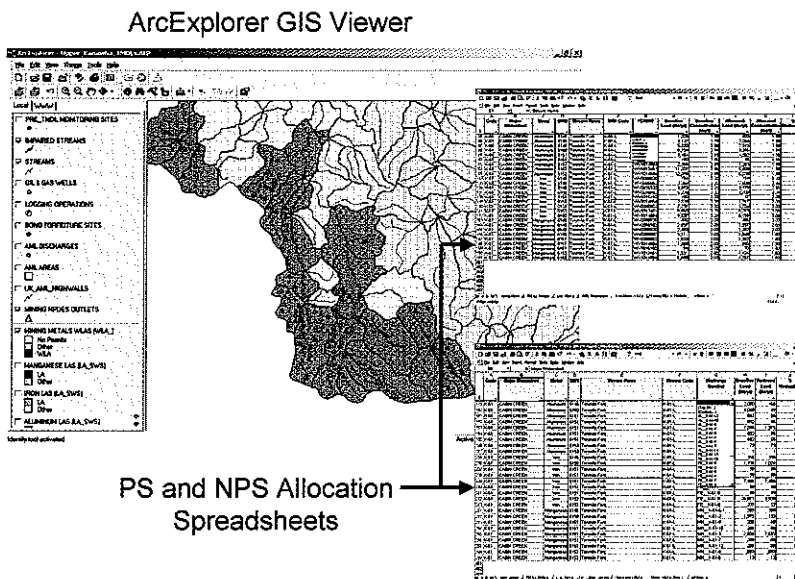


Over the past eight years, Tetra Tech has supported West Virginia Department of Environmental Protection (WVDEP) and Environmental Protection Agency (EPA) Region 3 in developing and fine-tuning a Total Maximum Daily Load (TMDL) methodology to address various water quality impairments caused by numerous point and nonpoint sources in West Virginia. The resulting innovative modeling approach, the Mining Data Analysis System (MDAS), was developed by Tetra Tech to simulate hydrologic and water quality conditions throughout large watersheds. MDAS is a comprehensive GIS, dynamic modeling, and analysis package that provides the ability to overcome the difficult simulation of a large-scale watershed while maintaining a great level of detail (i.e., segmenting watersheds into hundreds of smaller hydrologic units to address impairments in small, nested tributaries). The watershed modeling process involves the compilation of meteorological, landuse, hydrology, and pollutant data; hydrologic calibration and water quality calibration; and generation of nonpoint source and in-stream flows and pollutant loadings. Since 2003, Tetra Tech has been the exclusive TMDL contractor for WVDEP and as an ongoing effort, Tetra Tech staff routinely work with WVDEP staff to identify hydrologic and water quality characteristics of pollutant sources such as mines, harvested forest, oil and gas wells, acid mine drainage seeps, and failing septic systems throughout West Virginia. Furthermore, Tetra Tech has a great deal of experience querying WVDEP's databases (LUST database, WABbase, AML database, oil & gas database, mining permit boundaries, mining and industrial permit outlets), which we have access to through a virtual private network connection from our Charleston, WV office.

To date, Tetra Tech has constructed and calibrated hydrologic models that cover more than 82% of West Virginia. To assist WVDEP, Tetra Tech has designed a "TMDL on CD" concept where all relevant TMDL information (TMDL Reports and Appendices,



Technical documentation, and supporting data) is included on a CD-ROM. To further improve the “usability” of the TMDLs, WVDEP developed a series of interactive tools to provide TMDL implementation guidance. These tools are designed to simplify and assist "implementers" (nonpoint source staff and permit writers) in using the TMDLs to develop watershed plans and issue/renew permits. An interactive ArcExplorer geographic information system (GIS) project allows the user to explore the spatial relationships of the source assessment data, as well as further details related to the data. Users are also able to “zoom in” on streams and other features of interest. In addition, spreadsheet tools (in Microsoft Excel format) were developed to display both the data used during the TMDL development process and the detailed source allocations associated with successful TMDL scenarios. These tools provide guidance for the selection of implementation projects as well as for permit issuance and are also included on the TMDL Project CD. An example Coal River TMDL deliverable CD, which includes: ArcExplorer folder; TMDL Documents folder, which includes TMDL watershed appendices and allocation spreadsheets folders; Technical Report folder; Dissolved Aluminum Addendum folder; and the USEPA Approval Documents folders, is included in Appendix B of this proposal.

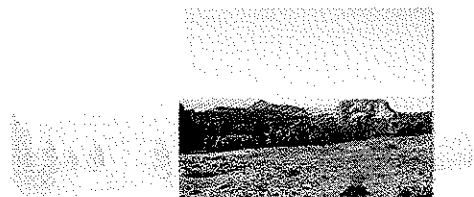


Virgin River Comprehensive Watershed Management Planning

Client Contact: Corey Cram, Washington County Water Conservancy District, (435) 673-3617

Project Dates: March 2005 to February 2006

The Virgin River watershed, a 2,800 square mile portion of the Lower Colorado River watershed, is located in the southwestern corner of Utah and encompasses portions of Washington, Kane, and Iron counties. Population within the watershed, especially in Washington County, is growing rapidly and has tripled in the past 20 years. As with many other rapidly developing watersheds, this growth presents many challenges to maintaining the current high quality of life. Among the most challenging of issues is the provision of adequate water supplies to sustain domestic, industrial, agricultural and natural resource areas. Diversions, dams, road construction, river channel changes, introduction or invasion of plants, non-native game and bait fish, recreational use, residential development along the river, and past livestock grazing have caused a loss of habitat for some native fish, mammals, birds, and reptiles.



Virgin River Watershed Management Plan

February 2006



Tetra Tech provided comprehensive watershed management

planning support to both the Washington County Water Conservancy District and the Utah Department of Environmental Quality (DWQ) to address water quality and drinking water issues in the Virgin River Watershed. Tetra Tech worked with the Virgin River Advisory Committee and Utah DWQ to identify project participants, establish leadership roles, develop team organization, and identify project priorities. The overall watershed management planning process produced several products, including a Total Maximum Daily Load (TMDL) report, a Surface Water Source Protection Plan, development of site-specific total dissolved solids (TDS) criteria, and a Watershed Management Plan.

TMDLs were developed for total dissolved solids, temperature, total phosphorus, and dissolved oxygen for various waters within the basin. Three weeks were spent in the field and an aerial photo survey was conducted to locate and quantify all significant pollutant sources. A combination of modeling tools, including load duration curves and mass balance approaches, was used to determine existing and allowable pollutant loads and make equitable allocations. The final TMDL report included an implementation plan and an identification and description of best management practices.

As part of comprehensive watershed management planning support, Tetra Tech is in the process of developing a Drinking Water Source Protection (DWSP) Plan for the Virgin River watershed in Utah. The DWSP Plan addresses three surface drinking water sources within this arid watershed spanning three counties in the southwest portion of the state. To develop the DWSP, Tetra Tech followed the approach required under Utah's Drinking Water Source Protection for Surface Water Sources rule. Tetra Tech used GIS to delineate the surface water protection zones according to the regulatory zone delineation requirements. Based on the protection zone delineations, Tetra Tech conducted an inventory of potential contamination sources (PCSs) for each of the surface drinking water sources. The inventory process integrated data provided by the State of Utah, as well as a windshield survey conducted during a week-long visit to the Virgin River watershed. Information collected during the windshield survey included location of PCSs, information related to potential hazards, and use of on-site controls to mitigate potential impacts from hazards. While visiting the watershed, Tetra Tech also collected information on the structural integrity of each surface drinking water intake structure. Tetra Tech developed a GIS-based approach for determining the natural setting sensitivity of each surface drinking water source and each PCS using climate, vegetation, slope and soil permeability data. To make a susceptibility determination for each surface drinking water source, Tetra Tech adapted and applied a susceptibility analysis methodology developed by the State of Colorado that generates a qualitative rating for risk, threat, and vulnerability. (The State of Utah does not prescribe a particular methodology; regulations simply state the factors that the methodology must use in making a determination.) Tetra Tech used the results of the susceptibility analysis and determination, including a prioritized list of PCSs for each surface drinking water source, to recommend land management strategies that will control impacts from pre-existing and future PCSs.

The Watershed Management Plan includes management and project recommendations that are responsive to key project issues while ensuring that the plan belongs to the residents of the watershed and focuses on issues including water rights, right-to-farm proposals, recreational needs, wetland protection, and property rights. Tetra Tech coordinated and facilitated stakeholder involvement activities to capture stakeholders' key issues. The stakeholder input process focused on analysis of past stakeholder input, facilitating meetings with the Committee comprised of watershed stakeholders to identifying key issues, and conducting facilitated small-group discussions at various locations in the watershed to narrow priority issues on a sub-watershed basis.

Success achieved: Tetra Tech was successful in compiling and analyzing all of the available watershed data; developing a final TMDL report; identifying the key sources of TDS and recommending site-specific criteria; developing a Drinking Water Source Protection Plan on a watershed-basis, including conducting the susceptibility analysis and recommending land management strategies to protect surface

drinking water sources; facilitating stakeholder meetings to identify key issues; and drafting a stakeholder-driven Watershed Management Plan.

Fairfax County, VA Watershed Planning Support

Client Contact: Mr. Fred Rose, Fairfax County Department of Public Works and Environmental Services (DPWES), Watershed Planning & Assessment Branch, Stormwater Planning Division, 12000 Government Center Parkway, Suite 449 Fairfax, VA 22035-0052, Fred.Rose@fairfaxcounty.gov

Project Dates: January 2006 to present

Tetra Tech has provided comprehensive watershed planning and stormwater support to Fairfax County, VA since January 2006. Tetra Tech is supporting the County in developing long-term watershed management plans which incorporate an assessment of current and future watershed conditions and problem areas, identify the County's future structural and non-structural needs, analyze stormwater management and BMP options, and prioritize recommended stormwater projects based on modeling data and cost/benefit information. Tetra Tech is assisting the County in managing the watershed planning process, which includes oversight of four environmental consulting teams that are responsible for various plan development functions. Watershed plans and technical tools under development by Tetra Tech will be used by County staff to address stormwater planning needs, stormwater permit requirements, Chesapeake Bay nutrient and sediment reductions goals, and local stakeholder concerns. Hydrologic, hydraulic, and water quality models being developed by Tetra Tech will be used to assess watershed conditions and quantify the benefits of various BMP and low impact development (LID) practices considered. Tetra Tech is also developing an enterprise data management system and other technical tools that will be used to develop these watershed plans, analyze future stormwater management options, evaluate indicators of water quality, provide for long-term data management, and visualization of modeling results and countywide GIS data.

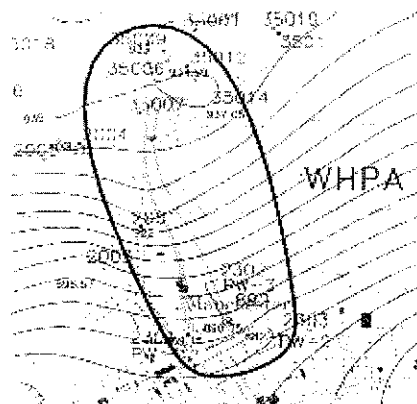
Wellhead Protection Area Delineation and Wellhead Protection Plan

Client Contact: Jeff Wallace, Village of Manchester, Michigan, (734) 428-7877

Project Date: January 2004 to December 2004

Tetra Tech completed Wellhead Protection Area (WHPA) delineation for the Village's sole-source well field. We met with the Village, obtained and reviewed available well and geological information, conducted extensive field activities, and worked closely with the Michigan Department of Environmental Quality (MDEQ), Drinking Water and Radiological Protection Division to ensure an appropriate scope of work.

Existing geologic and hydrogeologic reference materials were obtained and reviewed for incorporation into an aquifer conceptual model. Several hundred well records and drilling logs were obtained from the State and County health agencies to construct geologic cross sections and estimate the regional aquifer potentiometric surface. The Village's production wells and eleven private water supply wells were surveyed, and groundwater levels measured to verify the regional groundwater flow direction.



A contaminant source inventory was conducted to identify potential sources of contamination within the delineated wellhead protection area. The results of the WHPA delineation and the WHPP management strategies, contingency plans, new well inclusion criteria, and other required information, were compiled



and put together into a comprehensive Wellhead Protection Plan report, submitted to, and approved by the MDEQ.

Tetra Tech assisted the Village with obtaining a 50%-50% matching grant from the State of Michigan to conduct these WHPP activities.

High Point Watershed Assessment and Stormwater Plan

Client Contact: Lee Burnette, City of High Point, 211 S. Hamilton St., High Point, NC 27261, (336) 883-3328

Project Date: March 1999 to April 2001

Tetra Tech staff worked with the City of High Point, NC to develop alternative means to achieving water quality protection in a rapidly urbanizing area. Reservoir water supply water quality protection rules adopted by the NC Division of Water Quality apply a 50% impervious surface restriction to all developable areas outside of the proposed Randleman Lake's designated critical area and a 30% cap within the Critical Area. Tetra Tech helped the City evaluate alternative means to achieving an equivalent level of protection. Tetra Tech facilitated an 18-member Citizens Watershed Committee to help screen promising approaches, develop evaluation criteria, recommend preferred approaches, and comment on the resulting stormwater control ordinance and management plan. For the comparative analysis, Tetra Tech developed and applied a GIS linked watershed phosphorus-loading model to evaluate the water quality impact of different protection strategies for the Deep River 1 segment of Randleman Lake. Areas projected to need more intense urban development than that allowed in the Randleman Lake rules (Urban Focal Areas) were identified, and corresponding phosphorus loading offset amounts were estimated by the project team. The City adopted a watershed plan centered on phosphorus banking. The plan and adopted ordinance provide even greater water quality protection than that provided by the Randleman Lake rules, while also providing needed flexibility to accommodate planned growth. Tetra Tech also assisted in developing a Stormwater Management Plan, including review of the development ordinance and stormwater BMP design manual to identify opportunities to strengthen stormwater management policies and encourage low impact development design. Tetra Tech worked with the City to identify sensitive environmental areas, areas which will need greater stormwater management and land use controls, and areas most suitable for higher density development. The City incorporated the technical recommendations into a phased stormwater management plan, which was approved by the State. Tetra Tech conducted a LID Design Workshop for developers, engineers, architects, and planners. The project received the 2000 NCAPA Award for Plan Implementation.

Troublesome/Little Troublesome Creek Local Watershed Plan, Cape Fear River Basin

Client Contact: Hal Bryson, North Carolina Ecosystem Enhancement Program, 1652 Mail Service Center, Raleigh, NC 27699-1652, (919) 280-9654

Project Date: December 2003 to June 2005

For the NC Ecosystem Enhancement Program staff, Tetra Tech conducted technical assessments and provided local watershed planning support in the Troublesome and Little Troublesome Creek watersheds of the Upper Cape Fear River Basin. In the initial Scoping and Preliminary Findings phases of the project, GIS analysis, field reconnaissance, modeling and stakeholder input were used to identify future development as the primary threat to watershed functions in the Troublesome Creek watershed, especially in regard to the potential to cause stream erosion and instability in an area with highly erodible alluvial soils. In the Little Troublesome Creek watershed, urbanization in headwater areas and the associated stream channelization was found to have resulted in extensive stream erosion and aquatic habitat degradation. Based on field survey work, the project team assembled a hydraulic modeling framework to assess risk levels for key indicators of stream erosion potential throughout the study area for existing and future conditions. The framework was used in conjunction with assessment methodologies to evaluate

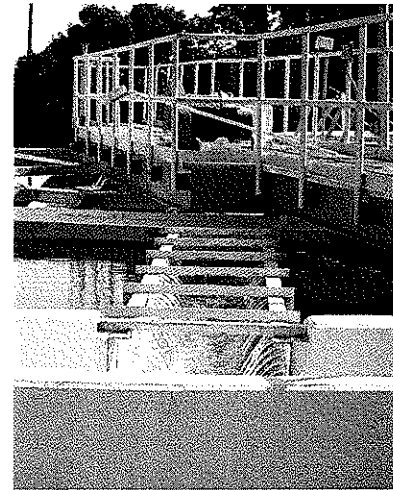
additional indicators such as riparian buffer condition, terrestrial habitat quality, and wetland status to identify and prioritize those subwatersheds with the greatest functional deficits under existing land use conditions, and those at the greatest risk for functional losses under future conditions. Using multiple indicator scores and input from a team of local stakeholders, subwatersheds were prioritized and the project team identified the most feasible and desirable restoration, preservation and management options to address or prevent functional losses. Specific site recommendations were developed to guide EEP implementation staff as part of the watershed plan.

Water and Wastewater Facilities Vulnerability Assessment and Emergency Response Plans, Naples, Florida

Client Contact: Mr. Robert Middleton, Utilities Manager, City of Naples, 380 Riverside Circle, Naples, FL 34102,
(239) 213-4716

Project Dates: January 2003 to December 2003

One consequence of the events of September 11th is a heightened concern among the citizens of the United States over the security of their water and wastewater facilities. The City of Naples operates a 30 MGD lime softening water treatment plant (WTP) and a 15 MGD biological nutrient removal wastewater treatment plant (WWTP), the City embarked on preparing the necessary documents to comply with the Public Health and Bioterrorism Preparedness and Response.



The City retained Tetra Tech to prepare the threat and vulnerability assessment (TVA) and the emergency response plan (ERP) for both the water and wastewater systems. The TVA evaluated the ability to either prevent threats from occurring and/or mitigate the impacts should they occur. Insight into the water and wastewater treatment methods utilized by the City, as well as the piping networks that were employed to convey the water and wastewater was paramount to the success of the TVA. Our team of experienced design professionals understood the unique features of the City's water and wastewater facilities and drew upon our resources to provide an integrated approach to assessing the vulnerabilities of and recommending upgrades to water and wastewater systems. The TVA included:

- Identifying mission critical assets
- Determining which mission-critical assets (e.g., equipment, communications, computer networks, etc.) were vulnerable to attack.
- Prioritizing under-protected assets in terms of their respective facility missions, operating objectives, monitoring experience, and physical locations
- The TVA report summarized all findings and recommended measures to safeguard all water system infrastructures.

The emergency Response/Operations Plan (ERP) took the TVA analysis one step further and implemented measures to counter and mitigate the affect of potential terrorist acts. This plan created the most direct path to ensuring safe utility services to end-users after an event. The ERP was site-specific, met a wide range of applicable federal, state, and local regulations, and included:

- Fire prevention and defense plans
- Evacuation, medical response, and exposure plans
- Confined space, entrapment and high angle rescue plans



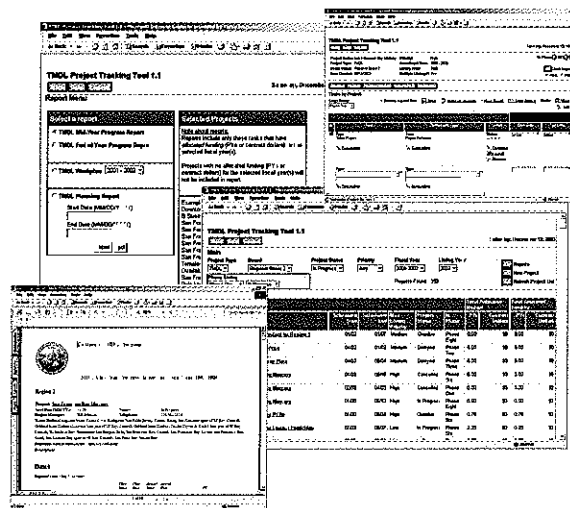
- Energy control and power lockout plans
- Severe weather programs
- Spill prevention control and countermeasure plans
- RCRA contingency plans
- Air episode plans
- PCB awareness plans
- Crisis communications plans
- Bomb threat procedures
- Critical incident stress debriefing programs
- Violence in the workplace programs and;
- Search and rescue procedures

TMDL Project Tracking System

Client Contact: Rik Rasmussen, California State Water Resources Control Board (SWRCB), Division of Water Quality, 1001 I St., Sacramento, CA 95814, (916) 341-5549

Project Dates: November 2002 to January 2003 (Phase I); August 2003 to January 2004 (Phase II)

The TMDL Project Tracking System is intended to assist the State and regional boards in tracking TMDL and other related projects such as basin planning, 303(d) listing, etc. The TMDL Tracking database maintains critical TMDL project information such as status, funding, allocated resources, and allows users to summarize the information and generate progress reports and annual work plans in HTML or PDF format. Because of tight deadlines, Tetra Tech developed the TMDL Tracking System following a rapid application development (RAD) process, which involved a highly abbreviated, and less formal life cycle. Tetra Tech's familiarity of the TMDL program allowed us to redesign the system quickly through a number of focused and highly productive facilitated meetings with California subject matter experts and target users. Features include:



- Manager summaries and detailed reports in HTML or PDF formats
- Report builder for custom reports
- Administration interfaces for system maintenance
- Standards-based and ready to deploy on many platforms

This project was developed using the J2EE 1.3 specifications for server-side technology. These services rely upon a J2EE-capable application server, such as Oracle 9i Application Server. J2EE technology allows the application to be highly scalable, easily extensible and able to support increasing numbers of users. Also, using J2EE technology allows the system, and related extensions, to be deployed on any J2EE-compliant application server on any computing platform that supports Java.

This project demonstrates Tetra Tech's ability to develop a Web application using a rapid yet structured development approach. Tetra Tech has successfully deployed and maintained the system remotely at the SWRCB server for over a year.



Interstate Stream Commission

Client Contact: Narragansett Indian Tribe, Rhode Island (401) 364-1100

Project Dates: June 2006 to present

Tetra Tech has been supporting the Narragansett Indian Tribe in its Water Resources Management Program (WRMP) since June 2006. The center of community life for the Tribe is located in the Pawcatuck-Wood Watershed. The tribal and municipal communities within this watershed are predominantly rural in character. Groundwater is the primary source of drinking water for communities in the Pawcatuck-Wood Watershed. In 1988 EPA designated the entire Pawcatuck Basin as a sole source aquifer (SSA).

The Tribe owns several significant surface water bodies and the sources of drinking water for the Tribe are the Lower Wood Principal Aquifer (PA) and the Narragansett Indian SSA. A primary purpose of the WRMP is to restore, manage, and protect the sole source aquifers (SSAs) that provide the only source of drinking water for the Tribe, as well as for other communities in this rural area. Tetra Tech assisted the Tribe in recently achieving three milestones, consisting of a nonpoint source (NPS) assessment, a NPS management program plan, and a groundwater assessment.

Tetra Tech investigated the susceptibility to contamination of drinking water from the source to the tap. Tasks for this program included (1) watershed delineation for the two adjacent, interjurisdictional subwatersheds in which the Lower Wood PA and the Narragansett Indian SSA are located, (2) identification of drinking water sources, and (3) evaluation of potential point and nonpoint sources of contamination. Water quality data for chemicals, radioactive isotopes, and microorganisms in surface water and groundwater was obtained from an extensive review of literature and data records from the Tribe, USEPA, USGS, RIDEM, University of Rhode Island, and watershed organizations. Tetra Tech also conducted a thorough investigation of historic, current, and projected land use in the two watersheds and identified areas of existing or potential risk. Tetra Tech evaluated the geographic distribution of land use and contamination, using existing GIS data also obtained from these sources, as well as new maps created to synthesize all the available data.

Wellhead Protection Plan Area Delineation

Client: Mathew Schindewolf Department of Services Public Director, City of Brighton, Michigan (810) 227-1911

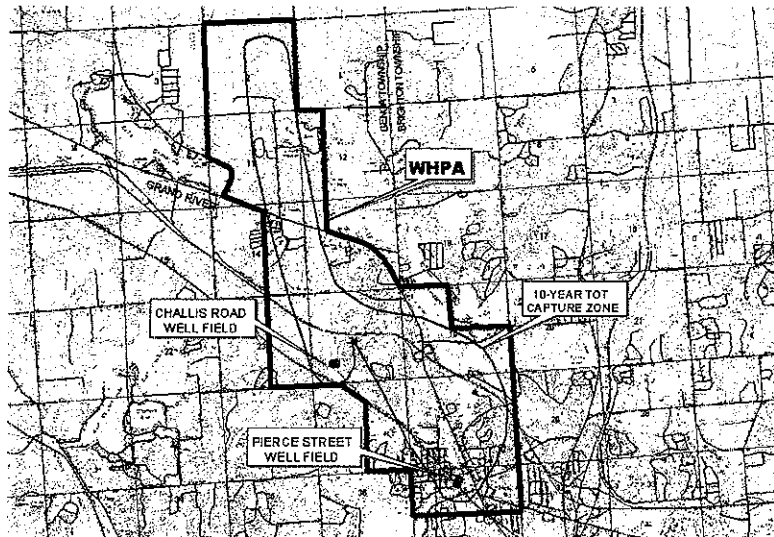
Project Date: September 2002 to Present

Tetra Tech successfully completed a Wellhead Protection Area (WHPA) delineation for the City of Brighton, Michigan. The City obtains water from two well fields installed in an unconfined and unconsolidated aquifer. Tetra Tech compiled existing geological and hydrogeological data for the study area in a geographical information system (GIS). These data included electronic water well logs for over 2,000 private water supply wells and several published GIS maps including bedrock geology, surface geology, watersheds, topography, aerial photographs and hydrology. With this information, Tetra Tech constructed a regional groundwater contour map and generalized geologic cross sections.

Tetra Tech conducted aquifer pumping tests at the well fields to determine aquifer characteristics and to identify hydraulic boundaries. This information coupled with the geologic cross sections and the groundwater flow map was used to develop a conceptual model of the aquifer system. Tetra Tech presented the conceptual model to the MDEQ in a GIS presentation. The MDEQ concurred with conceptual model and the General Particle Tracking Module of the United States Environmental Protection Agency's WHPA: A Semi-Analytical Model for the Delineation of Wellhead Protection Areas was selected to determine the ten-year-time-of-travel, or wellhead protection area.



Tetra Tech obtained water levels from residential wells to complete a “field verified” groundwater flow map. This data along with the aquifer characteristics were entered into the computer model. The ten-year-time-of-travel was calculated and Tetra Tech presented the results in a Wellhead Protection Area Delineation Report. The MDEQ approved the Wellhead Protection Area as presented by Tetra Tech, with only slight modifications.



3. Technical Approach

3.1. Project Organization

Tetra Tech has divided the Wheeling and Saint Albans Districts (Figure 3-1) into three smaller, more manageable areas: north, central and south regions as shown in Figure 3-2. Each of the three regions has been assigned a dedicated SWAP Specialist from Tetra Tech and a dedicated Field Operations Manager from Buchart Horn (Table 3-1).

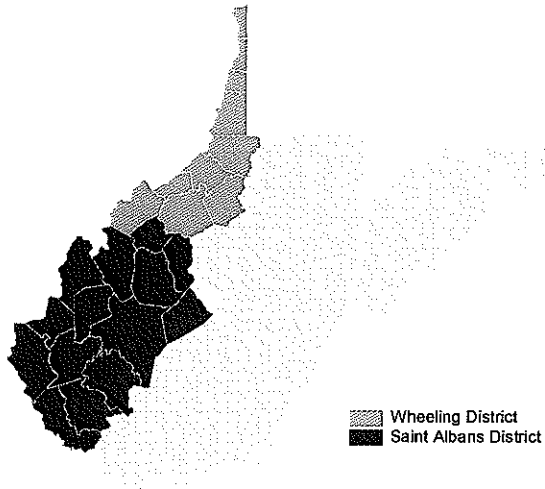
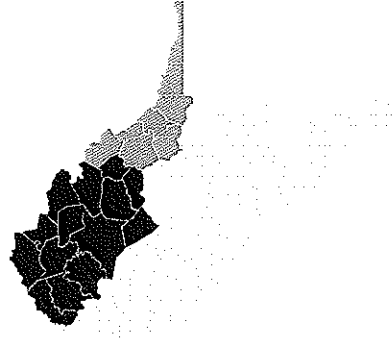


Figure 3-1. Wheeling and Saint Albans Districts

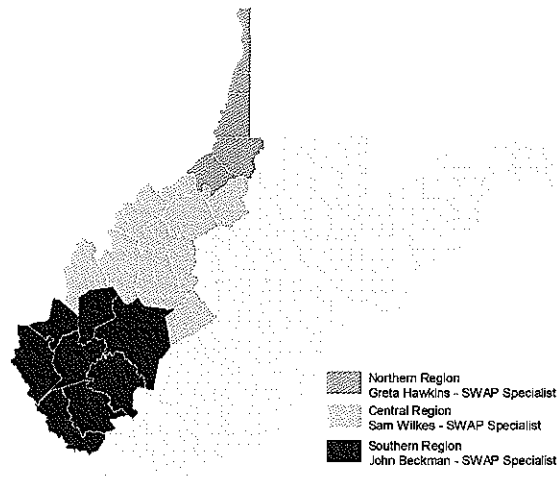


Figure 3-2. Tetra Tech's Three Proposed Regions



Table 3-1. Tetra Tech's proposed SWAP Specialists and Buchart Horn's Field Operations Managers

Regional Team	PWSID	Name	County	District	Type
Northern Region Greta Hawkins (Tt) SWAP Specialist Todd Klinger (BH) Field Operations Manager	WV3300506	Follansbee Municipal	Brooke	Wheeling	Groundwater
	WV3300508	Hammond PSD	Brooke	Wheeling	Surface Water
	WV3300512	Follansbee Hooverson Heights	Brooke	Wheeling	Surface Water
	WV3300517	Wellsburg	Brooke	Wheeling	Groundwater
	WV3301515	New Cumberland	Hancock	Wheeling	Groundwater
	WV3301516	Newell Company	Hancock	Wheeling	Groundwater
	WV3301517	Oakland PSD	Hancock	Wheeling	Groundwater
	WV3301520	Mountaineer Park Inc	Hancock	Wheeling	Groundwater
	WV3302603	Cameron Water	Marshall	Wheeling	Surface Water
	WV3302605	Glan Dale Water Works	Marshall	Wheeling	Groundwater
	WV3302607	Marshall County PSD 2	Marshall	Wheeling	Groundwater
	WV3302610	McMechen Municipal Water	Marshall	Wheeling	Groundwater
	WV3302611	Moundsville	Marshall	Wheeling	Groundwater
	WV3302618	Benwood Water Department	Marshall	Wheeling	Groundwater
	WV3304801	Friendly PSD	Tyler	Wheeling	Groundwater
	WV3304802	Middlebourne Water Works	Tyler	Wheeling	Surface Water
	WV3305202	Hundred Littleton PSD	Wetzel	Wheeling	Groundwater
	WV3305203	New Martinsville City Of	Wetzel	Wheeling	Groundwater
	WV3305204	Paden City	Wetzel	Wheeling	Groundwater
	WV3305205	Pine Grove Water	Wetzel	Wheeling	Surface Water
WV3305206	Grandview-Doolin PSD	Wetzel	Wheeling	Groundwater	
Central Region Sam Wilkes (Tt) SWAP Specialist Tony Diluca (BH) Field Operations Manager	WV3300701	Granstville Municipal	Calhoun	St. Albans	Surface Water
	WV3300801	Clay Water Dept	Clay	St. Albans	Surface Water
	WV3300806	Clay_Roane PSD (Procious District)	Clay	St. Albans	Surface Water
	WV3300901	West Union	Doddridge	Wheeling	Surface Water
	WV3301804	Cottageville PSD	Jackson	St. Albans	Groundwater
	WV3301810	Ravenswood Municipal Water Works	Jackson	St. Albans	Groundwater
	WV3301811	Riple City Of	Jackson	St. Albans	Surface Water
	WV3302704	Hartford Town Of	Mason	St. Albans	Groundwater
	WV3302708	Mason Water Dept	Mason	St. Albans	Groundwater
	WV3302709	New Haven Water Dept	Mason	St. Albans	Groundwater
	WV3302712	Mason Co PSD-Lakin Dist	Mason	St. Albans	Groundwater
	WV3302713	Mason Co PSD-Letart	Mason	St. Albans	Groundwater
	WV3302714	Mason Co PSD-Crab Creek	Mason	St. Albans	Groundwater
	WV3303704	Saint Marys	Pleasants	Wheeling	Groundwater
	WV3304307	Hughes River Water	Ritchie	Wheeling	Surface Water
	WV3304405	Spencer Water Dept	Roane	St. Albans	Surface Water
	WV3304407	Walton PSD	Roane	St. Albans	Surface Water
	WV3305402	Claywood Park PSD	Wood	Wheeling	Surface Water
	WV3305411	Vienna	Wood	Wheeling	Groundwater
	WV3305412	Williamstown Water Dept	Wood	Wheeling	Groundwater

Regional Team	PWSID	Name	County	District	Type
Southern Region John Beckman (Tt) SWAP Specialist Joe Crittenden (BH) Field Operations Manager	WV3300315	Boone Raleigh PSD	Boone	St. Albans	Surface Water
	WV3300609	Milton Water	Cabell	St. Albans	Surface Water
	WV3302009	Cedar Grove Community Of	Kanawha	St. Albans	Surface Water
	WV3302016	WVAWC-Kanawha Valley Dist	Kanawha	St. Albans	Surface Water
	WV3302024	Pratt Town Of	Kanawha	St. Albans	Surface Water
	WV3302203	West Hamlin City Of	Lincoln	St. Albans	Surface Water
	WV3302205	Lincoln PSD	Lincoln	St. Albans	Surface Water
	WV3302331	Logan Water Board City Of	Logan	St. Albans	Surface Water
	WV3302336	Man Water Works	Logan	St. Albans	Surface Water
	WV3302347	Buffalo Creek PSD	Logan	St. Albans	Surface Water
	WV3302357	Logan Co PSD - Greenville System	Logan	St. Albans	Surface Water
	WV3302364	Logan County PSD - Northern Regional	Logan	St. Albans	Surface Water
	WV3303002	Gilbert Water Works	Mingo	St. Albans	Surface Water
	WV3303003	Kermit Water Works	Mingo	St. Albans	Surface Water
	WV3303005	Matewan Water Works	Mingo	St. Albans	Surface Water
	WV330310	Prenter Water Company	Boone	St. Albans	Groundwater
	WV3304011	Putnam PSD	Putnam	St. Albans	Surface Water
	WV3305004	Fort Gay Water Works	Wayne	St. Albans	Surface Water
	WV3305007	Wayne Water Town Of	Wayne	St. Albans	Surface Water

Tt = Tetra Tech
 BH = Buchart Horn

3.2. Community Public Water Supply System and Stakeholder Meeting

Tetra Tech staff have provided varying levels of public participation support for all of the 4,000+ total maximum daily loads (TMDLs) we have developed to date. With extensive experience in a wide range of situations, both environmentally and politically, we understand the importance of presenting technical information in a clear and accurate manner to facilitate stakeholder understanding and buy-in. We have unmatched experience supporting public participation activities, providing us with the fundamental understanding of how to present highly technical information in a scientific yet user-friendly manner. Tetra Tech understands that it is equally important to know one's audience and to tailor presentation materials to the goals and issues relevant to all of the stakeholders in the watershed. Tetra Tech also has extensive experience coordinating among a variety of federal, state, and local agencies to facilitate development of a streamlined and integrated product; one that incorporates data from a number of disparate sources, addresses varying local concerns and issues, and provides a level of detail that will support continued, coordinated management in the watershed.

Over the years, Tetra Tech staff have successfully collaborated with stakeholders and agency personnel to address all comments thoroughly and efficiently. Tetra Tech's extensive experience with stakeholder involvement will ensure that all comments are addressed, tracked, and maintained in a database. Tetra Tech has also supported Environmental Protection Agency (EPA) and WV Department of Environmental Protection (WVDEP) by preparing presentation materials and participating in over 50 public meetings throughout West Virginia as part of TMDL development.

The proposed technical approach will include coordinating and conducting the project initiation meetings concurrently in the north, central, and south regions, which will be led by the proposed Tetra Tech SWAP Specialists in conjunction with the Buchart Horn Field Operations Managers. This allows for efficient coordination between the SWAP Specialists and the field teams conducting the potential contaminant source (PCS) surveys within the zone of critical concern for each community public water supply (CPWS). The meetings will take place in the morning so that ample time is available in the afternoon to address specific concerns from the community public water supply staff and so that they can accompany the field crews to specific contaminant sources, if necessary.

Once all of the field information is gathered and synthesized, the potential contaminant source maps will be created and the draft contingency and management plans will be created. The draft plans, along with the compiled source information, will be presented concurrently in the three regions by the Tetra Tech SWAP Specialists and the corresponding Buchart Horn Field Operations Managers during the follow up meetings. Any comments that are received from DHHR, the community public water supply, or other stakeholders will be addressed and incorporated into the final documents. The proposed timeline also allows for additional field work in the event that additional contaminant sources are identified during the document reviews or follow-up meetings.

Upon DHHR's review and approval of the final documents, the project closure meetings will be scheduled with the community public water supplies. The three regional Tetra Tech SWAP Specialists will coordinate and conduct all of the meetings with the community public water supplies in their respective regions. In order to meet the one year time frame, it is likely that these meetings will be conducted concurrently in the three regions.

3.3. Potential Contaminant Source (PCS) Survey

Tetra Tech has extensive experience documenting and presenting potential sources of contamination in West Virginia's watersheds through its work developing TMDLs throughout the state in conjunction with WVDEP Division of Water and Waste Management (DWWM). Characterization of existing and new sources is critical to the WV TMDL projects Tetra Tech has worked on over the past six years, and that experience would easily transfer to the field verification of existing PCSs and identification of new ones, including abandoned wells and leaking underground storage tanks (LUSTs). In addition, Tetra Tech is adept at using Microsoft Access, which serves as the primary tool for data storage, collection, and manipulation for TMDL projects.

Tetra Tech uses data from all available sources to develop WV's TMDLs. Relevant data encompass physical, chemical, biological, and demographic characteristics of WV's watersheds. Watershed landuse, point source data, and source tracking data are used to identify and characterize sources. As a result, Tetra Tech has extensive knowledge of the datasets available pertaining to potential pollutant sources throughout West Virginia and neighboring states. Tetra Tech staff have spent years cultivating relationships with the staff of WVDEP and other organizations who can provide further details regarding sources. Most notably are the WVDEP personnel responsible for watershed source tracking and those with knowledge of permit details and the ERIS database system. Over the years, Tetra Tech has developed relationships with WVDEP personnel in various departments related to the permitting of mining and non-mining related sources. This provides for greater efficiency in gathering source data within the time constraints of WVDEP's rigorous TMDL development schedule.

Tetra Tech works closely with WVDEP source tracking personnel in order to streamline the data collection process so that the appropriate type and amount of data are collected. When necessary, Tetra Tech personnel have accompanied WVDEP source tracking personnel in the field to assist with the

identification and characterization of sources. Tetra Tech's involvement in the source tracking process is extremely important to source characterization as it leads to enhanced data collection and more accurate representation.

Tetra Tech will review all raw data for accuracy. Suspect data will be identified through an exhaustive QA/QC process that includes the identification of spatial, temporal, and statistical outliers as they pertain to groundwater and surface water systems. Tetra Tech will contact each contributing agency or stakeholder to rectify any suspect data. Once accuracy of the data is assured, Tetra Tech will perform unit conversions and spatial modifications necessary to develop cohesive data critical for the development of a management plan. Tetra Tech will use Microsoft Access databases to manage the large volume of data to be received from existing databases and other sources. Over the past six years, Tetra Tech has worked extensively with WVDEP databases including WAPBASE, and has the demonstrated skill to transfer and manipulate data in a Microsoft Access database environment.

Tetra Tech has a demonstrated ability to combine and use data from multiple sources, as would be required by this project. One such innovative approach was using GIS software to intersect 911 addressable structure locations obtained from county governments with landuse coverages obtained from the West Virginia Gap Analysis Project. This manipulation enabled Tetra Tech to add areas of new residential development to the existing landuse matrix for TMDL development. The end product was a watershed landuse map that was eventually used to model nonpoint sources of fecal coliform bacteria attributed to residential landuse. In its WV TMDL work, Tetra Tech often uses Microsoft Access databases to consolidate, sort and filter data from multiple sources including the WVDEP's Watershed Assessment Program, WVDEP's pre-TMDL monitoring, USEPA's STORET database, and 308 data submitted by the mining industry. Combining data from multiple sources fills data gaps and provides Tetra Tech with the most complete picture of pollutant concentration dynamics in TMDL streams.

Tetra Tech has the ability to develop customized data and project management tools, as it has done for WV TMDL projects. Tetra Tech has developed a user-friendly MS Access database that automates the organization of WVDEP Office of Water Resources (OWR) permits and identifies the data that needs to be collected by WVDEP in order to accurately characterize each permitted source, which varies by permit type. Not only does this database provide for increased efficiency of data collection by WVDEP staff but the end product is in a consistent format that can be seamlessly integrated into Tetra Tech's modeling tools. A similar tool is under development to streamline the collection and input of source tracking data, which includes a variety of source types that are characterized by very different qualitative and quantitative properties. Tetra Tech has also successfully used MS Excel to develop tools for data collection and organization. One such tool was developed to facilitate the collection of data to accurately represent mining permits in the TMDL modeling. Mines are represented very differently in the modeling process depending on whether the associated discharges are precipitation-driven, pumped, or a combination of the two, and as a result, very different information is required to characterize them. Confounding the data collection process is the fact that the information required to characterize mining discharges is located in two different types of permits that are not otherwise linked: NPDES permits and Article III mining permits. The Microsoft Excel tool enables WVDEP staff to identify the type of permit, what information needs to be collected in order to characterize the discharge, and serves as a record for the sources of information. The tool also summarizes the information once it has been collected into a table that can be integrated with an MS Access database that summarizes the permit information and generates the landuse and point source tables required for model input.

In order to track and manage the collection, submittal, and review of the vast quantity of data required for TMDL projects in a one-year project lifespan, adequate project tracking tools are necessary. Tetra Tech uses Microsoft Excel to assign tasks and monitor their execution, as well as the submittal and review process in order to ensure that TMDLs are developed and finalized within the strict time constraints set

forth by WVDEP. Although the source water protection program's timetable is similar in nature to that of the TMDL process, the coordination required among multiple contractors, DHHR, and stakeholders, and the large number of plans that must be developed requires a more sophisticated management system to track the progress of each plan to be able to offer a clear picture of the overall effort. Tetra Tech proposes to adapt an online project management system, created for tracking projects related to waterbodies, to manage the many concurrent activities associated with developing these plans. The proposed management system tracks the following types of information:

- Projects and details about the project, including primary contact
- Project association with geographic regions and details about the area
- SWAP Specialists, Field Operations Managers and any other team contacts for each project
- Geographic management entity for each project
- Staff list and staff assigned to each project
- Project phases, tasks per phase, subtasks
- Deliverables per phase and task
- Project, phase, and task status
- Staff responsible for each task
- Planned and actual start and end dates for projects and tasks
- Estimated budget allocations for each subtask
- User authentication and user security roles

Tetra Tech intends to develop each of the 60 management plans in a consistent and repeatable manner. Therefore, at the outset of the project Tetra Tech will work with the client to define concrete and consistent tasks, phases and deliverables that will be completed during the development of each source water protection plan. These items will form the basis of what is tracked within the system. Similarly, Tetra Tech will work with the client to define the geographic areal units that will define each project. Each of these units will be given a unique identifier that will be tracked within the system. The system will have the flexibility to allow multiple projects to be conducted within one unit if needed.

The system also provides a report builder and reports that can be presented in either HTML or PDF format. These reports would be customized and enhanced for the purposes of the project. The reports and the system itself will be based on an Oracle database to allow for maximum scalability and data security. Tetra Tech will host the data management in a managed data center for the duration of the project. The online system will be password protected and will only be made available to the project team members of Tetra Tech and the client. The manager for each plan will be responsible for updating the status within the system and all parties will be able to generate reports at anytime to document progress. At the conclusion of the project Tetra Tech will provide the database of the tracking system (in Oracle and Microsoft Access format) for archival purposes.

Tetra Tech recognizes the importance of including stakeholders and interested members of the public in the process. At the beginning of the TMDL development process, an exhaustive search is made to solicit all available data from all watershed stakeholders. These entities primarily consist of state and federal land management agencies, but can also include universities, city and county governments, watershed groups, and private industry. Stakeholders who contribute their data become cognizant of the TMDL process, which can lead to increased understanding of the long-term goals and regulatory implications of TMDL implementation.

Tetra Tech envisions as part of the PCS survey report a submittal that displays all of the PCSs in GIS, similar to the pollutant source report that we have developed for WV's TMDL projects. The pollutant source reports have proven to be an invaluable tool not only to WVDEP but also stakeholders and

interested parties. The graphic interface provides a means by which to easily convey technical information to those without scientific or technical backgrounds. The PCS survey report can also be included as a part of each system's management plan.

All of the datasets required to characterize PCSs and the watersheds in which they are found will be represented in the PCS survey report: from the ZCC delineation to the potential contaminant sources. Preparing the PCS survey report not only provides a spatial representation of the source information available pertaining to the subject watershed but also provides an opportunity to systematically format all of the data and to identify any data gaps that need to be filled. Datasets can easily be transferred between Access and GIS. GIS provides a means by which to present the data in a manner that is easily understood by the public.

The PCS survey report will be submitted in a CD directory containing an ArcView project that spatially represents the PCSs in the subject area. For ease of use, the project will contain three views, one for each region. Within each view, shapefiles will be presented that represent potential contaminant sources and watershed physiographic data. Both verified existing sources and newly identified sources will be presented. Key photographs of sources can be linked in the GIS view. These shapefiles will be represented with appropriate symbols in the view legend and physical and observed details will be presented in the attributes table associated with each shapefile. A descriptive document (or legend) will also be submitted with the PCS survey report that explains in detail the contents of each project, view, and shapefile. An example CD deliverable of the Cheat River TMDL Pollutant Source Report is attached in Appendix B.

3.4. Management Plan

Tetra Tech will develop a management plan for each CPWS system. The management plan will provide a detailed, comprehensive approach to achieve source water protection goals in the source water protection area (SWPA). The plan will list key stakeholders, review existing management recommendations, and identify new management techniques applicable to reducing adverse impacts from known PCSs. The management plan will be offered for review to the CPWS system stakeholders at the follow-up meeting. The final version of the plan will be included within the CPWS site-specific report.

Data to be gathered during the project initiation meeting will be used to update the original source water reports with information concerning ongoing management activities. Existing management strategies will serve as the starting point for the management plan. The plan will include specific details about potential land acquisitions, pollution control ordinances, and educational opportunities provided by state agencies or watershed groups. Contact information for concerned individuals and local government officials will also be included in the plan.

Tetra Tech has experience in developing CPWS management plans. Tetra Tech is in the process of developing a Drinking Water Source Protection Plan for the Virgin River watershed in Utah. The plan addresses three surface drinking water sources spanning three counties in southwestern Utah. Tetra Tech used GIS to delineate the surface water protection zones and conducted an inventory of PCSs for each of the surface drinking water sources. The management plan includes a prioritized list of PCSs for each surface drinking water source, and recommends land management strategies that will control impacts from pre-existing and future PCSs.

Tetra Tech will draw on company-wide expertise to identify innovative best management practices (BMPs) with potential to reduce the impacts of PCSs in the source water protection areas (SWPAs). In recent years, significant progress has been made in developing BMPs to protect groundwater and surface

water quality. Tetra Tech has developed water quality modeling tools to calculate BMP effectiveness in reducing pollutant loads and protecting the health of drinking water reservoirs. Tetra Tech has used these tools to evaluate stormwater BMP effectiveness in watersheds of the city of Carrboro, in Orange County, North Carolina. A facilitated process using modeling tools in conjunction with input from a stakeholder advisory committee produced four viable management scenarios containing different mixes of BMPs, zoning restrictions, land purchase, and engineered stormwater controls. A comprehensive written report was prepared documenting the study findings and recommendations. Tetra Tech then designed and produced community outreach materials to communicate management alternatives under consideration, and encourage public response.

Tetra Tech has experience developing management plans for watersheds of all sizes. Tetra Tech used an integrated approach to develop a watershed management plan for the Morgan, Bolin, and Little Creek watersheds in Upper Cape Fear River Basin in North Carolina. Tetra Tech conducted GIS analysis, visual assessment, water quality data analysis, and stakeholder interviews during the initial scoping/characterization phase. In the preliminary findings report, several key stressors were identified with the potential to degrade watershed functions including stream erosion/instability, reservoir eutrophication, terrestrial habitat loss, wetland loss, and flooding potential. Conceptual models were developed linking indicators to these stressors, and appropriate assessment tools were then developed. A detailed assessment phase was conducted using remote sensing, field survey, and watershed modeling to identify and prioritize subwatersheds with the greatest opportunities for restoration and protection of watershed functions. Management recommendations were based on cost-effectiveness, and included site restoration, stormwater BMP retrofits, and preservation of intact landscapes. Recommendations were also made for strengthening local development and stormwater management ordinances.

Tetra Tech will use its hydrologic modeling experience to contribute improved watershed delineation areas and other hydrologic information to the CPWS management plans. Tetra Tech has over a decade of experience using hydrologic and water quality modeling to develop TMDLs for impaired streams in West Virginia. Tetra Tech has extensive experience delineating West Virginia watersheds and has built hydrologic models for many of the watersheds in the St. Albans and Wheeling Districts including the Coal River, Guyandotte, Upper Kanawha, Upper Ohio, and Tug Fork Watersheds.

3.5. Contingency Plan

Tetra Tech will develop a contingency plan for each CPWS system. The contingency plan will identify alternative sources of water to be used if existing sources become unusable because of degradation to water quality or quantity. The need for alternative water sources could be instantaneous, seasonal, occur in multi-year cycles such as drought, or progress steadily with increased demand from future growth. The timing and quantity of water needed from alternative sources would be expected to vary widely depending on the scenario. For instance, an accidental chemical spill upstream of a water supply intake could require a rapid, but short-term switch to an alternative water source. However, under drought conditions, the quantity of water to CPWS systems is reduced over much longer periods of time. Long-term issues unique to each SWPA, such as geologic conditions, abandoned mine lands, groundwater contaminant plumes, and siltation in reservoirs will also be identified in the contingency plans.

Tetra Tech has experience developing contingency plans to locate alternative water sources in response to contamination of an existing water supply. Tetra Tech planned and implemented a water supply contingency plan for the City of Loma Linda, California when the city's water supply was threatened by the movement of a regional trichloroethene and perchlorate groundwater plume. The project consisted of developing a plan to maintain good quality water through peak demand periods with a combination of short-term and long-term strategies. Implementation of the short-term strategies consisted of establishing

agreements with adjacent water utilities to enable water purchase during critical periods as well as the development of state-approved blending plans to continue pumping from affected wells while maintaining good quality water supply. Long-term strategies consisted of drilling, constructing, and permitting three new deep water supply wells. Implementation of the project consisted of drilling, well design, aquifer testing and analysis, well site development, and permitting.

As part of the SWAP program, the contingency plan will establish procedures to address emergency situations. Key CPWS staff will be identified as emergency coordinators and alternates. Contact information for these individuals will be organized in a quick-reference format. The plan will list major threats to the water supply that will be identified during the project initiation meeting and subsequent field surveys. Transportation routes used to haul toxic substances by truck, rail, or river will receive special attention in the plan. The plan will list contact information for the key private industry and local and state agency personnel responsible for responding to environmental or transportation-related emergencies. Minor threats and long-term trends in water quality or quantity particular to each CPWS will also be researched and discussed.

Tetra Tech has experience identifying threats to drinking water sources. As part of the effort to develop a drinking water source protection (DWSP) plan for the Virgin River watershed in Utah, Tetra Tech conducted an inventory of PCSs for each of the surface drinking water sources in the watershed. Information collected in the ZCC included location of PCSs and information related to potential hazards. This information was used to determine on-site controls to mitigate potential impacts from hazards. Tetra Tech developed a GIS-based approach for determining the natural setting sensitivity of each surface drinking water source and each PCS using climate, vegetation, slope, and soil permeability data. The plan included a susceptibility determination for each surface drinking water source based on qualitative ratings for risk, threat, and vulnerability.

In a related project, Tetra Tech conducted vulnerability assessments for several large municipal CPWSs in southern California, including the City of Alhambra in Los Angeles County. The City of Alhambra receives water from several different sources including wells, booster pump stations, reservoirs, and pressure zones. Tetra Tech analyzed threats to these water sources, as well as threats to the water distribution system, which consisted of treatment works, storage facilities, and distribution lines. Risks to the computer network and electronic systems that control the municipal water supply were also considered. Tetra Tech reviewed the city's existing emergency response plan, and prioritized a list of recommended security improvements.

3.6. Site-Specific Report

Tetra Tech will compile a comprehensive report for each CPWS system. Each site-specific report will contain four sections: results from the PCS inventory, management plan, contingency plan, and BMP summary with implementation recommendations. Upon completion, paper and electronic copies of the reports will be provided, along with a Microsoft Access database containing all data compiled during the project.

The PCS inventory section of the report will contain all the information collected during the project initiation and follow-up meetings, and also include results from necessary PCS inventory field surveys. Meeting minutes, as well as the names of stakeholders attending the meeting will be included. The site-specific reports will be tailored for each CPWS system, but the overall report organization will remain consistent to streamline programmatic oversight across all 60 CPWSs.

Each category of PCS will receive its own sub-section in the report. Existing known PCSs will be differentiated from new PCSs discovered during the PCS inventory. Groundwater sources, such as abandoned wells and underground storage tanks will be organized separately from permitted and non-permitted surface water sources. Because a GIS system will be used to track PCS locations and generate report maps, these GIS resources will be presented on a CD ROM to be included with the paper copy of the report.

The management plan will be folded into the site-specific report. All information regarding BMPs in the ZCC will be organized by BMP type, implementation date, and geographic location. Existing BMPs will be documented in this section, and recommended future BMPs will be prioritized by their potential effectiveness. Maps, tables, and output from applicable BMP effectiveness models will be included for tracking purposes.

The contingency plan will also appear in its own section in the site-specific report. The contingency plan will identify alternative sources of water to be used in case of interruption of the existing water supply. Short-term and long-term solutions will be discussed, including connecting to nearby CPWSs. Current emergency procedures will be analyzed and discussed. The contingency plan will also make provisions for future growth in drinking water demand, especially in communities experiencing significant residential and commercial development. A list of important local contacts will be added as an appendix to the report.

Finally, there will be a section to describe BMP implementation and BMP funding sources. Existing BMP implementation activities will be discussed. Additional BMPs and other protection measures will be analyzed for effectiveness. The report will recommend site-specific BMPs, and list funding sources in a report appendix. BMP recommendations will be accompanied by an implementation time frame and a cost estimate.

Tetra Tech has experience in identifying appropriate BMPs and rendering BMP cost estimates. For the Upper Neuse River Basin Association, Tetra Tech developed a stormwater BMP evaluation tool for the Upper Neuse River watershed near Durham, North Carolina. The Site Evaluation Tool (SET) is a simple Microsoft Excel program that features a stormwater model combined with a cost component that evaluates engineering costs for BMPs. The SET also takes into account construction, design, treatment, additional stormwater conveyance structures, and inspection and maintenance costs for BMPs. Each BMP is evaluated by contrasting pre- and post-development effects on variables such as stormwater quality and quantity, sedimentation, and nutrient loading. The SET is useful for analyzing new development sites, redevelopment sites, stormwater retrofits, or to predict the impacts avoided through land protection. The SET can also predict costs for all scenarios examined. Model documentation, user guide, training materials, and training workshops were developed for the client. The SET has since been used to assess potential pollutant avoidance in protected lands in the Upper Neuse River watershed.

3.7. Timeline

In order to accomplish all of the tasks (public meetings, PCS survey, and reports) for each of the 60 CPWSs, Tetra Tech has split the counties located in the Wheeling and St. Albans Districts into three geographic regions. One SWAP Specialist will be assigned one of the geographic regions and will coordinate all tasks for each of the CPWSs in their region so that projects will run concurrently. As soon as the project is awarded, Tetra Tech will begin planning and preparing for the project initiation meetings and coordinating field crews for the PCS survey. The three SWAP Specialists will coordinate with local and county officials to schedule times and locations for the project initiation meetings in their regions. We propose to conduct one meeting per day in each region for four days of the work week. The field crew

will be verifying the existing PCSs while the meetings are taking place and will then be available to document any new sources after the meetings with one day a week to catch up. We have allowed an extra month for the public initiation meetings in case of any scheduling difficulties. The field crews working on the PCS survey will also have an extra week after completion of the public initiation meetings to further investigate any outstanding issues. Once the field crews have completed the PCS survey, Tetra Tech will compile the data and submit it for BPH review, allowing 14 calendar days for review and two weeks for any revisions after BPH review.

Development of the management and contingency plans will take place concurrently with the public initiation meetings and PCS surveys. During the public initiation meetings, SWAP Specialists will be asking local and county officials and agencies for any previously completed management and contingency plans. Tetra Tech will use these completed plans to begin developing updated plans for each CPWS system.

Once the draft management and contingency plans have been developed, Tetra Tech will begin scheduling follow-up meetings for each of the 60 CPWSs. We have allowed nine weeks for this effort assuming that three to four meetings take place each week in each of the three regions. Also during this time, Tetra Tech will be preparing draft site-specific reports. We will begin submitting these site-specific reports for BPH review one month later and will allow 28 calendar days for BPH review of these documents, keeping in mind that Tetra Tech will be submitting several site-specific reports at a time. Once Tetra Tech has completed revisions and submitted final site-specific reports, we will begin scheduling project closure meetings. We expect to follow the same schedule as that proposed for the follow-up meetings, with three to four meetings each week in each of the three regions. This concurrently rolling schedule should allow enough time to complete all tasks for each of the 60 CPWSs within a 12 month period.



ID	Task Name	Start	Finish	2009		Oct 2009					Nov 2009				Dec 2009			
				9/13	9/20	9/27	10/4	10/11	10/18	10/25	11/1	11/8	11/15	11/22	11/29	12/6	12/13	12/20
1	Meeting Planning and Organization	1/1/2009	1/30/2009															
2	Project Initiation Meetings	2/2/2009	5/1/2009															
3	PCS Survey	2/2/2009	6/26/2009															
4	Field Verification	2/2/2009	5/8/2009															
5	Data Compilation	5/4/2009	5/29/2009															
6	BPH Review	6/1/2009	6/12/2009															
7	Revisions	6/15/2009	6/26/2009															
8	Development of Management Plans	2/9/2009	6/26/2009															
9	Development of Contingency Plans	2/9/2009	6/26/2009															
10	Follow-Up Meetings	6/29/2009	8/28/2009															
11	Site-Specific Reports	6/29/2009	11/27/2009															
12	Preparation of Draft Reports	6/29/2009	9/4/2009															
13	Submittal of Draft Reports	7/31/2009	9/11/2009															
14	BPH Review	8/3/2009	10/9/2009															
15	Revisions	8/31/2009	11/6/2009															
16	Submittal of Final Reports	10/5/2009	11/27/2009															
17	Project Closure Meetings	11/2/2009	12/31/2009															

Figure 3-3. Tetra Tech's Proposed Project Timeline

3.8. Requisite Equipment

Tetra Tech maintains state-of-the-art computing facilities, equipment, and software (Tables 3-2 through 3-6) to support our clients' needs for project management, information management, data and geospatial analysis, database management, mathematical modeling, literature searches, Internet access, file maintenance and storage, document production, and graphics generation.

Tetra Tech maintains an account with MeetingPlace for our teleconferencing and web conferencing needs. Teleconferencing and web conferencing can be arranged almost immediate through MeetingPlace with an unlimited number of attendees.

Tetra Tech's printing and reproduction resources are listed in Table 3-2. Tetra Tech also has extensive document and graphics production capabilities. For example, our Fairfax, VA, office maintains a fully equipped publications and graphics department with eight full time staff, skilled in both PC and Macintosh systems. Our desktop publishing and graphics specialists consistently produce high-quality environmental reports, brochures, posters, handbooks, documents, and multimedia products. Tetra Tech's publications and graphics department has the capability to generate multicolor or black-and-white maps, graphs, presentation charts, viewgraphs, 35mm slides, 36-inch-wide color posters, and other audiovisual materials using numerous type styles and page formats. We have expertise in developing and maintaining Internet-ready documents and functional, database-driven web sites for USEPA and other federal agencies. We are capable of producing layout, coding, scripting, graphics, production/editing, database setup, and output reports for the Internet.

Tetra Tech's computer hardware and systems capabilities are also listed in Table 3-2. Tetra Tech uses electronic communication systems to facilitate data transmission, e-mail, and Internet access. We maintain intra-office and Internet connectivity and an Internet Server that hosts a File Transfer Protocol (FTP) site and a World Wide Web (WWW) site. Tetra Tech maintains full 24-channel T1 direct access to the Internet for rapid and reliable external electronic communications.

Software applications used by Tetra Tech for statistical, database and web development are listed in Table 3-3, for GIS development and data processing are listed in Table 3-4 and for environmental modeling are listed in Table 3-5. The field equipment necessary to complete the potential contaminant source surveys and project meetings are listed in Table 3-6.

Our GIS resources include fully equipped GIS and computer-aided design (CAD) laboratories. Desktop GIS is widely used by our scientists and engineers on a daily basis to support our projects. More intensive GIS processing is achieved using ESRI's Arc/Info and ArcView, including the most recent ArcGIS 9.2 and Arc/Info, customized MapObjects applications and dedicated systems. In developing and applying databases and systems, Tetra Tech uses a variety of platforms, software tools and GIS based on our wide expertise in relational databases (e.g., Oracle, MS Access), GIS packages (e.g., Arc/Info, ArcView, Map Objects, ArcIMS), operating systems (e.g., Unix, Windows), and programming languages (e.g., C++, Visual Basic, Java, ArcView Avenue, Arc/Info AML).

Other support functions include Tetra Tech's accounts with numerous online information services, including GIS data repositories, and personnel with familiarity and experience searching a wide variety of databases, including WVDEP GIS Datasets, USEPA's STORET and U.S. Geological Survey (USGS) National Water Information System (NWIS). We also have easy access to a host of major national libraries, including USGS, U.S. Department of Agriculture (USDA), USEPA, National Oceanic and Atmospheric Administration (NOAA), and a large number of academic and public libraries. Tetra Tech also can connect directly to the mainframe at USEPA's National Computer Center in Research Triangle



Park, NC, with desktop access provided through a cluster controller. Tetra Tech has extensive experience using the expansive processing and storage resources available at USEPA's computer center.

The SWAP Specialists and the Field Operations Managers will have access to the required equipment to conduct all aspects of the field data gathering task and stakeholder meetings as outlined in Table 3-6. Both Tetra Tech and Buchart Horn have adequate equipment to conduct the required tasks as outlined in the proposed timeline section of this EOI on a concurrent basis.

Table 3-2. Desktop Access Data Processing Hardware

Equipment	Quantity
High Capacity Network Server	10
Pentium III/4 Processor IBM-Compatible PC	200
Macintosh PC (Power Mac, etc.)	5
Notebook/Laptop IBM-Compatible PC	25
Windows 2003/2000 Internet Server with FTP and World Wide Web support	12
Cluster Controller (Direct Access to USEPA's National Mainframe)	3
Hewlett-Packard DesignJet 5000 Color Plotter (60" wide)	1
Hewlett-Packard DesignJet 650C/PS Color Plotter (36" wide)	1
Hewlett-Packard Business InkJet 2250/2600	2
Hewlett-Packard DeskJet 1600C ColorSmart Printer	1
Hewlett-Packard 4050, 5000	2
Hewlett-Packard 8000N, 8100N	2
Minolta CF900 Color Laser Printer	1
Hewlett-Packard LaserJet Print Stations (5M, 4M Plus)	2
Epson 1520 PS Color Printer	1
Iomega 1-Gigabyte Jaz removable cartridge storage device	2

Table 3-3. Statistical, Database, and Web Development Software Packages

Database Software	Statistical Software	Web Development Software
<ul style="list-style-type: none">▪ Oracle 8i/9i▪ Microsoft SQL Server 2000▪ Microsoft Access 97/2000/2003▪ Paradox 7.0▪ Lotus Notes 4.6▪ Instant Database 2.0	<ul style="list-style-type: none">▪ Statistica 6.1▪ Total Access Statistics 2000▪ Sigma Plot 5.0▪ WQStat Plus▪ STATISTICA 5.0 Windows▪ SYSTAT Mac▪ SYSTAT 9.0 (Windows)▪ IBM MVS (Mainframe) SAS▪ PC SAS▪ Delta Graph	<ul style="list-style-type: none">▪ Dreamweaver MX 2004▪ Macromedia Studio MX▪ Lotus Domino 4.6▪ Microsoft Front Page▪ Fireworks▪ Flash▪ Authorware▪ Photoshop▪ JDeveloper

Table 3-4. GIS Development and Data Processing Hardware and Software

Equipment	Quantity
Pentium III/4 Processor IBM-Compatible Workstation	50
240 Gigabyte Mass Storage	2
1.6TB VXA-2 Tape Drive	2
8mm Tape Drive	2
4mm Tape Drive	1
1/4' 150MB Tape Drive	1
CD/DVD Writers	120
KURTA XLC 3648 36" x 48" Digitizing Table	1
Summasketch II Digitizer Table	2
Compaq Pagemarq 20 Printer	1
ESRI ArcInfo 9	1
ESRI ArcInfo 8	1
ESRI ArcView 9	6
ESRI ArcView 3.1 and 3.2 (Unix and Windows)	16
ESRI ArcIMS 4	1
ESRI ArcSDE 9	1
ESRI Map Objects Workstation 2.0	25
ESRI Spatial Analyst 1.1	5

Table 3-5. Environmental Computer Models and Systems used by Tetra Tech

Model Category	Model Name
Ecological	IFIM, HEP
Watershed Runoff	HSPF, NPSM, LSPC, MDAS, SWMM, HEC-1, TR-20, PSURM, WSTT, GWLF, AGNPS, P8, SWAT
Thermal Fate	EFDC, TRANQUAL, HSPF, DISPER, ELA
River Hydraulics	HEC-2, HEC-RAS, WSPRO, FESWMS-2DH, DAMBREAK, DWOPER, UNET
Hydrodynamics	EFDC, CAFE, TEA, CE-QUAL-W2, TABS-2, FESWMS-2DH, DYNHYD5, MIT-DNM, RMA
Discharge Plume	CORMIX, USEPA Plume Models
Mixing Zone	CORMIX, EFDC, TEA/ELA, CAFE/DISPER
Eutrophication	QUAL2E, WASP, CE-QUAL-W2, CE-QUAL-RIV1, RIVHW, EFDC, BATHTUB, LAKE2K
Toxic Fate	TOX15, SMPTOX, RIVRISK, AMMTOX, TOXCALC
Sediment Transport and Scour	TABS-2, STUDH, HEC-6, QUASED, HEC-RAS, EFDC
Ground Water	MODFLOW, MOC, PLASM, Random Walk, GLEAMS

Table 3-6. Field Equipment

Field Equipment	Quantity
4 wheel drive vehicles	3 (at a minimum, each field team will have access to a 4 wheel drive vehicle)
WAAS GPS (Submeter Accuracy)	3 (at a minimum, each field team will have access to a WAAS GPS unit with submeter accuracy)
Laptop Computers with MS Office 2003 (Access 2003 and ArcGIS 9.2)	3 (at a minimum, each field team will have access to a laptop computer for electronic data entry in the field)
Digital Cameras	3 (at a minimum, each field team will have access to a digital camera in the field)
1 large color plotter (HP 1050)	1 located in Charleston, WV, 1 in Fairfax, VA, and 1 in York, PA, office locations
InFocus (W360) Digital Display Projector	3 (each SWAP Specialists will have access to digital projectors for all stakeholder meetings)

**EDUCATION**

Ph.D , Agricultural Engineering,
University of Maryland, 1990

M Eng., Agricultural Engineering,
Cornell University, 1984

B.A., Mathematics, Hamilton
College, 1979

YEARS OF EXPERIENCE

Total: 23

With Tetra Tech: 17

PROFESSIONAL AFFILIATIONS

American Society of Civil
Engineers

Reviewer, Journal of
Environmental Engineering

American Society of Agricultural
Engineers

American Water Resources
Association

Soil and Water Conservation
Society

Alpha Epsilon

USDA National Needs Fellow

Cornell Master of Engineering
Fellowship

KEY AREAS OF EXPERIENCE

- Pollutant source assessment
- Watershed hydrology and stormwater
- Watershed runoff quality
- TMDL development and implementation
- Watershed management plan development
- BMP evaluation and implementation planning
- Tool development
- Information management system development
- Receiving water modeling
- Watershed modeling

Dr. Shoemaker has more than 20 years experience in the analysis of watersheds and ecosystems and development of management plans. She has provided project management and oversight for hundreds of work assignments under a variety of federal, state and local contracts. She has responded to numerous quick response requests for technical review and consultation. Dr. Shoemaker has also directed numerous large-scale, multi-disciplinary watershed management projects such as Lake Tahoe, Milwaukee, Clermont County, and Prince Georges County. She has applied both ground and surface water models including HSPF, BASINS, SWMM, GWLF, WASP, CREAMS, GLEAMS, PRZM, MODFLOW, and DRASTIC. Dr. Shoemaker supported the development and testing of the first version of GWLF, and the initial design and development of the BASINS modeling system. Dr. Shoemaker manages Tetra Tech's Water Resources Center, which includes over 60 specialists in modeling, water quality assessment, and systems development throughout the United States.

Project Experience

Prince George's County NPDES Support and Related Professional Services, Prince George's County, MD. Supported Municipal Stormwater Management and NPDES Permit Application for Prince George's County, MD. Developed a SWMM-GIS modeling framework for stormwater pollutant load estimations. Other recent task orders include green engineering and site design demonstration projects, BMP modeling system development, septic system databases, WPS update, and ongoing monitoring support.

Milwaukee Metropolitan Sewer District (MMSD) 2020 Planning study (Milwaukee, WI). Tetra Tech lead for the development of watershed modeling, analysis, and management alternatives evaluation for the MMSD 2020 planning study. This landmark study takes a regional watershed perspective to evaluating water quality management. Building a comprehensive modeling system including HSPF model of the watershed, linked with CSO and receiving water models in the estuary and near shore lake area. The project includes extensive multiple agency facilitation and public outreach support.

Lake Tahoe TMDL Development. Principal Investigator for the development and execution of a comprehensive four year plan to develop a study and TMDL including design of a modeling system, stakeholder involvement planning, data needs, and TMDL components. Oversaw the development of a watershed model, model testing, and collaboration with the interagency TMDL development group.

Region 3 TMDL Development and Modeling Support. Provided continuous support in developing TMDLs, training states, and providing technical review and analysis as needed. Under extremely short lawsuit-mandated time frames and limited budgets, directed the development of hundreds of TMDLs in WV, VA, and DE for metals, nutrients, and fecal coliforms.

Development of System for Urban Stormwater Treatment Analysis and Integration (SUSTAIN), USEPA ORD. Former project acronym: ISMDSF. Principal Investigator identifying needs, available models and modeling systems, conceptual design, and system prototype. Ultimately this system will provide tools to optimize watershed management activities and trade resources to meet identified water quality goals.



EDUCATION

M S., Environmental Engineering,
Virginia Tech, 1986

B S., Biology, University of
Kentucky, 1981

YEARS OF EXPERIENCE

Total: 20

With Tetra Tech: 15

KEY AREAS OF EXPERIENCE

- Project management
- Stormwater management
- Watershed-based planning
- Best management practices
- Green engineering and low impact development
- TMDL support
- GIS mapping
- Watershed modeling

Mr. Wilson is a water resources engineer with broad experience in environmental engineering and project management. He has extensive background in watershed management, particularly municipal stormwater and water resources best management practices. Mr. Wilson's multi-disciplinary scientific perspective compliments experience in engineering design; construction and operation of stormwater management systems; municipal and industrial wastewater treatment; and groundwater and soil remediation. Mr. Wilson has managed the contracting, staff, budget, and schedule for large projects and multi-disciplinary programs.

Project Experience

Dispersed BMPs in Shepherd Creek Watershed, EPA Office of Research and Development, Cincinnati, OH. Project manager for planning, design, and implementation of a field study of the effects of dispersed best management practices (BMPs) in a suburban watershed. GIS was used to develop area maps of the bid results and installations, as well as site maps for every property in the watershed. Tetra Tech is maintaining the BMPs for three years after installation (through 2010).

Beargrass Creek Water Quality Tool and Total Maximum Daily Loads (TMDLs), Louisville Metropolitan Sewer District (MSD), Louisville, KY. Project manager for development of the Beargrass Creek Water Quality Tool that predicts the water quality benefits of capital projects and management practices in a 61 square-mile urban watershed with a variety of water quality impacts, including both Combined Sewer Overflows and Sanitary Sewer Overflows. The Water Quality Tool is a coordinated set of computer models that allocates the point and nonpoint source loads for TMDLs being developed. Mapping products have been also been developed to illustrate the model results over the watershed.

Watershed Plan Reviews and Technical Assistance, MI. Performed technical review of five watershed management plans in Michigan as requested by EPA Region 5 and Michigan Department of Environmental Quality. The review included development of review criteria, mapping products using GIS, and a tool for detailed evaluation and scoring on completeness in terms of the new EPA guidance that specifies nine minimum elements. After initial review, Mr. Wilson visited each of the watersheds to discuss the review and provide assistance to the authors in revising the plans. He presented the findings of the reviews in workshops for watershed planners and regulators.

Louisville MSD Wet Weather/Water Quality Program, Louisville, KY. Developed a comprehensive program that addresses the sewer collection systems, sewer overflow (CSO and SSO) abatement, stormwater system (Phase I MS4 permit), and water quality issues for the countywide sewer district. Served as program manager, responsible for client communication, schedule/budget oversight, staff assignments, and management of 20 subconsultants who directed more than 30 projects.

Fulda Regional Sewer District, Wastewater System Preliminary Engineering Report, Fulda, IN. Planned and completed preliminary design of wastewater collection system for a small community with failing septic tanks. Alternatives evaluated were gravity sewers, low-pressure sewers with grinder pumps, new central wastewater treatment plant, and connection to neighboring town's treatment facility. Detailed capital and operating cost estimates were part of the alternatives comparison.

**EDUCATION**

M.S., Environmental Pollution Control, The Pennsylvania State University, 1997

B.S., Environmental Science, Widener University

YEARS OF EXPERIENCE

Total: 11

With Tetra Tech: 8

PROFESSIONAL AFFILIATIONS

American Water Resource Association

Water Environment Federation

KEY AREAS OF EXPERIENCE

- Extensive West Virginia TMDL development
- Pollutant source assessment
- GIS spatial analysis
- Watershed Modeling
- Biological Stressor Identification
- NPDES Permitting
- Watershed management plan development
- TMDL Tool development for Total Recoverable Metals, Dissolved Metals, and Acidity

Mr. Ludwig is the director of the Charleston, WV, office of Tetra and will coordinate closely with Mr. Wilson and the DHHR BPH project managers to ensure that projects are meeting all technical objectives according to schedule. Mr. Ludwig is a senior environmental scientist with over 10 years experience providing technical and management support to federal, state, regional, and private clients in the areas of water resource, watershed and water quality assessment, watershed modeling, and TMDL development. Currently, he serves as project manager for the existing TMDL contract with WVDEP DWWM that includes the development of TMDLs for total iron, total manganese, dissolved aluminum, pH, selenium, fecal coliform bacteria, and biological impairments throughout the state of West Virginia. Mr. Ludwig also has extensive experience implementing various hydrologic and water quality models and has played instrumental role in the technical development of the Mining Data Analysis System (MDAS), a GIS-based dynamic watershed tool that has been customized for watershed assessment and TMDL development efforts in West Virginia. Additionally, he has reviewed National Pollutant Discharge Elimination System (NPDES) permits and assessed measures taken to model the effects of discharge to stream systems. He has conducted a series of training courses to support USEPA and various states (WV, PA, KY, AZ) in modeling and watershed management development.

Project Experience

West Virginia TMDL Development for Hydrologic Groups B, C, and D. Under contract with WV DWWM, currently serving as project manager for more than 750 TMDLs for metals (iron, dissolved aluminum, manganese, and selenium), pH, fecal coliform bacteria, and biological impairments in the Lower Kanawha River, North Branch/Potomac River, Coal River, Gauley River, Potomac River Direct Drains, Greenbrier River, New River, Little Kanawha River, and James River watersheds

TMDL Development for Upper Kanawha and Upper Ohio North watersheds, WV. Under contract with West Virginia, Department of Environmental Protection, Division of Water and Waste Management, served as project manager for completion of more than 200 TMDLs for metals (iron, dissolved aluminum, and manganese), pH, fecal coliform bacteria, and biological impairments for the Upper Kanawha River and Upper Ohio North Watersheds in West Virginia.

West Virginia TMDL Development Support for USEPA Region 3. For USEPA Region 3, served as project manager for the development of over 1,000 pH and metals TMDLs in West Virginia including the Monongahela River, West Fork River, Tug Fork River, Guyandotte River, Elk River, and Tygart Valley River watersheds.

Dissolved Metals Transport Modeling for California Gulch, CO. In support of Colorado Department of Human Health and Environment, serving as Project Manager for dissolved metals transport modeling in the California Gulch watershed to evaluate remedial effectiveness scenarios of various mining reclamation activities in the California Gulch watershed.

Pennsylvania TMDL Development Support for USEPA Region 3. Served as project manager and lead technical advisor for TMDL development in Pennsylvania, including Chartiers Creek Brush Run, Plum Run, and Glanraffan. Documented and presented results in public meetings and prepared responses to written public comments.

**EDUCATION**

M.E.M., Environmental Management, Duke University, 1998

B.A., Biology, University of California – Santa Cruz, 1994

YEARS OF EXPERIENCE

Total: 11

With Tetra Tech: 8

KEY AREAS OF EXPERIENCE

- Water quality field studies
- Land use analysis and GIS
- Watershed data management
- Watershed model calibration and TMDL development
- Technical writing/editing
- Stream restoration evaluation and design
- Wetland/Botanical surveys

Mr. Beckman is an environmental scientist specializing in TMDL development and natural resources inventory. He has 11 years of professional experience performing scientific research, analysis, and large scale field surveys. Mr. Beckman currently supports Tetra Tech TMDL development efforts for the West Virginia DEP. His duties include data management, GIS analysis, water quality modeling, technical writing, field investigations, and public outreach support. Mr. Beckman works with West Virginia DEP staff as well as other state and federal agencies to develop the most recent and accurate watershed data necessary to build TMDL models for metals, sediment, acid deposition, and fecal coliform.

Project Experience

TMDLs for New River and Greenbrier River Watersheds, WV. For the WV DEP, served as TMDL development team member. Participated in the Stressor Identification workshop for biological TMDLs. Used GIS to draw watershed model subwatershed delineations. Built and calibrated MDAS watershed models. Developed TMDL load allocations and pollutant reductions. Assisted with agricultural pollution source tracking field surveys in impaired watersheds.

TMDLs for Gauley River and Potomac Direct Drains Watersheds, WV. For the WV DEP, served as TMDL development team member. Used watershed data to build MDAS models for fecal coliform and sediment. Performed hydrology calibration, water quality calibration, and load allocations for the Potomac Direct Drains watersheds models. Edited technical reports, and collected data for streambank erosion field studies.

TMDLs for Coal River, Lower Kanawha, and North Branch Potomac Watersheds, WV. For the WV DEP, served as TMDL development team member. Performed GIS analysis to contribute to the pollutant source reports for the three TMDL watersheds. Produced ArcInfo GIS project displaying TMDL results as part of the public TMDL report. Edited text and made figures for the public and technical TMDL reports.

Wetlands Baseline Survey, ND. For the Turtle Mountain Band of the Chippewa, developed survey protocol and sampled over 100 wetlands on tribal lands. Identified dominant vegetation, wildlife species, benthic substrate, invasive species, and anthropogenic disturbance. Designed MS Access database and ArcView GIS project to track and present survey results.

Wadeable Streams Assessment, NH, VT, ME. For the USEPA Office of Water, served on a field crew to sample over 50 streams in New Hampshire, Vermont, and Maine to study stream ecology and geomorphology. Collected water chemistry samples and benthic macroinvertebrate specimens; also measured stream flow, substrate, vegetative cover, large woody debris, and fish habitat.

Environmental Restoration Feasibility Study, Powderly Creek, Pennsylvania; USACE, Baltimore District. Performed wetland vegetation field surveys for this environmental restoration feasibility study. Used Evaluation for Planned Wetlands ecologic modeling methodology to calculate functional values of degraded wetlands. Developed a planting plan to restore native vegetation to degraded wetland and upland habitats.

**EDUCATION**

M.E.M., Environmental Management, Duke University, 2003

B.S., Geology, West Virginia University, 1998

YEARS OF EXPERIENCE

Total: 8

With Tetra Tech: 1

KEY AREAS OF EXPERIENCE

- Water quality field studies
- Land use analysis and GIS
- Watershed planning
- Watershed data management
- Watershed model calibration
- Technical writing/editing
- Wetland surveys

Ms. Hawkins is an environmental scientist focusing on water resources. She currently performs computer modeling, including Geographic Information System (GIS) analyses, to determine Total Maximum Daily Loads (TMDLs) for surface waters in West Virginia, Pennsylvania and Santa Barbara County, California. Ms. Hawkins has over 5 years of experience working on wetland delineation/permitting and watershed planning projects. She has analyzed GIS data for watershed planning in the Carolinas, and utilized GIS and HEC-HMS to model water quantity effects from development in Carolina watersheds. She has conducted water quality sampling on reservoirs and streams, as well as stream assessments for watershed planning. Ms. Hawkins is also trained to conduct endangered species surveys and wetland determinations and delineations.

Project Experience

TMDLs for Cheat River Watershed, WV. For the WV DEP, served as TMDL development team member. Created an ArcGIS 9.1 project containing four views based on the impairment types found within the watershed including metals (iron, manganese, aluminum and pH), fecal coliform bacteria, biological, and georder. Geographical features of the watershed and possible pollutant sources were represented in separate shapefiles.

TMDLs for Santa Barbara County Beaches, California. For the Central Coast Regional Water Quality Control Board and EPA, served as TMDL development team member. Used GIS to draw watershed model subwatershed delineations. Used watershed data to build LSPC models for indicator bacteria. Performed hydrology and water quality calibration. Edited text and created figures for public and technical reports.

Wasteload Allocation Modeling for Kentucky Department of Water. Modeled facility discharges using QUAL2K tool to determine appropriate NPDES permit limits for biochemical oxygen demand (BOD), ammonia (NH₃), and dissolved oxygen (DO). Reviewed and updated background data, including GIS files and previous permits. Updated QUAL2E model input files. Used translator tool, designed by Tetra Tech, to convert QUAL2E input files into QUAL2K.

Local Watershed Plan for Lower Creek Watershed, NC. For the NC Ecosystem Enhancement Program, served as project coordinator for a Comprehensive Local Watershed Plan (LWP) to address stressors impacting water quality, hydrology and aquatic habitat within two 14-digit HUCs covering 100 square miles in the Catawba River Basin. Identified restoration projects and developed a watershed management plan to be used by local governments.

Watershed Assessment for Lower Yadkin Watershed, NC. For the NC Ecosystem Enhancement Program, conducted stream visual assessments of stream reaches in order to characterize impairment sources. Used GIS and HEC-HMS to model water quantity effects on the watershed. Identified restoration projects to improve impairment. Assisted in developing a watershed management plan to be used by local governments to increase public awareness of watershed issues and provide guidance to improve water quality.

**EDUCATION**

M.S. Environmental Science & Policy, Johns Hopkins University, Baltimore, MD, 2003

B.S. Earth & Environmental Science, Wilkes University, Wilkes-Barre, PA, 1996

YEARS OF EXPERIENCE

Total: 12

With Tetra Tech: 5

LICENSES & CERTIFICATIONS

Professional Wetland Scientist (#00001395), July 2003

Certified Forest Stand Delineator and Conservation Planner in Maryland, September 2003

PROFESSIONAL AFFILIATIONS

Society of Wetland Scientists

Trout Unlimited

KEY AREAS OF EXPERIENCE

- Watershed assessment
- Pollutant source identification and assessment
- Watershed data management
- Water quality field studies
- ArcGIS analysis
- Data manipulation in GIS, MS Excel and MS Access
- Client interaction
- Public meeting facilitation
- Report documentation
- Statistical Data analysis
- Water quality modeling
- Abandoned mine lands inventories

Mr. Wilkes is an environmental scientist providing technical support in the development of Total Maximum Daily Loads (TMDL) to the West Virginia Department of Environmental Protection, Division of Water and Waste Management. His responsibilities include watershed data management, organization of the biological stressor identification process, modeling, and assisting with the development of various TMDLs (iron, aluminum, manganese, selenium, chloride, pH, fecal coliform, acid deposition, and sediment) for the state of West Virginia. Mr. Wilkes is experienced with contaminant source identification, stakeholder meeting facilitation, report preparation, and proficient in data management and GIS manipulations of large data sets.

Project Experience**Watershed Assessment, Pollution Source Identification for TMDL**

Development, WV. Provides watershed data management skills to organize chemical, biological and physical data for statistical analysis for more than 10 individual WV DEP TMDL projects. He assists in organizing the pollutant source report information, such as: watershed delineations, GIS data organization from multiple state agencies (forest harvest sites, forest burn sites, active oil and gas wells, mining permits and individual outlets, AMD seeps, stormwater construction permits, industrial waste permits, sewage treatment effluent permits, and various nonpoint landuse oriented sources of pollution) throughout West Virginia. Coordinates meetings with WVDEP, Tetra Tech staff, stakeholders and members of the public and composes reports during the TMDL development process.

Biological TMDL Development, WV. Organized and participated in the EPA stressor identification (SI) process for biologically impaired streams for TMDL development for the WVDEP. The EPA stressor identification methodology was used to identify pollutant stressors to the biological community to ensure that all significant pollutant sources (sediment, AMD, ionic strength, nutrients, habitat alteration, temperature, etc.) would be evaluated in the TMDL process. To further define biological impairments, macroinvertebrate tolerance values and a new modeling approach ("dirty reference modeling") were developed. Tolerance values were determined for macroinvertebrates at the genus taxonomic level and were based on observed data collected throughout the state. The macroinvertebrate observations were correlated with chemical and physical parameters also collected throughout the state. The "dirty reference modeling" is showing promising results and coupled with tolerance values and the EPA SI approach; demonstrate a tremendous strength of evidence for determining biological stressors in biological impaired streams.

Previous Experience

Mr. Wilkes' prior experience has given him a wealth of diversity and experience. He has sampled a multitude of media from surface water, soils, sediments and air for various parameters, such as metals, volatile organic compounds, nutrients and fecal coliform. He has collected numerous macroinvertebrate samples and identified them to family and genus levels. Mr. Wilkes has taken part in numerous hazardous materials investigations on abandoned mine lands and participated in the NEPA process for highway expansion projects.



EDUCATION

J.D., Suffolk University Law School, 1998

B.A., English, University of Connecticut, 1995

YEARS OF EXPERIENCE

Total: 10

With Tetra Tech: 8

LICENSES & CERTIFICATIONS

Certified Federal Contracts Manager

PROFESSIONAL AFFILIATIONS

National Contracts Management Association

KEY AREAS OF EXPERIENCE

- State and Local Government Contracts

Ms. Barker is the Contracts Group manager and a senior contract administrator in Tetra Tech's Fairfax office. She has several years of contracts experience covering the full spectrum of contractual activities from proposal preparation through contract close out. She has been extensively involved in the following areas: proposal preparation; negotiating and managing all levels and types of federal and private sector contracts and subcontracts; all aspects of financial reporting; interfacing with contracting officers; supervising and training of junior personnel; and drafting of contracts, subcontracts, consultant agreements and teaming agreements. She has a thorough knowledge of the FAR and currently has her CFCM (Certified Federal Contracts Manager) certification.

Project Experience

West Virginia TMDL Development. Serves as the Contract Administrator for Purchase Order No. DEP12147 and has done so since the project's inception.

Other contracting experience. Serves as the Contract Administrator for the majority of the Fairfax Operating Center's state contracts. She currently works on major contracts with Texas, Nevada, Florida, North Carolina and Minnesota

On the federal level, has managed contracts for the Army Corps of Engineers, the Department of Justice and the USEPA.

Has managed all types of contracts, including CPFF, CPFF/LOE, I&M, FFP and IDIQ.



EDUCATION

M.S., Biological Sciences, Florida State University – Tallahassee, FL, 1996

B.S., Biology, Virginia Polytechnic Institute and State University (Virginia Tech) – Blacksburg, VA, 1991

YEARS OF EXPERIENCE

Total: 13

With Tetra Tech: 8

PROFESSIONAL AFFILIATIONS

Water Environment Federation

KEY AREAS OF EXPERIENCE

- Biological and bacteria TMDL development
- Stressor identification
- Watershed management plan development
- Watershed modeling and stormwater implementation
- Water quality monitoring and bioassessment
- State regulatory experience (Virginia DEQ)

Mr. Boschen has 13 years of professional experience in water quality planning programs, stream and lake assessment, wetland permitting and mitigation, water quality and biological sampling, and watershed modeling studies. Mr. Boschen has experience with all aspects of the Clean Water Act, including wetland and stream protection programs (Sections 404 and 401), water quality standards, NPDES, water quality planning, and TMDLs. As an Environmental Engineer with Virginia DEQ, Mr. Boschen supported NPDES permit activities and modeling studies, performed assessments of water quality data and assisted in the production of the biennial 305(b) and 303(d) reports. His responsibilities also included coordination and management of nonpoint source pollution studies, management of the regional Virginia Water Protection Permit program (CWA, Section 401), and technical support to monitoring and regulatory programs.

Project Experience

Biological TMDL Development for West Virginia Streams. For WVDEP, served as the project manager for the development of biological TMDLs for streams in the Upper Ohio, Upper Kanawha, Lower Kanawha, Coal River, and North Branch Potomac watersheds in West Virginia. Coordinated stressor identification studies involving the analysis of available water quality, habitat, and biological data to determine the primary causes of impairment for each listed stream. Also participated in stressor identification studies for the Gauley River and Potomac Direct Drains watersheds.

Watershed Planning Support Services, Fairfax County, VA. For the Fairfax County Department of Public Works and Environmental Services, Co-Project Manager for the development of watershed planning protocols and technical tools. Tetra Tech is assisting the County in developing watershed plans for all 30 watersheds, including the development of watershed models (SWMM and HEC-RAS) and providing additional technical support. Assisting County staff in addressing stormwater planning needs, stormwater permit requirements, and Chesapeake Bay nutrient and sediment reduction goals.

Development of Watershed Loading Models. Led the development of GWLF model enhancements for sediment and nutrient modeling. Helped design an enhanced set of GWLF tools and capabilities to support TMDL development in West Virginia, Virginia, and other states. This work included the development of a GIS-based extension that rapidly creates GWLF input files, extended subwatershed modeling capabilities, a methodology to estimate stream channel erosion/deposition loads, and enhanced TMDL allocation tools.

Elk River TMDL Development, WV. For WVDEP and USEPA Region 3, participated in the development of mining TMDLs for the Elk River Basin in West Virginia. Provided watershed and water quality data analyses to determine correlations between sedimentation and metals loading. Also assisted in watershed modeling activities, including sediment source representation and TMDL calculations.

Biological and Bacteria TMDL Development for Virginia Streams. For the Virginia Department of Environmental Quality (VADEQ) and USEPA Region 3, served as the Project Manager for the development of biological and bacteria TMDLs for streams in the Potomac-Shenandoah, Tennessee-Big Sandy, Roanoke, and James River Basins.

**EDUCATION**

Postdoctoral Fellow, Northwestern University, 1970-72

PhD Chemistry, Brown University, 1970

MSc Chemistry, Brown University, 1968

BA Chemistry, New York University, 1965

YEARS OF EXPERIENCE

Total: 32

With Tetra Tech: 2

KEY AREAS OF EXPERIENCE

- Project management
- Aquatic Chemistry
- Drinking water regulations
- Water quality monitoring
- QA/QC review

Dr. Brass has more than 30 years of experience in EPA's drinking water program with focus on methods and monitoring support to standard setting and implementation programs, and served as Branch Chief and Methods Team Leader during the majority of this period. He has knowledge of the technologies and methods for the measurement of organic and inorganic chemicals and certain microbiological contaminants at trace levels in water, as well as the quality assurance and quality control procedures for the measurement of these analytes. More recently, he has supported a variety of projects at Tetra Tech, Inc. that include: assessing natural conditions for state ambient monitoring criteria; evaluating the occurrence and treatment of manganese in raw and finished drinking water; serving as the Quality Assurance Officer for a water and sediment monitoring project in Skagway, AK; and developing a marketing document for Tetra Tech's Disaster Management Initiative.

Project Experience

U.S. Environmental Protection Agency. Dr. Brass managed the drinking water Alternate Test Procedure (ATP) program, whereby applicants provide information to EPA to demonstrate the equivalence of methods to those approved for monitoring in drinking water regulations. Dr. Brass was a co-chair of the Methods and Data Comparability Board, a Work Group of the Federal Advisory Committee on Water Information. The focus of the Methods Board's activities is to develop ways of generating comparable data of known quality. He was instrumental in developing the National Environmental Methods Index that contains a broad range of methods for the measurement of contaminants in water. Dr. Brass is experienced in working with program staff at policy and technical levels in federal and state organizations and served as EPA, Office of Water liaison to Standard Methods, a consensus methods organization.

Natural Condition Based Water Quality Standards, AK. Provided information used in a guidance developed by the State of Alaska to show that natural conditions for a range of contaminants exceed established water quality standards (WQS).

Occurrence and Treatment of Manganese in Drinking Water and Sources of Supply, VA. Located and provided occurrence information for manganese in raw and finished drinking water based on data from reports published by the American Water Works Association Research Foundation and the State of Virginia. Additionally, assembled information on the ability of various drinking water treatment processes to remove manganese.

Quality Assurance Officer Skagway Harbor Sediment and Water Quality Monitoring, AK. Reviewed the data quality and measurement quality objectives for the project and provided a quality assurance and quality control review of all data generated. A report was written summarizing data quality that included a summary table of quality control data generated that included an analysis and interpretation, as required.

Guidance on the Comparability of Biological Measurements. Provided input to and a review of a guidance document to be provided to EPA. Based on experience with other disciplines, unique perspectives were applied to biological metrics.

**EDUCATION**

M.S., Environmental Science and Engineering, Colorado School of Mines, 1997

B.A., Environmental Engineering and History, Dartmouth College, 1995

YEARS OF EXPERIENCE

Total: 12

With Tetra Tech: 1

KEY AREAS OF EXPERIENCE

- Water resources and contaminant hydrogeology
- Geochemistry
- Mine environmental compliance
- Mine hydrogeology
- Well-head protection plans

Mr. Breckenridge has 12 years of experience in mining hydrogeology, water resource development, and environmental cleanup. His work includes a diverse array of projects, including well-head protection plans for drinking water wells in the state of Nevada, discovering a 7,000-gallon per minute (gpm) sustainable groundwater resource for silver mine in the Bolivian desert, modeling contaminant transport at an inactive uranium mill in Texas, and creating a geochemical model of a mining pit lake. He is also an expert in groundwater modeling using a variety of modeling platforms.

Project Experience

Well-Head Protection Plans, State of Nevada. Conducted two major well-head protection studies for the State of Nevada and the U.S. Environmental Protection Agency. The goal of the studies was to characterize the hydrogeologic system around critical water supply wells. A groundwater model was constructed that would predict the 5, 10 and 20 year capture zones of the operating wells. The areas of the capture zones were compared to existing and potential sources of pollution. The result was a planning tool whereby the State could restrict certain high-risk activities, such as chemical production, within the capture zones of drinking water wells thus lowering the risk of future environmental risk.

Sherman Dam Seepage Collection Wells, Farwell Irrigation District, Loup City, NE. Responsible for designing two large-capacity water supply wells at the toe of the Sherman Dam to capture groundwater resources seeping from the dam. The wells also helped dewater the dam materials, reducing pore pressures and improving dam safety.

Former Chemical Distribution Facility, UnoCal, Wichita, KS. Responsible for conducting an extensive soil and groundwater chemical investigation to optimize an existing groundwater treatment system. Using GeoProbe™ and hydropunch techniques, multiple soil and groundwater samples were collected to further define the extent of a chlorinated solvent plume and to determine the efficiency and capture of a pump-and-treat system.

Conquista Former Uranium Mill, Conoco/Phillips, Texas, TX. Modeled groundwater flow and transport to simulate the impacts of a closed uranium mill and a tailings disposal cell on the local and regional groundwater. The modeling involved the complex evaluation of site geochemistry and the impacts of a significant upgradient groundwater contamination source.

Uranium Mill Groundwater Remediation, Navajo Nation, NM, AZ, and UT. Performed data analysis to oversee the Department of Energy's groundwater remediation of four abandoned uranium mills on Navajo land. Built a comprehensive groundwater model for evaluating the geotechnical aspects of a tailings disposal cell, reviewing risk assessments, and designing remedial measures. The project required working closely with federal and tribal stakeholders to meet remediation goals.

San Cristobal Mine Water Supply, Nor Lipez Province, Bolivia. As a Project Engineer, discovered a sustainable 7,000 gpm water resource for a silver mine development in the high-elevation desert of Bolivia. Developed and installed pilot groundwater supply wells 100 to 200 meters in depth. The wells produced sufficient water to meet mine needs in an arid region where previous water investigations had failed.

**EDUCATION**

B.A., Economics, Wake Forest University, 1981

M.R.P., City and Regional Planning, University of North Carolina, 1985

YEARS OF EXPERIENCE

Total: 22

With Tetra Tech: 12

LICENSES & CERTIFICATIONS

American Institute of Certified Planners (A.I.C.P.) 1991

PROFESSIONAL AFFILIATIONS

American Institute of Certified Planners

American Planning Association

American Water Works Association

NCAPA 2000 Award for Plan Implementation (for city of High Point Project)

KEY AREAS OF EXPERIENCE

- Watershed assessment
- Watershed management plan development
- Stakeholder facilitation
- Public involvement
- Low impact development
- BMP evaluation
- Protocol development
- TMDL development
- Regulatory reviews
- Program development

With over 20 years of water resources planning and management experience, Ms. Brewer has coupled technical and policy analysis with stakeholder facilitation to develop innovative, cost-effective environmental protection strategies. As a planning consultant, she has assisted in conducting numerous local watershed protection studies, pioneered approaches for low-impact design, developed basin management frameworks in six states, and co-designed the USEPA's Watershed Academy. Prior to consulting, Ms. Brewer worked 11 years in local, state, and regional agencies, gaining extensive experience in program development and management in the areas of water resource protection, waste reduction, and GIS.

Project Experience

Charlotte-Mecklenburg Post-Construction Ordinance Development (NC). For Mecklenburg County Phase II jurisdictions and the City of Charlotte, North Carolina, presented Tetra Tech's watershed assessment evaluating future impacts of development without further management, and assisted in developing cost tool and site evaluation tool (SET) that could evaluate land use and BMP management techniques

McDowell Creek Watershed Management (NC). For Mecklenburg County and Town of Huntersville, worked with staff and advisory boards to develop management goals, targets, and strategies for managing new development centered on low-impact development design. Assisted in developing stormwater management ordinance and water quality design manual, adopted January 2003.

City of Chicago Stormwater Ordinance and Design Manual. Assisted the City of Chicago in developing a stormwater management ordinance and design manual requiring "green design" for new development and redevelopment. Assisted in drafting ordinance, working with multiple City Departments in negotiating stormwater management objectives and associated design performance standards. Coordinated ordinance with design manual development which incorporates low-impact design techniques.

Rockdale County Watershed Assessment and Management Plan (GA). For Rockville County GA, worked with staff, elected officials, and diverse 23-member stakeholder group to develop and adopt a comprehensive watershed management plan for the County. Led in development of management plan objectives; of indicators and targets related to management objectives; evaluation of alternative management approaches; management plan development; outreach; low impact design education for local staff and development community and a low-impact design pilot program...

City of High Point Deep River 1 Watershed Assessment Plan. Managed project for a watershed assessment and innovative watershed management plan for the City of High Point, NC. Assisted the City in developing and adopting a watershed management plan for future growth, which meets state water quality standards and nutrient management requirements. Used indicators, site assessment modeling and GIS watershed modeling to evaluate low-impact development design, targeted land acquisition, and trading density allowances in multiple management scenarios.



Jeffrey W. Brittingham

Environmental Scientist

EDUCATION

B.S., Soil & Plant Sciences,
University of Kentucky, 2001

YEARS OF EXPERIENCE

Total: 7

With Tetra Tech: 1

KEY AREAS OF EXPERIENCE

- Soil conservation
- Stormwater management
- Nutrient management and land application studies
- Phytoremediation
- Project management
- Groundwater and surface water quality monitoring

Mr. Brittingham is an environmental scientist with broad experience in the technical and management aspects of soil science, environmental science, and water resources. He is a Certified Professional Soil Scientist, Certified Professional in Erosion and Sediment Control, and a Certified Conservation Planner. He specializes in soils characterization, project management, and regulatory compliance. Other experience includes general stormwater support services, nutrient management, phytoremediation, groundwater recharge, and groundwater remediation.

Project Experience

Conservation Security Program, United States Department of Agriculture, Natural Resources Conservation Service, Central Kentucky. Served as Team Leader to implement the Conservation Security Program (CSP) in Kentucky. Trained and advised field office personnel in 23 Central Kentucky counties. Duties included independent oversight of the development of 47 contracts totaling over \$480,000 and 8,800 acres in Kentucky for fiscal year 2005. Developed implementation tools, workload analysis tools, outreach materials, program policy and administrative procedures.

Soil Conservationist, United States Department of Agriculture, Natural Resources Conservation Service, throughout Kentucky. Provided technical assistance to state, county, and city governments on a wide range of soil conservation, surface water, and groundwater, land use, engineering, and waste treatment issues. Developed and implemented comprehensive nutrient management plans, erosion prevention, and sediment control plans. Designed and engineered various conservation practices such as grassed waterways, water supply systems, ponds, stream crossings, subsurface drainage, sinkhole protection, riparian buffers, filter strips, vegetative covers, and animal waste storage facilities.

Annual Groundwater Monitoring Report, Sanger, CA. Developed and implemented groundwater and surface water monitoring plans. Designed monitoring well installation program and provided oversight for drilling operations. Developed a supplemental groundwater remediation system utilizing phytoremediation techniques.

Conjunctive Water Use Feasibility Study and Design, Westlands Water District under the Local Groundwater Management Assistance Act of 2000, Central California. Characterized soils, geology, and hydrology of an 1,000 acre crop farm and orchard. Interpreted data to address suitability of artificial recharge of groundwater. Duties included management of team staff, contractors, and drillers; coordination of the investigation with personnel from the California Department of Water Resources.

Storm Water Monitoring, California Department of Transportation, Central California. Mr. Brittingham worked as part of a regional on-call stormwater response team. His duties included coordination and collection of storm water samples in agricultural and urban settings, operation and troubleshooting automated storm water sampling systems. He assisted with the input and management of data to characterize statewide surface water runoff and subsequently assisted in the interpretation of water quality and land use datum.



Trevor Clements

Senior Project Manager

EDUCATION

M.E.M , Water Resource Systems Analysis, Duke University, 1983 (3-2 Program)

B A., Political Science, Environmental Conservation, Augustana College, IL, 1982

YEARS OF EXPERIENCE

Total: 25

With Tetra Tech: 12

PROFESSIONAL AFFILIATIONS

American Water Resources Association

Water Environment Federation

KEY AREAS OF EXPERIENCE

- Watershed assessment
- Watershed management plan development
- Stakeholder facilitation
- Public involvement
- Low impact development
- BMP evaluation
- Protocol development
- TMDL development
- Regulatory reviews
- Program development

Mr. Clements has 25 years experience in the assessment and management of surface water quality. He has become one of the nation's leading experts in comprehensive watershed management by working with numerous local, state, and federal agencies to develop integrated frameworks. From a technical standpoint, Mr. Clements has worked on researching and developing watershed approaches, managing modeling and assessment analyses, conducting watershed studies, evaluating sustainable management practices, drafting watershed management plans, supporting NPDES permitting processes, and developing monitoring programs. As an educator, his work has included developing training and outreach materials and conducting educational forums. He has also achieved national recognition for his skills in facilitating intensive work group sessions and partner meetings, trouble-shooting framework development and implementation barriers, facilitating stakeholder involvement, and refining program roles and procedures.

Project Experience

Handbook for Developing Watershed Plans to Restore and Protect Our Waters. Co-author of a guidance document prepared for USEPA's Office of Water. Wrote or edited numerous sections addressing the overall approach to watershed management, how to scope a watershed planning effort, setting goals and management objectives, developing indicators and targets, identifying promising management options, evaluating and selecting best management measures, designing an implementation program, and how to track implementation progress and adapt accordingly.

Mecklenburg County Phase II Post-Construction Ordinance Development. Managed project for Mecklenburg County and its Phase II municipal partners (Charlotte, Cornelius, Davidson, Huntersville, Mathews, Mint Hill, and Pineville) to develop basis for new post-construction ordinance that would address water quality, cumulative and secondary impacts, and hydrology related issues (flooding and stream channel instability). Led Tetra Tech facilitation of a 23 member Stakeholder Committee and panel of 14 local staff in developing and evaluating alternative management options upon which to base the ordinance requirements.

Town of Cary Town Center Stormwater Management Plan. Project Officer for effort to develop a watershed based stormwater management plan for the Town of Cary Town Center. Area is proposed for high density commercial and residential redevelopment to support regional rail service and help address sprawl.

North Carolina Local Watershed Plans. For the North Carolina Ecosystem Enhancement Program (NCEEP), managed contracts for local watershed plans to be developed in six areas of the state, three in the Upper Cape Fear River Basin, one in the Neuse River Basin, one in the Upper Yadkin River Basin, and one in the Catawba River Basin. Emphasis is placed on locating and prioritizing restoration opportunities and stormwater BMP retrofit sites.

Louisville MSD Resource Management Approach Development. Co-facilitated a conceptual outline for transition of operations for the Louisville Jefferson County Metropolitan Sewer District (MSD) to a watershed-based resource management approach. Key program elements and decision-making are to be based on linked goals, indicators, and targets so that benefits to the environment are maximized per program dollar expended. Program components included CSOs, SSOs, and MS4 related projects.

**EDUCATION**

B.S., Environmental Science and Policy, University of Maryland – College Park, 2003

B.S., Chemistry, University of Maryland – College Park, Ongoing

YEARS OF EXPERIENCE

Total: 6

With Tetra Tech: 5

KEY AREAS OF EXPERIENCE

- TMDL development
- Watershed modeling
- Data collection, management and analysis
- Source analysis
- GIS applications and analysis
- Physical and chemical water monitoring
- VBA programming
- LID design

Mr. Gurdian is an environmental scientist providing technical support to federal, state, and municipal clients in the areas of watershed management, hydrologic and water quality studies, point and nonpoint source pollution characterization and assessment, and TMDL development. Mr. Gurdian has supported the development of 23 TMDLs, focusing on all aspects of hydrologic and water quality modeling including data and source analysis. In addition, Mr. Gurdian has a strong background in GIS and has supported stream physical and chemical monitoring efforts. Mr. Gurdian currently serves as technical lead for the Schuylkill River PCBs TMDL project conducted for USEPA Region 3 in Pennsylvania.

Gauley River Fecal Coliform TMDL, WV. For USEPA Region 3 and WVDEP, provided technical support for the development of a watershed model to characterize source loading of fecal coliform bacteria to the Gauley River. Incorporated locally available climatological data into the model and calibrated to site-specific hydrologic and ambient water quality data to characterize the loading impacts of sources throughout the watershed.

Roanoke River PCBs TMDL, VA. For USEPA Region 3 and the VADEQ, led data review phase of PCB TMDL development for the Roanoke River. Included the collection, management, formatting and analysis of watershed data including pollutant sources and potential sources, water quality, sediment and fish tissue data. Collected data was used to create GIS coverages to analyze spatial relationships between source, tributary, water quality, fish tissue, and sediment data and to draw conclusions about potential additional sources. These data were synthesized to create a draft sampling plan and QAPP.

Hunting Camp Creek Fecal Coliform TMDL, VA. For USEPA Region 3 and the VADEQ, technical lead for the development of a watershed model to characterize source loading of fecal coliform bacteria to the Hunting Camp Creek. Tetra Tech's watershed model incorporated locally available climatological data and was calibrated to site-specific hydrologic and ambient water quality data to characterize the loading impacts of sources throughout the watershed.

Blackwater River Benthic TMDL, VA. For USEPA Region 3 and the VADEQ, provided technical support for the development of sediment TMDLs for the Blackwater River. In close consultation with VADEQ, supported the development of watershed specific sediment criteria on the basis of stressor analyses that incorporated locally collected benthic monitoring and water quality data.

Coastal Shellfish Bacteria TMDLs, NJ. For NJDEP and USEPA Region 2, served as technical lead for the development of loading models to estimate bacteria loadings to New Jersey coastal shellfish waters. An existing loading model was coupled with a custom tool and database developed by Tetra Tech to estimate loadings based on local land use and point source data for over 100 impaired water body groupings.

Landscape Assessment/Recovery Potential Illinois Pilot Project, USEPA. For USEPA, in partnership with USEPA and Research Triangle Institute, Inc. (RTI), developed landscape indicators to help assess the recovery potential of each 303 (d) listed waterbody in the State of Illinois. Readily available GIS coverages and other information were used to calculate indicator metrics based on stream and watershed attributes. Indicators were developed to provide information of factors that affect a watershed or waterbody's ability to recover lost or degraded functions.

**EDUCATION**

B.A., Environmental Sciences,
University of Virginia, 1996

YEARS OF EXPERIENCE

Total: 12

With Tetra Tech: 12

KEY AREAS OF EXPERIENCE

- Clean Water Act support
- Guidance development
- Water quality assessment
- Pollutant source assessment
- TMDL development and implementation
- Watershed management

Ms. Koenig is an environmental scientist with 12 years of professional experience providing general and technical support on projects for the USEPA's TMDL Program. In addition to developing numerous TMDLs, Ms. Koenig has provided extensive programmatic support for USEPA through development of guidance documents for TMDL development, support and coordination of meetings related to the TMDL program, and TMDL-related training and technology transfer. She has also provided technical and programmatic review of over 20 TMDLs and supported USEPA's response to comments on the Proposed Revisions to the Water Quality Planning and Management Regulation (40 CFR 130, August 23, 1999). Ms. Koenig has managed and participated in the development of a variety of TMDLs, with approaches ranging from spreadsheet, mass-balance analyses to detailed hydrologic and water quality modeling. Ms. Koenig has also managed several TMDLs in Utah, Florida, Virginia, and West Virginia.

Project Experience

USEPA TMDL Protocols. Supported the development of USEPA's *Protocol for Developing Pathogen Total Maximum Daily Loads (TMDLs)* (EPA841-R-00-002). The protocols were developed at the request of Regions and states to provide an organizational framework as well as technical background for establishing TMDLs for the most frequent causes of water quality impairment.

TMDL Guidance for California. Supported the development of *A Process for Addressing Impaired Waters in California*, a technical and programmatic guidance document developed for the California State Water Resources Control Board. The document provides information on identifying and performing appropriate technical analyses and approaches and regulatory actions for addressing waters that do not meet support designated uses

Alaska Fecal Coliform TMDL Support. Supported development of *Technical Approach for Fecal Coliform Bacteria TMDLs in Alaska*. Included factors affecting pathogen survival; pathogen source controls; methods to evaluate pathogen sampling data; methods to estimate pathogen loads from different sources; and technical approach options.

Development of USEPA's Watershed Handbook. Supported preparation of *Handbook for Developing Watershed Plans to Restore and Protect Our Waters*, which provides comprehensive information and guidance on developing and implementing watershed plans to restore and protect water quality. Authored several chapters including those on gathering data and information; data analysis to identify sources and causes; estimating pollutant loads; and setting goals and identifying necessary load reductions.

USEPA ORD Model Review. For USEPA ORD, supported the development of a comprehensive guidance document (*TMDL Model Evaluation and Research Needs*, EPA/600/R-05/149) on the applicability of models for TMDL development and implementation. Project involved the review of more than 60 process-based modeling systems used for TMDL development, including allocation of loads and evaluate of management

Bacteria TMDLs for USEPA Regions 3 and 4. Developed several bacteria TMDLs throughout USEPA Regions 3 and 4. Developed bacteria TMDLs for Muddy Creek, VA, (Virginia's first TMDL) and Lost River, West Virginia.



TETRA TECH, INC.

Michael S. Kovacich, C.P.G.

Associate Senior Hydrogeologist

EDUCATION

M.S., Earth Science, Western Michigan University, 1999

B.S., Geology with Minor in Biology, Eastern Michigan University, 1991

YEARS OF EXPERIENCE

Total: 14

With Tetra Tech: 9

KEY AREAS OF EXPERIENCE

- Water supply investigations
- Environmental site characterization and remediation
- Property transfer and redevelopment
- Wastewater investigations
- Wetland delineation

Mr. Kovacich has more than 14 years of professional experience applying hydrogeological principles to water supply, environmental investigations and remediation. Mr. Kovacich has helped complete wellhead protection delineations for several municipalities in Michigan. In addition, Mr. Kovacich has extensive experience completing large-scale site investigations at sites with a wide range of contaminants including hexavalent chromium and other heavy metals, brines, chlorinated solvents, PCBs, and refined petroleum products.

Project Experience

Wellhead Protection Area Delineation, Gogebic County, MI. Assisted with aquifer pump test evaluation and a preliminary Wellhead Protection Area (WHPA) delineation for the Chicago Mine public water supply source area in Michigan's Upper Peninsula. Water is obtained from two wells completed in a 172-foot long sealed-off portion of the 400-foot level drift of the former Chicago Mine. Determined that the fractures within this unit transmit groundwater to the supply drift, and presumably, to the rest of the mine system.

Wellhead Protection Area Delineation and Plan, Village of Manchester, MI. Completed the analysis of a 24-hour aquifer pump test. Developed a conceptual model of the local aquifer based on state well and pump records. Field verified regional water levels provided by state records. Modeled the regional groundwater surface and well field capture zones by analytical and numerical methods. Met with Village officials to explain the delineation and implement the Wellhead Protection Plan.

Wellhead Protection Area Delineation and Plan, City of Milan, MI. Assisted in the analysis and presentation of a 72-hour aquifer pump test. Developed a conceptual model of the local aquifer based on data obtained during drilling activities and from state records. Used groundwater modeling to determine 10 year time of travel for the city well field.

City of Davison, MI. Provided senior review of the bid specification for well drilling contractors to install a sixth water supply well. Well was successfully completed in the Michigan Formation and produces 900 gallons per minute. Provided senior review and analysis of a 24-hour aquifer pump test for permitting requirements.

City of Brighton, MI. Assisted in the data collection and analysis of a 72-hour aquifer pump test for the Challis Road Well Field and provided senior review and comment for Well Head Protection Delineation.

The Preserve, Scio Township, MI. Assisted in the collection and analysis of several short duration pump tests to determine the feasibility of using private individual wells verses a public well field to supply the development.

City of Petoskey, MI. Assisted with the evaluation of several aquifer pump tests and capture zone analysis for development of the wellhead protection area delineation for the city-wide wellfield.

City of Bessemer, MI. Assisted in the analysis and presentation of 30-day aquifer pump test for the Black River Well Field. Provided senior review of modeling used for wellhead delineation of the local wellfield.



EDUCATION

M.E.M., Water and Air Resources,
Duke University, 1995

B.S., Business Economics, Miami
University, 1992

YEARS OF EXPERIENCE

Total: 13

With Tetra Tech: 13

PROFESSIONAL AFFILIATIONS

Water Environment Federation

KEY AREAS OF EXPERIENCE

- Pollutant source assessment
- Watershed hydrology and stormwater
- Watershed runoff quality
- TMDL development and implementation
- Watershed management plan development
- BMP evaluation
- Tool development
- Information management system development

Mr. Kratt is an environmental scientist/hydrologist with 13 years of experience in studying a variety of water resource issues for federal, state, and local government clients. He has experience in using a holistic approach to watershed management that includes applying knowledge of surface water, groundwater, geology, soils, land use, and regulatory requirements. He has been extensively involved in the national and local evaluation of TMDL development activities and is Tetra Tech's coordinator for TMDL projects in the Midwest. Mr. Kratt is familiar with most of the loading and receiving water quality models used for watershed management, including their strengths and weaknesses for various applications. He has managed several large-scale watershed modeling projects and one of his specialties is explaining complex technical and regulatory water quality issues to the general public.

Project Experience

Ohio TMDL Support. Has provided technical support to Ohio EPA for numerous TMDL and watershed studies throughout the state. He has served as project manager for the development of contaminated sediments TMDLs in the Little Beaver Creek (Dayton) watershed, for nutrients/siltation TMDLs in the Wabash and Huron River watersheds, for metals/siltation TMDLs in the Duck Creek watershed, for bacteria TMDLs in the Mahoning River watershed, and for salinity in the Little Beaver Creek (Portsmouth) watershed.

Clermont County Watershed Management. Serving as deputy project manager for Tetra Tech's contract with Clermont County, Ohio. This is a multi-year project to develop and implement a comprehensive water resources management program for the County. Mr. Kratt has managed the preparation of a watershed characterization report evaluating land use impacts on the water resources of Clermont County, managed the application of a customized water resource model, and is currently assisting the county with the development of a community-lead TMDL. Mr. Kratt also managed the development of a Site Assessment Tool for the County to evaluate the impacts of new housing developments on water quality and quantity. The Site Assessment Tool allows users to input specific BMP design specifications to evaluate their ability to control individual storms.

Clinton River Watershed Initiative. Serving as Modeling Team Leader for Tetra Tech's contract with the Clinton River Basin Intercounty Drainage Board. This is a two-year project to promote better integration of the many ongoing watershed efforts in the Clinton River watershed. Mr. Kratt is leading a team of watershed modelers who will set up, calibrate, and apply a comprehensive water quality model to evaluate various potential management options, including facility improvements and urban and rural stormwater best management practices. Mr. Kratt is also providing support for the development of a Watershed Information Management System (WIMS).

Milwaukee Metropolitan Sewerage District (MMSD) 2020 Facility Plan. Serving as deputy project manager for Tetra Tech's project with the Milwaukee Metropolitan Sewerage District (MMSD). The purpose of this long-range planning effort is to identify improvements needed for MMSD facilities to accommodate growth and protect water quality through the year 2020. Tetra Tech is providing support to the 2020 Facility Plan with the development and application of a suite of HSPF models.



Henry Manguerra, Ph.D.

Senior Project Manager

EDUCATION

Ph.D., Bioresource Engineering, Colorado State University, 1995

M.S., Civil Engineering, Colorado State University, 1994

M.E., Land and Water Engineering, Asian Institute of Technology, Bangkok, 1989

B.S., Agricultural Engineering, University of the Philippines, 1985

YEARS OF EXPERIENCE

Total: 17

With Tetra Tech: 11

PROFESSIONAL AFFILIATIONS

American Society of Agricultural Engineers

American Society of Civil Engineers

Best Paper, Journal of Irrigation and Drainage Division, American Society of Civil Engineers, 1996

First Place, Professional Engineering (PE) Exam, Philippines, 1987

KEY AREAS OF EXPERIENCE

- Watershed management
- Watershed modeling
- Water quality modeling
- Tool development
- Geographic information system
- Database management

Dr. Manguerra is a water resources/environmental engineer with more than 15 years of professional experience in the areas of environmental and watershed planning and management. He has more than 10 years of experience developing GIS, decision support systems, models, databases, and web applications to support various water resources and environmental programs. This includes the development of integrated agency-wide environmental information management systems, GIS-based systems for watershed/water quality modeling, large data analysis systems, and program-specific applications such as for water quality monitoring, nonpoint source assessment, TMDL development, NPDES support, water quality/biological assessment, BMP implementation, and environmental impact assessment. He has successfully used and integrated diverse and emerging technologies in Internet development, GIS, geodatabase management, and computer programming to support USEPA and state watershed and surface water programs

Project Experience

Tahoe Integrated Information Management System Toolkit, Tahoe Regional Planning Agency. Project manager for the development of the TIIMS Toolkit, a web-based suite of tools that will be used to manage, track, and quantify the individual and combined effectiveness of various Water Quality Improvement Projects (including the BMP Retrofit Program) that are designed to improve the water quality threshold and meet target indicators of Lake Tahoe's clarity and allowable watershed loads. Dr. Manguerra led the requirements gathering and analysis for the TIIMS Toolkit and the development of the BMP Tracking Tool and Map Viewer.

California Integrated Water Quality System, California State Water Resources Control Board (SWRCB). Project manager for the development of the California Integrated Water Quality System (CIWQS). CIWQS is a Web-based enterprise information management system that provide automated tools and standard business processes for the state's NPDES and regulatory permitting, compliance, and enforcement programs, and the also the waterbody assessment program (e.g., 305b and 303d).

TMDL Project Tracking Tool and BMP Database, California State Water Resources Control Board (SWRCB). For the State of California's Water Resources Control Board, project manager for implementing, using a rapid application development approach, critical Web-based applications to support the TMDL and nonpoint source programs. This includes the TMDL project Tracking Tool, and BMP Miner Database using Java, J2EE, and Oracle technologies.

Prince George's County, Maryland. For Prince George's County, project manager for projects that involve design and development of GIS applications. Examples of such applications include Water and Sewer Application Retrospective database, a Wetland Tool, an Environmental Justice Tool, and BMP Assessment Tool. Ongoing and immediate projects include the improvement of the On-site Disposal System (OSDS) database, and data integration using ArcIMS/Oracle technology.

Surface Water Information Management System, Mississippi Department of Environmental Quality. Project manager for the design and development of the Surface Water Information Management System (SWIMS). The system involved the design and development of an Oracle/ArcSDE geodatabase.

**EDUCATION**

B.S., Geology/Hydrogeology,
California State University,
Fullerton, California, 1986

YEARS OF EXPERIENCE

Total: 24

With Tetra Tech: 18

KEY AREAS OF EXPERIENCE

- Municipal water supply projects
- Underground storage tank compliance
- Environmental assessment and site remediation
- Environmental permitting
- Groundwater quality testing
- Expert testimony and litigation support

Mr. Marroquin has over twenty years of professional and supervisory experience in a wide range of groundwater, soil, soil vapor, remediation, and litigation related projects. Specific areas of environmental assessment and remediation expertise include Phase I Environmental Assessments in connection with property transfers, soil and groundwater quality testing, soil vapor surveys, aquifer test planning and analysis, landfill investigations, and underground storage tank compliance and assessment activities. Other areas of expertise include large-scale water supply projects including siting, drilling, well design, site construction and all aspects of permitting for municipal operation.

Project Experience

City of Loma Linda, CA. Planned and implemented a Water Supply Contingency Plan for the City of Loma Linda. The existing City of Loma Linda well field and City's water supply was threatened by the movement of a regional trichloroethene (TCE) and perchlorate groundwater plume. The project consisted of developing a plan to maintain good quality water through peak demand periods and employed short-term and long-term strategies. Implementation of the short-term strategies consisted of building inter-ties with adjacent water purveyors to enable water purchase and development of approved blending plans to continue pumping from affected water while sources maintaining good quality water supply. Implementation of the long-term strategies consisted of drilling, constructing, and permitting three deep water supply wells.

Confidential Client, TX. Provided litigation support regarding contamination by a chemical plant of a major drinking water aquifer. Pre-trial activities consisted of review and compilation of data regarding plant waste control practices and organic and inorganic waste discharges to soil and groundwater for plant operations since the early 1950s. Assisted in the development of a demonstrative video providing the jury with factual data supported by aerial photographs, along with a graphical technical presentation illustrating a time-series video portrayal of modeled contaminant migration.

Confidential Client, Baldwin Park, CA. Implemented a field investigation following removal of nine underground storage tanks to assess the extent of diesel-affected soil in a coarse-grained alluvial fan environment. A unique approach to investigate and remediate soils was implemented that ultimately gained agency approval. Approximately 2,000 cubic yards of diesel-affected soil was remediated and the site was granted closure from the county.

San Bernardino County, CA. Provided litigation support services for an on-going water quality lawsuit in California. The project consisted evaluating the city's water distribution system and water supply from various city wells and evaluating the potential for consumption by individuals of chemically-affected water over time.

Kinder Morgan Bulk Fuel Terminal, San Diego, CA. Implemented an investigation to characterize the extent and migration pathways of a petroleum release from a high-pressure sub-grade product pipeline. The terminal facility was built over a shallow buried stream channel with groundwater occurring at approximately ten feet below ground surface. Soil vapor sampling techniques were utilized to identify flow channels where free-phase product was migrating at a rapid rate on top of the water table. Soil vapor data were used to accurately position groundwater monitoring and recovery wells to maximize performance.



EDUCATION

M.S., Environmental Science,
Drexel University, 1998

B.S., Chemical Engineering,
Carnegie Mellon University, 1994

YEARS OF EXPERIENCE

Total: 12

With Tetra Tech: 5

KEY AREAS OF EXPERIENCE

- Pollutant source assessment
- GIS data management
- Watershed hydrology
- Watershed modeling
- Water quality assessment
- TMDL development
- Tool development

Ms. Mellors is a water resources engineer providing technical support to federal, state, and municipal clients in the areas of watershed management, hydrologic and water quality studies, point and nonpoint source pollution characterization and assessment, and TMDL development and implementation. Ms. Mellors currently serves as technical lead for TMDL projects conducted for the WVDEP Division of Water and Waste Management in watersheds throughout West Virginia. She provides technical support to federal and state clients in the areas of watershed modeling, water quality assessment and management, and TMDL development, including research, data compilation and analysis, utilization of GIS to perform data analysis, and technical writing.

Project Experience

Metals and Fecal Coliform TMDLs for the Greenbrier River, James River, Little Kanawha River, Upper and Lower New River Watersheds, WV. Serving as technical lead for metals TMDL development for the Little Kanawha River watershed and the Upper and Lower New River watersheds, West Virginia for WVDEP Division of Water and Waste Management. Provides technical oversight and guidance for the development of fecal coliform TMDLs for the Greenbrier River and James River watersheds, West Virginia.

Metals, Sediment and Fecal Coliform TMDLs for the Gauley River and Potomac Direct Drains Watersheds, WV. Serving as technical lead for metals and sediment TMDL development for the Gauley watershed, West Virginia. Providing technical oversight and guidance for the development of fecal coliform TMDLs for the Gauley watershed, West Virginia and sediment and fecal coliform TMDLs for the Potomac Direct Drains watershed, West Virginia for WVDEP Division of Water and Waste Management. Developed an approach for modeling sediment and sediment related metals using MDAS.

Fecal Coliform TMDLs for the Coal River Watershed, WV. Served as technical lead for fecal coliform TMDL development for 83 streams in the Coal River watershed, West Virginia for WVDEP Division of Water and Waste Management. Documented the approaches and compiled findings in a final report.

Metals, Fecal Coliform and Sediment TMDLs for the Coal River, Lower Kanawha River, and North Branch of the Potomac River Watersheds, WV. Provided technical support for TMDL development for metals, fecal coliform and biological impairments for 175 streams in the Coal River, Lower Kanawha River, and North Branch of the Potomac River watersheds in West Virginia. Developed approaches and tools to quantify pollutant loadings from mining permits while working closely with WVDEP.

Fecal Coliform TMDLs for the Guyandotte River Watershed, WV. Served as technical lead for fecal coliform TMDL development for the Guyandotte River watershed, West Virginia, for USEPA Region 3. Documented the approaches and compiled findings in a final report and participated in public meetings.

Metals and Fecal Coliform TMDLs for the Upper Kanawha River and Upper Ohio River North Watersheds, WV. Served as technical lead in the development of fecal coliform TMDLs and provided technical support for the development of metals TMDLs for the Upper Kanawha and Upper Ohio North watersheds in West Virginia. Documented the approaches and compiled findings in a final report and participated in public meetings.

**EDUCATION**

M.E., Environmental Engineering,
University of Virginia, 1996

B.S., Civil Engineering, University
of Virginia, 1995

YEARS OF EXPERIENCE

Total: 12

With Tetra Tech: 12

LICENSES & CERTIFICATIONS

Engineer in Training, Virginia

PROFESSIONAL AFFILIATIONS

American Society of Civil
Engineers

KEY AREAS OF EXPERIENCE

- Pollutant source assessment
- Watershed hydrology and stormwater
- Watershed runoff quality
- TMDL development and implementation
- Watershed management plan development
- BMP evaluation and implementation planning
- Tool development
- Information management system development
- Receiving water modeling
- Watershed modeling

Mr. Parker is an environmental engineer with more than 10 years experience providing technical and management support to federal, state, regional, municipal, and private clients in the areas of watershed and receiving water modeling, watershed and water quality assessment, water resource planning, and Total Maximum Daily Load (TMDL) development. He is Director of the Water Resources Modeling and Assessment Group and supervises 25 engineers and scientists focusing on watershed and receiving water modeling, advanced model development, and stormwater management. Mr. Parker has conducted watershed assessments and TMDL/modeling efforts for metals, bacteria, nutrients, dissolved oxygen, sediment, temperature, and PCBs in West Virginia and throughout the country (DE, VA, NJ, PA, MD, KY, ME, VI, MA, DC, GA, AL, MS, TN, NC, SC, LA, FL, USVI, CA, OR, NV, AZ, HI, TX, NE, MN, NM, CO, and WA). His TMDL development and modeling support efforts over the past 9 years for USEPA, states, and territories have led directly to the completion of more than 2,000 defensible TMDLs. He has additional experience assessing BMPs, monitoring streams, and performing laboratory analyses on aquatic samples.

Project Experience

TMDL and Modeling Support for West Virginia DEP. Played a lead role in development of the Mining Data Analysis System (MDAS) and its application to metals and pH modeling and TMDL development for more than 100 streams, lakes, and rivers impacted by mining in the Tygart, Cheat, Monongahela, Elk, and Stony River Basins, WV.

TMDL, Monitoring, and Modeling Support for USEPA Region 3. Managed a PCB monitoring effort on the Shenandoah River to identify key sources, including point and nonpoint sources and background conditions. Provided technical support for development of VA's first fecal coliform bacteria TMDL (Muddy Creek) and first biological TMDLs (Cooks Creek and Blacks Run). Peer reviewed HSPF modeling application for TMDL development on Black Creek, VA and a multiple regression (statistical) model used to develop biological TMDLs for a mining-impacted stream in southwestern VA.

TMDL and Modeling Support for USEPA Region 4. Managed development of DO TMDLs for nearly 100 rivers in southern GA. Applied dynamic watershed (HSPF) and receiving water models (EFDC) to simulate nutrient and carbon inputs, in-stream fate, and sediment diagenesis processes.

Modeling and TMDL Support for USEPA Region 1. Provided management and technical oversight for development of a hydrodynamic and water quality model of the Lower Charles River, MA, to address eutrophication.

Modeling and TMDL Support for USEPA Region 2, North Atlantic States, and U.S. Territories. Providing management and technical oversight for TMDL development efforts for NJ shellfish waters, NJ lakes, watersheds in Puerto Rico, and coastal waters in the USVI.

Modeling and TMDL Support for USEPA Region 9 and Western States. Provided technical oversight, QA/QC, and coordination for multiple TMDL projects throughout California. Supported USEPA in developing temperature TMDLs for the North Fork Eel River in California. Developed a GIS-based shade model that simulates solar radiation reaching the stream.

**EDUCATION**

Ph.D., Biological and Agricultural Engineering, Texas A&M University, 2003

M.Tech., Water Resources Development and Management, Indian Institute of Technology – Kharagpur, India, 1998

B. Tech., Agricultural Engineering, Kerala Agricultural University – India, 1996

YEARS OF EXPERIENCE

Total: 7

With Tetra Tech: 5

LICENSES & CERTIFICATIONS

Engineer-in-Training, Texas, 2001

PROFESSIONAL AFFILIATIONS

American Society of Agricultural Engineers

American Geophysical Union

American Water Resources Association

KEY AREAS OF EXPERIENCE

- Watershed hydrology
- Watershed runoff quality
- GIS tool development
- Information management system development
- Ambient water quality assessment

Dr. Paul is an environmental engineer with expertise in water resources, watershed modeling, and geographic information systems (GIS) with overall 5 years of experience in water resources field. He is currently the technical lead and deputy project manager for Berkeley County (WV) On-site Wastewater Treatment Systems Study. He is proficient in using GIS tools such as ArcView, ArcGIS, Avenue Scripting language, and ArcObjects. He has expertise in water quality models HSPF and SWAT. His information technology skills include programming languages Java, C++, C, and FORTRAN and database related tools Oracle, Developer/2000, and MS Access. He developed part of the ArcGIS interface for a Best Management Practice Decision Support System that is designed to optimize the placement and dimensions of urban BMPs.

Project Experience

Berkeley County On-site Wastewater Treatment Systems, WV. Serving as the technical lead and deputy project manager for the on-site wastewater treatment system. The system is designed to ensure that the septic systems and alternative waste water treatment facilities within Berkeley County are functioning properly. This will be achieved through: 1) determining the most effective means of managing these systems; 2) placing in a common digital format all existing information on these systems in the county included in currently permitted systems; and, if funding permits, 3) establishing comparable information of all systems which are not currently in a database as a permitted system.

Best Management Practice Decision Support System, USEPA and Prince George's County, MD. Developed part of the ArcGIS interface for a Best Management Practice Decision Support System. The system is designed to optimize the placement and dimensions of urban BMPs.

Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), USEPA. Enhanced the STEPL model developed for USEPA Grants Reporting and Tracking System. Added BMP Efficiency Calculator, another spreadsheet based tool that calculates the efficiency for land use support and management options. Also conducted various STEPL training organized by USEPA/states.

Mercury TMDL for Alamo Lake, AZ. Performed watershed level modeling to estimate mercury loadings into Alamo Lake using Watershed Characterization System Mercury Loading Tool.

The Wastewater Information System Tool, USEPA. Designed and developed the Wastewater Information System (IWIST) tool; a Microsoft Access based management information system for USEPA to aid in identifying and capturing important system inventory and service information, and to help standardize management information so data can be easily transferred to other systems. Key data elements are grouped under the following categories: General Site Information, Permit Information, Facility Served, Site Evaluation Information, Treatment System, and Service reports.

Assessment Calculator, AZ. Helped to develop an internet based tool to assist DEQ in identifying designated use attainments and impaired waters. The Assessment model is able to determine how potential changes in surface water standards or designated uses could impact future assessments.



TETRA TECH, INC.

Esther Peters, Ph.D.

Senior Environmental Scientist

EDUCATION

Ph.D., Biological Oceanography,
University of Rhode Island, 1984

M.S., Marine Science, University
of South Florida, 1978

B.S., Biology, Furman University,
1974

YEARS OF EXPERIENCE

Total: 31

With Tetra Tech: 17

LICENSES & CERTIFICATIONS

Engineer in Training, Virginia

PROFESSIONAL AFFILIATIONS

American Society of Civil
Engineers

KEY AREAS OF EXPERIENCE

- Quality assurance and quality control
- Monitoring
- Risk assessment

Dr. Peters is an aquatic toxicologist and pathobiologist with more than 30 years of experience in aquatic biology and extensive project management experience. She has participated in contaminant and biota monitoring programs in temperate estuarine and coastal marine environments, as well as tropical coral reef ecosystems. Her expertise includes research on the effects of exposures to xenobiotics and other environmental stressors on a variety of invertebrates and fish in both field and laboratory studies. She has performed extensive work on the comparative histopathology of invertebrates and fish, particularly carcinogenesis, as well as the relationships between adverse environmental conditions and diseases caused by pathogens and parasites. Dr. Peters has participated in the development and review of research projects for testing the toxicity and carcinogenicity of chemicals and in human health and ecological risk assessments. Dr. Peters has also examined human health risks from consumption of chemically contaminated finfish and shellfish. She is Quality Assurance Manager for the Fairfax, Virginia, group offices, serving as Quality Assurance Officer for contracts in the Fairfax office and for Tetra Tech's Biological Research Facility. Dr. Peters is a member of the American Society for Quality.

Project Experience

Office-wide Quality Assurance Program. Developed office-wide quality assurance program and quality systems and tools to meet quality assurance requirements of diverse contracts in the Fairfax Group offices. Developed office-wide format for standard operating procedures (SOPs) and wrote SOP for preparing quality assurance project plans (QAPPs) according to USEPA requirements and guidance; reviewed work plans; assisted in the development of and reviewed data quality objectives, QAPPs, and SOPs for projects involving field sampling, laboratory analysis, and data collection and data management; conducted field and laboratory audits, and performed data verification and validation.

Watershed Management Plan for Clermont County, OH. Prepared the Watershed Management Plan for Clermont County (Ohio) Project XLC, a USEPA program to assist communities in achieving superior environmental performance. Worked with Martin Brossman, QA Manager for USEPA/AWPD and other members of the QA Consultation Team, to provide comprehensive guidance to the Clermont County Project XLC Team for achieving specified standards of quality management throughout the program.

Laboratory Quality Assurance Review. Conducted laboratory evaluation and management system review for Tetra Tech's Biological Research Facility, with recommendations for improving the quality assurance plan and procedures for this in-house laboratory, which is used to conduct toxicity tests of sediment and water samples and analyses of benthic macroinvertebrate assemblages for biological assessments.

QAPP Development for Mississippi Monitoring. Managed development of a QAPP for the Mississippi Department of Environmental Quality for field sampling and biological and chemical laboratory analyses to support 303(d) list assessment and calibration of the index of biological integrity for Wadeable streams.



EDUCATION

M.A., Marine Affairs, University of Virginia, 1996

B.A., Environmental Science, University of Virginia, 1993

YEARS OF EXPERIENCE

Total: 12

With Tetra Tech: 8

PROFESSIONAL AFFILIATIONS

Water Environment Federation

KEY AREAS OF EXPERIENCE

- Pollutant source assessment
- Watershed modeling
- TMDL development and implementation
- Watershed management plan development
- BMP evaluation
- Tool development

Ms. Rafi has more than 10 years of professional experience in public sector environmental science and policy. She has supported numerous aspects of the Coastal Zone Management and Clean Water Acts at both the state and national levels, performing public outreach, interagency coordination, and conflict resolution. She has been a member of the Water Resources Group at Tetra Tech, since October 2000, where her activities include TMDL development for fecal coliform and metals-impaired waterbodies, curriculum development for watershed modeling courses, and database development in support of numerous USEPA programmatic initiatives. Her technical and communications skills include watershed assessment and modeling using GIS-based tools and spatial data analysis techniques, developing strategies for and conducting public outreach initiatives, meeting facilitation, and development of management indicators for gauging program performance.

Project Experience

West Virginia TMDL Support. For the West Virginia Department of Environmental Protection, supported development of sediment TMDLs in the Upper Kanawha, Lower Kanawha, Upper Ohio, North Branch Potomac, and Coal River Basins. Worked with a team developing a large number of TMDLs for metals, fecal coliform bacteria, and sediment. Required the coordination of two modeling efforts using GWLF and LSPC to generate allocations on the same spatial scale.

Dunloup Creek, WV, TMDL. For the USEPA Region 3, reviewed available data for the Dunloup Creek watershed in southern West Virginia and prepared a metals, fecal coliform bacteria, and biological impairment TMDL. Watershed loading was modeled with the Mining Data and Analysis System and a reference watershed approach was used for calibrating hydrology. Prior to modeling, activities included acquiring and analyzing available datasets; identifying missing information areas; and recommending additional data collection. TMDL development required representation of permitted point sources and nonpoint sources, as well as continuously flowing mine seeps and discharges.

Tug Fork, WV, TMDL. For the USEPA Region 3 performed a data review and analysis for the Tug Fork River watershed in preparation of a metals and pH TMDL. Activities included acquiring and analyzing available datasets; identifying missing information areas; and recommending additional data collection.

Cheat River and Tygart Valley River, WV, TMDLs. Supported USEPA Region 3 with the development of mining TMDLs for the Cheat River and Tygart Valley River watersheds in West Virginia. Provided technical writing, editorial, and mapping support for the draft and final documents. Assisted project team in preparing materials for public meetings.

Watershed Planning Tools. For USEPA Office of Wetlands, Oceans, and Watersheds (OWOW), assisting the Watershed Planning Team to coordinate and integrate Office of Water programs so that watershed planning activities will be more comprehensive, and consistent at the state, tribal, and local level. Leading conceptual development of a suite of tools that will include a shared definition of the watershed approach, an agreed upon process for developing comprehensive watershed plans, and a structure to facilitate information-sharing among USEPA program offices and ultimately the end users.



Tham Saravanapavan, P.E.

Senior Environmental Engineer

EDUCATION

M.A., Geography, Boston University, 2000

M. Eng., Civil Engineering, University of Tokyo, 1996

B.S., Civil Engineering, University of Peradeniya, 1993

YEARS OF EXPERIENCE

Total: 15

With Tetra Tech: 5

LICENSES & CERTIFICATIONS

Registered Professional Engineer, Massachusetts, No 46644

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers (ASCE)

American Water Resources Association (AWRA)

LID Technical Committee, EWRI-ASCE

LID Standard and Guidance sub-committee, EWRI-ASCE

KEY AREAS OF EXPERIENCE

- Stormwater management
- Watershed modeling
- Water quality modeling
- TMDL development
- Water supply management
- Watershed management plan development
- BMP planning and designing
- Watershed and stream restorations

Mr. Saravanapavan is a civil/environmental engineer with 15 years of experience providing technical support to federal, state, regional, municipal, private and international clients in the areas of water resources management, watershed and water quality assessment, planning and designing of storm water BMPs, watershed modeling, TMDL development, hydrology and hydraulic assessments, water treatment and supply system designing, and flood control and flood mitigation analysis. At Tetra Tech, he has managed a Stormwater and Aquatic Life TMDL for Vermont, BMP and low impact development (LID) planning and implementation project for Prince George's County (MD), Spa Creek Watershed Plan Development, the Penjajawoc (ME) modeling and TMDL project, a BMP Decision Support System Development for Vermont, LID Training for Naval District Washington, and LID Economic Analysis for USEPA. Mr. Saravanapavan is also experienced in designing and conducting field studies, including water quality monitoring, flow measurement, stream surveys, and soil and geo-environmental site assessments.

Project Experience

Integrated Water Management at the Site Scale: Case Study for Prince George's County, Maryland. Leading a case study to integrate water management practices, LID, water recycling, and on-site wastewater management to better manage stormwater available at the site-scale. Performed a detailed site characterization including soil infiltration tests, bore-hole geotechnical tests, and deep percolation tests. Evaluated hydrologic balance and potable water use to identify site-scale stormwater management options including LID alternatives, stormwater recycling alternatives, and on-site wastewater options.

Watershed Restoration and Stormwater Management; Vermont Department of Environmental Conservation. Manages a stormwater modeling project for Vermont DEC to develop hydrology models for selected watersheds throughout the state. Models are employed to develop flow duration statistics and hydrological targets for watersheds impaired due to poor aquatic life ecosystems. Models are being used to select and size stormwater BMPs needed to restore the watershed and streams to support healthy aquatic life.

Merrimack Water Demand Analysis. Managed the Merrimack River Water Demand Analysis for Massachusetts Department of Environmental Protection. Worked with 21 municipalities and agencies to understand the current uses, withdrawals, and discharges including permitting issues. Developed IWR-MAIN model and predicted water demand by 2020. Identified critical conditions and issues to be concerned in future water withdrawal permitting in the watershed.

Illicit Discharge Detection and Elimination Plan (IDDEP). Provided the Town of Andover, MA support to develop an IDDEP. Support included project management, data and literature collection and analysis, and development of IDDEP including designing of monitoring and investigation programs and time lines.

Stream Restoration and BMP Plan. Supported New Hampshire Department of Environmental Services (NH DES) to develop a stream restoration and BMP plan for the Salmon Brook Watershed in Nashua, NH.



EDUCATION

M.S., Hydrogeology, Ohio University, 1987

B.S., Geology, University of Maryland, 1979

YEARS OF EXPERIENCE

Total: 21

With Tetra Tech: 17

KEY AREAS OF EXPERIENCE

- Water Resource Investigations
- Groundwater Modeling
- Site Characterization
- Litigation Support
- RCRA Corrective Action

Mr. Shupe has more than 20 years of experience in water resources investigations; groundwater flow and transport modeling; hazardous waste site characterization; expert witness testimony; environmental geostatistics; aquifer testing and aquifer test data analysis; borehole geophysical logging; and deepwell construction.

Project Experience

Groundwater Supply Investigation, Loudoun County, VA. Conducted an earth resistivity investigation of fractured bedrock in the Lovettsville vicinity to identify suitable locations for a high-capacity groundwater supply well. Results from the investigation allowed follow-up test drilling to focus on a relatively limited number of favorable sites. The groundwater supply based on the test wells exceeded expectations.

Drainfield Investigation at Greenfield Farm, Loudoun County, VA. Performed an earth resistivity investigation of 20 proposed septic tank drainfields at a residential development site located in the limestone conglomerate area of eastern Loudoun County, Virginia. The county regulatory authority requires drainfields to have sufficient thickness of native soils and the absence of limestone solution features that would allow the drainfields to contaminate groundwater. The investigation demonstrated to the satisfaction of the agency that the drainfields were located appropriately for the protection of groundwater.

Palm Beach County Water Utilities Department, FL. Assessed the water supply potential of the System 8W Wellfield with respect to saline water upconing in support of a water use permit application. Designed and supervised the installation of a saline interface monitor well network. Developed and calibrated three-dimensional flow model for assessing upconing potential.

Palm Beach County Water Utilities Department, FL. Developed and calibrated a three-dimensional flow model to assess the water supply potential of the System 3W Wellfield with respect to impacts to adjacent surface water features in support of a water use permit application. The model results provided the basis for an increase granted by the South Florida Water Management District in the maximum groundwater withdrawal allocation for the wellfield.

Ohio Environmental Protection Agency, Fernald DOE Site, OH. Preparing a calibrated flow and reactive transport model (using the RT3D modeling code) of the Great Miami Aquifer in the vicinity of the Fernald DOE site. The model is being used to assist OEPA with their evaluation of DOE's aquifer cleanup performance. Mr. Shupe also assists the agency oversight of the Fernald cleanup by coordinating GeoTrans/Tetra Tech expertise for the review of site documents, remedial design issues, and supporting technical analyses.

Chemical Manufacturing Facility, Butler County, PA. Developed two focused work plans to address groundwater contamination issues in bedrock aquifer units underlying the facility. The investigations were conducted under EPA Region 3 Review. He designed the investigations to accurately assess the extent of groundwater impacted by the facility in a multi-level bedrock aquifer system. He completed the work plans on the fast-track schedule required by the owner.



EDUCATION

M.S., Hydrogeology, The University of New Hampshire, 1984

B.S., Geology and Environmental Studies, St. Lawrence University, 1978

YEARS OF EXPERIENCE

Total: 30

With Tetra Tech: 6

KEY AREAS OF EXPERIENCE

- Water supply development and management
- Contamination investigation & remediation
- Groundwater contamination evaluation with numerical models
- Regulatory support
- Litigation support
- Technical assistance in numerical modeling

Mr. Skipp has 30 years of experience in hydrogeology; numerical modeling of groundwater flow and transport; site investigation; groundwater system management; aquifer test evaluation; saltwater intrusion analysis; and groundwater supply development.

Project Experience

Loudon County, VA. Project manager for a number of small-scale hydrologic investigations for housing developments in Loudoun County, Virginia. Work included coordinating test well drilling with contractor, managing field staff responsible for conduct of associated pumping tests, evaluating the potential impact of the development on the quantity and quality of local groundwater resources, interacting with County regulatory officials, and preparation of summary reports for submission to the County.

Large Industrial Complex, Atlantic Coastal Plain. Prepared an evaluation of potential groundwater supply alternatives. Assessment included evaluation of the existing system, the potential for expanded pumping at existing wells, and possible new offsite pumping locations.

Confidential Client, New Jersey. Project manager on a program to evaluate and summarize potential alternatives for addressing potential contamination of a public supply wellfield by historic groundwater releases at a former industrial site. Under this program, various technical engineering alternatives and monitoring programs for addressing the potential problem were identified, and preliminary engineering plans and associated costs were prepared. Client used the results of this evaluation to identify a rational and cost-appropriate response to the problem.

City of Indianapolis, IN. Project Manager on program to provide technical review of wellhead protection modeling projects. Tasks include technical review of numerical models developed by other consultants to define wellhead protection areas, participation in expert panel, and coordination with City personnel.

St. Johns River Water Management District, FL. Principal staff on development of three-dimensional groundwater flow model of regional groundwater flow in the Floridan aquifer in east-central Florida. Model was the basis for subsequent three-dimensional saltwater transport model.

Southwest Florida Water Management District, FL. Developed and calibrated a regional, two-dimensional, finite element, fracture flow groundwater flow model of the Floridan aquifer for an area in west-central Florida to aid in evaluation of regional water supply alternatives.

Southwest Florida Water Management District, FL. Lead technical staff for an evaluation of the potential for flood waters from a river to travel up a major spring conduit in a limestone aquifer. Evaluation included: review and technical characterization of flood levels and frequency. Results of the analysis were used to provide general guidelines for evaluating the susceptibility of production wells completed on the conduit to flooding.

Confidential Client. Provided day to day lead technical direction on field program designed to provide the data necessary to document compliance of the client's water supply production with state and federal regulations. Field program included conduct and evaluation of a site-wide well test, groundwater quality sampling, aerial infrared survey, and installation and monitoring of underwater seepage meters.



EDUCATION

M.A., Risk Communication,
Morehead State University, 1994

B.A., Journalism, University of
Georgia, 1977

YEARS OF EXPERIENCE

Total: 27

With Tetra Tech: 9

LICENSES & CERTIFICATIONS

Kentucky Division of Water Class I
Wastewater Treatment Plant
Operator

Erosion and Sediment Control (GA
Soil & Water Conservation
Commission, Louisville MSD)

PROFESSIONAL AFFILIATIONS

International Erosion Control
Association

American Society of Agricultural
Engineers

National Onsite Wastewater
Recycling Association

Water Environment Federation

KEY AREAS OF EXPERIENCE

- Stakeholder facilitation
- Watershed management
- Stormwater assessment and control
- Erosion and sediment control
- Training
- Antidegradation
- Public outreach
- Onsite wastewater treatment systems

Mr. Toning is a senior watershed planner and trainer specializing in wastewater and stormwater management, erosion protection and sediment control, environmental management, risk assessment and communication, public health issues, and technology transfer with extensive experience in policy development and program design for watershed assessment, planning, and management projects. Over the past 25 years he has directed and managed stormwater management training programs; onsite wastewater and nonpoint source pollution assessment and control projects; erosion and sediment control training programs; environmental and natural resource policy research initiatives; solid waste planning and management programs; watershed training courses; the publication of environmental management guidance documents; and the development, coordination, and facilitation of public meetings, conferences, and workshops on a wide variety of environmental, public health, and natural resource topics

Project Experience

TMDL National Training Project. Work assignment leader for TMDL overview workshop developed by USEPA and Tetra Tech. Assisted in curriculum development, produced and edited slide presentations, conducted presentations, led group exercise, and facilitated case study discussion for introductory workshop in Atlanta in 2001.

Antidegradation Implementation - Arizona and West Virginia. Co-leader of work assignments to develop an antidegradation implementation guidance document for the West Virginia Department of Environmental Protection and Arizona Department of Environmental Quality. Conducted research on state and national Clean Water Act antidegradation issues and approaches, prepared issue summaries for state water agency staff, led consensus meetings with stakeholders, and co-wrote guidance document.

Clean Water Act - National Training Program. Work assignment leader for Clean Water Act training programs sponsored by the USEPA Office of Water. Assisted in program development, conducted presentations on various sections of the Clean Water Act, facilitated group exercises, led discussion groups for workshops at USEPA Regional Offices and other state/federal training sites

Acid Mine Drainage Guide - USEPA. Co-wrote *A Citizen's Guide to Address Contaminated Coal Mine Drainage* for USEPA Region 3. The guide addresses identification of CMD problems, organization of watershed partnerships, watershed assessment, contaminated mine drainage treatment technologies and options, and fundraising.

USEPA Watershed Management and Stream Restoration Training. Project manager for developing and conducting *Working at a Watershed Level* and *Stream Corridor Restoration* training courses. Responsible for developing course content and materials, recruiting instructors, planning field trips, facilitating interactive group exercises, and conducting sessions on watershed planning.

USEPA Outreach and Stakeholder Involvement - National Program Support. Project manager for a series of watershed planning, stakeholder involvement, and public outreach workshops conducted in 20 states for public agencies and private organizations. Tasks included organizing and promoting the workshops, developing instructional materials, and marketing watershed awareness.



EDUCATION

CERG, Geographic Information Science, George Mason University, Anticipated 2009

B.S., Environmental Science, Iowa State University, 2006

YEARS OF EXPERIENCE

Total: 2

With Tetra Tech: 1

KEY AREAS OF EXPERIENCE

- GIS spatial analysis
- Water quality data management
- Field sampling
- TMDL modeling support

Ms. Wiese provides technical support on various projects related to watershed and water quality assessment and management, including literature searches, research, data collection and analysis, utilization of GIS to perform data analysis, technical writing, watershed modeling, and completion of TMDLs. Ms. Wiese has two years of professional experience in the environmental sciences field, including work with the Iowa State Wetland Research Group as a lab technician, and an internship with the Minnehaha Creek Watershed District in Deephaven, MN as a permitting representative.

Project Experience

New Jersey TMDL Program. Assisted in the development of TMDLs for New Jersey's DEP and EPA Region 2. The TMDLs assessed fecal coliform impairments in more than 70 listed lakes in New Jersey. Participated in gathering and analyzing data, including water quality, climate data, geography, land use and land practices information, point source and nonpoint source information. Analysis included a variety of statistical analyses as well as analysis through the use of GIS. Assisted in determining pollutant sources in lakes and development of TMDLs.

Louisiana TMDL Program. Contributed to TMDL development for impaired streams in the Pearl River Basin for the Louisiana DEQ and EPA Region 6. The TMDL assessed mercury impairments. Participated in gathering and analyzing data including water quality, fish tissue, climate, and land use information. Performed calculations to determine mercury loads from atmospheric depositions and assisted in the development of the TMDL.

Chesapeake Bay TMDL Program. Providing ongoing technical support to the EPA Chesapeake Bay Office on the model documentation for the Chesapeake Bay TMDL.

NPDES Permit Support, MD. Participating in NPDES permit support for Prince Georges County Maryland. Tasks included water quality sampling, data collection, and maintenance of ISCO flow meters and samplers.

Watershed Management Plans, Fairfax County, VA. Contributed to development of watershed planning protocols and technical products to assist County staff in addressing stormwater planning needs, Virginia stormwater permit requirements, and Chesapeake Bay nutrient and sediment reduction goals. Current GIS and modeling tasks include maintaining GIS data directory, GIS editing and analysis, organizing field reconnaissance GIS data, development of preprocessing tools using Model Builder and setup of watershed SWMM models.

**EDUCATION**

M.S., Biology – Urban GIS,
University of Wisconsin,
Milwaukee, WI, 2001

B.A., Biology, University of
Colorado, Boulder, CO, 1995

YEARS OF EXPERIENCE

Total: 11

With Tetra Tech: 7

LICENSES & CERTIFICATIONS

P.M.P., Project Management
Institute

KEY AREAS OF EXPERIENCE

- Water quality assessment
- Geospatial analysis
- Tool development
- Information management
system development

Mr. Zastrow has over 10 years of experience in the application of computing technology to the environmental sciences. He is a biologist and aquatic toxicologist and has conducted ecological and laboratory investigations of aquatic systems as small as a one-acre alpine lake and as large as the Laurentian Great Lake Michigan. His technical expertise includes seven years of experience in the use of geographical information systems (GIS) to visualize and solve complex spatial problems. Mr. Zastrow has more than five years of technical and practical experience in all phases of the software life cycle, including requirements analysis, technical approach development, design, build, user acceptance testing, quality assurance, deployment, and user training.

Project Experience

Texas Commission on Environment Quality (TCEQ) Surface Water Quality Management Information System (SWQMIS). Managed the collection and organization of system requirements, conducted geodatabase design, and coordinated closely state users as an integral member of the requirements and design team. SWQMIS is an enterprise, statewide system for planning and managing water quality data collection activities, streamlined receipt of data from agency staff, laboratory information management systems, real-time field sampling devices, and partner agencies. SWQMIS supports an integrated GIS, water standards management, rigorous traceability and quality controls, and provides a foundation for integration with a planned automated assessment tool and network transmittal of data to USEPA's STORET. Has performed as a water quality and GIS subject matter expert.

Arizona Assessment Calculator (AZAC). Project manager for the development of Arizona Assessment Calculator (AZAC). AZAC is a Java-based model that will integrate with ADEQ's comprehensive water quality database and will provide indices and metrics that are set forth in the Arizona Impaired Waters Rule.

Information Technology Support for the California State Water Resources Control Board (SWRCB). Project lead for development of the California Integrated Water Quality System (CIWQS) project. CIWQS is an enterprise information management system, supported with extensions to desktop tools such as ArcGIS, that provide automated tools and standardized business processes to improve the State's and Regional Boards' ability to enhance and preserve the quality of California's waters.

Lake Tahoe Integrated Information Management System (TIIMS). Supported the later stages of phase 1 development through project coordination, design assistance, system testing and planning for later phases. Programs include Lake Tahoe's BMP Retrofit Program which requires all residential and commercial properties within the Lake Tahoe Basin to implement BMPs to reduce nonpoint source pollution loads into Lake Tahoe.

El Paso County, Colorado Water Quality Analyzer (WQA). Conceived of and led the design of an internal research project to develop innovative water quality assessment tools. The product is desktop application and server-side XML-based data service (both spatial and tabular data) developed for the analysis and visualization of water quality data. WQA is comprised of a map viewer and water quality analysis modules.

**EDUCATION**

Ph.D., Soil Science, Louisiana State University, 2006

M.S., Soil Science, Chinese Academy of Sciences, 2002

B.S., Environmental Management, HuaZhong Agricultural University, 1999

YEARS OF EXPERIENCE

Total: 5.5

With Tetra Tech: 1.5

PROFESSIONAL AFFILIATIONS

Soil Science Society of America

American Geophysics Union

KEY AREAS OF EXPERIENCE

- Water Quality Modeling
- Heavy Metal Biogeochemistry
- Groundwater Modeling
- Soil Quality Assessment
- TMDL Development
- Agricultural BMPs
- Acid Mine Drainage

Dr. Zhang is an environmental engineer with extensive engineering and scientific experience specializing in hydrologic and water quality modeling, watershed management, point and nonpoint source pollution assessment, soil and groundwater remediation, agricultural system management, heavy metal contamination analysis, TMDL development and implementation. He has extensive scientific knowledge in soil and water sampling, characterization, and assessment. Dr. Zhang possesses extensive programming experience concentrated in the surface and groundwater quality modeling. He currently develops and applies reactive transport model for TMDL development and remedial investigation. Dr. Zhang published more than 10 peer reviewed articles on major journals in the area of environmental science. He has also served as peer reviewer for several international journals on environmental management.

Project Experience

West Virginia Metals TMDLs Development for Hydrologic Groups C and D. For West Virginia Department of Environmental Protection (WVDEP), gathered, compiled, and prepared relevant water quality data for characterization and modeling of the Gauley, Little Kanawha, and New River watersheds. Developed and calibrated models for more than 30 impaired streams. Prepared mining and non-mining NPDES permit relational databases. Prepared comprehensive TMDL scenario databases where all of the project information can be accessed and queried.

Dissolved Metals Transport Modeling for Left Hand Creek, James Creek, and Little James Creek, CO. In support of EPA region VIII, developed dissolved copper, zinc, lead, and cadmium TMDL in the Left Hand watershed using an in-stream chemical transport model developed by Tetra Tech. Analyzed hydrologic and water quality data collected under the critical high flow and low flow conditions. Evaluated remedial effectiveness scenarios of various mining reclamation activities in the Left Hand watershed.

Dissolved Cadmium and Zinc Transport Modeling for Silver Creek, UT. In support of EPA Region VIII, had a lead technical role in the development of models for simulating dissolved Cd and Zn transport for Silver Creek near Park City, Utah. Evaluated water quality data and pollutant sources to determine the relationships between in-stream metal concentrations and discharge from mine tailing. Used steady state solute transport model equipped with sediment transport routines coupled with a dynamic chemical speciation model to simultaneously simulate multiple dissolved metals.

Non-Point Source Monitoring and BMP Development for TMDL Implementation in Bayou Wikoff Sub-Watershed, LA. In support of Louisiana Department of Environmental Quality (LADEQ), technical lead for monitoring nonpoint pollutant source and developing BMPs for TMDL implementation in Bayou Wikoff watershed in southern Louisiana. Evaluated multiple BMPs for reducing sediment and nutrient (N and P) load from sugarcane and pasture field.

Tiffany S. Bates

Education:

BS/Environmental Biology/Clarion University

Years' Experience:

Total: 1

Ms. Bates has experience in abandoned mine lands drainage and other facets of environmental engineering and pollution control. Her experience includes undergraduate research specializing in water resources.

Contract Documents Preparation for Priority Sewers

Rehabilitation/Restoration/Repair, Washington Suburban Sanitary Commission, Montgomery County, MD. Supported preparation of contract documents for 2,900 sewer segments (130 miles of pipe) of "no-dig" collection system improvements.

SR 0024-011 Intersection Improvements, Springettsbury, Windsor, and York Townships, PA. Conducted site visit and prepared Phase I Environmental Site Assessment ..

Assessment of Underperforming Water Supply Well, New Freedom Borough, PA. Assessment of a poorly performing water supply well that included review of documentation for all Borough wells, a site visit, and a summary report

Guilford Water Authority, Bartle Wells Nos. 1 & 2 and Valley Quarries Well No. 1 Development, Chambersburg, PA.

Sewage Facilities Improvements, East Berlin Borough, PA. Design of two trunk sewers and improvements to treatment facilities to increase treatment capacity to 0 243 MGD as described in January 2007 Act 537 Plan

Guilford Water Authority, Pond Bank Wells Nos. 1 & 2 Development, Chambersburg, PA.

Modern Landfill, NPDES Permit Renewal, York, PA. Preparation of application for renewal of the National Pollutant Discharge Elimination System Permit for existing wastewater treatment plant and sediment pond discharges

Architectural Review of Behney Motors Property, Borough of Middletown, PA. Professional services for Phase I Environmental Site Assessment to renovate former 8,484 square foot property as Borough Maintenance Facility

May 2006 - August 2006, Engineering, Scientific and Technical Intern, PA Dept. of Environmental Protection, Bureau of Mine Reclamation, Harrisburg, PA. Traveled throughout PA, obtaining and compiling water samples from field investigations; writing, recording and entering the data into a computer state database.

Undergraduate Research

2006 - 2007, Clarion University: The impact of Dogwood Run, an organically enriched tributary, to the Yellow Breeches in the Harrisburg Area

2001, Christ Church School, VA: The Comparison of Oxygen Content in Sea Grass and Unconsolidated Sediments of the Chesapeake Bay

George J. Crittenden

Education:

Coursework/Tennessee State University

Coursework/Kentucky State University

Years' Experience:

Total: 31

Mr. Crittenden has 31 years of experience in providing design, technical services, and surveying for airports, residential subdivisions, highways, and mine land reclamation projects.

City of Williamson - Water System Improvements, Mingo County, WV. Senior Design Technician responsible for drafting and field support to develop a clear picture of the system's current condition and capacity, to estimate the remaining useful life of system components, to develop recommendations for replacements and upgrades, to estimate possible construction costs, and to complete a prioritized plan for implementation of the improvements.

City of Williamson - Water Line Extension, Mingo County, WV. Senior Design Technician responsible for assisting the project engineer with water line layout and drafting duties for extension of a water main and all necessary utilities from the City of Williamson to the Mingo County Airport and nearby residences

Town of Hamlin - Storm Sewer System Improvements Preliminary Study and Report, Lincoln County, WV. Senior Design Technician responsible for conducting a stormwater drainage study

Phase I Wastewater System Improvements, Logan County Public Service District, WV. Senior Design Technician responsible for preparation of wastewater collection system construction plans and grading plans for new WWTP.

I-81 Tabler Station Interchange, Berkeley County, WV. Identified and verified, in the field, Karst features within the roadway design corridor. The roadway was designed to avoid impacts on the located Karst features. Project Designer.

Corridor H Final Design, WV DOT (2 design sections), Grant County, WV. Identified and verified, in the field, Karst features within the roadway design corridor. Sand filters, peat filters, and grassed berms were designed to protect the Karst features from roadway storm runoff

SR 52 Lafayette to Red Boiling Springs, Macon County, TN. Identified and verified, in the field, locations that potentially contained buried fuel storage tanks. Field investigations coupled with local resident interviews discovered buried storage tanks that were unknown to the Tennessee Department of Transportation. Additionally, the project entailed locating water wells that were located within 500 feet of the proposed roadway centerline. After the water wells were located, the property was interviewed and information was collected on the well. Project Designer

SR 10/US 231 Bedford County Line to Christmas Creek, Rutherford County, TN. Identified and verified, in the field, locations that potentially contained buried fuel storage tanks and located an abandoned salvage yard. Additionally, the project entailed locating water wells that were located within 200 feet of the proposed roadway centerline. Project Designer.

NE Hopkinsville Bypass, Christian County, KY. Identified and verified, in the field, Karst features within the roadway design corridor. The roadway was designed to avoid impacts on the located Karst features. Project Designer.

Luke R. Cunningham

Education:

BS/ Architecture
Engineering/Fairmont State
University

Years' Experience:

Total: 3

Professional Affiliations:

American Institute of Architects,
Student Member 2003-2006

Mr. Cunningham has over three years of experience in architectural design for new and existing facilities and structures. This experience includes work with federal, state, and local government agencies and private clients.

Investigation and Proposed Modifications to State Capitol Parking Facility, Charleston, WV. Repair/refurbishment investigation services on prestressed concrete structure, prepare proposals for upgrades to fire detection and protection systems, and prepare a repair guidance document with order of magnitude costs.
Architect

Squadron Operations Building 107 Repair, Pennsylvania Air National Guard/171st ARW, Coraopolis, PA. Field investigation and design for repair (by replacement) of HVAC systems, installation of a wet pipe sprinkler system in the facility, replacement of the domestic hot water heater, repair of select exterior features of the building (including roof replacement), renovation of select interior spaces, and modification of the electrical system for emergency power operations
Architect

Statewide Architectural Services, WVDOT. Preparation of preliminary studies, design, and preparation of contract plans and related documents for Division of Highways buildings, rest areas, weigh stations and related facilities. Architect

Corridor H Final Design, WVDOT, Grant County, WV. Design and development of construction documents for a four-lane divided highway with two major structures and a minor third structure including drainage and specialized erosion and sediment control due to the project location and ecological sensitivity of Greenland Gap.

I-81 Tabler Station Interchange, West Virginia DOI, Martinsburg, WV. Study, design, and preparation of construction contract plans and related documents for the new Tabler Station Connector Road including modification of ramps, replacement of an overpass bridge, and design of an industrial access road
Architect

Administrative and Judicial Facilities Renovation Design, Preston County Commission, Kingwood, WV. Space needs analysis of the former Wesbanco Building, across from the Preston County Courthouse, and design of a more centralized campus of County services. Architect

Combat Arms Training Simulator and Combat Arms Training and Maintenance Facility Design, Pennsylvania Air National Guard/171st ARW, Coraopolis, PA. Conceptual through 100% design for a 2,800 square foot Combat Arms Training Simulator (CATS) and Combat Arms Training and Maintenance (CAIM) facility including administrative offices, classrooms, and maintenance and storage areas.
Architect

Elkins Maintenance Facility, WVDOT, Randolph County, WV. Study, design, and preparation of contract plans and related documents for the construction of the Division of Highways' District 8 Equipment Shop Building located on US 219 north of Elkins. Architect

Anthony DiLuca

Education:

Associate/Building Construction Management/Wentworth Institute of Technology

Years' Experience:

Total: 18

Mr. DiLuca has worked in the field of construction management, quality assurance, and quality control since 1989, a number of those years were spent in environmental engineering.

Design and Permitting for Well No. 9, West Manchester Township Authority, York, PA. Provided services for the design and permitting of a new groundwater source for public supply. Senior Environmental/Construction Manager

Herr's Ridge Development Construction Inspection and Other Services, Gettysburg Municipal Authority, PA. Full-time Resident Inspection and other services for water supply installation of 13,550' of ductile iron pipe, 177 service taps, 16 fire hydrants, four air release valves, a pumping station, controls, and a standby generator. Senior Environmental/Construction Manager

Master Agreement for A/E Services, American Water, New Jersey, Pennsylvania, West Virginia, and Virginia. Engineering, design, bidding and construction services in Pennsylvania, New Jersey, West Virginia and Virginia

I&I Analysis/Inventory and Capacity Evaluation, PA American Water, Coatesville, PA Performed sewer system inventory, flow metering, and two-phase capacity evaluation; delivery of manhole and sewer geodatabases as well as technical reports. Senior Engineer

Mill Road Sewer Extension, Chambersburg, PA. Senior Designer responsible for collection system inspections, flow meter installations, operation and maintenance of meters, data collection and database management, and infiltration and inflow inspections.

CSXI Terminal Water Main and Sanitary Sewer Extension Construction Administration and Resident Project Representative Services, Guilford Township, PA. Senior Environmental/Construction Manager

Lycoming Creek Wellfield Improvements, Williamsport Municipal Water Authority, PA. Improvements at nine of the Authority's existing groundwater wells including pumps, piping, electrical and instrumentation, and construction of raw and finished water transmission mains. Senior Engineer

PA American Water, Wastewater Treatment Plant Upgrade and Expansion, Coatesville, PA. Design, permit, bidding, and construction phase services related to the upgrade and expansion of the Coatesville Wastewater Treatment Plant, currently a 385 mgd facility that will utilize oxidation ditches to meet new discharge criteria at an increased flow of 7 mgd. Senior Environmental/Construction Manager

Conewago Township Sewer Authority Infiltration/Inflow Evaluation, York, PA. Evaluation to monitor inflow and infiltration for wastewater collection system. Senior Designer responsible for collection system inspections, flow meter installations, operation and maintenance of meters, data collection and database management, and infiltration and inflow inspections.

Pershing Avenue Interceptor Replacement, City of York, PA. Senior Environmental/Construction Manager

Richard A. Eisenhour

Years' Experience:
Total: 7

Mr. Eisenhour has more than seven years of experience providing construction inspection services for Buchart Horn.

Lisburn Road Reconstruction, PennDOT District 8-0, Cumberland County, PA. Reconstruction of 2 miles of SR 0015 in District 8-0, Cumberland County, with concrete and an adjacent roadway using superpave; construction of a dual, single span prestressed concrete I-beam bridge; retaining walls; sound barriers; new traffic signals; relocation of existing roads and utilities; new drainage systems, signage and guiderails; and a new concrete glare screen in the median. Engineer responsible for daily PennDOT inspection of excavation, bituminous and concrete paving, bridge and sound wall erection, erosion and sedimentation pollution control, material sampling and testing, signalization installation, and drainage. Office duties included setting up PennDOT work orders, daily accurate diary entries and assisting in biweekly submission of estimates.

Six-Lane Widening of I-76 & I-276, PA Turnpike Commission, Montgomery County, PA. Construction of \$202 million total reconstruction of urban freeway, with eight bridge replacements (steel and concrete); oversight of Turnpike widening from two to three lanes eastbound and westbound between Valley Forge and Norristown. Includes services during both design and construction phases. Engineer responsible for oversight of construction operations including paving (both concrete and bituminous), installation of new drainage, maintenance and protection of traffic during construction, erosion and sedimentation control, and signalization. Office duties included daily accurate diary entries, filing of related paper work and assisting in estimate preparation.

Schoolhouse Road (T-702) Bridge, Oliver Township Supervisors, Mifflin County, PA. Preliminary engineering, environmental studies, and final design for replacement of T-702 Schoolhouse Road Bridge over Town Run. Engineer

PA American Water, Wastewater Treatment Plant Upgrade and Expansion, Coatesville, PA. Design, permit, bidding, and construction phase services related to the upgrade and expansion of the Coatesville Wastewater Treatment Plant, currently a 3.85 mgd facility that will utilize oxidation ditches to meet new discharge criteria at an increased flow of 7 mgd. Engineer

Brian A. Frick

Education:

BS/ Civil Engineering/ University of Pittsburgh

Registrations:

ACI Concrete Field Testing
Technician - Grade I, #01120622,
Exp 10/23/12

Years' Experience:

Total: 4

Mr. Frick has over four years of experience as a construction manager and site representative for environmental studies and transportation projects.

Bridge Replacement for SR 0075 over Tuscarora Creek, PennDOT District 2-0, Juniata County, PA. Environmental studies, preliminary and final design, and construction phase services to replace a four-span I-beam bridge over Tuscarora Creek outside Port Royal with a new three-span structure. Site Representative

Six-Lane Widening of I-76 & I-276, PA Turnpike Commission, Montgomery County, PA. Construction of \$202 million total reconstruction of urban freeway, with eight bridge replacements (steel and concrete); oversight of Turnpike widening from two to three lanes eastbound and westbound between Valley Forge and Norristown. Includes services during both design and construction phases

Lackawanna Avenue Bridge Rehabilitation, City of Scranton, PA.

Environmental studies, preliminary engineering, final design, and construction services for rehabilitation of a three-span, 78m structure over the D&H Railroad and the Lackawanna River. Site Representative

Stephen K. Geltmacher

Education:

BS/ GeoEnvironmental
Studies/ Shippensburg University

Years' Experience:

Total: 3

Mr. Geltmacher is an Environmental Scientist, providing services in environmental engineering and construction management

NJDOT, Additional Environmental Investigation at the Mays Landing Maintenance Facility, Atlantic Co., NJ. Professional engineering services to perform site investigation and remedial activity work at the Mays Landing Maintenance Facility. Environmental Specialist responsible for groundwater testing.

Hazardous Waste Remedial Investigation and Remediation Action at Sand Hill Maintenance Facility, South Brunswick Township, NJDOT, Middlesex County, NJ.

2004 Landfill Well Sampling, Guilford Township Board of Supervisors, Chambersburg, PA. Environmental Specialist responsible for groundwater and gas vent testing

I&I Analysis/Inventory and Capacity Evaluation, PA American Water, Coatesville, PA. Performed sewer system inventory, flow metering, and two-phase capacity evaluation; delivery of manhole and sewer geodatabases as well as technical reports. Environmental Specialist responsible for GPS of sanitary sewer lines, inspection and data development of lines and manholes.

Wastewater System GIS Update, Derry Township Municipal Authority, Hershey, PA. Survey of manhole locations using sub-centimeter GPS and development of an application that enabled users to analyze the sewer system's ability to handle a new sanitary sewer load. GIS Analyst responsible for updating attribute data regarding sanitary sewer lines and management of databases.

Continued Operating Assistance for Clocktower Remediation System, General Dynamics OTS, Lancaster, PA. Environmental Specialist responsible for groundwater sampling.

Walt Whitman Service Plaza Remedial Investigation, New Jersey Turnpike Authority, Camden County, NJ. Remedial Investigation (RI) and additional site investigations at the Walt Whitman Service Area 3S, located at Milepost 29 0, south of the New Jersey Turnpike, Cherry Hill Township, and Camden County, New Jersey.

General Dynamics, Field Work for Groundwater Remediation, Red Lion, PA. Remedial activities, site characterization and reporting including drilling, modifications to existing systems, surveying and analytical services

Act 537 Plan Update, Borough of Chambersburg, PA. Evaluation of the WWTP for expansion, additional nutrient removal, and update to the Act 537 Plan.

Todd R. Klinger

Education:

BS/Landscape
Architecture/Pennsylvania State
University

Years' Experience:

Total: 28

Professional Affiliations:

Pennsylvania Certified
Horticulturist

Pennsylvania Landscape &
Nurserymen's Association

American Society of Landscape
Architects

Association of Landscape
Contractors of America

Mr. Klinger has over 28 years of experience in the field of landscape design, construction, sales, and management. His field experience enables him to provide site inspections, on-the-job design changes, problem resolutions when construction implementation and design converge, and coordination of project team efforts. Mr. Klinger's abilities include all facets of Landscape Architecture from site analysis through final plan development.

Linden Water Line Replacement, NJ American Water, Union County, NJ. Engineering, design, bidding and construction services for replacement of a water main extending to Grasselli Point, Linden, NJ. Landscape Architect

Master Agreement for A/E Services, American Water, New Jersey, Pennsylvania, West Virginia, and Virginia. Engineering, design, bidding and construction services in Pennsylvania, New Jersey, West Virginia and Virginia.

I&I Analysis/Inventory and Capacity Evaluation, PA American Water, Coatesville, PA Performed sewer system inventory, flow metering, and two-phase capacity evaluation; delivery of manhole and sewer geodatabases as well as technical reports. RTK/GPS was also used to log all utilities within the collection system. GPS survey

Review and Recommendations for Water and Sewer Facilities, Manwalamink Water Company, Shawnee-on-Delaware, PA. Provided review and recommendations for modernizing existing water and sanitary sewer facilities and planning new facilities for the proposed growth. Designer responsible for performing drawdown testing for sanitary pump station improvements

Environmental Engineering, Surveying, and Related Services, West Tennessee River Basin Authority, Western TN. Multi-year, multi-task assignment to provide engineering, surveying, and related services for the West Tennessee River Basin Authority, including the watersheds of the Obion, Forked Deer, and Hatchie Rivers but excluding the watersheds of the Loosahatchie and Wolf Rivers. Tasks include inspection of existing stream control structures, stream restoration, and rehabilitation of outlet structures. Landscape Architect

Design and Permitting for Well No. 9, West Manchester Township Authority, York, PA. Provided services for the design and permitting of a new groundwater source for public supply. Landscape Architect responsible for erosion and sediment control plan.

Five Forks Water Treatment Facility, James City Service Authority, Williamsburg, VA. Design of groundwater treatment/desalination facility to treat water from brackish aquifers; ultimate output 5.0 MGD. Landscape Architect responsible for landscape design, grading and erosion control development for the site.

CSXI Terminal Water Main and Sanitary Sewer Extension Construction Administration and Resident Project Representative Services, Guilford Township, PA. Landscape Architect

Guilford Water Authority, Bartl Wells Nos. 1 & 2 and Valley Quarries Well No. 1 Development, Chambersburg, PA. Landscape Architect

Travis M. Rose

Education:

BS/Industrial Technology/West Virginia University, Institute of Technology

AS/Civil Engineering Technology/West Virginia University, Institute of Technology

Years' Experience:

Total: 9

Mr. Rose has more than nine years of experience as a transportation designer. His experience includes:

- Development of construction documents and right-of-way plans
- Property map layout and descriptions
- Project design
- Mapping
- Coordination with Department of Transportation personnel and subcontractors

I-81 Tabler Station Interchange, West Virginia DOT, Martinsburg, WV. Study, design, and preparation of construction contract plans and related documents for the new Tabler Station Connector Road including modification of ramps, replacement of an overpass bridge, and design of an industrial access road. Senior Designer

Corridor H Final Design, WVDOT, Grant County, WV. Design and development of construction documents for a four-lane divided highway with two major structures and a minor third structure including drainage and specialized erosion and sediment control due to the project location and ecological sensitivity of Greenland Gap. Senior Designer

Jones and Laughlin Overpass Bridge, WVDOT, Martinsburg, WV. Replacement of the Jones and Laughlin Overpass Bridge located approximately 0.48 mile northwest of the intersection of WV 19 and Berkeley County Route 45/4. Senior Designer

Virginia DOT, Right-of-Way and Construction Plans for Route 220, Botetourt County, VA. Prepared right-of-way and construction plans for widening of existing 2-lane roadway to a 4-lane roadway with a median. Senior Designer