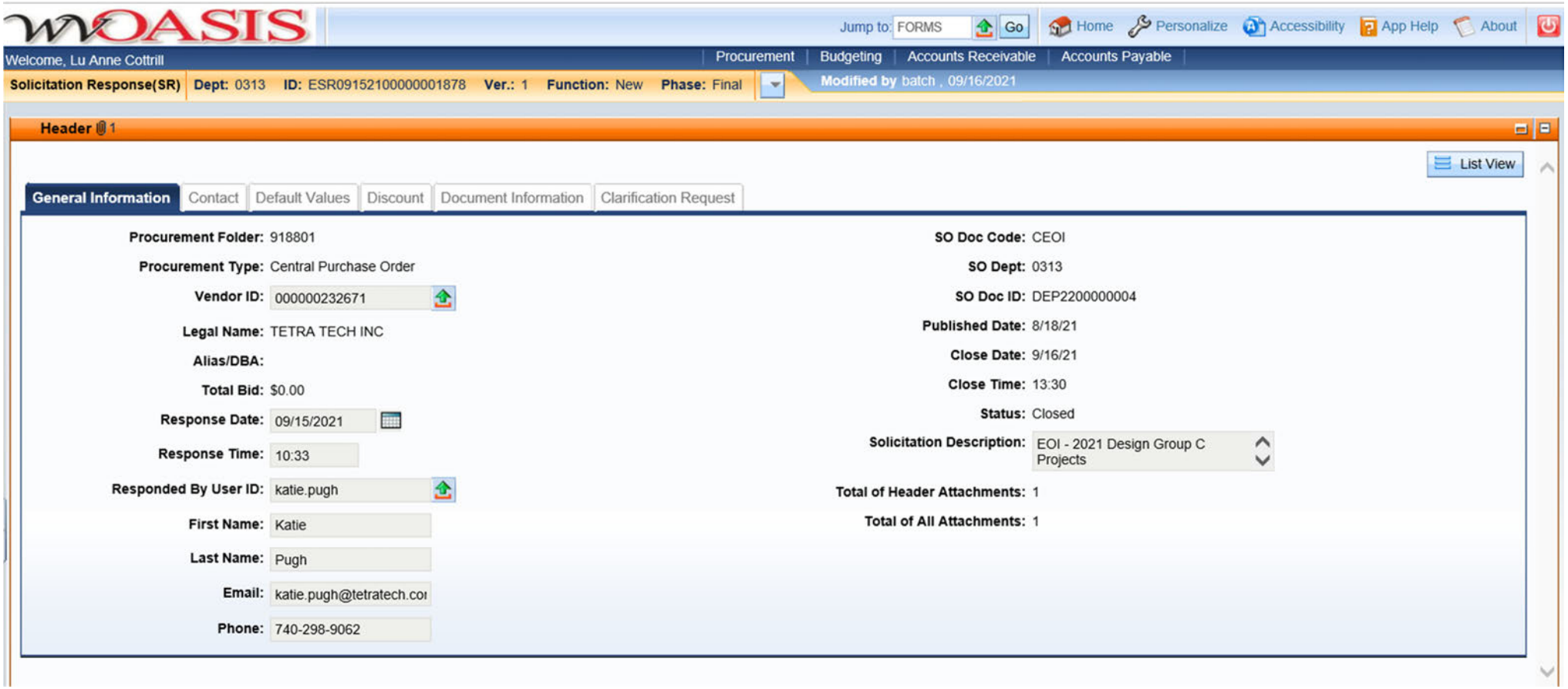
The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.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Procurement
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Solicitation Response(SR) Dept: 0313 ID: ESR09152100000001878 Ver.: 1 Function: New Phase: Final
Modified by batch , 09/16/2021
Header 1
List View
General Information
Contact
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Document Information
Clarification Request
Procurement Folder: 918801
Procurement Type: Central Purchase Order
Vendor ID: 000000232671
Legal Name: TETRA TECH INC
Alias/DBA:
Total Bid: $0.00
Response Date: 09/15/2021
Response Time: 10:33
Responded By User ID: katie.pugh
First Name: Katie
Last Name: Pugh
Email: katie.pugh@tetratech.co
Phone: 740-298-9062
SO Doc Code: CEOI
SO Dept: 0313
SO Doc ID: DEP2200000004
Published Date: 8/18/21
Close Date: 9/16/21
Close Time: 13:30
Status: Closed
Solicitation Description: EOI - 2021 Design Group C Projects
Total of Header Attachments: 1
Total of All Attachments: 1

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

State of West Virginia
Solicitation Response

Proc Folder:	918801
Solicitation Description:	EOI - 2021 Design Group C Projects
Proc Type:	Central Purchase Order

Solicitation Closes	Solicitation Response	Version
2021-09-16 13:30	SR 0313 ESR09152100000001878	1

VENDOR

000000232671
TETRA TECH INC

Solicitation Number: CEOI 0313 DEP2200000004

Total Bid: 0 **Response Date:** 2021-09-15 **Response Time:** 10:33:46

Comments:

FOR INFORMATION CONTACT THE BUYER
Joseph E Hager III
(304) 558-2306
joseph.e.hageriii@wv.gov

Vendor
Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	EOI Engineering Design Services - Flatbush Highwall				0.00

Comm Code	Manufacturer	Specification	Model #
81100000			

Commodity Line Comments: EOI

Extended Description:

*Dates of Service are estimated for bidding purposes only.

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	EOI Engineering Design Services - Fords Run Drainage				0.00

Comm Code	Manufacturer	Specification	Model #
81100000			

Commodity Line Comments: EOI

Extended Description:

*Dates of Service are estimated for bidding purposes only.

TETRA TECH

September 16, 2021

Mr. Joseph E. Hager III
Department of Administration, Purchasing Division
2019 Washington Street East
Charleston, WV 25305-0130

Re: EOI- 2021 Design Group C Projects CEOI 0313 DEP2200000001

Dear Mr. Hager,

Please find enclosed Tetra Tech's Expression of Interest (EOI) for the 2021 Design Group C Projects CEOI 0313 DEP2200000001

Tetra Tech has completed numerous similar mine reclamation and remediation projects in the past for numerous clients which include, but not limited to, landslide analyses design/remediations, design of portal seals, reclamation of coal refuse sites, highwall elimination, drainage design, mitigation of AMD drainage, and design or drainage facilities associated with the mining industry. Individual personnel to be assigned to these projects have as much as forty (40) to forty-five (45) years' experience in the mining industry addressing these items.

If you should have any questions or concerns please contact me at mike.kearns@tetratech.com or via phone at (304)650-2804

Sincerely,

Michael S. Kearns, P.E., M.S.
Project Manager

MSK
Enclosures

Tetra Tech
947 Canyon Road, Morgantown, WV 26508
www.tetratech.com

WVDEP-DLR-AML
EOI-2021 Design Group "C"

Locations: The Projects are located in Randolph and Barbour Counties.

Project 1: Flatbush Highwall is located off County Route 151 between Ellamore and Norton in Randolph County, WV, and is for the reclamation of the existing highwall and the previously constructed AMD ponded area.

Project 2: Fords Run Drainage is located off County Route 24/2 east of Philippi in Barbour County, WV, and is for the repair and replacement of existing AML reclamation features and facilities and mitigation of failing structures and grading.

Project Goals and Objectives

The above listing of projects has identified specific issues associated with each different and separate locations. Tetra Tech has extensive experience in the remediation and resolution of Civil/Mining Engineering projects as those listed above. Common to each project would be a similar initial approach prior to addressing the *Project Goals and Objectives*.

Upon receipt of the formal notice to proceed, Tetra Tech would attend an on-site project kick-off meeting at each site with WVDEP personnel to discuss the project issues and work plan to reach a consensus on the technical approach for each of the sites. The kick-off meeting would also provide the opportunity for WVDEP personnel to express to Tetra Tech their concerns, objectives, and initial thoughts on each of the projects for discussion. Upon completion of the on-site project kick-off meetings a *Document of Understanding* will be prepared by Tetra Tech for each of the above Project Areas for review and input by WVDEP to create a work plan and goal-oriented document for each project.

Base mapping will be required for each of the projects. It is Tetra Tech's understanding the mapping will be provided for all projects, however, some additional checks, spot locations, and potential additional feature items may be required to be located for design purposes. Tetra Tech will utilize a sub-contract surveying company for these services.

Based on the initial and available information, a preliminary conceptual plan will be prepared for review by WVDEP personnel. The preliminary conceptual plan will identify the general layout of the site, specific issues identified, proposed water routing, areas of additional concern and in the case of land stability issues, soil bore hole locations associated with the proposed geotechnical investigation.

Tetra Tech will prepare and submit to obtain the required permits as determined at the Pre-Design Meeting. Required permit applications will be prepared for submittal for the project. All required plans, specifications and required additional data will be included within the application. Required permits may include the following:

- 401/404 Stream and Wetland Permits
- Construction Stormwater General Permit
- WVDOH Occupancy Permit (Driveway Permit)
- Bat Survey/Clearance of Buffer Zones.
- NPDES Modification

****

The requested responses to the project goals and objectives as stipulated within the EOI are listed below:

Goal/Objective 2.1: Develop construction plans and technical specifications to stabilize the landslide, and design new drainage features and structures if the existing structures are unable to be repaired or replaced.

Response: In order to develop the construction plans and technical specification to stabilize the landslide, the development of the geotechnical investigation plan would be completed. The geotechnical plan would consist of the drilling and sampling of soils in the vicinity of the landslide. Tetra Tech will provide a geotechnical engineer on site during the drilling operations. The number, locations, and depths of borings would be dependent on the extent and size of the landslide. In addition to the sampling of soils, the geotechnical boring plan would attempt to identify existing slip planes, the extent and locations of any perched aquifers as well as elevation of phreatic surfaces at the completion of the drilling and 24 hours thereafter. Soil testing would be completed by Tetra Tech's in-house soil laboratory located in Morgantown, West Virginia. Potential soil tests and number of tests to be conducted would be determined following the geotechnical drilling and sampling operations but could possibly include the following tests:

Potential Soil Tests

- Visual Description
- Grain Size Analyses
- Hydrometer Test
- Moisture Content
- Direct Shear
- Standard Proctor
- Atterberg Limits

Plan and cross section views will be developed to provide the design of the stabilization and remediation of the landslide area. Plan and cross section views will provide the location and design

parameters of the final slope configuration and will show the location and details of proposed subsurface drainage underdrains, final slopes, proposed keyways, and typical detail slope saw-cut excavation as part of the reconstructed/stabilized slope. Stability analyses will be completed utilizing the Slide 2 program to assist in determining the stable configuration of the final slope configuration with a minimum standard safety margin of 1.5. Specifications will be developed indicating compaction requirements such as degree of compaction, optimum moisture, plus or minus variance on moisture, lift thickness and other quality control parameters for compaction during construction.

On-site drainage features and structures will be evaluated during the kick-off site meeting. An additional site visit may be required to provide additional evaluation of these features and structures. If it is determined, the existing structures and/or features are unable to be repaired, a remediation plan will be designed, or alternative designs will be provided.

Construction drawings and specifications will be developed based on the design concept approved by WVDEP and in conformance with the WVDEP Guidelines for Preparation of Design Plans & Specifications. Drawings will be 24" x 36" format and produced from base mapping files in AutoCAD 2019 format. Final drawings and specifications will be provided for use for review by WVDEP and for use by the selected contractor. Plans and specifications will be prepared

Detailed specifications will be prepared in a manner compatible with the WVDEP contracting documents and consistent with base specifications available from the WVDEP website. Complete technical specifications in Microsoft Word will be provided with the final submission.

Goal/Objective 2.2: Design plans and develop specifications to control any associated water with the site.

Response: Drainage areas within the project area will be determined. If possible, diversion ditches will be located in the upstream area in order to control and divert the drainage around the project area. Acid mine drainage (AMD) water will be identified on the plans and designed to be routed separately from the "clean" surface drainage, All drainage ditches, swales, and culverts will be sized and designed in accordance with standard engineering practices. Size, slope, and lining of the proposed ditches and culverts will be specified on the plans and be based on required storm events. Design of drainage conveyances, including drainage channels, underdrains and /or other controls to safely convey water off -site will be designed in accordance with standard engineering practices and will fully consider the safety of the existing public dwellings and structures near the project areas. Hydrologic and hydraulic analyses will be performed. HydroCAD Stormwater Modeling program will be utilized in analyzing and sizing drainage structures for the project.

Goal/Objective 2.3: Design plans and develop specifications for limits of disturbance, storm water control and erosion and sediment prevention. All disturbed areas are to be regraded and revegetated.

Response: The Erosion and Sediment Control Plans (E&SCP) will include:

- Narrative and description of Best Management Practices (BMPSs)
- Construction Sequence
- Narrative and description of post-construction stormwater management
- E&SCP with detail drawings
    - A general vicinity location map
    - Erosion and Sediment Control plan sheets
    - Post Construction Stormwater Management plan sheets
    - E&SCP details will be per the WVDEP's E&S standards manual.

Detailed grading plans will be provided showing existing contours, proposed final grading contours, location of Erosion and Sedimentation Control devices such as silt fence, super silt fence, sumps, swales, compost filter socks and other erosion control devices. In addition, a proposed seeding and revegetation plan will be include on the plans and within the specifications.

Goal/Objective 2.4: Design plans and develop specifications for all conditions encountered on the project site.

Response: Detailed design plans and specification will be prepared for other conditions encountered on the project site. Other conditions may include the following as applicable:

- Exposed mine spoil and refuse on the site. – Reclamation measures such as, but not limited to re-soiling and revegetation of the area, excavating and relocating the spoil/refuse to another location on the site to be buried, re-soiled and revegetated. The spoil/refuse should be properly compacted prior to re-soiling and revegetation. Proposed Regrading and revegetation of affected area would be included within this item.

- A plan and specifications to mitigate AMD drainage, including possible horizontal borings would be prepared. The plan would consider the quantity, flow rate and chemical properties of the AMD drainage. Alternative solutions would be considered within the final design. Also, existing AML reclamation features and facilities will be evaluated as to failing structures and grading. Designs would be considered for replacement or alternatives would be consider such as rerouting of flow or elimination of flow.

- Highwall reclamation and previously constructed AMD ponded area. Highwall reclamation would be designed for the specific projects. Cross-sections would be developed along the length of the highwall showing the existing configuration of the highwalls. A regrading plan will be developed dependent on the existence of existing spoil located below the bench to potentially folding over this material onto to the bench in conjunction with regrading of the existing highwall to regrade to a more stable and safer slope. Other measures would be considered depending on the existence of existing excess spoil and material on-site. The AMD ponded area would be evaluated during the on-site review. Alternatives would be considered such as re-routing of the AMD drainage or other alternatives.

- Design of access or accesses as required. Accesses will be designed utilizing AutoCad software. Plan view, designed profile, and roadway cross sections shown at an appropriate interval will be prepared and will be included within the final drawing package. Typical sections will be shown to indicate design features such as roadway cross slopes, pavement composition (gravel, asphalt, or concrete) and thickness, side slopes of embankments/cut slopes and proposed ditching. The roadway will be design in accordance with WVDEP mining and reclamation standards or other standards as determined by WVDEP. Final design of the roadway will attempt to design the roadway to a balanced cut/fill situation, if possible. Cut and fill quantities will be listed on the plans.

Proposed Staffing Plan

With 21,000 employees in 450 offices worldwide Tetra Tech has the resources to build an experienced team for this project. The Key personnel for this project are as follows:

Michael Kearns, PE, Senior Civil Environmental Engineer

West Virginia University, 1977, BS Civil Engineering
West Virginia College of Graduate Studies, 1982, MS Civil Engineering

Michael Kearns has over 40 years of diversified engineering experience in Civil Engineering field. Mr. Kearns is a licensed Professional Engineer in the States of West Virginia, Maryland, Ohio and Pennsylvania. He is also a licensed Professional Surveyor in the State of West Virginia.
Mr. Kearns' past professional experiences has been in the mining industry, site development, municipal engineering and highway engineering as well as environmental engineering disciplines. Mr. Kearns also has extensive experience in the areas of Surface and Underground coal mine permitting, Preparation of the Storm Water Pollution Prevention Plans and mine plan aspects which consist of the drainage and sedimentation control design, sedimentation pond design, diversion ditch design, surface mine planning, preparation of wetland and stream mitigation plans and design and evaluation of Division of Water and MSHA size impoundment structures. Mr. Kearns also performs the calculation of earthwork quantities, stability analyses of slopes and the preparation of the final plans for permitting or bidding purposes.

Farley R. Wood, PE, Senior Project Manager/Operations Manager: St. Clairsville Ohio

Pennsylvania State University, 1984, BS Mining Engineering

Mr. Wood is a registered Professional Engineer in three states with more than 30 years of diverse experience in consulting and the mining industry. His experience includes engineering, project management of projects up to $100 million, operations, environmental and safely compliance, permitting and executive level leadership. Mr. Wood's experience encompasses surface mining techniques, along with underground mining techniques. His engineering experience covers design, cost estimating, long-term maintenance planning and risk avoidance designs, surface and underground mine planning and mine closure, waste disposal stream relocation and restoration, acid mine drainage treatment systems, health and safety and quality management. Mr. Wood has extensive mine drainage experience having completed several projects in Pennsylvania, West Virginia and Maryland.

Thomas A. Gray, PE, Energy and Natural Resources Group Manager

Pennsylvania State University, 1973, BS Mining Engineering
University of Pittsburgh, 1977, MBA

Mr. Gray has more than 40 years of professional experience. He is a technical expert in mining engineering, mine reclamation, coal ash disposal and utilization, watershed and ecosystem restoration, mine subsidence, acid mine drainage remediation, mine stabilization via grouting and abandoned mine fire mitigation. Mr. Gray specializes in active and abandoned mining projects and with infrastructure projects that have mining related concerns. His project management responsibility has included construction, engineering, regulatory compliance, and research and development. He has been responsible for the successful completion of many unique projects. Mr. Gray is an industry leader for mine drainage projects encompassing several states.

Gregory Hynes, PE, Project Engineer

Youngstown State University, 1987, B.E. Civil Engineering

Youngstown State University, 1997, M.S. Civil Engineering

Mr. Hynes has 31 years of professional engineering experience including utility pipelines and abandoned mine land reclamation. Additionally he has designed and permitted numerous mine surface facilities, oil and gas well pad sites, potable water distribution systems, stormwater conveyance systems, sanitary sewerage systems, and developed E&S control plans.

His mine reclamation experience began in 1991 and includes acting as principal engineer or project manager responsible for design calculations, cost estimates, plans, and technical specifications for over 50 abandoned mine land reclamation project sites in West Virginia, Ohio, Pennsylvania, and Virginia for agencies including WVDEP, ODNR, USCOE, VDMME, and PADEP. Projects included reclamation of steep refuse piles, highwalls, burning refuse, exposed mine entries, abatement of acidic mine drainage, active and passive AMD treatment, and mine subsidence grouting. His responsibilities also included tracking schedules and budgets, project billing, and hiring sub-consultants. Mr. Hynes has also prepared permit applications and construction level drawings and specifications for proposed surface mine facilities in PA, WV, and NC. Projects included permitting and reclamation of various mining facilities such as pipelines, shaft sites, boreholes, preparation plants, pits, refuse storage areas, slurry impoundments, treatment ponds, stream enclosures, sedimentation ponds, E&S controls and numerous minor permit modifications.

Heather Trexler, PG, Senior Geologist

West Virginia University, BS Geology
West Virginia University, MS Geology

Ms. Trexler has over 17 years of professional experience with responsibilities for proposal preparation, staff oversight, job and budget tracking, technical report preparation, and client development for coal mining, natural gas and environmental projects. She is the Department Manager of the Energy and Natural Resources Group in the Pittsburgh office and leads projects requiring a multi-disciplinary team of

professionals including engineering, geology, hydrogeology, and ecology. Projects activities for coal mining development include mine abandonment designs and the preparation of permits to state agencies in Pennsylvania and West Virginia for mine expansions and associated surface activities. Additional technical projects include the evaluation of current and potential wing current and potential impacts to water resources.

Eric DiFatta, PE, Civil Engineer

University of South Carolina, 2008, BS Civil Engineering

Mr. DiFatta has design experience in traditional & specialty geotechnical structures, including retaining walls (RC, MSEW, S&L/P&P), reinforced earth (RSS, soil nailing, ground anchors), river causeways, cofferdams and deep foundations. His experience also encompasses subsurface exploration and investigation, structural design applied to geo-structures, seepage and stability analyses, erosion and sediment control design, and periodical dam safety compliance inspections. Additionally, Mr. DiFatta has experience in the design of earth & coal refuse dams and impoundments.

Matthew Ridgway, EIT, Civil Engineer

West Virginia University, 2013, BS Civil Engineering
West Virginia University, 2013, BS Mining Engineering

Mr. Ridgway offers years of diverse' experience assisting clients with management, project management, engineering and managing the design and construction of complex projects. He has a proven history as a geotechnical engineer performing and overseeing task including preliminary site investigations, engineering analysis and design and construction oversight all while maintaining cost-savings initiatives. Mr. Ridgway is an effective communicator and has a history of effectively overseeing and managing complex projects with multiple stakeholders who share different interest. He is constantly demonstrating success while dealing with complex issues in highly stressful and ever-changing environments. Mr. Ridgway has worked in a wide variety of both public and private sector projects and is able to use the diversity of his experience to provide new and creative solutions to complex problems. As an involved manager who takes ownership and pride in his work, he will ensure that project teams have the resources and support needed to not only meet but exceed all expectations

Katherine Pugh, Environmental Scientist

Heidelberg University, 2009, BS Environmental Biology

Heidelberg University, 2009, BS Water Resource Management

Ms. Pugh is experienced in the permitting and environmental compliance field, including five years working for major coal mine operators. Ms Pugh has worked with state and federal agencies in Appalachia and interior coal basins and has extensive water permitting experience. In addition, she has experience in wetland delineation and field biology. Her experience includes both actual performance of work and project management.

Ms. Pugh's expertise encompasses all aspects of environmental permitting including SMCRA, Clean Water Act 401/402/404 and Clean Air Act permitting. She also has extensive experience with endangered plant and animal species coordination specifically Indiana Brown Bat and development and installation of mitigation projects. In addition Ms. Pugh has worked extensively in the environmental compliance field. Ms. Pugh has extensive experience in water sampling in both field and industrial settings. Her experience includes SPCC and Stormwater development and compliance, TRI reporting, NPDES compliance including water treatment, sampling and reporting and mitigation monitoring and reporting.

TETRA TECH

MICHAEL S. KEARNS, P.E.

Senior Civil Environmental Engineer

EXPERIENCE SUMMARY

Michael Kearns has over 40 years of diversified engineering experience in Civil Engineering field. Mr. Kearns is a licensed Professional Engineer in the States of West Virginia, Ohio and Pennsylvania. He is also a licensed Professional Surveyor in the State of West Virginia.

Mr. Kearns attained his Masters Degree in Civil Engineering specializing in soils and foundations. He has approximately 40 years of experience in geotechnical engineering performing stability analyses associated with slip remediation, impoundment design, the evaluation and design of numerous different types of retaining walls including cast-in-place, segmental and modular retaining walls as well as reinforced earth designs.

Mr. Kearns' past professional experiences has been in the mining industry, site development, municipal engineering and highway engineering as well as environmental engineering disciplines.

Mr. Kearns also has extensive experience in the areas of Surface and Underground coal mine permitting, Preparation of the Storm Water Pollution Prevention Plans and mine plan aspects which consist of the drainage and sedimentation control design, sedimentation pond design, diversion ditch design, surface mine planning, preparation of wetland and stream mitigation plans and design and evaluation of Division of Water and MSHA size impoundment structures. Mr. Kearns also performs the calculation of earthwork quantities, stability analyses of slopes and the preparation of the final plans for permitting or bidding purposes. He has also prepared Emergency Action Plans (EAP) for these types of structures and has designed large raw coal storage and refuse facilities. Mr. Kearns is an MSHA certified impoundment inspector and instructor.

Mr. Kearns has worked on hundreds of surface mine and deep mine permits over his career. As an engineering consultant in his field, Mr. Kearns coordinates all engineering work, manages budgets, schedules tasks, prepares proposals, and oversees all designs. Mr. Kearns responsibility is the coordination of the engineering regulatory aspects associated with the mining industry and requirements of West

EDUCATION

B. S., Civil Engineering, 1977
West Virginia University

M.S. Civil Engineering, 1982
WV College of Graduate Studies

REGISTRATIONS AFFILIATIONS

Professional Engineer, WV
1981, [redacted]

Professional Engineer, OH
1991, [redacted]

Professional Engineer, PA
1992, [redacted]

License Professional Surveyor - WV

American Society of Civil Engineers

National Society of Professional Engineers

National ASCE Committee on Employment Conditions

IOGAWV Rules Committee

Wetzel County Oil and Gas Task Force

OFFICE

St. Clairsville Ohio

YEARS WITH TETRA TECH

1 Year

Virginia, Pennsylvania DEP and Ohio ODNR-DMRM. Permit requirements would also include property research, hydrologic investigations and determination of hydrologic consequences, stream and wetland delineation, associated 404/401 permitting, NPDES permitting, performing associated due diligence, sub-surface investigation and addressing all other state and federal regulatory requirements.

Mr. Kearns experience has also extended to the oil and gas industry in the States of West Virginia and Ohio. As Project Manager, Mr. Kearns has worked with the oil and gas clients in managing the oil and gas projects from the preparation of the conceptual plan for evaluation by the client through construction .His experience as Project Manager includes the design of numerous oil and gas pad sites, access roadways, drainage ditches and impoundments/storage detention facilities and centralized impoundment structures, preparation of the erosion and sedimentation control plans preparation of the stormwater general permit application. These services have also included managing and preparation of the construction contract plans and specifications, preparation and submittal of the regulatory permits for approval, bidding documents and providing construction management for the oil and gas client. As a Licensed Surveyor, Mr. Kearns has utilized his professional expertise in the research required for parcel boundary determinations associated with the development of the contract construction plans and permitting..

Other areas of expertise include soils engineering, water/sewer engineering, transportation engineering, and site development.

RELEVANT EXPERIENCE

Senior Project Manager, Confidential Client, Monroe County, Ohio: Conducted the field investigation into the location and cause of an 200-foot tall slope failure, 700-foot long slip area. Performed geotechnical investigation, stability analyses, prepared construction drawings and construction management for mitigation and repair.

Senior Project Manager, DAC Energy, Haynes Oil/Gas Well Site: Performed the site design and WVDEP & NPDES permitting for a 5-acre oil/gas pad site located in Wetzel County, West Virginia. Design included overall site design, determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site. In addition, predrill water sampling and testing was performed for this area. As Project Manager, I was responsible for preparation of Construction Plans and Specifications for submittal and approval of the Oil and Gas permit to WVDEP. These plans were utilized for the construction of the well pad site by the client. Environmental investigations and clearance for the site as well as performing the site land survey were also performed.

Senior Project, Protégé' Energy, Monroe County, Ohio: Performed the site design for several oil and gas sites located in the state of Ohio for Protégé'. Design included overall site design, determination of earthwork quantities, preparation of the E&S plan, and addressing slope stability for the site. As Project Manager, responsible for preparation of Construction Plans and Specifications for submittal and approval of the Oil and Gas permit to ODNR and the construction of the well pad site.

Senior Project Manager, StatOil, Monroe County, Ohio: Performed the pad site and access road design for several oil and gas sites located in the state of Ohio for Statoil'. Design included overall site design, determination of earthwork quantities, preparation of the E&S plan, determination of permit issues and addressing slope stability for the sites. As Project Manager, responsible for preparation of Construction Plans and Specifications for submittal and approval of the Oil and Gas permit to ODNR and the construction of the well pad sites. Coordinated and performed pre-drill water well surveys and testing for approximately 2,500 private water wells. I also was Project Manager for a post-well pad fire environmental impact study. This was a major fire that encompassed the entire well pad just prior to fracking operations. Federal EPA, State OEPA, Corps of Engineers, ODNR and Fish & Wildlife were involved in this investigation

.

Senior Project Manager, StatOil, Various Counties, West Virginia, Ohio: Performed weekly inspections of Centralized Impoundment and well pad sites. The inspections, as required (impoundments) by the State Regulatory Agencies identified deficiency and maintenance items required to be addressed by the client.

Senior Project Manager, StatOil, Various Counties, West Virginia, Ohio: Worked with Statoil Real Estate Division to evaluate and identify potential Centralized Impoundment sites. Performed preliminary evaluation of sites for potential stream/wetland issues, feasibility of construction, and other environmental considerations in determining a go, no-go purchase of the tract of land from the landowner by Statoil. A preliminary conceptual plan was developed for each potential site.

Senior Project Manager, SouthWest Energy, Various Counties, West Virginia: Performed Centralized Impoundment inspections and prepared required regulatory updates including preparation of the emergency action plans associated with the Annual Centralized Impoundment Certifications for the client. Approximately 27 impoundments were included.

Senior Project Manager, Trans-Energy, Various Counties, West Virginia: Performed above ground Storage Tank (AST) inspections and certifications for approximately 50 to 60 AST located at various client's well pad sites. The final report included the current status of the tanks as to WVDEP requirements and recommendations for meeting WVDEP requirements.

Senior Civil Environmental Engineer, The Marshall County Coal Company, 6 North 6 South Bleeder Shaft Sites (2018-2019): Performed the site design for the two (2) bleeder shaft sites located in Marshall County near the Pennsylvania/West Virginia border. Design included determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site.

Senior Civil Environmental Engineer, The Marshall County Coal Company, 6 North No 1 Bleeder Shaft Site (2018-2019): Performed the site design for the two (2) bleeder shaft sites located in Marshall County, near Cameron, West Virginia. Design included determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site.

Engineering Manager, The Marshall County Coal Company, Annual Impoundment Inspections (2013-2018): Performed the Annual Impoundment Inspections of the permitted sediment ponds and submittal of the annual certifications to WVDEP.

Engineering Manager, The Ohio County Coal Company, Annual Impoundment Inspections (2013-2018): Performed the Annual Impoundment Inspections of the permitted sediment ponds and submittal of the annual certifications to WVDEP.

Engineering Manager, The Marshall County Coal Company, Package Sewer Plant Design (2018) Design and NPDES & WV Bureau of Health Permitting for a sewage treatment plant for a coal facility located in Marshall County, Franklin-Woodland area. Preparation of the contract/permit drawings and specifications.

Senior Project Manager, The Marshall County Coal Company, 5 North No 2 Portal Site Design: Performed the site design and WVDEP & NPDES permitting for a 26 acre mine portal site located in Marshall County, near Cameron, West Virginia Design included overall site design, determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site, Sewage Package Plant (25,000 gpd) design and permitting.

Senior Project Manager, The Marion County Coal Company, 7 North No 1 Portal Site Design: Performed the site design and WVDEP & NPDES permitting for a 32 acre mine portal site located in Marion County, West Virginia. Design included overall site design, determination of earthwork quantities, preparation of the E&S plan, determinization of permit issues and addressing slope stability for the site, Sewage Package Plant (25,000 gpd) design and permitting.

Senior Project Manager, The Tunnel Ridge Coal Company, Short Creek Preparation Plant Site: Performed the site design and WVDEP & NPDES permitting for a 40 acre coal mine preparation plant site located in Ohio County, north of Wheeling West Virginia. Design included overall site design, determination of earthwork quantities, siting of the prep plant facilities, preparation of the grading plan, design of the sediment and treatment ponds on the preparation plant site and preparation of the overall E&S plan.

Senior Project Manager, Rayle Coal Company, Short Creek, Clearview Mining Area: Preparation of a WVDEP Surface Mine and NPDES permit for mining of the No 11 coal approximately 124 acres adjacent to a coal refuse facility. Preparation of the erosion and sediment control, coordination of sub-surface investigation, prime farmland investigations, and other aspects and requirements of the surface mine permit.

Project Manager/Engineer, The Penn Ridge Coal Company, Avella Preparation Plant Site: Performed the site design and WVDEP & NPDES permitting for a 35 acre coal mine preparation plant site located in Washington County, Pennsylvania. Design included overall site design, property research, determination of earthwork quantities, siting of the prep plant facilities, preparation of the grading plan, design of the sediment and treatment ponds on the preparation plant site and preparation of the overall E&S plan.

Senior Project Manager, Confidential Client, Expert Witness/Testimony. Appeared before the Ohio Division of Reclamation Review Board as an expert witness relative to the condition and acceptability of an existing impoundment that was to remain permanent on a property owner's land.

Project Engineer, Jack A. Hamilton & Associates, Flushing, Ohio. (2003-2011) As a consultant with this firm, performed hundreds of annual pond inspections/certifications for numerous clients. Field reviewed ponds for maintenance and functionality issues or defects. Annual pond inspections were completed in West Virginia and Ohio.

Project Engineer, Rosebud Mining Company, Rosebud Prep Plant and Refuse Site : Performed the site design and ODNR & NPDES permitting for a coal mine preparation plant site and coal refuse disposal site Design included overall site design, property research, determination of earthwork quantities, siting of the prep plant facilities, preparation of the grading plan, design of the sediment and treatment ponds on the preparation plant site and preparation of the overall E&S plan.

Project Engineer, Various Mining Companies, HEC-RAS Drainage Studies: Performed numerous flood studies associated with the mining areas that crossed existing streams. Numerous evaluations were made to determine the impact of a bridge structure installed over a streams which a hydrologic and hydraulic evaluation had to be made to determine if and to what degree the structure could potentially impact flow.

TETRA TECH

FARLEY R. WOOD, P.E.

Senior Project Manager, Operations Manager, Principal Engineer

EXPERIENCE SUMMARY

Farley Wood has over 35 years of diverse experience in the mining industry. His experience includes engineering, operations, project management, environmental and safety compliance, permitting, mergers and acquisitions, and executive level leadership. He is a licensed Professional Engineer in Pennsylvania, West Virginia, and Ohio.

Mr. Wood's expertise encompasses surface mining techniques including truck and shovel, draglines, highwall mining, and dredging systems; along with underground mining techniques encompassing both room and pillar and longwall methods; along with refuse and tailings disposal. His engineering experience covers mine design, cost estimating, long and short-term operational planning, reserve development, exploration, maintenance planning, surface and underground mine planning operations, mine closure, mineral and aggregate processing, coal cleaning/preparation, waste and tailings disposal, stream relocation and restoration, acid mine drainage treatment systems, health and safety, and quality management.

Mr. Wood's regulatory compliance and permitting experience includes mine permitting in seven states, water quality compliance, stormwater, and air quality permitting and compliance. His management experience includes creation of operating budgets and budget management, capital and operating cost estimates, sales, contract negotiation, health and safety program management, and cash management.

RELEVANT EXPERIENCE

Senior Project Manager, South Fayette Conservation Group, Gladden AMD Treatment Plant (2019 - Present) Design/Build/Operate: Design, permit, build, and operation of a water treatment facility to restore eight miles of impacted stream in Allegheny County Pennsylvania. The $13 M project will lower an existing discharging mine pool, treat the Acid Mine Drainage utilizing hydrogen peroxide as an oxidizing agent, and pump the precipitated sludge into underground mine working for disposal.

EDUCATION

B. S., Mining Engineering, 1984, Penn State University

Post-Graduate Master of Business Admin. Courses, 2004, Bowling Green State University

TRAINING/CERTIFICATIONS

Professional Engineer, PA 1990, [redacted]

Professional Engineer, OH 1993, [redacted]

Professional Engineer, WV 1991, [redacted]

US Dept. of Interior, Office of Surface Mining, Appalachian Regional Reforestation Initiative

Coaching and Leading People – Pennsylvania State University

Ground Control Safety in Underground Mining – Pennsylvania State University

Ground Control in Mining – ICGCM

Pillar Design for Room and Pillar Mining - MSHA

Mine Drainage Symposium – WV Mine Drainage Task Force

Metallurgical Coal Evaluation for Coke Making – Coaltech Petrographic Associates

OFFICE

St. Clairsville Ohio

YEARS OF EXPERIENCE

36

YEARS WITH TETRA TECH

5

Senior Project Manager, Exelon Power, Peach Bottom Marina Dredging (2018-2019): Performed a feasibility study into dredging operational alternatives to reduce costs. Once option was chosen performed design work, permit modifications, provided bid documents, and bid technical review.

Senior Project Manager, Guernsey Power Plant, Lands Unsuitable for Mining Petition to Ohio DNR (2018): Petitioned on behalf of Guernsey Power Station to designate plant and substation areas unsuitable for mining. The designation was requested and granted to protect the plant from potential future mining impacts and address coal ownership issues.

Senior Project Manager, Alleghany Land Trust, Wingfield Pines Inflow Reconstruction (2018-2019): Managed the project to re-establish acid mine drainage flow to passive treatment system that entailed mine dewatering, bulkhead design and installation, permitting, and creation of new gravity flow water system that would be self-sustaining into the future.

Project Engineer, Sunoco Pipeline, Current and Future Subsidence Threats to Pipeline Construction (2018): Determining the subsidence potential of areas beneath planned horizontal directional drillings of the Mariner East I and II Pipeline through investigation of previous mining and finite element analysis modeling of potential future subsidence impacts to the pipeline.

Principal Investigator, US Dept. of Energy / National Energy Technology Laboratory, Rare Earth Elements Associated with Coal and Coal By-Products (2016 to 2018): Manage federal project to identify and quantify the existence high levels of rare earth elements in coal seam and associated geology in the Northern Appalachia, Central Appalachia, and Rocky Mountain coal basins.

Senior Project Manager, West Virginia DEP, Office of Special Reclamation, Royal Coal Project (2016) Reclamation and Water Treatment: Manage engineering and reclamation design for bond forfeitures site in southern West Virginia. Site consists of coal preparation plant remnants, coarse refuse disposal, tailings disposal, rail siding, and water treatment system design to meet discharge standards.

Senior Project Manager, Ramaco Resources (2016) Due Diligence: Performed an environmental due diligence and permit review on a 76 million ton room and pillar and surface mine reserves called Elk Creek Property in the Dorothy, Williamson, Cedar Grove, Alma, Eagle, #2 Gas, and Ben's Creek seams in Logan County WV. Evaluated environmental liabilities, permit issues and time estimates, and outstanding issues.

Senior Project Manager, PaDEP Rausch Creek Plant Upgrades (2016) Capital Project: Managed upgrade and modernization project for watershed based acid mine drainage treatment facility located in eastern Pennsylvania.

Senior Project Manager, Weirton Area Port Authority (2014 to 2015) Development Project: Managed development of inland river port facility on the upper Ohio River, including facility closures, redesign, infrastructure expansion, river terminal design and permitting, community involvement, and facility re-opening.

Vice President, AK Coal Resources (2011 to 2014) Capital Project: Started and managed new underground mining division for Fortune 500 steel company. Managed $100 million vertical integration greenfield project from inception through full production. Responsible for reserve development, workforce development, engineering management, operations management, operational profit and loss, lease and contact miner management, coal preparation and tailings disposal.

Vice President, Coal Innovations (2013 to 2014) Plant and Refuse Disposal Expansion: Managed expansion project for low vol metallurgical coal preparation facility that doubled plant capacity and improved fine coal recovery. Responsible for the final design, equipment selection, along with construction and budgetary oversight. Managed expansion of coal tailings disposal site, inclusive of site selection, design, and permitting.

Vice President, AK Coal Resources (2012): M&A Lead: Lead team in evaluation, negotiation, and closure of acquisition of Coal Innovations, a coal processing and refuse disposal operating company in Somerset County, Pennsylvania.

Senior Engineering Manager, AK Coal Resources, (2011 to 2012) Capital Design: Conducted costing, site design and construction of new mining complex. Supervised site development, subcontractors, and construction. Selected and installed mining equipment, material handling systems, along with communication and monitoring systems. Certified operation of stormwater system, mine water treatment system, SPCC plan, and ground control plans.

Director of Environmental Compliance and Permitting, Murray Energy Corp. (2007 to 2011): Managed all operational and environmental permitting, compliance, and associated projects for seven operating units of a national mining corporation. Worked on state and federal levels to insure uninterrupted mining operations, and environmental compliance was maintained.

Sr. Project Manager, Ohio Valley Coal Corp. (2008 to 2011) Capital Design: Management of the Casey Run coal tailings disposal project in Ohio. Responsible for project cost analysis, site selection, impoundment design, surface water management, underdrain design, permitting, agency coordination (state and federal), mitigation, alternatives analysis, biological studies, reclamation planning, and hydrologic modeling of discharge quality.

Sr. Project Manager, Ohio Valley Coal Corp. (2010 to 2011) Waste Disposal: Management of Tailings Dam #2 expansion project. Responsible extending the life of the facility, cost analysis of alternatives, emergency response plan, stability analysis, water balance, property acquisition, permit modifications, construction, testing, and water quality management of a slurry impoundment supporting two longwall mines.

Sr. Project Manager, Murray Energy Corp. (2010 to 2011) SPCC Compliance: Developed SPCC plans for all subsidiary facilities in Ohio, West Virginia, and Pennsylvania. Facilities included underground coal mines, surface coal mines, coal preparation plants, tranloading facilities, waste disposal sites, maintenance and rebuild shops, and water treatment facilities.

Sr. Project Manager, KenAmerican Resources (2009 to 2010) Water Treatment: Led design team, managed installation and operations of Andalex AMD remediation project in Kentucky. Responsible for

design of passive sulfate reducing bioreactor treatment system, approval by state and federal agencies, installation, and operation and monitoring of the system.

Sr. Project Manager, OhioAmerican Energy (2008 to 2009), Reclamation: Managed the FGD Beneficial Use demonstration project with American Electric Power (AEP) in Ohio. Permitted, designed, monitored, and constructed FGD disposal sites using FGD to reclaim highwalls on abandoned mine sites.

Sr. Project Manager, American Coal Company (2010 to 2011) Waste Disposal: Managed tailings disposal permitting in Illinois. Responsible for site selection, impoundment design, permitting, agency coordination (state and federal), mitigation, alternatives analysis, biological studies, and hydrologic modeling of discharge quality.

Sr. Project Manager, AmericanMountaineer Energy (2010 to 2011) Design and Permitting: Design and permitting of a greenfield longwall complex in West Virginia. Responsible for site design, tailings disposal site selection and design, permitting, mitigation, and rail loadout design and construction.

Project Manager, Oxford Mining (2006 to 2008) Permitting and Certification: Responsible for surface mine permitting in multiple states. Designed, constructed and certified all stormwater management systems, and annual reviews and renewals.

Vice President – Operation, MGQ Inc. (2005) Due Diligence: Acquisition of high quality dolomitic limestone reserves. Identified, verified, and acquired reserves for new quarry operations. Performed exploration, reserves evaluation, and financial analysis to determine value of assets.

Vice President - Operations, MGQ Inc. (2001 to 2005): Operational and P&L responsibility for chemical grade ore and aggregate mining and material processing in Ohio. Profitably operated the largest single aggregate producing facility (+4 Mt/yr) in the state of Ohio, serving chemical and aggregate markets by rail and truck.

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Vice President - Operations, Rohr Corporation (2000 to 2001): Operational and P&L responsibility for dredging system manufacture. Designed, fabricated, and constructed highly automated custom dredging and material handling and processing systems throughout the US.

Director of Engineering and Mining Operations, Nugent Sand Corp. (1996 to 2000): Engineering, operational, and P&L responsibility for multiple inland and river dredging and material processing facilities in Kentucky and Indiana. Responsibilities included capital projects, mining, processing, and material handling system designs and their operations.

General Manager, Samco Inc. (1994 to 1996): Operational and P&L responsibility for sand and gravel dredging and material processing in northeastern Ohio. Manufactured specialty sand and gravel product on a project specific basis.

Senior Vice President, James Coal Co./Mincorp (1992 to 1994) Due Diligence: Evaluated multiple underground and surface mine reserves in southern West Virginia and eastern Kentucky. Evaluated

remaining reserves, access to future reserves, environmental liabilities, permit issues and time estimates, performed financial analysis.

Senior Vice President, James Coal Co./Mincorp (1992 to 1994): Responsible for P&L for mountain top removal and contour surface mining operations in southern West Virginia. Responsible for mining and reclamation operations, safety and health compliance, mine planning, permitting, reserve acquisition, equipment selection, long and short-term mine plans, financial budgets and forecasts, and workforce development.

Vice President, Engineering, Roxcoal Inc./Mincorp (1990 to 1994) Due Diligence: Evaluated multiple underground and surface metallurgical and steam grade reserves in western Pennsylvania and northern West Virginia. Evaluated remaining reserves, access to future reserves, environmental liabilities, permit issues and time estimates, performed financial analysis.

Vice President, Engineering, Roxcoal Inc./Mincorp (1990 to 1994): Responsible for engineering for underground mining operations including mine planning, permitting, reserve acquisition, equipment selection, long and short-term mine plans, merger and acquisition due diligence, and health and safety.

Sr. Mining Engineer, Adobe Mining / Darmac Coal (1984 to 1990): Responsible for engineering support for surface and underground mining operations, mine plans, and permitting. Led reserve development team comprised of leasing agents, exploratory drilling, and engineering evaluations. Recipient of numerous mine reclamation awards

MEMBERSHIPS

American Institute of Mining, Metallurgical, and Petroleum Engineers
Society of Mining, Metallurgy & Exploration
Holmes Safety Association
    NW Ohio Chapter Founder and President
Ohio Valley Oil and Gas Association

TETRA TECH

THOMAS A. GRAY, PE

ENERGY AND NATURAL RESOURCES MANAGER

EXPERIENCE SUMMARY

Mr. Gray has more than 40 years of professional experience. He is a technical expert in mining engineering, mine reclamation, coal ash, mineral appraisals, rare earth elements associated with coal, watershed and ecosystem restoration, mine subsidence, acid mine drainage remediation, and abandoned mine fire mitigation. Mr. Gray specializes in active and abandoned mining projects and with infrastructure projects that have mining related concerns. His project management responsibility has included construction, engineering, regulatory compliance, and research and development.

RELEVANT EXPERIENCE

Senior Program Manager; US Department of Energy / National Energy Technology Laboratory; Rare Earth Elements Associated with Coal and Coal By-Products; Northern and Central Appalachia Basin. Managed project to identify and quantify the existence high levels of rare earth elements in coal seams and associated geology in the Northern and Central Appalachia.

Senior Program Manager; US Department of Energy / National Energy Technology Laboratory; Rare Earth Elements Associated with Coal and Coal By-Products; Rocky Mountain Basin. Managed project to identify and quantify the existence high levels of rare earth elements in coal seams and associated geology in the Rocky Mountains.

Senior Program Manager and Principle Investigator; US Department of Energy / National Energy Technology Laboratory; Assessment of Rare Earth Elemental Contents in Select US Coal Basins. Managed project investigating the association of coal and rare earth elements by looking at the geophysical makeup of coal basins, determining the geologic relationships that may exist between rare earth element occurrences in various coal basins, cataloging instances of elevated rare earth elements and identifying likely sources of rare earth elements in the US coal basins.

Senior Program Manager and Principal Investigator; US Department of Energy / National Energy Technology Laboratory; Study on the Utilization of Portable Hand-Held XRF Spectroscopy as a Screening Tool for Rare Earth Elements in Coal and Coal Waste Products. Managed project investigating the effectiveness of applying X-Ray Fluorescence (XRF) spectrometer analysis as a field screening method to evaluate coal and coal waste products for Rare Earth Elements..

EDUCATION

BS, Mining Engineering, Pennsylvania State University, 1973

MBA, University of Pittsburgh, 1977

AREA OF EXPERTISE

Mining Engineering

REGISTRATIONS/ AFFILIATIONS

Professional Engineer, WV, 1988, [redacted]

Professional Engineer, PA, 1978, [redacted]

Professional Engineer, MD, 1989, [redacted]

Professional Engineer, VA, 1980, 1[redacted]

Professional Engineer, OH, 2009[redacted]

YEARS OF EXPERIENCE

40

Project/Contract Manager; Professional Design Services Contract; Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Reclamation; PA. Currently managing this open-end contract to provide professional design services to remediate problems such as acid mine drainage, contamination of water supplies, degraded stream quality, subsidence, and abandoned refuse and waste piles, strip mines, highwalls, and landslide-prone areas.

Senior Project Manager; Open-End Contract; Maryland Department of the Environment Bureau of Mines; Frostburg, MD. Managed an open-end contract to provide technical assistance in mine engineering, acid mine drainage treatment and mine reclamation. Completed 16 projects, including evaluating the use of solar or wind power to operate a mine water treatment plant.

Project Manager; Open-End Hydrogeology/Mining Contract; Maryland Department of the Environment Bureau of Mines; Frostburg, MD. Managed an open end contract that provided hydrogeology services to the state agency.

Plans for Reclamation of Abandoned Mine Lands

Senior Project Manager; Abandoned Coal Mine Pool Wastewater Overflow Elimination; Township of Upper St. Clair in conjunction with PADEP, Three Rivers Wet Weather Development Corporation, EPA, and Heinz Foundation; Upper St. Clair, PA. Investigated feasibility of eliminating wastewater overflows by diverting the flow into a pumped down abandoned underground coal mine pool as a temporary storage reservoir. After weather event subsides the overflow would be pumped out of the mine to a treatment facility. The project addressed not only the pollution from the sewer overflow but also the pollution from the mine drainage as both would be treated together. The DOE's National Energy Technology Laboratory and the University of Pittsburgh assisted with the project by researching the combined treatment of alkaline sewage and acidic mine water.

Project Manager; Coal Combustion Byproduct Based Grout Project; WVDEP; Monongalia County, WV. This R&D project injected coal combustion byproduct based grout into 25 acres of abandoned mine workings to reduce the generation of AMD and to reduce subsidence potential. Responsible for research and development investigation, construction plans and specifications, monitoring construction, and preparing a research report. Project sponsors included Allegheny Energy, DOE, Consol, and the Electric Power Research Institute.

Project Manager; OSM Little River Mining Reclamation Project; Cloudland, GA. The Office of Surface Mining Little River Reclamation project near Cloudland, Georgia, required regrading an abandoned coal mine strip pit to eliminate a highwall, construction of drainage channels, and revegetation of disturbed areas. The survey was conducted to prepare site topography and cross sections at 50-foot intervals for reclamation and restoration of approximately 2,500 feet of abandoned highwall (as high as 100 feet) from surface mining. A grading plan was prepared that included site drainage features for two drainage channels.

Closure of Mine Openings

Senior Project Consultant; Mine Seal Research; NIOSH; Fayette County, PA. Research project to evaluate a potentially significant improvement to current state-of-the-art practice of constructing mine seals through vertical boreholes when direct access is prohibited. The new technology was tested and proved to be effective in providing barriers to airflow and to impound water and other inert materials.

Project Manager; Fisher Run and Tunnelton Mine Portal Closures; WVDEP Office of AML and Reclamation; Lewis and Preston Counties, WV. Project Manager for the preparation of construction drawings to install wet mine seals and drainage improvements for the closure of abandoned mine portals on private property in Weston and Tunnelton, WV. Prepared construction specifications and construction cost estimate for the closure of nine mine portals.

Project Manager; Mine Seal Designs; Ohio Valley Coal Company; Aledonia, OH. Prepared mine seal designs for three shafts for use at an active coal mine during mine closure. The mine seals were designed to withstand the expected water pressure after the maximum mine pool has developed.

Project Manager; Mine Seal Evaluation; Duquesne Light Company; Greensboro, PA. Evaluated suitability of a mine seal at the Gray's Landing Lock and Dam being constructed on the Monongahela River by the USACE.

Control and Extinguishment of Subsurface Mine Fires

Senior Project Manager; Dolph Mine Fire; PA DEP – Bureau of Abandoned Mine Reclamation. Responsible for the design of a complete extinguishment plan for the mine fire near Scranton, Pennsylvania. The actual mine fire is on two coal seams and associated coal refuse embankment.

Senior Engineer; Colorado Statewide Mine Fire Abatement Contract; Colorado Division of Reclamation, Mining and Safety; CO. The Colorado Inactive Mine Reclamation Program (CIMRP) is charged with abating, to the extent possible, hazards associated with mining activities resulting from mining which occurred prior to August, 1977. Six underground coal mine fires were identified for funding for reclamation design for their abatement and Tetra Tech was retained for this work. Mr. Gray is serving as a lead engineer supporting this work, which includes project development, design, procurement documents, and field management of fire abatement activities. Projects begin with the development of a mine fire abatement strategy and then the development of an abatement design. An Invitation for Bid is then created to find a suitable contractor and Tetra Tech then provides construction management and inspection services.

Project Manager; Abandoned Coal Mine Fire Remediation Plan; Confidential Client; PA. During the development of a well pad, a natural gas drilling client operating in the Marcellus Shale experienced elevated temperatures in excavated materials due to a burning abandoned coal mine. Tetra Tech investigated the subsurface conditions and Mr. Gray managed a Mine Fire Remediation Plan for the client.

Senior Project Manager; Dolph Mine Fire; Office of Surface Mining; Lackawanna County, PA. The Dolph mine fire was burning in coal refuse and two underground abandoned anthracite coal mines. A site investigation was completed to define the limits of fire and to recommend fire control methods. A cut-off trench was selected, plans and specifications were prepared and a contractor was selected. Construction was successfully completed and the fire is under control.

Project Consultant; Percy Mine Fire Control Project; PADER; Fayette County, PA. Provided consultation for this mine fire control project that involved mine grouting to contain an underground mine fire. The fire was successfully controlled.

Senior Project Manager; Cohen Mine Fire; Office of Surface Mining; OSM; Baldwin Borough, PA. Provided surveying and consultation for this small underground abandoned coal mine fire.

Senior Project Manager; Maiolie Mine Fire; Office of Surface Mining; Washington Township, PA. Provided surveying and consultation for this small underground abandoned coal mine fire.

Senior Project Manager; Coal Mine Fire Abatement; Office of Surface Mining; Elk County, PA. Managed the surveying during the abatement of a 1.5 acre coal mine fire. Quantity surveys were initiated within 24 hours of request by OSM.

Project Advisor; World Bank Mine Fire Appraisal; Dhanbad, State of Bihar, India. Assisted in the mine fire appraisal project to assess the fires in 17 coal seams of the 450 sq. km. coalfield for the world's largest complex of above-ground and underground mine fires.

Project Manager; Coal Refuse Pile Reclamation; Maple Coal Company; Colver, PA. Prepared technical specifications for reducing the potential for spontaneous heating at the Colver coal refuse pile.

Abatement or Treatment of Drainage and Acid Mine Drainage Water Pollution

Project Engineer; Parker Run Mine Drainage Design; West Virginia Department of Environmental Protection Office of AML&R; Marion County, WV. Supporting this contract, which includes design of drainage conveyances, design installation of mine seals, highwall reclamation, design of refuse reclamation, design of stream bank stabilization, design of structural and trash removal/disposal, and re-vegetation of disturbed areas.

Project Manager; Blacklick Creek Vinton/Wehrum Mine Drainage Treatment Facility Design; PADEP Bureau of Abandoned Mine Reclamation; Indiana County, PA. Tetra Tech was retained by PADEP for the design of a mine drainage treatment facility. Managing this large, multifaceted project included the design of a mine water conveyance system, design of relief boreholes, assessment of local mines for sludge disposal, coal refuse pile analysis, mine shaft and subsidence assessment, historical and museum commission documentation/clearance, conceptual treatment facility layout, public involvement through the development of a website, and the development of bid documents.

Project Manager; Palo Alto Mine Drainage Study and Design; PADEP Bureau of Abandoned Mine Reclamation; Borough of Palo Alto, PA. Managing this mine drainage study. Mine drainage is appearing at a residence in the Borough of Palo Alto during heavy precipitation events. Previous attempts at remediation by PADEP and the Office of Surface Mining were unsuccessful. Tetra Tech will conduct study the site then provide preliminary and final designs. The project will also include drilling, water testing, and surveying.

Project Advisor; East Avoca Mine Drainage Study; PADEP Bureau of Abandoned Mine Reclamation; Avoca Borough, PA. Providing oversight for this mine drainage study in Avoca, PA. Several residents along Grove Street in Avoca have reported incidents of mine water in basements and in their yards during heavy precipitation events. Tetra Tech's investigation will determine the location and depth of abandoned mine workings that may be the source of mine water occasionally noted along Grove Street. Tetra Tech will then propose alternative solutions to abate the drainage problem.

Senior Project Manager; Alkaline Coal Ash Injection to Mitigate Acid Mine Drainage; CTC Foundation in conjunction with PADEP BAMR and Others; Washington, DC. Evaluated the injection of alkaline coal ash into the 537-acre Valley No. 2 mine to mitigate an AMD (500 gpm) pollution to the Conemaugh River and nearby Big Spring Run. Provided technical consultation for the investigation and authored a technical report. The project team included PADEP, Bureau of Abandoned Mine Reclamation, the Kiski-Conemaugh Coalition, Blacklick Creek Watershed Association, Reliant Energy, the Western PA Watershed Protection Project, St. Clair Township, and PA DCNR.

Senior Project Manager; Acid Rock Seepage Mitigation; University of Pittsburgh in Conjunction with PADOH; Snowshoe, PA. A research project was conducted to determine the cause of and the potential mitigation solutions to an acid rock seepage condition in a rock filled highway embankment. It was determined that infiltration percolating through the embankment was becoming acidic when contacting pyrite rich sandstone. The now acidic water further contacted the underlying clays and developed high concentrations of aluminum. The seepage, estimated to average 25 gpm, severely polluted Jonathan Run. Mitigation schemes were evaluated and treatment was selected. A preliminary design of a sodium hydroxide treatment system was prepared.

Senior Project Manager; Passive Treatment Techniques for Acid Mine Discharges; MAX Environmental Services; Yukon, PA. Developed plans to use passive treatment techniques to treat most of the effluent from a hazardous waste disposal facility. Water sources included near neutral surface water runoff, acidic mine discharges and alkaline underflows from disposal cells.

Senior Project Manager; South Branch Blacklick Creek Acid Mine Drainage Feasibility Study; USACE Pittsburgh District; Nanty Glo, PA. Completed a feasibility study to determine the most effective passive abatement method for treating acid mine drainage at the abandoned mine and restoring the aquatic environment of the South Branch Blacklick Creek. Project manager for the conceptual design and cost estimate. A general evaluation report for the restoration of the aquatic ecosystem was completed.

Senior Project Manager; Mine Pool Acid Discharge Investigation; LTV Corporation; Greene County, PA. Conducted an investigation of the potential to utilize biological remediation for a large mine pool acid discharge. Responsible for evaluating and developing a field test to utilize sulfate reduction bacteria to mitigate the large Clyde Mine Pool discharge.

Senior Project Manager; Thompson Run Watershed Acid Mine Drainage Assessment and Restoration; Municipality of Monroeville; Monroeville, PA. Prepared a watershed restoration project for Thompson Run, a tributary of Turtle Creek. Responsible for assessing the adverse impacts of acid mine drainage on the 16-square-mile watershed and developing a realistic restoration plan.

Project Manager; Acid Mine Drainage Identification / Mine Pool Water Sourcing Study; Confidential Client; Forest City, PA. Identified large acid mine drainage sources around Forest City to be used as potential sources of water for a Marcellus Shale client's fracing operations in northeast PA. Mr. Gray gathered the historic flow and chemistry data for the discharges. Two discharges were singled out for further consideration, Vandling and Grey Slope. The mine pools were georeferenced onto a map with these discharges. A conceptual passive treatment system was designed for the Vandling Discharge with an associated pipeline to transport the water to a truck loading area.

Project Manager; Casselman Mine Acid Mine Drainage Prevention and Response Plan; Maryland Energy Resources; Garrett County, MD. Prepared a plan for submittal to the state of Maryland which outlined the measures to be taken to prevent impacts to the Casselman River by mine water when an underground coal mine was closed. The plan needed to include provisions that explained the interaction of the final mine pool with the Casselman River, what measures would be taken to avoid seeps, outflows, and other discharges resulting from the mine pool, how the mine pool would be controlled post-mining, a monitoring and detection plan for acid mine drainage seeps, and a response/mitigation plan should a seep or discharge occur.

Project Manager; Kempton Mine Acid Mine Drainage Study; Mettiki Coal Company; Western MD. Completed a mine drainage study to determine the feasibility of eliminating AMD flowing from the abandoned Kempton mine into the headwaters of the Potomac River by siphoning water from the pool into an adjacent active underground mine. The study evaluated the potential for lowering the mine pool to below the level of the discharge by siphoning water from the pool into Mettiki's active underground mine.

Evaluation and/or Rehabilitation of Existing Passive or Active AMD Treatment Systems

Project Engineer; AMD Treatment; PADEP; Cresson, PA. Supporting this preliminary design evaluation associated with the proposed Cresson AMD Treatment Plant. BAMR has entered into an agreement with the Susquehanna River Basin Commission to provide treated AMD to supplement flow during low flow periods. Project is currently in the field investigation phase to identify the location of the proposed facility and mine water extraction wells.

Project Manager: Bear Run Acid Mine Drainage Passive Treatment System; Indiana County Conservation District in Conjunction with PADEP; Indiana County, PA. Project Manager for the design of a passive AMD mine treatment system, site grading and PADEP / Indiana County Erosion and Sediment Control permit, stream restoration and preparation of a PADEP Government Financed Construction Contract for a third party contractor to remove coal refuse from the site. Prepared construction grading plans, permits and hydraulic analysis of the Bear Run stream for a stream culvert crossing.

Project Manager: Group Gladden Mine Acid Mine Drainage Treatment System; South Fayette Conservation; South Fayette Township, PA. Preparation of a site grading plan and passive AMD treatment system to treat a maximum flow rate of 1,500 gpm of AMD flow from the abandoned Gladden Mine into Millers Run and Chartiers Creek. Preparation of a grading plan, specifications and design calculations to create 3 acres of passive treatment ponds and design of a spray pumping system to deliver 1,000 gpm of AMD through a nozzle system for aeration and evaluation of stream flow losses in areas affected by past mining.

Project Manager; Acid Mine Drainage Passive Treatment Design; BethEnergy Mines; Ebensburg, PA. Completed a preliminary design of a large passive treatment system to treat acidic mine water from a permitted closed coal mine. Responsible for a conceptual design of the passive treatment system and final design and construction oversight of a pilot test treatment system.

Senior Project Manager; Pilot Passive Acid Mine Drainage Treatment System; Glenn Springs Holding, Inc. (subsidiary to Occidental Petroleum); Tire Hill, PA. Designed a pilot passive treatment system including an anoxic limestone drain, sedimentation ponds, and wetlands to treat acid mine water from an underground coal mine. Performed construction monitoring and prepared as-built drawings.

Senior Project Manager; Jandy Coal Refuse Acid Mine Drainage Investigation and Design; Paint Creek Watershed Association in Association with PADEP; Windber, PA. Investigated acid mine drainage on the Jandy coal refuse disposal site. It was determined that the source of the contamination was a reclaimed surface mine spoil and adjacent abandoned deep coal mine. The selected mitigation approach was to reduce the surface infiltration through drainage controls and to reduce the level of the mine pool so that the groundwater levels would be reduced and thus eliminate the discharge. Design plans were prepared as part of this project.

Project Consultant; Owings Mine Complex Site Reclamation Acid Mine Drainage Treatment System Design; WVDEP; Charleston, WV. Reclamation design of an abandoned mine site comprising old mine structures, open mine portals, refuse piles and numerous acid mine drainage producing discharges. Evaluated water quality and designed a passive AMD treatment system design at the Owings Mine Complex site. ***Awarded: James E. "Pete" Pitsenbarger AML Award North, West Virginia Reclamation Awards.***

Water Line Extension/Water Line Replacement

Project Manager; Pump and Overland Pipeline System; Duquesne Light Company; Greene County, PA. Designed approximately two miles of a pump and overland pipeline system and provided designs and specifications for a half mile overland pipeline, including a bridge crossing.

Project Advisor; Gauley River and Heizer/Manilla Creek Water Line Extensions; WVDEP; Nicholas County, WV. Evaluated construction documents for the Gauley River and Heizer/Manila Creek water line extension projects.

Project Manager; Water Pipeline and Pump Station; Cambria Township Water Authority in conjunction with Inter-Power/AICon Partners; Colver, PA. Designed and provided construction inspection for a 2.5-mile water pipeline and pump station project. The system provides up to 1600 gpm of water for the Municipality of Cambria Township and for the Colver Power Plant. The Colver Plant is a 110 mw water-cooled facility.

Surface Mine Reclamation

Project Manager; Surface Mining Act; Maryland Department of the Environment Bureau of Mines; Frostburg, MD. Managed an open end contract that provided hydrogeology services to the state agency. Investigated and provided expert opinions of the impacts on two domestic water supply sources from surface mining in Raynor and Kinsinger, MD. Reported on the impacts of surface coal mining activities on the quality and quantity of local groundwater supplies in the vicinity of Mill Run, MD. Reviewed the groundwater hydrology section of a surface coal mine permit application during agency review.

Project Manager; Coal Ash Disposal Guidelines for Surface Mines; Maryland Department of Natural Resources; MD. Prepared guidelines for the disposal of coal ash in surface mines.

Mine Subsidence Control

Project Manager; Mine Subsidence Investigation; Virginia Department of Mines, Minerals, and Energy (VA DMME); Wise County, VA. Mr. Gray led an investigation to characterize suspected mine voids on two

residential properties which exhibited evidence consistent with mine subsidence. Mr. Gray retained and coordinated with two subcontractors to aid in completing the work – a land surveyor and a driller. Work consisted of a property survey, a ground penetrating radar (GPR) survey, and generation of mapping and a drilling investigation plan. Mr. Gray completed the drilling investigation plan by selecting locations to drill based on physical observations and the results of the GPR survey. Drilling operations included downhole camera services by the Federal Office of Surface Mining (OSM). After the drilling was completed, a report was drafted including recommendations for addressing the subsidence features.

Project Manager; Natural Gas Pipeline Subsidence Study; MarkWest Energy; Southwest PA. MarkWest Energy approached Tetra Tech to perform a preliminary subsidence study to determine the level of subsidence risk along two proposed natural gas pipeline alignments in southwest PA. The appropriate mine maps of the mines which were located beneath the proposed alignments. The proposed alignments and mine maps were georeferenced onto a USGS map. The level of cover was identified and the existing and planned mine workings by mining method and approximate extraction ratio were classified. This information was used to predict the relative presence/risk of past, present, and future subsidence. A high risk of future subsidence under one of the alignments was identified.

Senior Project Manager; Longwall Mining Subsidence; Consol Energy; Greene County, PA. Evaluated longwall mining subsidence and impacts to surface structures.

Project Manager; Streyer Run Mine Subsidence Impacts Assessment; Maryland Department of the Environment Bureau of Mines; Garrett County, MD. Assessed potential mine subsidence impacts on Streyer Run from proposed underground mining.

Project Engineer; Preliminary Subsidence Assessment; Capels Resources (Subsidiary to Berwind Corporation); McDowell County, WV. Preliminary subsidence assessment project for underground coal mining property being proposed as a sanitary landfill.

Senior Project Manager; Subsidence Evaluation; Duke Energy; Edwardsport, IN. Evaluated subsidence potential at an undermined site selected as a new power plant location. The mining under this site was approximately 50 feet deep and had been abandoned for over 50 years. Plans and specifications were prepared for grouting 20 acres of the site with a fly ash/cement mixture. Testing was performed to verify the suitability of the grout mix. Available onsite ash was investigated and determined to be acceptable. Construction monitoring was also performed.

Project Manager; West Elk Mine; Mountain Coal Company, LLC; Somerset, CO. Completed subsidence evaluation and report for ten longwall panels extending into the Dry Fork lease in Gunnison County, CO. Potential impacts to Deep Creek Ditch were evaluated.

Water Supply Replacement

Project Advisor; Water Supply Extension Project; WVDEP; Logan County, WV. Prepared construction documents for a water supply extension project.

Project Advisor; Mill Creek-Isom Water Supply System Design; WVDEP; Chapmanville, Logan County, WV. Designed a water supply system to service approximately 800 residents of the Mill Creek-Isom Community along Godby Branch watershed.

Project Manager; Geotechnical and Hydrologic Investigation to Provide Municipal Water Supply; Inter-Power/AlCon Partners; Colver, PA. Conducted a geotechnical and hydrologic investigation for a 53'-high embankment dam to provide a municipal water supply and cooling water for a cogeneration power plant. Completed an environmental assessment, including wetland delineation, wetland mitigation design and cultural resources investigations. Provided design, cost estimating, permitting and construction monitoring services for the Dam and Reservoir.

Other Mining Related Projects

Project Manager: Fishing Run Stream Sealing; South Fayette Conservation Group (SFCG) in Association with PADEP; South Fayette Township, PA. Installation of five (5) weirs and continuous flow meters to monitor the stream flow conditions, analysis of flow data, stream corridor land surveying, geophysical surveying to identify subsurface cracks and flow patterns, stream base study to identify stream sections which flow directly over fractured bedrock, stream sealing design alternatives analysis, and the stream encroachment permit pre-application meeting.

Project Manager; Alternative Fuel Supply and Ash Disposal Evaluation; Suez Energy Generation North America – Northeastern Power Company (NEPCO); McAdoo, PA. Identified all permitted and non-permitted fuel (anthracite culm) supply and ash disposal sites within a 30 mile radius of the NEPCO power plant. 42 permitted sites and 16 non-permitted sites were identified as alternative options to NEPCO's current fuel supply and ash disposal sites. After discussions with NEPCO and the site operators and owners, the list was narrowed down to seven permitted and two unpermitted sites. A final report was prepared that provided final recommendations for future operations

Project Manager; Gladden Mine Pool Water Sourcing Study; Range Resources South Fayette Township, PA. Range Resources was seeking a source of water for their fracing operations near South Fayette Township. Tetra Tech analyzed the feasibility of pumping and treating water from the Gladden Mine Pool at a rate sufficient to lower the mine pool enough cut off the Gladden discharge and restore Miller's Run.

Senior Project Manager; Kempton Mine Water Treatment Facility; MD Department of the Environment Bureau of Mines; Frostburg, MD. The Kempton mine water treatment facility was designed to use electricity generated by a diesel engine due to its remote location. Alternative sources of electricity were investigated, including solar, wind and a new transmission line.

Senior Project Manager; Chartiers Creek/Fishing Run Mine Discharge Investigation; South Fayette Conservation Group in Association with PADEP; South Fayette Township, PA. During an investigation of the deep mine discharges in Chartiers Creek it was found that Fishing Run was being diverted into a deep mine entrance and after becoming polluted coming out at the Gladden discharge, the largest pollution source in the watershed. Through a grant from PADEP a reclamation design was prepared and permitted. The design included sealing the mine entrance, reclaiming abandoned highwalls, removing dangerous mine structures and restoring 2000 feet of stream channel. Construction monitoring was performed.

Senior Project Manager; Chartiers Creek Mine Discharge Assessment; Chartiers Nature Conservancy in Association with PADEP; Crafton, PA. Assessed the characteristics of the large deep mine discharges in the Chartiers Creek main stem. Flow and chemical data was collected for nine mine discharges over a 12 month period. Mine maps were obtained and scanned into a GIS database. The conceptual hydrology of the

mines was evaluated, including underground drainage basins and pooled conditions. This information was used to develop a restoration plan for the watershed.

Senior Project Manager; Watershed Restoration Plan; Cambria County Conservation and Recreation Authority; Ebensburg, PA. Prepared a watershed restoration plan to restore the headwaters of the Little Conemaugh River. Various treatment alternatives were evaluated and the most economical and technically feasible approach was recommended.

Senior Project Manager; Geotechnical Investigation for Monongahela Properties; Office of Surface Mining; Washington County, PA. Managed a geotechnical investigation to provide an opinion on the source of ground movements that damaged four properties in the town of Monongahela. Responsible for conducting exploratory drilling and preparing a report of findings for four residential properties and the intervening roadway that had been affected by ground disturbance.

Senior Project Manager; Water Well Investigation; Office of Surface Mining; Indiana County, PA. Evaluated water wells to address complaints of methane gas venting from old wells. Provided an opinion of the source of gas being vented from the wells.

Project Consultant; River Conservation Plan; Kiski-Conemaugh River Basin Alliance; Johnstown, PA. A river conservation plan for the 1,800 sq. mile Kiski-Conemaugh River Basin comprising five major watersheds was prepared. The River Basin Conservation Plan resulted in a comprehensive plan aimed at remediation the river basin. The plan was prepared in accordance with the guide lines of the PA DCNR Rivers Conservation Program.

Project Manager; Mine Water Migration; New Warwick Mining Company; Greene County, PA. Evaluated potential for mine water to migrate through geologic strata between two mines in different coal seams. Estimated when the filling mine pool in the recently abandoned Shannopin deep mine would flow into the overlying active mine through the mine floor.

Project Engineer; Underground Coal Mining Complex Evaluation and Water Treatment Plant Design; Inter-Power of New York; Colver, PA. Completed a potential environmental liabilities assessment of a large property. Provided a water treatment plant preliminary design and associated cost estimates. Evaluated potential environmental liabilities associated with the purchase of an inactive underground coal mining complex and associated runoff and leachate collection ponds, including mine, surface water, and refuse pile leachate and runoff collection and treatment, and ecological and ground-water impacts. Cost estimates for post-closure, including water treatment were also prepared.

Mining Engineer; Robena Coal Mine Water Pumping System Design; U.S. Steel Corporation; Greene County, PA. Planned and designed the mine water pumping system at the Robena Coal Mine using 19 pumps within the mine, several miles of pipeline, and discharging approximately two million gallons per day.

Project Manager; Mining Complex Water Balance Study; Confidential Client; Belmont County, OH. Work consisted of identifying all water uses and discharge points for a mining complex containing two longwall mines, a proposed third longwall mine, two prep plants, a proposed third prep plant, a slurry impoundment, and multiple surface sedimentation ponds. The goal of the project was to conceptually design a freshwater impoundment in an adjacent valley to control the current and anticipated water uses. Drainage and stream flow data from the previous five years were modeled with the needs of the mining complex to

determine the required capacity of the impoundment to allow ample storage for dry months while conforming to TDS discharge requirements. Multiple dam scenarios were modeled utilizing Carlson to minimize the surface disturbance and stream impacts while achieving the desired fresh water storage volume in the impoundment.

Project Manager; Galbraith Landslide Abatement/Geotechnical Investigation; Office of Subsurface Mining; Allegany County, MD. Conducted a geotechnical investigation to gather the required site information to design landslide abatement measures for a 140-ft. wide landslide uphill from the Galbraith residence in Barton, MD. The investigation involved drilling, testing, and surveying to characterize the site, and design abatement measures to stabilize the landslide.

Project Manager; Coal Refuse Pile Slope Stabilization; Office of Surface Mining; Allegany County, MD. Prepared an abatement plan for stabilizing the slope of a coal refuse pile (Sand Spring gob pile) adjacent to a small stream. The refuse pile was eroded by the stream during Hurricane Ivan and left a near vertical, unstable slope. The abatement plan consisted of a combination of regrading and vegetative ("soft armoring") and riprap stabilization. Hydrologic and hydraulic analyses were also provided.

Senior Project Manager; Mine Shaft Investigation; Office of Surface Mining; Auburn, MI. Project Manager responsible for investigating and determining the location of 13 mine shafts, varying in depth from 100 feet to 250 feet. The shafts were subsequently stabilized using compaction grouting under a separate project.

Project Engineer; Quecreek Mine Expansion Permit; Quecreek Mine; PA. Managed the development of a mine expansion permit for submittal to PADEP. The project also included water quality and hydrogeologic analysis, pillar stability analysis, and a geologic analysis.

Project Manager; Hunlock Power Station; UGI Corporation; PA. Responsible for design and permitting to expand the ash disposal site at the station.

Project Manager; Johnsonville Power Station; Tennessee Valley Authority; Johnsonville, TN. Developed an ash management plan. Grading plans, separating ash disposal areas into different cells, were completed.

Project Manager; Coal Disposal Site Reclamation; Costain Coal Corporation; KY. Prepared a plan to utilize a coal ash/soil mixture in lieu of using all soil to reclaim a coal disposal site at a much lower cost than the permitted plan. This plan was approved by the State of Kentucky and successfully implemented.

Project Manager; North Branch Mine; Island Creek Corporation; WV. Mine planning, cost estimating, and permitting services for the mining of coal waste and the disposal of AFBC ash at the North Branch Mine, including exploration and geotechnical evaluation. The site was planned to be mined in a manner such that non-fuel material and coal ash could be placed behind mining in a way that the site would be returned to a stable condition.

Project Engineer; BethEnergy Mines Mine Feasibility Study; Nicholas County, WV. Conducted a feasibility study of a four million ton per year mountain-top removal project. The mine was permitted and operated successfully.

Project Manager; Surface Mine Permits; Addington, Inc.; Kanawha County, WV. The 1000+-acre surface mine was graded so that stable side slopes would be created. The erosion controls were designed as long ponds that would blend into the graded hills at completion of reclamation.

Project Engineer; DOE Mine Ventilation Evaluation/Design; Carlsbad, NM. Provided mine ventilation evaluation and design and managed a shaft grouting project to reduce water infiltration into a nuclear waste disposal facility, a constructed salt mine approximately 2000 feet deep.

Project Manager; Wardrop; Peer Review of Yongding Shangzhai Coal Mine Due Diligence Study; FuJian Province, China. Reviewed and provided technical comments on the reserve estimate, mining, and risk assessment portions of a due diligence report prepared by Wardrop for an existing long wall coal mine in China.

Project Manager; PBS Coals, Inc.; Due Diligence Study of a Potential Acquisition; Somerset County, PA. Verified coal reserves and investigated environmental liabilities of two separate coal companies (35 separate sites) for potential acquisitions.

Project Manager; US Steel Corporation Abandoned Mine Shaft Reopening; Washington County, PA. Developed a plan to re-open an abandoned shaft in an adjacent mine for ventilation purposes in an active coal mine.

Project Manager; Island Creek Coal (subsidiary to Occidental Petroleum) Structural Integrity Investigation; Grant and Tucker Counties, WV. Structural integrity investigation project for a 125-foot-high, 500 kV steel lattice transmission tower immediately above chain pillars separating two longwall panels of a 300 feet deep mine. Responsible for evaluations, including structural analysis and prediction of the impacts of active longwall mining on the electrical transmission tower.

Project Manager; Greene County Development Authority Mine Feasibility Investigation; Waynesburg, PA. Completed a feasibility investigation and financial evaluation for the potential purchase of an existing mine by forming an employee stock ownership plan by the mine's employees.

Mining Engineer; U.S. Steel Corporation Dilworth Mine and Maple Creek Mine Construction Oversight; Western PA. Provided construction oversight for construction of a new shaft at the Dilworth mine and a new bathhouse at the Maple Creek mine.

Project Engineer; ANR Coal Company Mine Permitting and Construction Management; Wise County, VA. Complete permitting, site construction design, contractor selection, and construction management for a one million ton per year coal mine facility and coal waste disposal site in Virginia.

Project Engineer; ANR Coal Company Mine Feasibility Study and Economic Evaluation; Webster County, WV. Completed a feasibility study and economic evaluation for a one million ton per year West Virginia mine complex. Provided permitting services, prepared construction plans and specifications and provided onsite construction management.

CHRONOLOGICAL WORK HISTORY:

Tetra Tech, Inc., Pittsburgh, PA, Group Manager – Energy, and Natural Resources, 2007 to present. Responsible for projects associated with energy and natural resources.

GAI Consultants, Inc., Monroeville and Homestead, PA, Business Development Director and Senior Project Manager, 1997- 2007. Managed ecosystem restoration, mine drainage remediation, mine grouting, CO2 credit training and abandoned mine fire mitigation projects.

GAI Consultants, Inc., Charleston, WV, Branch Manager, 1994-1997. Managed mine reclamation, environmental regulatory, air quality permitting, trail designs and natural gas industry projects.

GAI Consultants, Inc., Monroeville, PA, Lead Engineer and Engineering Manager, 1986-1994. Managed mining, municipal waste, ash disposal and utilization and dam design projects.

Dravo Corporation, Pittsburgh, PA, Senior Engineer and Project Engineer, 1978-1986. Managed Engineering Procurement and Construction (EPC) contracts for construction of a $500 million new steel mill and was operation manager at the Waste Isolation Pilot Plant (a nuclear waste repository).

U.S. Steel Corporation, Uniontown, PA, Management Trainee, Mining Engineer, and Assistant Mine Foreman, 1973-1978. Direct Supervision of an underground coal mine production unit, directed surface and underground construction projects, including ventilation, ground control and mine drainage.

PROFESSIONAL AFFILIATIONS:

Society for Mining, Metallurgy, and Exploration, Inc., (SME)
- Past Chairman of Pittsburgh Section
- 1997 Distinguished Member Award (Pittsburgh Section)
- 2009 Distinguished Member (National)

PUBLICATIONS:

2018 Gray, T.A., "Rare Earth Elements in Coal Resources within the Rocky Mountain Coal Basins", presented at the Rocky Mountain Coal Institute Annual Meeting, Vail, CO, June 24-26, 2018

2018 Gray, T.A., "Coal and coal Mine Wates, a Resource for Rare Earth Elements", presented at 2018 PA Abandoned mine Reclamation Conference, State College, PA, June 21, 2018.

2018 Gray, T.A., Wood, F.A., Pugh, K, Moore, J. Richers, D., Andersen, A., Bryan, R., "Identification and Characterization of Coal and Coal By-Products Containing high Rare Earth Element Concentrations", Northern and Central Appalachia, prepared for National Energy Technology Laboratories, DE-FE-0026648.

2018 Gray, T.A., Wood, F.A., Pugh, K, Moore, J. Richers, D., Andersen, A., Bryan, R., "Identification and Characterization of Coal and Coal By-Products Containing high Rare Earth Element Concentrations", Rocky Mountain Basin, prepared for National Energy Technology Laboratories, DE-FE-0026929.

2018 Gray, T.A., “Rare Earth Elements in Coal”, presented at the North American Coalbed Methane Forum, Southpoint, Canonsburg, PA, April 18, 2018

2018 Gray., T.A., “Rare Earth Elements in Coal”, presented at the SME/Pennsylvania Anthracite Meeting, Reading, PA, March 8, 2018

2017 Gray, T.A., “Rare Earth Elements in Coal”, presented at the Pittsburgh/Section SME/PCMIA Meeting, Canonsburg, PA, October 2017

2016 Gray, T.A., Perry, E. Sasiharan, S., Knott, D., “Geotechnical and Environmental Characteristics of Final Open Cut Coal Mine Voids in the USA with Applicability to Australian Mines”, presented at the Mine Rehab Conference April 7, 2016, NSW Australia

2015 Gray T.A., Andersen, H.T., Bryan, R., Richers, D., “Rare Earth Occurrences Proximal to the Cretaceous/Tertiary* Boundary in the Raton Basin, South-central Colorado” presented at the AiCHe Conference, Salt Lake City, Utah, November 8-13, 2015

2015 Gray, T.A., Bryan, R.C., Richers, D., Andersen, H.T., “Assessment of Rare Earth Elemental Contents in Select United States Coal Basins”, January 2015

2015 Gray, T.A., Andersen, H.T,. Bryan, R., Richers, D., “Rare Earth Occurrences in Coal and Their Association with Tonsteins, Diapirs, and Igneous Activity” presented at the 2015 Pittsburgh Coal Conference, October 6, 2015

2015 Gray, T.A., Gray R.E., Balaz, W.P., “Update on Mine Closure Sealing and Abandonment Practices” presented at Mine Closure 2015, Vancouver, Canada, June 1-3, 2015

2014 Gray T.A., Quinlan, S., Milavec, P., Smth, T., Johnston, C., Tresse, C., “Cresson AMD Abatement Project” presented at SME Annual Meeting Denver CO, February 2014.

2011 Gray T., Furniss, M., Gessler, M., Jones, M., McCay, J., Paison, W., Stonebraker, W., Cunningham, D., Coen, D., Knudsen, S., “Cost-Effective Application in the power Generation Market”, prepared for National Energy Technology Laboratory, DOE/NELT-2011/1483

2010 Gray, T. A., Assessment of Risk, Legal Issues and Insurance for Geologic Carbon Sequestration in Pennsylvania. Presented at Pittsburgh Geologic Society Meeting, September 2010. Pittsburgh, PA.

2010 Gray, T. A, “Assessment of Risk, Legal Issues, and Insurance for Geologic Carbon Sequestration in Pennsylvania. Presented at PA BAR Institute – Environmental Law Forum, April 22-23, 2010, Harrisburg, PA.

2010 Gray, T.A., “Greenhouse Gas Emission Trading to Mitigate Coal Mne Fires” presented at the Energy Utility Environmental Conference at Tucson, AZ, February 2010.

2009 Gray, T. A., Bruhn, R.W., Mack, J.F. (OSM) “Dolph Abandoned Mine Fire Control Project” presented at the 2009 annual SME meeting in Denver, Colorado, February 22-25, 2009.

2007 Gray, T.A., “Surface Mining” article for inclusion in McGraw-Hill Encyclopedia of Science and Technology, 10th edition

2005 Gray, T.A., and Horrell, S. (PADEP). “Ninevah Acid Mine Pollution Abatement Project” presented at the 2005 World of Coal Ash, Lexington, KY, April 15, 2005.

2004 Gray, T.A., Crayne, L.M., Trevits, M.A., Glogowski, P.E. "Demonstration of Remote Mine Seal Construction" presented at the Annual SME Meeting, Denver, Colorado, February 23-25, 2004.

2003 Gray, T.A., and Broush, J.C. "Use of GIS in Mining Applications" presented at the Seminar on the Use of GIS in Mining Application at California University, Canonsburg, PA, May 8, 2003.

2003 Gray, T.A., and Smith, Ed, USACE, "Ecosystem Restoration - South Branch Blacklick Creek" published in the March-April 2003 issue of The Military Engineer, SAME's monthly magazine.

2002 Gray, T.A., Gray, R.E. "Coal Combustion Products Can be Used to Construct Tailing Dams" presented at the 19th Annual International Pittsburgh Coal Conference, Pittsburgh, PA, September 25, 2002.

2002 Gray, T.A. and Gray, R.E. "Omega Mine Injection Projects" presented at the PA Conference on Abandoned Mine Reclamation, June 15, 2002, State College, PA.

2002 Gray, T.A., Gray, R.E., and Newman, F.B. "Utilization of Coal Combustion By-Products in Tailing Dams" presented at the Tailing Dams 2002 meeting in Las Vegas, NV, May 1, 2002.

2000 Gray, T. A., Kyper, T.N., Smith, E., and Hedin, R. "Feasibility Study for Ecosystem Restoration by Remediation of the Webster Mine Discharge at Nanty Glo, Pennsylvania." Presented at the U.S.D.O.E., NETL Facility, Morgantown, WV, October 4, 2000.

2000 Gray, T. A., Michalski, S.R., and Parkinson, J.W. "Re-Mining Coal Preparation Plant Slurry Ponds" presented at the Tailing Dams 2000, Association of State Dam Safety Officials Annual Conference, Las Vegas, NV, March 28-30, 2000.

1998 Gray, R. E., and Gray, T. A. "Coal Mine Reclamation by Ash Haulback." Presented at the 8th Congress of International Association of Engineering Geology, Vancouver, B.C., September 1998.

1998 Gray, T. A., Moran, T. C., Broschart, D., and Smith, G. "Injection of Coal Combustion By-Products into the Omega Mine for the Reduction of Acid Mine Drainage." Presented at the Pittsburgh Coal Conference in Pittsburgh, PA, September 15, 1998.

1998 Gray, T. A., Moran, T. C., Broschart, D., and Smith, G. "Injection of Coal Combustion By-Products into the Omega Mine for the Reduction of Acid Mine Drainage." Presented at the 1998 Annual National Meeting of the American Society for Surface Mining and Reclamation (ASSMR), Saint Louis, MO, May 16-21, 1998.

1998 Gray, R.E., and Gray, Thomas A. "Coal Combustion Ash Haulback." Presented at the 1998 Annual National Meeting of the American Society for Surface Mining and Reclamation (ASSMR), Saint Louis, MO, May 16-21, 1998.

1998 Moran, T. C., Gray, T. A., Smith, G. A., and Broschart, D.W. "Injection of Coal Combustion By-Products into the Omega Mine for the Reduction of Acid Mine Drainage." Presented at the West Virginia Surface Mine Drainage Task Force in Morgantown, WV, April 7-8, 1998.

1997 Gray, T. A., Moran, T. C., Broschart, D. W., and Smith, G. A. "The Omega Mine Grout Injection Project." Presented at the International Ash Utilization Symposium, Lexington, KY, October 20-22, 1997.

1997 Gray, T. A., Moran, T. C., Broschart, D. W., and Smith, G. A. "Using Coal Combustion By-Products to Reduce Acid Mine Drainage at the Omega Mine." Presented at the 19th Annual National Abandoned Mine Lands Conference at Canaan Valley, WV, August 18-19, 1997.

1997 Kyper, T. N., Snodgrass, J., and Gray, T. A. "Disposal of Coal Combustion By-Products in Underground Coal Mines." Published in the University of Kentucky Center for Applied Energy Research bimonthly newsletter, Energeia.

1997 Gray, T. A., Moran, T. C., Broschart, D., and Smith, G. "Plan for Injection of Coal Combustion Byproducts into the Omega Mine for the Reduction of Acid Mine Drainage." Presented at the 1997 Annual Meeting of the American Society for Surface Mining and Reclamation, Austin, TX, May 10-16, 1997.

1997 Ward, Patrick E., and Gray, T. A. "Environmental Standardization ISO 14000." Presented at the Central Appalachian Section of the Society for Mining, Metallurgy and Exploration, Inc.'s 1997 Annual Spring Meeting, Lexington, KY, April 4, 1997.

1997 Gray, T. A. "Coal Ash Utilization at Coal Mines." Presented at the West Virginia Mining and Reclamation Association Meeting, February 14, 1997.

1994 Gray, T. A., Perry, M. T., and Conrad, P. W. "Management of Coal Waste Disposal for Reduced Environmental Impacts and for Increased Profits." Presented at the annual meeting of the Society for Mining, Metallurgy, and Exploration, Albuquerque, NM, February 14-17, 1994.

1992 Gray, T. A., and Gray, R. E. "Mine Closure, Sealing, and Abandonment." In SME Mining Engineering Handbook, 2nd ed., edited by H. L. Hartman. Society for Mining, Metallurgy, & Exploration, 1992.

1991 Gray, T. A., Perry, M. T., and Gray, R. E. "Ash Haulback Alternatives for Coal Mine Operators." Presented at the American Mining Congress Coal Convention, Pittsburgh, PA, June 5, 1991.

1991 Gray, T. A., Bruhn, R. W., Luxbacher, G. W., and Ferrell, J. R. "The Structural Response of a Steel Lattice Transmission Tower to Mining-Related Ground Movements." Presented at the 10th International Conference on Ground Control in Mining, Morgantown, WV, June 10-12, 1991.

1990 Gray, T. A., and Perry, M. T. "Overview of AFBC Ash Disposal Options for Coal or Coal Waste Burning Power Plants." Presented at the Seventh Annual International Pittsburgh Coal Conference, Pittsburgh, PA, September 10-14, 1990.

1986 Gray, T. A. and Sethi, S. "Computer Modeling of Underground Ventilation at WIPP." Presented at the fall meeting of the Society of Mining Engineers of the AIME, St. Louis, MO, September 7, 1986.

TETRA TECH

Gregory Paul Hynes, PE

Project Manager

EXPERIENCE SUMMARY

Mr. Hynes has 31 years of professional engineering experience including utility pipelines and abandoned mine land reclamation. Additionally he has designed and permitted numerous mine surface facilities, oil and gas well pad sites, potable water distribution systems, stormwater conveyance systems, sanitary sewerage systems, and developed E&S control plans.

His utility pipeline experience began in 1987 when he was employed as district engineer for an Ohio public water utility. His design experience over the last 29 years includes route layout selection and E&S plans for industrial raw water pipelines for Chevron, USS Steel, Foundation Coal, and CONSOL. More recently he has provided E&S design and plan reviews of overland gas pipelines for Sunoco and EQT. He has also designed and managed dozens of potable water distribution projects totaling hundreds of miles in length for projects in overland, rural, suburban, and urban settings.

His mine reclamation experience began in 1991 and includes acting as principal engineer or project manager responsible for design calculations, cost estimates, plans, and technical specifications for over 50 abandoned mine land reclamation project sites in West Virginia, Ohio, Pennsylvania, and Virginia for agencies including WVDEP, ODNR, USCOE, VDMME, and PADEP. Projects included reclamation of steep refuse piles, highwalls, burning refuse, exposed mine entries, abatement of acidic mine drainage, active and passive AMD treatment, and mine subsidence grouting. His responsibilities also included tracking schedules and budgets, project billing, and hiring sub-consultants. Mr. Hynes has also prepared permit applications and construction level drawings and specifications for proposed surface mine facilities in PA, WV, and NC. Projects included permitting and reclamation of various mining facilities such as pipelines, shaft sites, boreholes, preparation plants, pits, refuse storage areas, slurry impoundments, treatment ponds, stream enclosures, sedimentation ponds, E&S controls and numerous minor permit modifications.

EDUCATION

Youngstown State University

M.S., 1997, Civil Engineering

B.E., 1987, Civil Engineering

REGISTRATION

Professional Engineer,

[redacted], PA

[redacted], OH

[redacted], WV

TRAINING/CERTIFICATIONS

HES GENERAL ORIENTATION

PA DEP ESGP2, 2013

OFFICE

Canfield, OH

YEARS OF EXPERIENCE

31

YEARS WITH TETRA TECH

5

EXPERIENCE

Oil & Gas

Senior Engineer; EQT; Mountain Valley Pipeline Project, WV& VA (2016- Present) Provide design quality assurance reviews and coordination assistance as needed for development of E&S plan and permit drawings and details for a 300+ mile gas pipeline across WV and Virginia.

Water Acquisition and Design Engineer; Chevron Appalachian/Michigan Business Unit; Ohio & WV (2013- 2016) During this three year assignment provided full time route engineering planning, budgeting, design, E&S reviews, and construction management support services for the Marshall County waterline project including 13 ½ miles of 24" HDPE pipe over very rugged terrain, a 4 MGD intake and triplex pumping station near the Ohio River, three water booster stations, and several thousand feet of above ground waterline extensions to support well development.

Project Manager/Engineer of Record; Gulfport Energy, Ohio Well Development projects (2013-15) Well site predrill surveys, permitting, E&S and design plans for two dozen well sites including grading, access, surface water and E&S controls. Projects also included evaluation of potential water sources for frac operations.

Project Manager/Engineer of Record; Rice Energy, Ohio and Pennsylvania Well Development projects (2013-15) Well site predrill surveys, permitting, E&S and design plans for multiple well sites including grading, access, surface water and E&S controls.

Engineer of Record; Markwest Liberty, LLC, Bluestone to Sunoco Pipeline (2013), Western Pennsylvania; Provide design reviews, coordination assistance, and sealed erosion and sediment control plans and restoration plans for a gas pipeline through Beaver and Butler Counties.

Review Engineer; Rice Energy; Bigfoot to Monster Jam Pipeline Project, Belmont County Ohio (2013) Provide design reviews and coordination assistance as needed for development of E&S plan and permit drawings and details for a shared gas and water pipeline.

Mining & Abandoned Mine Land Reclamation

Project Manager; Little Conemaugh Treatment Plant Site Evaluation (2018); Pennsylvania DEP, Bureau of Abandoned Mine Reclamation; Portage Township, PA. Responsible for project management and oversight of site evaluation for suitability as a treatment plant location. Site assessments included review of available geologic, mining, hydrologic data, drilling information, borehole logs, and water level information from shallow and deep monitoring wells. Based on the collection and evaluation of geotechnical and water data, perform a quantitative assessment of the risk of vertical mining induced subsidence. Additional assessments of impacts to two downstream bridges, the Little Conemaugh River channel, and adjacent properties were required.

Project Manager; LaRosa Fuels (2018); West Virginia Land Stewardship Corp. for the WVDEP Office of Special Reclamation; Monongalia/Marion County, WV. Responsible for project management and oversight of engineering design, development of construction and erosion sediment control plans, specifications, quantities and cost estimates. The project included site characterization and development of an active AMD treatment system to meet NPDES discharge limitations of a bond forfeiture site on the Monongahela River. The selected system included a 60 feet tall hydrated lime storage silo, mixing vault, control building, sludge pumps and storage cells, 50' diameter concrete solids contact clarifier, and polishing ponds. Detailed plans and specifications were developed to include site grading, drainage control, and the active water treatment system including detailed electrical drawings.

Project Manager; Energy Marketing Slurry Impoundment Reclamation (2018); West Virginia Land Stewardship Corp. for the WVDEP Office of Special Reclamation; Barbour County, WV. Responsible for project management and oversight of engineering design, development of construction and erosion sediment control plans, specifications, quantities and cost estimates. The project included design of the reclamation of an abandoned 30-acre fine coal refuse slurry impoundment and development of a construction plan for dewatering and grading the impoundment. The plan required spreading three feet of coarse coal refuse obtained from the embankment over the fine refuse utilizing a variation of the "surge" method. Geogrid and geotextile underlayment were specified below the coarse coal refuse cap for added strength. The anticipated construction sequence includes an incrementally enlarged working platform of coarse coal refuse from which the fine refuse is to be access and graded.

Project Manager; Buffalo Coal (2018); West Virginia Land Stewardship Corp. for the WVDEP Office of Special Reclamation; Grant County, WV. Responsible for project management and oversight of engineering design, development of construction and erosion sediment control plans, specifications, quantities and cost estimates. The project included site characterization and development of an active AMD treatment system to meet NPDES discharge limitations of several bond forfeiture sites around the vicinity of the Mount Storm Reservoir. The design includes a selection and design of an AMD collection and pumping system to provide centralized active treatment of discharges from 4 permit sites spread over a 6-mile area Detailed plans and specifications are currently being developed to include site grading, drainage control, and an active water treatment system.

Project Manager; Parker Run Highwall (2014); WVDEP; Marion County, WV. Responsible for project management, engineering design, and development of construction plans, specifications, and cost estimates. The project included exploratory drilling, and preparation of

reclamation plans and specifications for five sites containing steep refuse piles, numerous suspected mine entries, acid mine drainage, and stream impacts. Design measures included site grading of steep refuse piles to provide stable slopes and positive drainage, installation of wet and dry mine seals, bat gates, access roads, collection channels, E&S controls, preservation of mine headings considered as historic structures, removal of refuse encroachments into stream banks, demolition of dilapidated buildings and foundations, and final revegetation.

Project Manager; Review of Coal Mining and Reclamation Permit Applications (2013), Ohio Department of Natural Resources; Locations in Harrison and Jefferson County, Ohio. Responsible to provide engineering review and comment for coal mine and reclamation permit applications including the Sterling Mining Corporation, Shean Hill No. 6 Surface Mine in Jefferson County, and the Oxford Mining Company, Branson Ridge Underground Mine in Harrison County.

Project Manager; Energy Marketing Slurry Impoundment Sediment Pond Rehabilitation (2013); WVDEP Office of Special Reclamation; Barbour County, WV. Responsible for project management and oversight of engineering design, development of construction plans, specifications, quantities and cost estimates. The project included development of a feasibility level reclamation plan and cost estimate for dewatering the 30 acre abandoned coal slurry impoundment, grading and removal of accumulated course and fine coal from within the impoundment, and regarding the 130 foot tall impoundment embankment in accordance with the requirements of the original mine permit. Detailed plans and specifications were developed for rehabilitation of a dilapidated sedimentation pond and spillway located at the base of the impoundment, which would be required for future dewatering of the main impoundment.

Project Manager; Colliers Highwall Reclamation (2012); WVDEP; Brooke County, WV. Responsible for project management, engineering design, and development of construction plans, specifications, and cost estimates. The project included exploratory drilling to determine mine pavement elevations, and preparation of reclamation plans and specifications for a mile long highwall ranging from 30 to 70 feet high and containing numerous refuse piles, mine entries, and impounded water. Design measures included site grading of steep refuse piles and backfilling exposed highwalls to eliminate impounded mine water, provide stable slopes and positive drainage, installation of wet and dry mine seals, bat gates, access roads, collection channels, E&S controls, and final revegetation.

Project Manager; Simpson Creek Highwall, Tipple, and Portals (2012); WVDEP; Barbour County, WV. Responsible for project management, engineering design, and development of construction plans, specifications, and cost estimates. The project included exploratory drilling, and preparation of reclamation plans and specifications for five sites containing numerous suspected mine entries to a large underground mine complex. Design measures included elimination of impounded mine water, installation of wet mine seals, access roads, collection channels, tipple demolition, minor site grading to provide positive drainage, and final revegetation.

Project Manager; Wymer Portals and Acid Mine Drainage (2012); WVDEP; Monongalia County, WV. Responsible for project management, engineering design, and development of construction plans, specifications, and cost estimates. The project included development of site mapping, exploratory drilling, and preparation of reclamation plans and specifications for a large abandoned mine complex. Design measures included elimination of impounded mine water, installation of wet mine seals, bat gates, and access roads, elimination of highwalls by proposed

earthwork and site grading with available on site refuse and spoil materials, and final revegetation. Numerous surface water and mine drainage structures including ditches, pipes, and underdrains were also required.

Project Engineer; Ely & Puckett Creek AMD Feasibility; USACE Nashville District; Lee County; VA. Responsible for performing research of geological data and mining maps, review of water quality data, and feasibility level design of acid mine drainage abatement measures, including equalization ponds, open limestone channels, Successive Alkalinity Producing Systems, and aerobic wetlands. Prepared construction plans and specifications for the project which included erosion and sedimentation control measures, site regrading, mine seals, collection and diversion ditches, earthwork, soil cover placement, and revegetation. Baker was responsible to asses characteristics related to the site, acid mine drainage (AMD), watersheds and the groundwater hydrology. The purpose was to develop a technically and economically feasible passive treatment system to the AMD discharges in order to restore the Ely and Puckett Creeks ecosystems. Firm prepared the feasibility report that presented conceptual designs and preliminary cost estimates.

Project Engineer; Ely and Puckett Creek Sub basins, Powell River Ecosystem Restoration; USACE Nashville District; Lee County, VA. Responsible for performing research of geological data and mining maps, review of water quality data, and design of acid mine drainage abatement measures, including equalization ponds, open limestone channels, Successive Alkalinity Producing Systems, and aerobic wetlands. Prepared construction cost estimates, plans, and specifications for the project which included erosion and sedimentation control measures, site grading, mine seals, earthwork, collection and diversion ditches, soil cover placement, and revegetation. The primary goal of the project was to design systems for the treatment of the AMD at each site in order to improve water quality in the watershed. The reclamation plan for the project was developed by Baker.

Task Manager; Fort Gordon Mine Closure Sites, US Army Signal Center; USACE New Orleans District; Fort Gordon, GA. Designed mine closure plans, specifications, and report for six mine sites within Fort Gordon in conjunction with the overall stormwater plan for the base. These sites included legacy mine pits and borrow areas. Reclamation design plans and specifications included site grading plans, stabilization of surface water drainage channels, drainage control, importation of soil cover, and E&S controls.

Project Manager; Davidson Highwall; WVDEP; Monongalia County, WV. Responsible for project management, engineering design, and development of construction plans, specifications, and cost estimates. The project included development of site mapping, exploratory drilling, and preparation of reclamation plans and specifications for a large abandoned mine complex. Design measures included elimination of impounded mine water, installation of wet mine seals, stream channel restoration, elimination of highwalls by proposed earthwork and site grading with available on site refuse and spoil materials, and final revegetation. Numerous surface water and mine drainage structures including ditches, pipes, and underdrains were also required.

Project Engineer; Cadiz Streets II Stabilization - Abandoned Mine Lands; Ohio Department of Natural Resources (ODNR); Harrison County, Cadiz, OH. Assisted in the preparation of grout stabilization plans to address subsidence due to pre-law mining beneath a residential neighborhood. Also, prepared specifications and cost estimates for the project.

Project Manager; Mineral City Park Acid Mine Drainage Remediation Study; ODNR; Tuscarawas County, Mineral City, OH. Responsibilities included field reconnaissance to identify acid mine drainage (AMD) sources within a 730 acre watershed impacting an unnamed tributary to Project required documentation of findings including conceptual abatement design alternatives, prediction of improvements to stream quality, ranking of sites based on environmental impacts, design of stream restoration, and preparation of the feasibility report.

Project Engineer; Elkins Coal Refuse Reclamation; WVDEP; Preston County, WV. Responsible for performing research of geological data and mining maps, designing reclamation measures, and preparing construction plans and specifications for the project which included erosion and sedimentation control measures, site earthwork and grading, slope stability analysis, mine seals, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; Tibbs Run Portals & Tipple Reclamation; WVDEP; Monongalia County, WV. Performed research of geological data and mining maps, review of water quality data, and design of reclamation measures, including mine seals, underdrains, and mine water collection channels. Prepared construction plans, specifications, and cost estimates for the project, which included erosion and sedimentation control measures, site regrading, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; National Mine Complex Reclamation, WVDEP; Monongalia County, WV. Responsible for performing research of geological data and mining maps, designing reclamation measures, and preparing construction plans and specifications for the project which included erosion and sedimentation control measures, site earthwork and regrading, slope stability analysis, mine seals, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; St. Mary's Landfill; PADEP; St. Mary's, PA. Performed preliminary analysis and design of reclamation measures. Baker conducted a site investigation of an uncontrolled industrial/residual landfill. The landfill had been undermined and leachate was flowing into the mine, exiting through an old mine portal, and impacting local trout streams.

Project Engineer; Dennison/State Route 800 Mine Drainage Project; ODNR; Dennison, Tuscarawas County, OH. Responsible for reviewing geological data, mining maps, and water quality data, and providing design of mine drainage abatement measures, including a metals precipitation pond and aerobic wetland. Provided environmental assessment documentation, and design of storm sewers for surface water, and conveyance pipes for mine water.

Project Engineer; MacArthur Mine Subsidence; WVDEP; Raleigh County, WV. Responsible for performing drilling inspection, mine map research and interpretation, and parking lot and roadway restoration, and developing specifications, plans, and cost estimates. The project required test drilling in a residential neighborhood in order to estimate grouting requirements to abate its underground mine subsidence problems.

Project Engineer; Barberton & Mount Eaton Subsidence Risk Evaluation; ODNR; Barberton and, Mount Eaton, OH. Responsible for providing site reconnaissance and field location of proposed exploratory boreholes. A residential area within the City of Barberton, Summit County, Ohio is known to be undermined by unmapped workings in the Sharon #1 Coal Seam.

Project Engineer; Beech Bottom Refuse Reclamation Project; WVDEP; Ohio and Brooke Counties, Beech Bottom, WV. Responsibilities included site design and preparation of the project construction plans and specifications. The project included three sites located along the Ohio River containing barren refuse piles ranging in size from 15 to 60 acres. The reclamation plan developed by Baker provided for the refuse piles to be graded to stable slopes, covered, and vegetated to reduce AMD generation. Refuse piles encroaching on the Ohio River were graded and covered with a mat liner and vegetated for erosion control. Site drainage with collection ditches and storm water piping was also designed to provide positive drainage. A phase I archaeological investigation of a proposed borrow area located in the Ohio River Floodplain was performed as required by the WV SHPO.

Project Engineer; Big Hollow Mine Dump Reclamation; WVDEP; Mullins, WV. Performed research of geological data and mining maps. Prepared construction plans and specifications for the project which included erosion and sedimentation control measures, site regrading, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; Twilight Burning Refuse Reclamation; WVDEP; Twilight, WV. Responsible for performing research of geological data and mining maps, designing reclamation measures, and preparing construction plans, specifications, and cost estimates for the project which included erosion and sedimentation control measures, site earthwork and grading, mine seals, methods of extinguishing/quenching actively burning refuse, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; Piney Swamp Run Refuse No. 1 Reclamation Project; WVDEP; Keyser, WV. Responsible for performing research of geological data and mining maps, review of water quality data, and design of acid mine drainage abatement measures, including anaerobic/compost wetlands, successive alkalinity producing systems, anoxic limestone drains, metals settling ponds, and open limestone channels. Prepared construction plans, specifications, and cost estimates for the project, which included erosion and sedimentation control measures, site regrading, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; Turnhole Branch Reclamation Project; WVDEP; McDowell County, WV. Responsible for performing research of geological data and mining maps, designing reclamation measures, and preparing construction plans, specifications, and cost estimates for the project which included erosion and sedimentation control measures, site earthwork and regrading, underdrain, slope stability analysis, mine seals, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; Pageton Mine Refuse Reclamation; WVDEP; Pageton, WV. Responsible for performing research of geological data and mining maps, designing reclamation measures, and preparing construction plans and specifications for the project which included erosion and sedimentation control measures, site earthwork and regrading, slope stability analysis, mine seals, collection and diversion ditches, soil cover placement, and revegetation

Project Engineer; North Fork Yellow Creek AMD Ecosystem Restoration; USACE Pittsburgh District; Hammondsville, OH. Responsible for providing feasibility level design and plans for the required AMD abatement and reclamation measures. The project involved conceptual measures for the abatement of AMD emanating an abandoned mine site. The site containing three abandoned mine entries and acid mine drainage (AMD) is very close to the North Fork of Yellow Creek, a tributary to the Ohio River. The nearby receiving stream is impacted by the AMD discharge. Orange and yellow staining is visible at the stream bank. The primary goal of the project was to identify the most practical passive or active treatment scheme for treating the AMD and thus improve water quality in the stream.

Project Engineer; Masontown No. 4 Reclamation, AMD Abatement; WVDEP; Masontown, WV. Responsible for performing research of geological data and mining maps, review of water quality data, and preparation of construction plans, specifications, and cost estimates for the project which included erosion and sedimentation control measures, site earthwork and grading, mine seals (wet and dry), collection and diversion ditches, stream crossings, soil cover placement, and revegetation. The Masontown No. 4 project required the design of measures for the abatement of acid mine drainage (AMD) emanating from abandoned mine entries and refuse piles at four specific sites along two tributaries to the Cheat River.

Project Engineer; Odd-Moore Mine Reclamation; WVDEP; Raleigh County, Odd, WV. Responsible for performing research of geological data and mining maps, designing reclamation measures, and preparing construction plans, specifications, and cost estimates for the project which included erosion and sedimentation control measures, site earthwork and regrading, underdrains, limestone ditches, abandoned mining structure removal, soil cover placement, and revegetation. The Odd Moore Refuse Pile abandoned mine land site consisted of two refuse piles covering approximately 12 acres with steep unstable slopes, four abandoned mining impoundments, a concrete foundation and remains of an old tipple, and acid mine drainage (AMD) seepage, all in close proximity to an existing residence.

Project Engineer; Vienna Mine Shafts – Abandoned Mine Lands; ODNR; Vienna, OH. Responsible for providing plans, specifications, and cost estimates for sealing two 100-foot-

deep mine shafts located at two different sites and determine the best design for sealing the shafts. Both sites are on wooded lots adjacent to occupied residences.

Project Engineer; Watson Portal and Refuse Reclamation; WVDEP; Fairmont, WV. Responsible for performing research of geological data and mining maps, review of water quality data, and design of acid mine drainage abatement measures, including anoxic limestone drains, metals settling ponds, and open limestone channels. Prepared construction plans and specifications for the project, which included erosion and sedimentation control measures, site regrading, mine seals, collection and diversion ditches, abandoned barge and coal refuse removal from the North Branch of the Monongahela River, soil cover placement, and revegetation.

Project Engineer; Point Marion Maintenance; WVDEP; Monongalia County, WV. Responsible for performing research of geological data and mining maps, review of water quality data, and design of acid mine drainage abatement measures, including aerobic wetlands, successive alkalinity producing systems, metals settling ponds, open limestone channels, and fly ash soil amendments. Prepared plans and detailed cost estimates for the project, which included site regrading, mine seals, collection and diversion ditches, soil cover placement, and revegetation. The project involved the maintenance and rehabilitation of an AML site originally reclaimed by others in the 1970's. The existing site included four mine seals, a geotextile lined collection channel, a concrete energy dissipater basin and riprap spillway overflow. The site area was along a steep hillside above Cheat Lake. Acid mine drainage was observed emanating at several locations below the collection channel indicating that seepage was not being intercepted as intended in the original design. The channel itself was in need of repair as evidenced by ponded water, erosion, and exposed sections of the existing geotextile lining.

Project Engineer; S.R. 0079, Section A23, Interstate 79 Missing Ramps; PennDOT District 11-0; Collier and Robinson Townships, Pittsburgh, PA. Responsible for providing water dewatering plans and water volume estimates for AMD to be treated during construction. This project involved the addition of two direct connection ramps at the existing interchange of Interstate 79 and Route 22/30 west of Pittsburgh. The so-called "missing ramps" provides a direct link between Interstate 79 and the Pittsburgh International Airport. This project presented challenging structural designs, traffic analysis, and complex roadway geometric designs, which were further complicated by the high volume of traffic on Interstate 79 and Route 22/30. To accommodate the new ramps and avoid right of way impacts, the existing highway was shifted up to 50 feet and lanes were added in each direction while maintaining all lanes of traffic to reduce delay and congestion. 1.1 acres of wetland mitigation and 500 feet of stream mitigation were included with this project. In addition, coal found within the excavation area was salvaged while the acid water in the abandoned coal mines was collected, neutralized, and then released into natural tributaries. Finally, Stormwater Management Best Management Practice was included to retain the surface runoff.

Project Manager; Lindentree AMD Remediation Project; ODNR; Carroll County, Lindentree, OH. Responsibilities included performance of hydrologic and hydraulic analysis for culvert and collection ditch design, preparation of grading layout, design of a passive acid mine drainage treatment wetland, restoration of an existing stream channel, and preparation of the project plans and specifications.

Project Engineer; Cheat Lake Highwall; WVDEP; Monongalia County, WV. Responsible for performing research of geological data and mining maps and review of water quality data.

Prepared construction plans, specifications, and cost estimates for the project which included erosion and sedimentation control measures, site earthwork and regrading, mine seals (wet and dry), collection and diversion ditches, stream crossings, soil cover placement, and revegetation. The Cheat Lake Highwall abandoned mine land site consisted of a 19-acre refuse pile, numerous abandoned mine openings discharging acid mine drainage (AMD), and a dangerous highwall in close proximity to a residential area.

Project Engineer; Emoryville Mine Complex Reclamation and AMD Remediation; WVDEP; Emoryville, WV. Responsible for performing research of geological data and mining maps, review of water quality data, and design of acid mine drainage abatement measures, including open limestone channels, Successive Alkalinity Producing Systems, and aerobic wetlands. Prepared construction plans and specifications for the project which included erosion and sedimentation control measures, site regrading, mine seals, collection and diversion ditches, abandoned barge and coal refuse removal from the North Branch of the Monongahela River, soil cover placement, and revegetation. The Emoryville Mine Complex project required the design of measures for the abatement of acid mine drainage (AMD) emanating from abandoned mine entries and piles at three sites. AMD discharges and coal refuse piles are located along both sides of Emory Creek, a tributary to the North Branch Potomac River.

Project Engineer; Flemington Portals and Drainage; WVDEP; Taylor County, WV. Responsible for providing review and oversight of all hydraulic and hydrologic calculating performed on the project, and developing conceptual plans for review with the client prior to finalization of the design. The design portion of the project included the following: design of reclamation measures for an abandoned highwall area, construction of diversion and collection ditches, replacement of an existing culvert, repair to existing mine seals and ditches, erosion and sedimentation control measures, and site grading to eliminate the existing ponded areas, and revegetation. The work also included preparation of construction plans and specifications including the cost estimate.

Project Engineer; North Chickamauga Creek and Nolichucky River Watershed Restoration Studies; USACE Nashville District; TN and NC. Assisted in preparation of a conceptual AMD abatement system design. Project involved field and literature research to determine the water resources problems in the basins including flooding, erosion, stream stability, and ecosystem deterioration, and acid mine drainage (AMD). Potential solutions and economics of those solutions were investigated to determine if a federal interest existed. Solutions investigated included flooding control levees, structure elevation, flood warning systems, wetland creation and mitigation, AMD mitigation, and stream bank stabilization. As a result of the watershed evaluation, a preliminary design for an AMD abatement system was performed.

Project Engineer; North Branch Potomac River AMD Abatement; USACE Baltimore District; Garrett County, MD and Grant and Mineral Counties, WV. Responsible for performing research of geological data and mining maps, review of water quality data, and design of acid mine drainage abatement measures, including aerobic wetlands, anaerobic/compost wetlands, successive alkalinity producing systems, anoxic limestone drains, metals settling ponds, open limestone channels, and fly ash soil amendments. Prepared plans and detailed cost estimates for the project, which included site regrading, mine seals, collection and diversion ditches, soil cover placement, and revegetation. A reconnaissance study by the U.S. Army Corps of Engineers, Baltimore District determined that mine drainage from a

particular watershed area was primarily responsible for the degradation to aquatic habitat of the Upper North Branch Potomac River.

Project Engineer; Major Mine Expansion Project, Mine Complex; Confidential Client; Southwestern PA. Performed preliminary design of water supply, storage, and distribution lines. Baker provided permitting services for this coal mine expansion project in Pennsylvania. The project provided for expansion of the underground mine permit area as well as new surface facilities consisting of a portal, slope, preparation plant, water intake structure and fresh water impoundment, three valley-fill type coal refuse disposal areas, and a rail loop with a coal load-out. These surface facilities encompass approximately 1,453 acres. The project eventually was cancelled, but not before permit applications were submitted and some comments were received. Permits required for the project include a USACE 404 Permit (including an Environmental information Document), PADEP Coal Mining Activity Permit, Coal Refuse Disposal Permit, and Dam Permit, and MSHA approval.

Project Engineer; Mine Reclamation for Borgman Refuse and Portals; WVDEP; Preston County, WV. Responsible for performing research of geological data and mining maps, designing reclamation measures, and preparing construction plans and specifications for the project which included erosion and sedimentation control measures, site earthwork and regrading, slope stability analysis, mine seals, collection and diversion ditches, soil cover placement, and revegetation. Baker's responsibilities included site reconnaissance, survey and mapping, subsurface investigation, designing grading, drainage control structures, ditches, passive treatment for AMD, earthwork, and preparation of plans, specifications and costs.

Project Engineer; Kayford Mountain – Recommendations to Ameliorate Subsidence; WVDEP; WV. Provided field reconnaissance of a subsidence crack associated with mine subsidence. A four-foot wide, 400-foot-long subsidence crack appeared on the side of Kayford Mountain in a location that would be mountaintop-mined. Baker investigated the causes of the "mountain crack", determined the stability of the rock mass, and prescribed any remediation needed to prevent down slope damage due to falling masses.

Project Engineer; Hardy Coal Reclamation Bond Forfeiture; ODNR; Belmont County, Ohio. Responsible for reviewing geological data and mining maps, and providing design of reclamation measures required for the forfeiture site. Also provided environmental assessment documentation, and prepared construction plans and specifications for the project, including erosion and sedimentation control measures, site regrading, collection ditches, stream relocation, soil cover placement, and revegetation. The project site is a partially reclaimed mine site. The project area included an old soil stockpile area and the remnants of a large sedimentation pond. The pond and its embankment have redirected the flow of water in a stream causing both soil erosion and impoundment of water. The reclamation plan developed provided for relocation and restoration of the stream channel, regrading revegetation of the project area to provide a freely draining surface, and diversion and collection of surface water as needed. Improvement of an existing access road with rock aggregate to allow for construction access was also planned.

Project Engineer; Huff Run Site; ODNR; Lindentree, OH. Provided evaluation of AMD water quality data, and recommended possible abatement measures. This task of the Ohio Department of Natural Resources Open-End contract is for Initial Site Review & Preparation of Fee Proposal; detailed site reconnaissance; subsurface investigation; evaluation of AMD source(s); conceptual design and evaluation of possible abatement alternatives; and recommendations and preparation of report.

Project Engineer; Kempton Refuse and Acid Mine Drainage; WVDEP; Tucker County, WV. Responsible for performing research of geological data and mining maps, review of water quality data, and design of acid mine drainage abatement measures, including open limestone channels, SAPS cells, and aerobic wetlands. Prepared construction plans and specifications for the project, which included site grading, mine seals, collection and diversion ditches, soil cover placement, and revegetation. Work performed by Baker for the West Virginia Division of Environmental Protection (WVDEP) under this contract on the Kempton Refuse and AMD project included performance of site reconnaissance and office research, field surveying, test drilling, analysis and design of reclamation measures, preparation of construction plans and specifications, and development of a quantity estimate and construction cost estimate.

Project Engineer; Jed-Havaco Refuse Reclamation; WVDEP; WV. Performed research of geological data and mining maps, designed reclamation measures, and prepared construction plans, specifications, and cost estimates for the project which included erosion and sedimentation control measures, site earthwork and regrading, slope stability analysis, mine seals, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; Denver Street Drainage Abatement; WVDEP; WV. Performed research of geological data and mining maps, designed reclamation measures, and prepared construction plans, specifications, and cost estimates for the project which included erosion and sedimentation control measures, mine seals, pond for active treatment of mine water during dewatering of mine pool, water conveyance pipe, collection ditches, and diversion ditches.

Project Engineer; Stonewood Reclamation; WVDEP; WV. Performed research of geological data and mining maps, designed reclamation measures, and prepared construction plans, specifications, and cost estimates for the project which included erosion and sedimentation control measures, site earthwork and regrading, slope stability analysis, mine seals, collection and diversion ditches, soil cover placement, and revegetation.

Project Engineer; Stark Drainage Abatement; WVDEP; WV. Performed research of geological data and mining maps, designed reclamation measures, and prepared construction plans, specifications, and cost estimates. The project included erosion and sedimentation control measures, mine water conveyance pipe in underdrains and horizontally bored into mine workings, a manhole and inlet with West Virginia Department of Transportation, Division of Highways' roadway crossing, placement and piping collection and diversion ditches, and underdrains.

Project Engineer; Beatty Church-Whetsell Road Highwall No. 2; WVDEP; WV. Performed site grading; determined earthwork requirements; performed drainage design, mine seal and underdrain design, and drilling inspection; and prepared plans, specifications, and cost estimates. The site required regrading of material to a stable slope against the existing highwall.

Project Engineer; Emerald No. 7 Shaft & Portal Facility; Pennsylvania Services Corporation; PA. Provided engineering design and permit preparation services. Baker designed and obtained permits for this new shaft and portal facility for Emerald Mine. The 53-acre shaft site includes a 6-acre shaft pad area, separate pads for a substation/water tank area and rock dust borehole site, a shaft cuttings pit, sedimentation pond, a 0.5 mile long access road to the shaft pad and access roads to the ancillary facilities. Plans to construct a bathhouse at the shaft site were not firm at the time of permitting, consequently, shaft site development was presented as two phases. The second phase of development presented site expansion for

the bathhouse. In addition to preparing construction documents for the site work, Baker applied for and obtained the following permits: PADEP Coal Mining Activity Permit Revision, and PennDOT Highway Occupancy Permit. Baker also assisted Emerald Mine personnel with obtaining a local zoning change needed for shaft site construction by participating in project presentations before the planning commission and zoning hearing board.

Project Engineer; Mine Reclamation Costs for Former Mines; U.S. Steel Mining; Various Locations in PA, WV, and, AL. Responsible for performing detailed appraisal of reclamation and demolition quantities and costs as well as obtaining scrap value estimates for inactive mining sites and facilities.

Project Engineer; Emerald Mine Disposal Area No. 2 Slurry Impoundment; Emerald Coal Resources, LP; Greene County, PA. Responsible for preparation of permit drawings and application for coal mining facilities. Area No. 2 is a 105-acre coal refuse slurry impoundment designed and permitted by Baker for the Emerald Mine. This is a valley-fill type facility requiring construction of a 300-foot high dam using some upstream construction practices. The facility includes a sedimentation pond located just downstream of the slurry impoundment. The following permits were applied for and obtained: PADEP Coal Refuse Disposal Permit, PADEP Dam Permits, USACE /PADEP Joint 404/105 Permit, and MSHA Approval. Baker also provided construction phase services for this project.

Project Engineer; Emerald Mine, Cumberland Mine Permits; Emerald Coal Resources, LP; Waynesburg, PA. Prepared the "Coal Mining Activity Permit" required by the Pennsylvania Department of Environmental Protection. Performed hydrologic and hydraulic analysis of proposed drainage structures, including storm routing, analyzed and designed modifications to an existing sedimentation pond and coal stockpile area expansion, developed erosion and sedimentation control measures, determined earthwork requirements, and addressed all items required to complete permit modules. Baker provided Site Design, Permitting and Construction Document Preparation for the No. 6 Bleeder Shaft. The 27.5-acre shaft site includes the shaft opening and associated pad area; a cuttings pit, a sedimentation pond, a treatment pond, access roads, a gob vent borehole and pad, a dewatering and an injection borehole and pad, diesel tank and pad, substations with associated pad area, and topsoil/soil stockpile area(s).

Project Manager/Senior Engineer; No. 6 Shaft Dewatering Pipeline; Cumberland Coal Resources, LP; Greene County, PA. Duties included development of scope of work and cost estimate, evaluation of pipeline requirements and permit preparation for a coal mine dewatering system and lined holding pond for control of drainage. Project included preparation of required roadway permits, permit modules and drawings.

Project Manager/Senior Engineer; Dewatering Pipeline from No. 1 Bleeder Shaft; Cumberland Coal Resources, LP; Greene County, PA. Duties included evaluation of pump and pipeline requirements and hydraulics for design of modifications to a coal mine dewatering system for drainage from a deep coal mine. Project included preparation of PADEP permits, PennDOT permits, permit modules and drawings, construction cost estimate and specifications.

Project Manager/Lead Engineer; Chalk Mine Permit Modification and Renewal; The Feldspar Corporation; Spruce Pine, NC. Project Manager/lead engineer for renewal and modification to a granite (pegmatite) strip mine operation permit. The modification included expansion of permitted mining areas, and revisions to surface drainage and sedimentation ponds for the 205 Acre Chalk Mountain Mine facility. The permit included plans showing proposed grading, excavation limits, rock highwall cuts, E&S including two sedimentation ponds,

diversion and collection ditches, and mine reclamation plans showing proposed final grading and backfill, final cover, site boundary safety and security measures, and revegetation.

Project Engineer; Disposal Site No. 4; The Feldspar Corporation; NC. Responsible for preparation of erosion and sediment plans and surface water design for the proposed mine spoil disposal site at Chalk Mountain Mine Site.

Task Manager/Engineer; No. 7 Dewatering Borehole Deep Well Pumps and Discharge Pipelines; Cumberland Coal Resources; Greene County, PA. Duties included evaluation of pump and pipeline requirements and hydraulics for design of a coal mine dewatering system for drainage from a deep coal mine. Project included preparation of PADEP permits, construction drawings, bidding documents and specifications. Performed hydraulic calculations and selected pipeline material and class requirements based on anticipated pressures and provided air and vacuum valves and launch pit for future cleaning (pigging) of the pipeline.

Project Engineer; Coal Stockpile Expansion and Stream Enclosure Permit; Pennsylvania Services Corporation; PA. Responsible for providing engineering design and permitting services for expansion of the Cumberland preparation plant coal stockpiles and associated stream enclosure. Firm prepared the PADEP Coal Mining Activity Permit and USACE 404 Permit required to enclose a stream segment and thereby facilitate expansion of the clean coal stockpile area. Performed hydrologic, hydraulic, and structural analysis of the proposed 1500 foot long corrugated metal pipe arch required to pass below the expanded coal stockpile at the coal preparation plant including erosion and sedimentation control measures, geosynthetic liner, and earthwork.

Senior Engineer; Coal Refuse Disposal Facility, Bailey Mine Complex; Consol Energy; PA. Prepared an alternatives analysis report as required by the Pennsylvania Department of Environmental Protection in order to identify the most desirable site for the proposed coal refuse facility. The report included comparison of engineering, environmental, social, and economic impacts of the proposed facility for five possible sites. The evaluation included numerous inquiries with state agencies regarding the various factors under their jurisdiction. Engineering evaluation included available storage volumes and preliminary layouts of the facility at each alternative location.

Project Engineer; Mine Expansion Project; Consol Energy; Southwestern, PA. Performed preliminary design of water supply, storage, and distribution lines associated with the expansion of an underground mine permit area as well as new surface facilities consisting of a portal, slope, preparation plant, water intake structure and fresh water impoundment,

Project Engineer; Coal Stockpile Expansion and Stream Enclosure Permit; Pennsylvania Services Corporation; PA. Responsible for providing engineering design and permitting services for expansion of the Cumberland preparation plant right-of-way, coal stockpile and associated stream enclosure.

Project Engineer; Maple Creek Mine Permit Application; Maple Creek Mining, Inc.; PA. Assisted in Pennsylvania Coal Mining Activity Permit preparation. Prepared a renewal/revision application for the Coal Mining Activity Permit to include 1,675 additional acres. Permitting activities involved mapping, environmental resources inventory, subsidence and hydro geologic impact evaluations, ground and surface water inventories and sampling, water sampling, research of property ownership, permit preparation and coordination with the review agency as needed to secure the permit.

Project Engineer; Edwards Shaft Permitting; Cyprus River Processing; PA. Assisted in the preparation of a Pennsylvania Department of Environmental Resources "Coal Mining Activity Permit." Performed water sampling, geological research, mapping, and the groundwater and surface water inventory as required to complete the applicable permit modules.

Project Engineer; Cumberland Additional Acreage Permitting; U.S. Steel Mining Company; Cumberland, MD. Assisted in the preparation of a Pennsylvania Department of Environmental Resources "Coal Mining Activity Permit." Performed water sampling, geological research, mapping, and the groundwater and surface water inventory as required to complete the applicable permit modules.

Municipal/Utilities

Project Manager/Engineer of Record; City of Canfield Ohio, Fairview Ave Drainage Improvements (2014) Engineering analysis, design, bidding, and construction management services for stormwater piping improvements. The project required hydrologic analysis and design of system improvements that included replacement of 800 feet of existing 18" CMP stormwater piping along residential streets with 30" HDPE including site restorations and relocations of existing water and sanitary pipe where required.

Project Engineer; National Church Hollow Road Waterline Feasibility Study; WVDEP; WV. Performed research of geological data and mining maps, evaluated impacts of past mining activities and AMD on groundwater within the study area, and evaluated existing water distribution systems. Project included field research and sampling of surface and groundwater, plotting laboratory test results on Piper Trilinear Diagrams, identifying possible solutions to water quality problems, and preparing a detailed written report including preliminary construction cost estimates for recommended water supply alternatives. The National Church Hollow Road Waterline Extension Feasibility Study was completed for the West Virginia Division of Environmental Protection (WVDEP) and included detailed research of the local hydrology, hydrogeology, geology, and past mining activities, as well as collection and analysis of representative water samples and interviewing residents. Conclusions regarding the impact of that past mining activities have had upon local hydrogeology conditions as well as on water quality and quantity were formulated based upon information collected as part of the investigation. Finally, the report presented recommendations regarding remedial actions including extension of the National Church Hollow Road water distribution system and upgrades to the existing treatment facility.

Project Engineer; Afghanistan National Civil Order Police (ANCOP) Projects; USACE, TAC; Winchester, VA. Responsible for preparation of civil plans and specifications, design calculations, and narratives for the subject facilities. Supervised and prepared the Ready-to-Advertise complete civil designs, specifications, and construction cost estimates for three standard Afghanistan National Civil Order Police (ANCOP) projects. Each design was intended to function as a proto-typical design for use by AED, in Afghanistan, and included well water development and supply, wastewater collection and disposal, stormwater, roadways, site layout, and force protection requirements

Project Engineer; Water System Improvement (2012); Ohioville Borough Municipal Authority; Ohioville Borough, PA. Duties included design plans and specifications for water system improvements including 4500 LF ductile iron pipe extension, altitude valve and by pass vault, master meter pit, and pressure reducing valve vault.

Lead Utility Engineer; Norfolk Southern Railway Co. Intermodal Facility; Greencastle, PA. Lead utility engineer provided design services for water distribution and wastewater collection facilities including a master meter pit and separate private water main extensions for potable domestic water supply and fire protection. Also provided plans and specifications for expansion

of the waste collection system to provide conveyance of wastewater from the proposed buildings to the existing municipal collection system

Engineering Representative; Retainer and Engineering Services; PA; 1994 – 2012. Pennsylvania. Engineering representative to the Ohioville Borough Municipal Authority (2006-2012) and Industry Borough Municipal Authority (1994-2012). Provided engineering representation and services as needed to address permitting and operational issues associated with the authority's water distribution and sanitary collection systems.

Lead Civil Engineer; Bagram Airfield Site Design; United States Army Corps of Engineers, Middle East District. Lead civil engineer and task manager for site design services for design of a proposed fire station, fighter hangar, and rigging facility at separate locations on the base. Civil site design included permanent connection to base-wide water and sewer utility systems (under construction at time of design). Contingency systems for water and sewage were also required should the facilities be commissioned prior to completion of the base-wide water and wastewater systems. Temporary systems included PE water storage tanks, skid mounted water pumps, sanitary grinder pumps, and wastewater holding tanks. Permanent systems included water main extensions, water service lines, sanitary force and gravity lines, and bolted steel tanks for fire protection systems.

Municipal Engineer; Engle Road Water Main Relocation; Industry Borough Municipal Authority; Industry Borough, PA. Duties included design drawings and specifications and construction sequencing for abandonment and replacement of existing cast iron waterline with new ductile iron pipe due to PennDOT Roadway realignments. The project involved temporary measures to maintain water supply during installation and testing, also preparation of estimates and PennDOT forms for partial reimbursement of relocation expenses.

Project Engineer; Operational Readiness Training Complex; USACE New York District; Fort Drum, NY. Acted as lead design engineer during a field design charrette. Prepared conceptual layouts and designs including water and sewer utility supply and site grading for the ORTC facility. Presented results to the client with an oral presentation at the conclusion of the charrette.

Project Engineer; Reach Back Design Assistance; CETAC-EC-TF and EC-TS Afghanistan Engineering District; Winchester, VA. Responsible for providing design plans and specifications for water and wastewater facilities at Bagram Air Field Base. Water treatment included a membrane nano-filtration system, and wastewater treatment was a modular train of prefabricated package plants. The work was performed in CETAC's Winchester, VA office and included preparation of drawings, specifications, and design analyses for civil, and environmental engineering systems including wastewater treatment and collection system, water treatment and collection system, structures.

Senior Engineer; Bear Creek Chemical Sites - Potable Water System Feasibility Report; PADEP; Butler County, PA. The project required the preparation of a feasibility report to review potential sources of drinking water to supply water users of the project area within the Bear Creek watershed. The study included review of water resources, estimates of water consumption, conceptual designs and cost estimates of viable alternative sources of water supply, and recommendation of a preferred source of supply.

Project Engineer; Remedial Site Investigation and Residential Water Supply Assessment/Treatment (Slocum Lead Site); Wapwallopen, PA. Responsible for selection of a residential treatment system for a number of houses impacted by water quality problems and prepared a bid form to solicit price quotes.

Project Engineer; Afghanistan National Border Police (BP) Zone Command Projects; USACE TAC; Various Locations in Afghanistan. Responsible for preparation of civil plans and specifications, design calculations, and narratives for the subject facilities. Prepared the Ready-to-Advertise complete designs, specifications, and construction cost estimates for two standard Afghanistan National Border Police Zone Command (BP Zone) projects. Each design was intended to function as a proto-typical design for use by AED, in Afghanistan, and included structures/buildings, infrastructure, and force protection requirements.

Project Engineer; Wetlands Design for Peebles Site 7; General Electric; Peebles, OH. Responsible for design, preparation of construction plans and specifications for the proposed wetland and associated surface drainage structures. The detailed design included wetland layout planting and inlet/outlet structures including design of a pipeline for conveyance of water from an existing septic system based on required capacity and ODNR permit requirements.

Municipal Engineer; Engle Road Lift Station Improvements; Industry Borough Municipal Authority; Industry Borough, PA. Duties included recommendations for improvements to an underground lift station. Provided guidance and recommendations and met with contractor to achieve project goals which included construction of an above ground enclosure over the lift station to house all electrical controls and propane backup generator. Project required removal of damaged electrical control panel from the underground vault, installation of new control panel, relocation and repairs to electric power generator, and relocation propane fuel tank.

Project Engineer; McDowell County Public Water Supply System; WVDEP; WV. Performed distribution system hydraulic analysis and pipeline design, storage tank sizing, drilling inspection, well pump design, and booster station design, and assisted in preparing plans, specifications, and cost estimates. The project included complete design of a new water treatment plant, two water storage tanks and foundations, and distribution system consisting of 29 miles of pipe to serve over 900 proposed residential users at an estimated cost of $5,300,000.

Project Engineer; Sheridan Road Reclamation; ODNR; Coshocton, OH. Prepared design plans and specifications for proposed reclamation measures. The mine drainage abatement plan developed included design of 12-inch and 18-inch HDPE mine drainage conveyance pipes and airtight manholes to intercept and convey water from a mine drain before entering an existing surface channel. Seepage into a residential basement was to be intercepted by an underdrain of sand, aggregate, and perforated 12-inch HDPE pipe. Also included was removal of accumulated iron sludge precipitates from an existing surface channel, improvements to the channel including grading and synthetic mat liner installation, and repairs to a failed residential basement drain system.

Project Engineer; County Routes Water Line Extensions; WVDEP; WV. Performed distribution system hydraulic analysis and pump station design, renovation of an existing pump station, and preparation of plans, specifications, and cost estimates. The project included installation of over 90,000 feet of PVC and Ductile Iron pipe to serve 170 residential and commercial connections.

Project Engineer; Kane's Creek Water Line; WVDEP; WV. Performed water distribution system hydraulic analysis and pipeline design, and pump selection, and prepared plans, specifications, and cost estimates. The project included installation of 6,000 feet of 6-inch PVC pipe, and 2,000 feet of 2-inch PVC pipe to serve 26 residential connections.

Project Engineer; Moundsville Water Line; WVDEP; WV. Provided pipeline layout, and prepared plans, specifications, and cost estimates. The project included replacement of 6,000 feet of 10-inch PVC transmission line, and replacement of deteriorated pipelines at several locations within the distribution system.

Municipal Engineer; 300,000 Gallon Willowbrook Standpipe and 100,000 Gallon Barclay Hill Standpipe Painting; Industry Borough Municipal Authority; Industry Borough, PA. Duties included development of plans, bid packages, specification ns, and construction management for rehabilitation of paint coatings of two existing welded steel standpipes.

Project Manager and Lead Investigator; Highland Avenue Wellhead Protection Study; Industry Borough Municipal Authority; Industry Borough. Prepared a detailed report on the municipal water source wells for the Borough of Industry including groundwater including computer modeling with WhAEM V.3.1.0. to delineate a wellhead protection area, research into potential sources of contamination, and a comprehensive report documenting conditions and contingency plans.

Project Manager; Route 59 Waterline Extension; Preston County PSD#2; Preston County, WV. Designed and managed the project including preparation of plans and specifications for extension of water distribution lines along Route 59.

Project Engineer; Page-Kincaid Water Line; WVDEP; WV. Performed water distribution system hydraulic analysis and pipeline design, storage tank sizing, and drilling inspection, and prepared plans, specifications, and cost estimates. The project included installation of over 73,000 feet of 6-, 4- and 2-inch PVC and Ductile Iron pipe, three water storage tanks, two booster stations, and modifications to an existing booster station to serve 100 new residential connections.

Project Engineer; Dogtown Road Water Line; WVDEP; WV. Performed water distribution system hydraulic analysis and pipeline design, storage tank sizing, and drilling inspection, and assisted in preparing plans, specifications, and cost estimates. The project included installation of 25,000 feet of 6-inch PVC, 4,400 feet of 2' PVC, and a 195,000-gallon storage tank to serve 70 new residential connections.

Project Engineer; Turkey Run Water Line; WVDEP; WV. Performed water distribution system hydraulic analysis and pipeline design, and assisted in preparing plans, specifications, and cost estimates. The project included installation of 15,300 feet of 8-inch PVC, 4,700 feet of 4-inch PVC, and 6,500 feet of 2-inch PVC pipe to serve 31 new residential connections.

Project Engineer; Berwind, Canebrake and Vallscreek Feasibility Study; WVDEP; WV. Performed research of geological data and mining maps, evaluated impacts of past mining activities on groundwater within the study area, and evaluated existing water distribution systems. Project included performing field research and sampling of surface and groundwater, plotting laboratory test results on Piper Trilinear Diagrams, identifying possible solutions to water quality problems, and providing preliminary construction cost estimates for recommended alternatives.

Project Engineer; Cucumber, Newhall, Squire, Johnstown, and Jacob's Fork Feasibility Study; WVDEP; WV. Performed research of geological data and mining maps, evaluated impacts of past mining activities on groundwater within the study area, and evaluated existing water distribution systems. Project included performing field research and sampling of surface and groundwater, plotting laboratory test results on Piper Trilinear Diagrams, identifying possible solutions to water quality problems, and providing preliminary construction cost estimates for recommended alternatives.

Project Engineer; Kane's Creek Feasibility Study; WVDEP; WV. Performed research of geological data and mining maps, evaluated impacts of past mining activities on groundwater within the study area, and evaluated existing water distribution systems. Project included performing field research and sampling of surface and groundwater, plotting laboratory test results on Piper Trilinear Diagrams, identifying possible solutions to water quality problems, and providing preliminary construction cost estimates for recommended alternatives.

Project Engineer; County Routes Feasibility Study; WVDEP; WV. Performed research of geological data and mining maps, evaluated impacts of past mining activities on groundwater within the study area, and evaluated existing water distribution systems. Project included performing field research and sampling of surface and groundwater, plotting laboratory test results on Piper Trilinear Diagrams, identifying possible solutions to water quality problems, and providing preliminary construction cost estimates for recommended alternatives.

Project Engineer; Marion Township Water Line; Marion Township Board of Supervisors; Marion County, WV. Performed design of a new water distribution system, including hydraulic analysis and pipeline design, master meter and pressure reducing pit, and field flow tests, and

prepared plans, specifications, and cost estimates. The project included installation of 22,000 feet of 8-inch PVC to serve 50 residential and 2 industrial connections.

Project Engineer; Schiller Street Water Line, Storm Sewer, and Repaving; Borough of Baden; Baden, PA. Performed design and construction inspection of proposed pipelines and pavement, and prepared plans, specifications, and cost estimates. The project included installation of 2,000 feet of 6-inch Ductile Iron pipe to serve 15 residential connections, 1,500 feet of CMP and inlets, and 5,000 SY of asphalt pavement.

Project Engineer; Railroad Street Water Line; Midland Municipal Authority; Midland, PA. Performed design for replacement of deteriorated water lines, including plans and specifications preparation, construction management, and inspection. The project included installation of 8,000 feet of 8-inch Ductile Iron pipe to maintain service to 30 residential, one industrial, and five commercial connections.

Project Engineer; Beaver Falls Infiltration and Inflow Study; Beaver Falls Municipal Authority; PA. Performed field and office data collection, including flow measurements and facilities inspection, in order to identify sources of infiltration and inflow for the existing sanitary collection system and provide a report, including recommended system assessment and abatement measures.

Project Engineer; Poland Township Water Line Study; Ohio Water Service Company. Performed distribution system layout and water tank siting, hydraulic pipeline design, and construction cost estimate for the proposed project which included high service pumps, a one-million gallon storage tank, and seven miles of 8-inch-, 12-inch-, and 16-inch-diameter Ductile Iron pipe and related fittings.

Project Engineer; North Side Fire Flow Study; Ohio Water Service Company. Performed field and flow testing and hydraulic modeling of the distribution system in the project area. Prepared a report and recommended system improvements for increasing fire flow capabilities within the system, including computer simulation of anticipated results due to recommended improvements.

Project Engineer; Evans Lake Raw Water Line Cleaning; Ohio Water Service Company. Assisted in the design of launch and retrieval sites for a "poly-pig" line cleaning device to be inserted into the 16-inch raw water line. Performed field flow testing and hydraulic analysis in order to document the improvements in pipeline hydraulics realized after completion of the project.

District Engineer; Ohio Water Distribution System Extensions; Ohio Water Service Company. Acted as developer liaison and provided construction management, cost estimates, pipeline sizing, and layout of numerous developments requiring new service lines/ and Ductile Iron water line extensions to provide water service. This work included multiple projects requiring Ductile Iron mainline extensions totaling over 60,000 linear feet. Individual developments/water line projects included: Sturbridge Place, The Vineyards of Poland, Candywoods, Fonderlac Country Club, California Avenue, Timberbrooke Development, Boardman Park, Pharmore Plaza, Sami-Quick Stop Plaza, The Wholesale Club, Brookstone Place, Raintree Run, Dobbins, South Avenue Warehouses, McClurg Road Industrial Park, Eisenhower Drive, Quail Hollow, and others

Project Engineer; Hopewell Business and Industrial Park Phase II; Beaver County Corporation for Economic Development; Beaver County, PA. Duties included evaluation of an existing force main and lift station and subsequent design of a sanitary collection system,

pump station, and force main, including plans and specifications. Also estimated sanitary requirements and prepared sanitary planning modules and part II lift station permit documents as required by the Pennsylvania Department of Environmental Protection. Assisted in preparation of the project plans and prepared specifications.

Project Engineer; Woodlawn Road Sanitary System; Beaver County Corporation for Economic Development; Aliquippa, PA. Duties included design and layout of the sanitary collection system, pump station, and force main, including plans and specifications. Also estimated sanitary requirements and prepared sanitary planning modules and part II lift station permit documents as required by the Pennsylvania Department of Environmental Protection. Assisted in preparation of the project plans and prepared specifications.

Project Engineer; Beaver Falls Sanitary Trunk Line Replacement; Beaver Falls Municipal Authority; Beaver Falls, PA. Provided preliminary design for the replacement of several miles of deteriorated sanitary sewer lines, including performing route location/relocation and preparing plans and cost estimates.

Project Engineer; Aliquippa Infiltration and Inflow Study; Aliquippa Municipal Authority; PA. Performed field and office data collection, including flow measurements and facilities inspection, in order to identify sources of infiltration and inflow for the existing sanitary collection system and provide a report, including recommended abatement measures.

Project Engineer; Morgan/Lewis/Bockius – Ocean Landings; Morgan, Lewis & Bockius; PA. Responsibilities included background investigation and report for locations and elevation of submerged cable landing sites on Long Island, New York.

Project Engineer; Miller Mountain Waterline Feasibility Study; WVDEP; WV. Performed research of geological data and mining maps, evaluated impacts of past mining activities and AMD on groundwater within the study area, and evaluated existing water distribution systems. Project included field research and sampling of surface and groundwater, plotting laboratory test results on Piper Trilinear Diagrams, identifying possible solutions to water quality problems, and preparing a detailed written report including preliminary construction cost estimates for recommended water supply alternatives

Project Engineer; Terra Alta Water Supply Feasibility Study; WVDEP; Terra Alta, WV. The Town of Terra Alta Waterline Extension Feasibility Study was completed for the West Virginia Division of Environmental Protection (WVDEP) and included detailed research of the local hydrology, hydrogeology, geology, and past mining activities, as well as collection and analysis of representative water samples and interviewing residents.

Project Engineer; Harvey Run Road Sanitary Sewerage System Expansion, Harvey Run Road / 9th Street Service Areas; New Sewickley Township Municipal Authority; New Sewickley Township, PA. Responsible for providing engineering design and completing Penn Vest Application for the sanitary system. The Harvey Run Road Area Sewer Project provided for the collection, conveyance and pumping of sanitary sewage from approximately 150

previously unsewered residences in New Sewickley Township. This project eliminated the occurrence of malfunctioning on-lot septic disposal systems.

Project Engineer; Moon High School and Middle School Campus; Eckles Architecture; Moon Township, PA. Performed field flow testing of fire hydrants. Baker was retained by Eckles Architecture and Engineering, in conjunction with the Moon Township School District, to prepare the design drawings for a renovated High School and Middle School combined campus. The site is located between University Boulevard and Beaver Grade Road in Moon Township, Allegheny County, Pennsylvania.

Project Engineer; Iraq Relief and Reconstruction Program Construction Management Services; USACE, TAC; Baghdad, Iraq. Provided review of submittals for civil infrastructure on an as-needed basis. Baker, as part of the Stanley-Baker-Hill, LLC joint venture, provided diverse program and construction management services to the USCOE under a $20 billion contract to develop and implement a construction management program for the rebuilding of Iraq.

Project Engineer; Gilbertsville Perchloroethylene (PCE) Investigation; PADEP; Gilbertsville, PA. Responsible for preparation of plans and specifications for an 800-foot waterline extension to provide potable water to impacted residents. Plans included abandonment of existing private water wells. Baker performed a Groundwater Investigation on behalf of the Pennsylvania Department of Environmental Protection (PADEP) in a rural area of Montgomery County, Pennsylvania to identify the source of perchloroethylene (PCE) impacting the water quality in several private wells. The investigation activities were prompted by the discovery of elevated levels of PCE by the local health Department following complaints from the local homeowners. The project was then referred to the PADEP HSCA program for further investigation. Baker worked with the client and conducted background research for developing a cost-effective solution to locate the source of PCE impacting the private residential wells at the site.

Project Engineer; Fort Bliss Training Area Infrastructure Gap Analysis; USACE Fort Worth District; Fort Bliss, TX. Evaluated needs and adequacy of existing water infrastructure. Baker prepared a Training Area Infrastructure Gap Analysis in support of Army stationing initiatives and associated planned Military Construction at Fort Bliss, Texas.

Project Engineer; Franklin County Regional Intermodal Facility; Norfolk Southern Corporation; Greencastle, PA. Responsible for design and permitting of water and sanitary sewer connections required for the proposed intermodal facility. Baker is providing engineering and design services, permitting, and coordinating with another environmental consultant who is preparing the environmental clearance document for a new intermodal freight facility to serve the mid-Atlantic region, as part of an initiative to establish a high-speed intermodal freight rail route between the Gulf of Mexico and the Northeast. Baker's responsibilities include site investigation, geotechnical and civil engineering, design of five facilities and an overpass, drainage design, erosion and sediment control, and utility coordination.

Project Engineer; Turkey Run Water Line; WVDEP; WV. Performed water distribution system hydraulic analysis and pipeline design, and assisted in preparing plans, specifications, and cost estimates. The project included installation of 15,300 feet of 8-inch PVC, 4,700 feet of 4-inch PVC, and 6,500 feet of 2-inch PVC pipe to serve 31 new residential connections.

Project Engineer; County Routes Feasibility Study; WVDEP; WV. Performed research of geological data and mining maps, evaluated impacts of past mining activities on groundwater

within the study area, and evaluated existing water distribution systems. Project included performing field research and sampling of surface and groundwater, plotting laboratory test results on Piper Trilinear Diagrams, identifying possible solutions to water quality problems, and providing preliminary construct cost estimates for recommended alternatives.

TETRA TECH

Heather Trexler, PG
Project Manager / Geologist

EXPERIENCE SUMMARY

Ms. Trexler has over 17 years of professional experience with responsibilities for proposal preparation, staff oversight, job and budget tracking, technical report preparation, and client development for coal mining, natural gas and environmental projects. She is the Department Manager of the Energy and Natural Resources Group in the Pittsburgh office and leads projects requiring a multi-disciplinary team of professionals including engineering, geology, hydrogeology, and ecology. Projects activities for coal mining development include mine abandonment designs and the preparation of permits to state agencies in Pennsylvania and West Virginia for mine expansions and associated surface activities. Additional technical projects include the evaluation of current and potential mine pools and reviewing current and potential impacts to water resources.

EDUCATION

MS, Geology
West Virginia University, 2003,

BS, Geology
University of Cincinnati, 2001,

REGISTRATIONS / AFFILIATIONS

Professional Geologist, [redacted], PA

SME Chairman Coal and Energy Division

Past President Pittsburgh Coal Mining Institute of America

OFFICE

Pittsburgh, Pennsylvania

YEARS OF EXPERIENCE

17

YEARS WITH TETRA TECH

8

RELEVANT PROJECT EXPERIENCE

Project Manager; Miller Springs Remediation Management, Inc.; Bird Mine No.2/3 – Sludge Line Replacement; Somerset County, PA; Jul 2020 to October 2020. Manager of response to PADEP due to Notice of Violation for the treated sludge release from the plant. Project included preparation of design for new sludge line and oversight of installation.

Project Manager; Vesuvius USA; Globe Mine; Conceptual and 20% Design; Hancock County, WV; Jan 2020 to Nov 2020. Manager of engineering design team for acid mine drainage treatment facility, design flow of 120 gpm. Project includes conceptual treatment design; treatability/bench-scale testing, and process / structural / civil / electrical / instrumentation 20% engineering design. Prepared probable construction cost estimates.

Project Manager; Equitrans Midstream; Subsidence Review; Belmont County, OH; 2020. Conducted an online records search and evaluated the documented mining conditions for four existing dams. Review detailed mine maps to evaluate the type of mine workings and categorize the potential for subsidence at each dam. Recommended mitigation measures.

Project Manager; Vesuvius; Globe Mine Hydrogeologic Study; Hancock County, WV; 2020. Reviewed past mining, evaluated the potential presence of a mine pool, conducted environmental reviews for potential surface inflows into the underground workings, reviewed recharge to/discharge from the mine based on assumptions and comparable watersheds, and evaluated if it would be technically and economically feasible to improve management of the discharge by constructing mine seals that would restrict, control (impound) or direct flow within the deep mine.

Project Manager; Elliot Solar; Subsidence Review; Gibson County, IN; May 2020 to Jan 2021. Prepared detailed description of the aspects of past mining, methods that were used to remove the coal, description of the general types of subsidence, methodology of review, professional opinion on the potential for subsidence and type of subsidence, and mitigation recommendations for a solar project.

Project Manager; Renewable Energy Aggregators; Old Forge AMD Treatment Design; Luzerne County, PA; Jun 2020 to Dec 2020. Manager of engineering design team for acid mine drainage treatment facility. Project includes data collection, data analysis, conceptual treatment design, treatability/bench-scale testing.

Project Manager; EQM Gathering OPCO, LLC; Multiple Natural Gas Pipelines; Greene and Washington County, PA; 2020. Evaluated potential for project to encounter acid-forming materials, mine voids, or other mine features (strip pits, highwalls, openings) for multiple projects. Evaluated potential impact to project if features are encountered. Recommended best management practices to avoid or minimize impacts.

Project Manager; PA DEP – Bureau of Abandoned Mine Reclamation; Blacklick Creek Treatment Facility; Cambria and Indiana County, PA; 2018 to Present. Manager of engineering design team for abandoned acid

mine drainage treatment facility, the treatment plant is designed for 5,000gpm and expected construction costs are $17M. Project includes conceptual through final treatment design for process / structural / civil / electrical / instrumentation /architecture. Responsible for management of exploratory drilling program, residential well survey, bench scale testing program, and local/ state/federal permitting of all proposed activities. Prepared abandonment plan for shafts, slope entry, and boreholes open to the mine.

Project Manager; Miller Springs Remediation Management, Inc.; Bird Mine No.2/3 – Strayer 3 Pump Borehole; Somerset County, PA; October 2017 to Present. Prepared permit application to PA DEP for additional surface acres to an underground mine for a new pump borehole and discharge line. Directed and managed field crews for collection of data, reviewed and performed quality control of field data, and evaluated potential ground water and surface water impacts due to proposed mining activity.

Project Manager, Mountain Valley Pipeline, LLC; Bradshaw Compressor Station; Wetzel County, WV; June 2015 to October 2017. Served as manager of multi-disciplinary team for a technically challenging project that included creating grading concepts, preparing geotechnical investigation work plan, geotechnical design and obtaining the necessary permits for the construction of a compressor station in steep terrain. Worked with client and drafting/engineering departments to design earthwork and stormwater controls for 6-acre pad and 10,800-foot long access road for compressor and dehydration units. The steep terrain in the project area and marginal stability of some slopes would have required conventional fill embankments over 200-feet high and hundreds of feet long. The team reviewed alternate designs: Reinforced Soil Slopes (RSS), Soldier Pile Wall and Mechanically Stabilized Wall. Reinforced Soils Slopes were designed for three of the four pad fill slopes with maximum heights of 57 feet. The team designed the RSSlopes to enable use of less preferred (clayey) on-site borrow materials and predicted time-dependent settlements and deformations to assess potential impacts on future compressor station structures and piping. Where the Client found that certain structures might be exposed to intolerable movements given the planned timing of their construction, the team adjusted the site development plan to source some preferred borrow materials for use in critical segments of RSS. Tetra Tech also worked with the Client to address corrosion issues, including the implications of stray currents from the corrosion protection system planned on the pad.

Project Manager, Mountain Valley Pipeline, LLC; Mobley Interconnect Station; Wetzel County, WV; June 2015 to October 2017. Served as manager of multi-disciplinary team for creating concept and final grading plans, prepared and executed geotechnical investigation work plans, designed retaining walls, performed H&H analyses and designed stream bypass structures, obtained necessary permits, and prepared bid documents for this interconnect station project in Wetzel County, WV. The site was constrained by a steep hillside and major electric utility R/W to the south, and streams to the east, west and bisecting the planned pad. To meet the Client needs, Tetra Tech designed three (3) retaining wall systems (tiedback soldier pile, gabion, Redi-Rock® wall systems) to address different constraints around the pad and bypass streams affecting the pad. The team designed a stepped channel with gabion baskets to carry one stream through the soldier pile wall and divert the stream through an open box channel across the pad to reconnect with the native stream below the pad. A second stream channel was relocated through a culvert under a corner of the pad.

Project Manager, Equitrans, LP; Equitrans Expansion Project; $400,000; Allegheny, Greene Washington Co, PA; June 2015 to present. Served as manager of multi-disciplinary team for environmental permitting and assistance with Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission (FERC) for four (4) proposed natural gas pipelines, for a total of 7 miles. Prepared and reviewed erosion and sediment control plans and site restoration/post-construction stormwater management plans to County Conservation Districts for an ESCGP-2. Prepared Chapter 105 General Permits and USACE Joint Permit for impacts to streams and wetlands. Project included two new permanent gravel pads for pipeline tie-in and taps which required Post-Construction Stormwater Management BMPs. Served as lead technical reviewer for FERC Resource Reports for Water Use and Quality, Geologic Resources, and Soils and prepared responses to Environmental Information Requests. Prepared Preparedness, Prevention, and Contingency Plan (PPC) and Emergency Action Plan (EAP). Project also included soil fertility sampling and identifying suitable seed mixes to attract pollinators.

Project Manager, Equitrans, LP; Redhook Compressor Station; $75,000; Greene Co, PA; June 2015 to October 2017. Served as manager of multi-disciplinary team for design, environmental permitting and assistance with Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission (FERC) for a proposed compressor station pad of 9 acres. Prepared final and concept grading plans, subsurface exploration program, erosion and sediment control plans and site restoration/post-construction stormwater management plans to County Conservation Districts for an ESCGP-2. Managed subsurface investigation program for the design and construction of the compressor pad. Subsurface investigation encountered 3-ft thick coal seam in proposed cut. Developed plan to handle over 3,000 tons of coal to be removed during development of site. Developed innovative

stormwater management plan that included water quality credits due to client's need of large pad and limited space for permanent stormwater controls.

Project Manager; MarkWest Liberty Midstream & Resources, LLC; Multiple pipeline projects, Washington County, PA; Jan 2017 to Present. Evaluated presence of naturally occurring geologic formations that may have the potential to cause pollution during earth disturbance activity and past/current mining conditions within proposed project areas. Evaluated potential changes to mine discharges due to proposed project activities and recommended measures to prevent or mitigate AMD discharges. Specific evaluations for horizontal directional drills (HDD) and potential to encounter mine voids.

Project Manager; PA DEP – Bureau of Abandoned Mine Reclamation; Blacklick Creek Treatment Facility; Cambria and Indiana County, PA; 2014 to 2016. Manager of feasibility and design of collection, conveyance of three of the largest abandoned mine discharges within Blacklick Creek watershed. Responsible for development of exploratory drilling program, pollution loading study, obtaining property easements, design of mine water conveyance systems, design of abandoning/plugging existing unmanaged mine discharges, and state permitting of all proposed activities. Georeferenced mine maps using ArcGIS.

Project Manager; PA DEP – Bureau of Abandoned Mine Reclamation; Cresson AMD Abatement Project; Cambria County, PA; 2014 to 2016. Evaluated potential impacts to residential water sources due to lowering of underlying mine pool. Developed monitoring program of water sources to begin once project is initiated. Designed and prepared technical specifications for replacement supplies.

Project Manager; Sunoco Pipeline, LP; Pennsylvania Pipeline Project; Washington County, PA; Jun 2015 to Present. Investigated the potential for subsidence to occur under the proposed Pennsylvania Pipeline Project alignment due to closed/abandoned underground coal mines. Reviewed past mining history and mine workings to types of subsidence that could be expected. Prepared analysis and mitigation approaches to reduce or eliminate the potential of subsidence impacts to the proposed project. Also prepared Incidental Coal Extraction request and coal handling plan when coal/black shale is encountered in the pipeline trench to reduce the potential to create pollution.

Project Manager; Miller Springs Remediation Management, Inc.; Bird Mine No.2/3; Somerset County, PA; 2012 to Present. Part of site engineer team for perpetual mine water treatment of a closed underground mine. Developed plans to optimize mine pool management and treatment that included review of alternate pumping locations and management of NPDES outfalls.

Project Manager; PA DEP – Bureau of Abandoned Mine Reclamation; East Avoca – Grove Street Drainage Borehole; Luzerne County, PA; Jan 2014 to May 2014. Directed engineering and geology team to design drainage borehole to drain mine water from one coal seam to a lower coal seam. Prepared of bid documents, plans and technical specifications to be included in bid package for PA DEP reclamation project. Georeferenced mine maps using ArcGIS.

Project Manager; Miller Springs Remediation Management, Inc.; Bird Mine No.2/3 – Weber Borehole; Somerset County, PA; Nov 2013 to Apr 2014. Prepared bituminous permit application to PA DEP for additional surface acres to an underground mine for an interconnecting borehole between two coal seams. Directed and managed field crews for collection of data, reviewed and performed quality control of field data, and evaluated potential ground water and surface water impacts due to proposed mining activity.

Project Manager; Miller Springs Remediation Management, Inc.; Bird Mine No.2/3 – NPDES Renewal; Somerset County, PA; 2012 to Present. Prepared permit application to PA DEP for renewal of mine water treatment activities. This mine is located within a TMDL watershed and new NPDES effluent limitations based on loading allocations. Collaborated with PA DEP to consolidate outfalls so that new effluent water quality and quantity limitations could be met.

Project Manager; PA DEP – Bureau of Abandoned Mine Reclamation; East Avoca – Grove Street Drainage Study; Luzerne County, PA; 2013. Project involved investigation of unexpected high flow discharges (over 1,000 gpm) from the base of an embankment along the back yards of several residences along Grove Street in Avoca Borough, Luzerne County, Pennsylvania. Responsible for directing additional data collection, exploratory drilling program, interpreting mining history, and preparing evaluation and recommendations. Recommended mitigation of unlined storm drainage ways along I-80 and also installation of a borehole to interconnect upper and lower mine pools and allow for the upper mine pool to drain to the lower pool without discharging to the surface.

Project Manager, Laurel Mountain Midstream, LLC; Bezjak Seep-fix Design; Fayette County, PA; November 2012 to July 2014. After a pipeline was installed, the pipeline right-of-way had a nearly continuous source of water seeping into the right-of-way from up-gradient abandoned mine workings that prohibited vegetation re-growth after the construction activity. Coordinated with PA DEP to protect newly-forming wetlands due to mine seep and prepared subsurface infiltration trench design to drain areas that are not wetlands.

Project Manager, Laurel Mountain Midstream, LLC; Bezjak Sampling Project; Fayette County, PA; Nov 2012 to Jul 2014. Project manager responsible for providing engineering, mining and soil analysis assistance due to pipeline trench dewatering of acidic water from adjacent abandoned mine. Prepared soil sampling plan to determine any impacts from trench dewatering onto livestock pasture. Provided expert witness testimony during court hearing to describe mining history and proposed soil sampling plan. Conducted soil sampling under direct PADEP supervision and prepared evaluation report and recommendations due to dewatering of the trench.

Project Manager, Range Resources – Appalachia, LLC; Best Water Source Investigation; Washington County, PA; Jul 2012 to Sep 2012. Project consisted of evaluating seep at existing impoundment site suspected to be contaminated by discharge from a coal seam. Conducted sampling and quality evaluation and provided recommendation for direct discharge of seep.

Project Manager; American Bituminous Powers Partner, LP; Reclaimed mine site investigation; Marion County, WV; Apr 2012. Performed a site assessment and provided general recommendations as to the possible source and corrective actions for elevated levels of Aluminum of a reclaimed surface coal mine. Elevated levels of Aluminum were detected in several of the retention ponds that control runoff from the site. The area draining to these structures had been reclaimed but exhibited poor vegetation reestablishment. Based on soil and ground water samples, it was determined that the elevated aluminum was related to the naturally low pH of the topsoil that was releasing high levels of soluble aluminum, which can be toxic to some vegetation. Additionally, the site reclamation was not protecting against erosion, so specific improvements in the grading of the site and erosion and sediment controls were recommended.

Project Manager; CONSOL Energy; Meigs Complex Mine Pool; Meigs County, Ohio; 2005 to 2011. Prepared Probable Hydrologic Consequence Statement for three recently closed longwall mines to determine expected date of filling of void, potential for breakout of mine pool and expected changes in quality of mine pool over time. Reviewed historic data for amount of void space, discharge quality of mine water and local aquifer depths. Prepared report to Ohio Department of Natural Resources detailing history of the mines, current status of mine pool quality and quantity, expected mine pool quality and quantity, potential for beneficial use of mine pool and mine pool management strategies.

Senior Geologist; CONSOL Energy; Bailey Mine Expansion; Greene County, PA; Jun 2006 to Mar 2011. Managed permit expansion of longwall coal mine. Developed work plan for collection of necessary hydrologic and geologic data for permit application which included the door-to-door survey of over 200 properties for water supplies, installation of over 30 monitoring wells and monitoring of over 50 stream stations. Additionally, directed and managed field crews for collection of data, reviewed and performed quality control of field data, and evaluated potential ground water and surface water impacts due to proposed mining activity. Completion of this project included weekly communication with client for progress updates and communication with PA DEP to address concerns or questions.

Project Manager; CONSOL Energy; Enlow Fork Mine Expansion; Greene/Washington Counties, PA; 2004 to 2007. Managed permit expansion of longwall coal mine. Developed work plan for collection of necessary hydrologic and geologic data for permit application which included the door-to-door survey of over 500 properties for water supplies, installation of over 40 monitoring wells and monitoring of over 60 stream stations. Additionally, directed and managed field crews for collection of data, reviewed and performed quality control of field data, and evaluated potential ground water and surface water impacts due to proposed mining activity. Completion of this project included weekly communication with client for progress updates and communication with PA DEP to address concerns or questions.

Project Manager; CONSOL Energy; Enlow Fork & Bailey Mine surface activities; Greene/Washington Counties, PA; 2004 to 2011. Prepared geology and hydrology sections of bituminous permit applications for shafts, boreholes and portal facilities for support of underground mining activities. Developed work plan for collection of necessary hydrologic and geologic data for permit application, directed and managed field crews for collection of data, reviewed and performed quality control of field data, and evaluated potential ground water and

surface water impacts due to proposed mining activity. Completion of this project included weekly communication with client for progress updates and correspondence with PA DEP to address concerns or questions.

Project Manager; CONSOL Energy; Bailey Mine Refuse expansion; Greene County, PA; 2004 to 2011. Prepared geology and hydrology sections of bituminous mine permit application for expansion of refuse impoundments to support of underground mining activities. Developed work plan for collection of necessary hydrologic and geologic data for permit application and a detailed evaluation of potential ground water and surface water impacts due to proposed activity. Completion of this project included weekly communication with client for progress updates and communication with PA DEP to address concerns or questions.

Project Manager; Rosebud Mining Company; Kocjancic; Clarion County, PA; 2004 to 2011. Prepared geology and hydrology sections of bituminous mine permit applications for new underground room and pillar mine. Reviewed field data collected by other consultant and evaluated potential ground water and surface water impacts due to proposed shallow depth of mining activity. The assessment of potential impacts was complicated by previous surface mining above the proposed underground mine and the potential for a post-mining break-out of the mine pool. Completion of this project included regular communication with client for progress updates and correspondence with PA DEP to address concerns or questions.

TETRA TECH

Eric A. DiFatta, P.E.
Project Engineer

EXPERIENCE SUMMARY

Mr. DiFatta has design experience in traditional & specialty geotechnical structures, including retaining walls (RC, MSEW, S&L/P&P), reinforced earth (RSS, soil nailing, ground anchors), river causeways, cofferdams and deep foundations. His experience also encompasses subsurface exploration and investigation, structural design applied to geo-structures, seepage and stability analyses, erosion and sediment control design, and periodical dam safety compliance inspections. Additionally, Mr. DiFatta has experience in the design of earth & coal refuse dams and impoundments.

RELEVANT EXPERIENCE

ENGINEERING AND DESIGN

Geotechnical Design of Earth Retaining Systems for Development of Compressor Stations, Interconnect Station, Access Roads and Pipeline Corridors – Segments of the Mountain Valley Pipeline (MVP) Project, WV.

- Soil Nailing and Rock bolting systems
- Mechanically-Reinforced Soil Slope (RSS up to 57-feet high)
- Cantilevered Post & Panel Retaining Walls
- Characterization of Material Properties
- Slope Stability Analyses
- Estimate of construction costs, preparation of construction/bid documents, and bod-phase assistance
- Project and Certifying Engineer for all five (5) compressor and interconnect stations

Geohazard Assessments for Major Pipeline Projects – OH, PA, WV

- Reconnaissance for Problem Ground Conditions Along Development Corridors - Landslides, Karst Features, Mine Subsidence, Surface Water and Groundwater Control Issues, Expansive Soils & Rock, etc.
- Construction Phase Investigation of Encountered Hazards (e.g., landslides, UG mines, highwalls, karst sinkholes, groundwater control issues), and Directional Drilling Challenges in Problem Ground
- Field Assessment of Probable Causes
- Engineering & Design of Corrective Actions

Reinforced Concrete (RC) Cantilever spillway walls, Muleshoe Reservoir Dam-Hollidaysburg, PA. Performed the analyses and design for right and left RC spillway walls and also, assisted in the writing of the MathCAD program utilized to more optimally design the spillway walls. Also, performed calculations to evaluate a hydraulic valve house with a single door opening and concrete slab-style roof to be constructed with 8-inch concrete block, reinforced grout-filled (CMU).

Wisecarver Reservoir Dam – Jefferson, PA. Assisted with the engineering & design of the planned Roller Compacted Concrete (RCC) downstream slope buttress and overflow protection system for the Wisecarver Reservoir Dam. Also, performed inspections of the RC emergency spillway channel, sill, and associated retaining walls to determine necessary scope of concrete repairs and improvements, and identify possible voids beneath the spillway slab, and assisted with other field investigations

Emsworth BC Left and Right Abutment Wall Stabilization, Ohio River – USACE, Pittsburgh District. Developed loading diagrams and performed the structural design for stabilization plans encompassing new wall alternatives (reinforced concrete cantilever, concrete gravity, and master pile/combination walls) and hybrid stabilization systems (mechanically stabilized earth, micropiles, rock anchors) for the Emsworth

EDUCATION

B.S. Civil Engineering, University of South Carolina, 2008

AST in CADD, Triangle Tech, 2001

AREA OF EXPERTISE

Geotechnical

REGISTRATIONS/ AFFILIATIONS

Professional Engineer: AL, KY, NJ, OH, PA, TN, VA, WV

American Society of Civil Engineers – Pittsburgh Section

TRAINING/CERTIFICATIONS

MSHA Impoundment Inspection Certification, 2011

Certified ACI Concrete Field Testing Technician, Grade I, Expires 3/2020

MSHA Part 48 Surface Miner Safety Training (24-Hour), 2009

Troxler Certified Nuclear Gauge Operator, 2009

Confined Space Entry, 2003

OFFICE

Monroeville, PA

YEARS OF EXPERIENCE

12

YEARS WITHIN FIRM

5

CONTACT

eric.difatta@tetratech.com

Back Channel Dam left and right abutment walls. Applied graphical and numerical analysis techniques to define the loading diagrams for the existing abutment walls and the alternative stabilization plans.

Prairie State Power Plant – Marissa, Illinois. Performed the geotechnical analyses and structural design for a soil nail wall excavation support system for an Unloading Pit. The temporary soil nail wall was to be for a period of approximately two (2) months. A proposed load (crane) was considered as a dead load and was analyzed to be placed 15 feet away from edge of excavation and located directly at edge of excavation. The primary software used for the geotechnical analyses was SLIDE.

Mine Complex, Greene County – PA. Performed the geotechnical analyses and structural design for an approximate 15-foot high Reinforced Concrete (RC) Cantilever wall for containment of a raw coal stockpile adjacent to a stream. The wall was designed for a D10 dozer surcharge loading. Also, performed slope stability analyses to evaluate the positioning of the retaining wall near the top of the stream bank. MathCAD and SLIDE software and structural analysis spreadsheets were employed for the design.

Bridge Pier Cofferdams & Construction Causeway – Brayman Construction Corp. – Various Projects Designed and Evaluated temporary shoring river causeways and cofferdams that where subject to scour and base seepage for bridge pier and abutment replacements. Provided contractor with design and construction plans for shoring systems and coordinated with the contractor to use salvaged material.

Mine Complex, Greene County - PA Designed and evaluated a Post & Panel Retaining Wall with rock anchors, below an existing coal bin to allow for the construction of a new plant surge bin. The wall had to be designed to allow little to no movement due to the vibration of the existing bin located directly above the proposed wall. The wall heights analyzed ranged from 10-feet to 55-feet, with and without anchors.

FirstEnergy Corp, Hatfield's Ferry CCB Landfill, Greene County - PA Designed and evaluated a reinforced concrete vault to be placed in the existing landfill slope to facilitate cleaning of the leachate conveyance piping system. The vaults were designed to contain a sump area, where the pipes were through. The wall heights analyzed on the vault ranged from 12-feet to 15-feet, with a sloped backfill.

DAM SAFETY INSPECTIONS

Periodic Dam Safety Inspection – Bailey Central Mine Complex; CONSOL Pennsylvania Coal Company, LLC Greene County, PA; 2011 to Present Performed periodic safety inspections on high hazard dams associated with a large mining operation. Evaluated instrumentation data and prepared, sign and seal reports for State and Federal documents regarding current conditions and necessary remediation of deficient conditions for fourteen (14) dams. Coordinated with owner and contractor to remedy deficient conditions maintain safety compliance.

Periodic Dam Safety Inspection – Various Ponds in Alabama; 2020 to Present Performed periodic safety inspections on dams associated with mining operations in Alabama. Evaluated the structures and prepared, sign and seal reports for State and Federal documents regarding current conditions and necessary remediation of deficient conditions for up to eight (8) dams. Coordinated with owner and contractor to remedy deficient conditions maintain safety compliance.

SUBSURFACE EXPLORATION & INSTRUMENTATION

Geotechnical Investigations, Various Clients, Various Locations

- Developed drilling plans, depth of drilling and sampling procedures.
- Assisted in the supervision of exploratory subsurface drilling, pressure testing and test pitting investigation.
- Collected and logged soil and rock samples to be prepared for testing.
- Analyzed laboratory data reports to develop site soil and rock design parameters and assisted in the preparation for geotechnical recommendations for foundation designs.
- Supervised the installation of standpipe piezometers in coal refuse and earthen dam. Performed construction monitoring and quality control duties during the piezometer installation.

MINE REFUSE DISPOSAL/TAILING IMPOUNDMENTS

IP Harmar Holding, LLC – Harmar Slurry Impoundment; Allegheny County, PA; 2018 to Present Certifying Engineer, Performed H&H calculation for of an existing slurry impoundment to obtain a low hazard classification for post-abandonment structure. The abandonment plan consisted of leaving a remnant pond in place with a contributory area of approximately 103 acres with a low-flow outlet system.

FirstEnergy Generation, LLC – Hatfield CCB Landfill Property Ash Slide Remediation; Greene Count, Pennsylvania 2019. Project Engineer responsible for remediation and restoration associated with cleanup and stabilization of an Ash Slide with coordination with PADEP Bureaus of Residual Waste, Water Quality Management, and Waterway and Wetlands. Responsibilities included designing an engineered slope design and performing slope stability analysis, sampling and analysis of the ash for property characterization, construction support and Construction Certification Report. Was certificating engineer

for the Slope Stabilization Plan.

Slope Stability, Major Mine Complex – Greene County – PA Performed seepage and slope stability analyses on proposed slurry impoundments, as well as embankment drainage structures and surface drainage structures (i.e. channels, culverts and diversion ditches) for erosion and sedimentation control plans. Assisted in the preparation of regulatory permit application documents.

Mine Subsidence Evaluations and Subsidence Control Plans – Mining Client, AL. Assisted in preparing subsidence control plans with longwall mining operations in Alabama. Also assisted with engineering evaluations for past and planned underground mining beneath major dams, railroads, electrical towers and intervening transmission lines, deeply buried pipelines, bridges, and commercial and residential structures.

TETRA TECH

Matthew T. Ridgway, PE
Civil Engineer V

EXPERIENCE SUMMARY

Mr. Ridgway has diverse experience assisting clients with management, project management, engineering and managing the design and construction of complex projects. He has a proven history as a geotechnical engineer performing and overseeing tasks including preliminary site investigations, engineering analysis and design and construction oversight while maintaining cost-savings initiatives. Mr. Ridgway is an effective communicator and has effectively overseen and managed several projects with multiple stakeholders who share different interest. He successfully deals with complex issues in a highly stressful and ever-changing environments. Mr. Ridgway has worked in a wide variety of both public and private sector projects and is able to use this diversity of experience to provide new and creative solutions to complex problems. Mr. Ridgway will ensure that project teams have the resources and support needed to not only meet but exceed expectations

RELEVANT EXPERIENCE

EARTH RETENTION, SLIDE INVESTIGATION AND MITIGATION

Project Engineer; Slide Mitigation; Confidential Client; West Virginia. Performed investigation on an active slide along an active railway. Completed stability analyses for repair recommendations.

Project Engineer; Bridge Failure Investigation; Pennsylvania DOT; Pennsylvania. Managed and performed the installation process for multiple instruments installed as part of an investigation into the failure of an adjacent structure. Instrumentation installed includes piezometers, in-place inclinometers, multi-point borehole extensometers and integrated data loggers.

Project Manager; Slip Repair; Confidential Client; Pennsylvania. Conducted the field investigation into the location and cause of a 80 foot tall slope failure adjacent to a stream in north-central Pennsylvania. Performed stability analyses and prepared construction drawings for mitigation and repair.

Project Manager; Slip Repair; Confidential Client; Pennsylvania Completed field investigation and prepared permits, conducted stability analysis and prepared construction drawings for a 70 foot high slope failure adjacent to a stream in northeastern Pennsylvania

Project Engineer; Pipeline Slope Failure Remediation; Confidential Clients; Pennsylvania and West Virginia. Conducted over 30 field evaluations and investigations of slope failures along pipeline right of ways and on well pad sites. On selected sites conducted stability analysis and oversaw field repairs.

Project Engineer; Reinforced Steepened Slope; West Virginia Department of Highways; West Virginia. Performed design and stability analysis for a fifty-foot-tall 1500 foot long reinforced steepened slope.

Project Manager; Slip Repair; Confidential Client; Pennsylvania Completed field investigation and prepared permits, conducted stability analysis and prepared construction drawings for a 20 foot high slope failure caused by stream erosion of the toe in northeastern Pennsylvania. .

Project Manager; High Wall Stability; Confidential Client; Pennsylvania Performed field investigation of existing bedrock to create a 50 foot tall highwall adjacent to a property boundary in Williamsport, Pennsylvania. Design plans included a falling rock retention system.

Project Manager; Slip Repair; Confidential Client; Pennsylvania Conducted the field investigation into the location and cause of a 40 foot tall slope failure in Washington Pennsylvania. Performed stability analyses and prepared construction drawings for mitigation and repair.

EDUCATION

BS, Civil Engineering,
West Virginia University, 2013

BS, Mining Engineering,
West Virginia University, 2013

AREA OF EXPERTISE

Civil/Geotechnical Engineering

Instrumentation

Mine Site Reclamation

Slope Stability

Deep Foundation

Land/Site Development

Forensic Investigation

Geostructures

LICENSE

Professional Engineer
(CO, MD, PA, VA, WV and WY)

OFFICE

Morgantown, WV

YEARS OF EXPERIENCE

7

YEARS WITHIN FIRM

1

CONTACT

matthew.ridgway@tetratech.com

Project Engineer; Reinforced Steepened Slope; West Virginia Department of Highways; West Virginia. Performed design and stability analysis for a fifty-foot-tall 1500 foot long reinforced steepened slope.

Project Manager; Retaining Wall Design; West Virginia Department of Highways; West Virginia. Managed the geotechnical investigation and design for this site along in Harrison County, West Virginia. Investigation included locating borings on an active slip for the purposes of designing a retaining wall of approximately 15 feet in height and 40 feet in length. Calculated forces on the wall and analyzed for design and selection of beams for a pile and lagging wall using LPILE. Complete stability analysis using Slope/W and RocScience Slide software.

Project Manager; Retaining Wall and Fill Instrumentation; Yeager Airport; West Virginia. Managed and performed the installation process for several instruments in a large fill area that included two retention walls. Instrumentation installed included piezometers, shape arrays, strain gauges, strand meters, multi-point borehole extensometers, data loggers and threads.

Project Manager; Retaining Wall Design; West Virginia Department of Highways; West Virginia. Managed the geotechnical investigation and design for this site along in Harrison County, West Virginia. Investigation included locating borings on an active slip for the purposes of designing a retaining wall of approximately 25 feet in height and 30 feet in length. Calculated forces on the wall and analyzed for design and selection of beams for a pile and lagging wall using LPILE. Complete stability analysis using Slope/W and RocScience Slide software.

Project Engineer; Abutment Wall Design; West Virginia Department of Highways; West Virginia. Performed calculations for forces on bridge abutments walls and designed abutment walls and foundations.

Project Engineer; Slope Failure Investigation; Confidential Clients; West Virginia. Worked with Expert Witness to conduct field and forensic investigations of 5 slope failures in West Virginia, including Yeager Airport's 210' high fill slope. Conducted all field investigation and performed reverse engineering to determine cause and location of failure. Provided the Expert Witness with data for testimony.

Project Manager – Retaining Wall Design; City of Morgantown; West Virginia Managed the geotechnical investigation and design for this site along in the city of Morgantown, West Virginia. Investigation included locating borings on an active slip for the purposes of designing a retaining wall of approximately 20 feet in height and 155 feet in length. Calculated forces on the wall and analyzed for design and selection of beams for a pile and lagging wall using LPILE. Complete stability analysis using Slope/W and RocScience Slide software.

Project Manager; Camden Street Storage Tunnel, Clark Construction; Maryland. Managed and performed the installation process for multiple piezometers and multi-point borehole extensometers for a utility storm drainage tunnel.

Project Manager; Retaining Wall Design; Allegheny County; Maryland. Managed the geotechnical investigation and design for this site along in Allegheny County, Maryland. Investigation included locating borings on an active slip of coal refuse for the purposes of designing a retaining wall of approximately 15 feet in height and 176 feet in length. Calculated forces on the wall and analyzed for design and selection of beams for a pile and lagging wall using LPILE. Complete stability analysis using Slope/W and RocScience Slide software.

Project Manager; Retaining Wall Failure, Confidential Client; West Virginia. Managed and performed the installation process for the investigation into a retention wall failure including the installation of multiple in-place inclinometers.

Project Engineer; Retention Wall; Confidential Client; Ohio. Oversaw the re-design and construction of a pile and lagging retention wall on a country road in Monroe County, Ohio.

Project Manager; Retaining Wall Design; Fairmont Regional Medical Center; West Virginia. Managed the geotechnical investigation and design for this site in the city of Fairmont. West Virginia. This project consisted of the selection and design of a segmented block retaining as well as the foundation recommendations for the wall.

TETRA TECH

Katherine A. Pugh
Environmental Scientist

EXPERIENCE SUMMARY

Ms. Pugh is experienced in the permitting and environmental compliance field, including five years working for major coal mine operators. In addition, she has experience in wetland delineation and field biology. Her experience includes both actual performance of work and project management.

Ms. Pugh's expertise encompasses all aspects of environmental permitting including SMCRA, Clean Water Act 401/402/404 and Clean Air Act permitting. She also has extensive experience with endangered plant and animal species coordination specifically Indiana Brown Bat and development and installation of mitigation projects. In addition Ms. Pugh has worked extensively in the environmental compliance field. Ms. Pugh has extensive experience in water sampling in both field and industrial settings. Her experience includes SPCC and Stormwater development and compliance, TRI reporting, NPDES compliance including water treatment, sampling and reporting and mitigation monitoring and reporting.

RELEVANT EXPERIENCE

NPDES Permitting Support *NRG Homer City Generating Station*: Provided support to the Homer City Generating station for the renewal of their NPDES permit. Included coordination and meetings with PADEP along with regular meetings with the station to ensure compliance.

Permitting Support *Gladden AMD Treatment Plant:* Responsible for obtaining permits for all aspects of the *design*, build, and operation of a water treatment facility to restore eight miles of impacted stream in Allegheny County Pennsylvania. The $13 M project will lower an existing discharging mine pool, treat the Acid Mine Drainage utilizing hydrogen peroxide as an oxidizing agent, and pump the precipitated sludge into underground mine working for disposal.

Sample Support and Data Management *Technology Laboratory, Rare Earth Elements Associated with Coal and Coal By-Products, Appalachian Coal Basins*: Organizing sample collection, packaging and shipment to lab and Data Management of sample information for a federal project to identify and quantify the existence high levels of rare earth elements in coal seam and associated geology in the Northern Appalachia and Central Appalachia coal basins.

Sample Support and Data Management *Technology Laboratory, Rare Earth Elements Associated with Coal and Coal By-Products, Rocky Coal Basins*: Organizing sample collection, packaging and shipment to lab and Data Management of sample information for a federal project to identify and quantify the existence high levels of rare earth elements in coal seam and associated geology in the Rocky Mountain coal basins.

Permitting Support *Various Oil and Gas Pipeline Projects* Have assisted multiple pipeline projects in various permitting roles. Have assisted in different roles in the permitting process such as stormwater permits and LEDPA analysis. Have worked on both state and local permitting actions.

Field Reconnaissance Leader *Maryland Department of the Environment, Scenic Rail Road Subsidence Evaluation*. Lead the field reconnaissance in subsidence the identification along an undermined section of the Maryland Scenic Railroad in Frostburg Maryland.

EDUCATION

B.S., Environmental Biology, 2009, Heidelberg University

B.S. Water Resource Management, Heidelberg University

AREA OF EXPERTISE

Environmental Permitting and Compliance

REGISTRATIONS/ AFFILIATIONS

N/A

TRAINING/CERTIFICATIONS

US Army Corp of Engineers Wetland Delineation Training

Ohio EPA Qualitative Habitat Evaluation Index (QHEI) Level II Certification

Ohio Department of Natural Resources Wildlife Collectors Permit

Pennsylvanian DEP Wildlife Collectors Permit

OFFICE

St. Clairsville, OH

YEARS OF EXPERIENCE

10

Sampling Lead, *AEP, ELG Water Balance Monitoring* Responsible for developing and executing sampling plans for multiple power plants. The sampling plan captures water quality at all stages of the power generation process and all sampling events are performed in one day to allow for a representative snap shot of the plant's operations.

Permit and Compliance Manager, AK Coal Resources subsidiary of AK Steel Holdings located in Somerset County Pennsylvania. Was in charge of obtaining all necessary permits for opening and operation of an underground coal mining complex. Also was responsible for all environmental compliance requirements for the operation.

Project Manager; SPCC Plan Development. In charge of writing, updating SPCC plans for multiple active operations.

Project Manager; TRI Reporting, Responsible for collecting and compiling information to be submitted for the EPA's annual TRI report for multiple active operations.

Project Manager; Permitting. Responsible for all aspects of permitting for multiple coal mines and associated preparation plant. Agency coordination included PADEP Bureau of District Mining Operations

Project Manager; CWA 402 Compliance. Responsible for compliance of several CWA 402 permits which included water treatment and reporting. PADEP Bureau of Clean Water.

Project Manager; Coal Innovations Refuse. Responsible for all aspects of overseeing design and permitting of both the existing coarse coal refuse disposal site and a proposed site. PADEP Bureau of District Mining Operations, PADEP Bureau of Clean Water, Army Corps of Engineers, US Fish and Wildlife Service.

Biologic Coordinator, Murray Energy Corporation Responsible for all permitting, monitoring and compliance of all biological related functions for all coal mining, processing and waste disposal operations for a national company. These functions included CWA 401/402/404 permitting, air permitting, endangered species coordination specifically Indiana Brown Bat, water quality treatment SPCC and Stormwater development and compliance

Project Scientist; SPCC Plan Development. In charge of writing, updating SPCC plans for multiple active operations.

Project Manager; TRI Reporting, Responsible for collecting and compiling information to be submitted for the EPA's annual TRI report for multiple active operations.

Project Scientist; Andelex Mine Drainage Sulfate Reducing Bioreactor, KenAmerican Resources, McLean County KY. Worked as project scientist to install a Sulfate Reducing Bioreactor to treat mine drainage. Oversaw the sampling and compliance of the system.

Project Scientist: Century Mine Wetland and Stream Mitigation, American Energy Company, Belmont County, Ohio. Worked on overseeing compliance and remediation of a large wetland and stream mitigation site. Included coordination with both the Army Corps of Engineers and Ohio EPA

Project Manager; 401/404 Permitting; Responsible for all aspects of 401/404 permitting for Murray Energy in multiple states for underground mines, surface mines and refuse disposal sites. Responsibilities included delineations and biological sampling, preparation and submittal of permits, agency coordination, mitigation and compliance. Agency coordination included Army Corps of Engineers, Ohio EPA and US Fish and Wildlife Service.

Project Manager; AMEI Mining Permit, AmericanMountaineer Energy, Harrison County, WV. Responsible for coordinating all aspects of permitting for a greenfield longwall coal mine, prep plant and refuse disposal area. Responsibilities included coordination of SMCRA, 401/402/404 and Air permits along with development of extensive mitigation plan and agency coordination. Agency Coordination included WVDEP, Army Corps of Engineers and US Fish and Wildlife Service.

Project Scientist; Casey Run, Ohio Valley Coal, Belmont County Ohio. Responsible for coordinating all aspects of permitting refuse disposal area in an exception value watershed. Responsibilities included coordination of SMCRA, 401/402/404 permits along with development of extensive mitigation plan and agency coordination. Agency coordination included ODNR, Army Corps of Engineers, US Fish and Wildlife Service, Ohio EPA and USEPA.

OTHER INFORMATION (EX.: PUBLICATION(S), AWARD(S)…)

Past Projects

TETRA TECH

Royal Coal Project
Mine Drainage and Reclamation Design

CLIENT

West Virginia DEP

Office of Special Reclamation

LOCATION

Fayette County, WV

DURATION

2015 - 2017

COST

$249,100

PROJECT TEAM

Terry Smith, PE - Project Manager
Chris Lewis, PE – Sr Project Engineer
Farley Wood, PE – Project Manager
Joseph Herbstritt
Keith Lutz

REFERENCE

Nathan Parks, Regional Engineer
WV DEP - OSR
304-574-4465
Nathan.l.parks@wv.gov

KEY FEATURES

- Mine drainage treatment design
- Demolition and reclamation design
- Exploratory drilling
- Site with hillside instability history

PROJECT DESCRIPTION

Under a contract with West Virginia DEP Office of Special Reclamation, Tetra Tech performed a field evaluation and prepared design drawings and specifications for collection and treatment of abandoned mine drainage at the Royal Coal Company site located near Thurmond, West Virginia. The project area consists of two sites; the lower site which sits along the New River, and adjacent to the New River Gorge National Park and was the location of the coal preparations plant, rail loadout, coarse refuse disposal, and coal slurry disposal ponds. The upper site consists of coarse refuse disposal site. The two sites are connected by belt conveyor within a tunnel that transferred the coarse refuse from the coal preparation plant to a coarse refuse disposal site at the top of the mountain. Drainage from the lower site that is impacted by filtration through the coarse and fine refuse will be collected and treated to achieve compliance with NPDES Permit effluent limitations.

As part of the preliminary evaluation, Tetra Tech performed the following tasks: water quality characterization and flow data analysis, aerial mapping and field surveying, subsurface investigation, and a slope stability analysis. Topographic relief of the site ranges greatly, from a maximum elevation of approximately 2,330 feet to around 1,000 feet along a railroad corridor in the lower area. The site includes areas of past hillside instability dating back to 1972 when the coal preparation plant was constructed. A slope stability analysis was performed to determine areas within the permit boundary that are suitable for excavation of ponds and construction of foundations and to identify

any borrow material suitable for establishing vegetative cover over exposed coal refuse. A total of four (4) soil borings and twenty (20) test pits were completed as part of the subsurface investigation. Tetra Tech planned, supervised, and documented the subsurface exploration at the site and prepared a geotechnical report, which summarized the findings and recommendations of the slope stability analysis.

Base topography maps showing existing conditions were developed from the aerial mapping and field surveys. Tetra Tech developed grading plans, erosion and sedimentation control plans, demolition plans for remaining structures and site plans of the proposed collection and treatment system. Tetra Tech designed a gravity collection systems to route mine impacted waters to the proposed AMD treatment system and to segregate uncontaminated stormwater runoff. The AMD treatment system consists of neutralization and precipitation of metals using hydrated lime with settling ponds and a sludge disposal pond.

TETRA TECH

Frush Enterprises

Mine Reclamation and Mine Drainage Treatment

CLIENT

West Virginia Department of Environmental Protection

LOCATION

Harrison County, West Virginia

DURATION

2015 - Ongoing

COST

$125,000

PROJECT TEAM

Tom Gray, PE – Sr. Project Manager

Greg Hynes, PE – Project Manager

Terry Smith, PE – Project Engineer

Keith Lutz – CAD designer

REFERENCES

David McCoy
Senior Engineer
Office of Special Reclamation
(304) 457-4588 ext 43218
David.b.mccoy@wv.gov

KEY FEATURES

- Mine Reclamation of Bond Forfeiture Site
- Mine Drainage Conveyance and Treatment
- Slope Stability Analysis

PROJECT DESCRIPTION

Tetra Tech was awarded a design engineering contract for reclamation of the former Frush Enterprises mine site, a bond forfeiture surface mine located in Harrison County, West Virginia. The project area consists of two surface mined areas. Site A is a former surface mine site of approximately 34 permitted acres on the northern end of the project area. Underground mining occurred at Site A prior to surface mining. Site B is a former surface mine of approximately 42 permitted acres located at the southern end of the project area. The project objective is to collect acid mine drainage (AMD) from surface mined areas and from abandoned underground mine workings and then treat the AMD to meet water quality standards prior to discharge into receiving streams. A combination of passive and active treatment systems are included in the design in order to meet the effluent quality limitations. Aeration of the mine water using oxic limestone channels followed by a sedimentation pond and then a polishing constructed wetland was employed at two locations. For the largest underground mine discharge, water is treated by a mechanical aeration system followed by a sedimentation pond. In addition to collection and treatment of AMD, stabilization of two slope failures is needed. A slope stability analysis was performed to assess the cause of each of the slope failures and slope stabilization measures were designed for the areas where failures occurred.

TETRA TECH

Buffalo Coal Permits – Mount Storm WV
AMD Collection and Treatment Plant Design

CLIENT

West Virginia Land Stewardship Corporation

LOCATION

Mount Storm, West Virginia

DURATION

2017 - 2020

COST

$400,000

PROJECT TEAM

Tom Gray – Sr. Project Manager

Greg Hynes – Project Manager

Terry Smith, John Dietz, Mark Sustarsic – Senior Engineers

Matt Pinkerton – Design Engineer

REFERENCES

Ken Ellison, Manager
WVLSC
Email: kellison@wvlsc.org

KEY FEATURES

- Site Characterization
- AMD Sampling and Flow Measurement
- Design of AMD Collection System
- Design of Active Treatment System

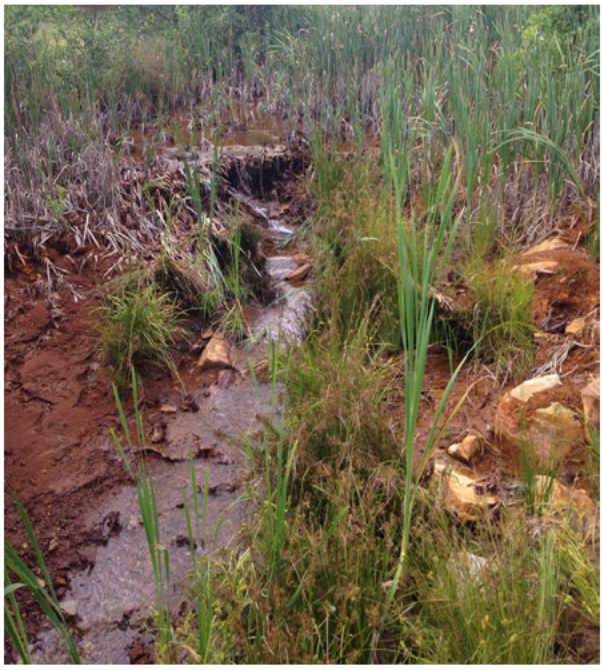
PROJECT DESCRIPTION

Tetra Tech was awarded a design engineering contract by the West Virginia Land Stewardship Corporation (WVLSC) for study and design of a mine water collection and treatment system for the Buffalo Coal Permit sites, a series of 5 bond forfeiture sites located near the Mount Storm Lake and power plant extending along a 6 mile long project area along the boundary of Tucker and Grant Counties. Acid mine drainage from the sites is partially treated with individual systems of lime or caustic soda. The systems are influenced by uncontrolled surface water inflows and in most cases have not capture all the AMD discharges from the individual sites that make their way into the Stony River. The proposed AMD collection system will convey discharges form each site to a single treatment plant.

The objective of this project is to design a treatment system to provide effluent meeting the NPDES water quality discharge standards for the site. Site investigations were performed included field reconnaissance, surveying, water sampling and laboratory testing, and flow measurement. From these investigations a basis for the design report and preliminary designs were prepared for a collection and active treatment system. Two locations were to be evaluated for siting a treatment facility, however a third site was introduced for consideration and a site nearby was ultimately selected. When constructed, the treatment system is to be operated by the WVDEP. Due to the levels of Aluminum and Iron known to be present in the AMD, an active treatment system with hydrated lime application, polymer addition, and settling in triplex rectangular clarifiers prior to discharge was selected.

Site reconnaissance documented numerous seeps and mine water discharges, from which a sampling and flow monitoring plan was developed. Flow data provided by WVDEP was statistically evaluated and selected seeps were field measured, sampled, and tested. The water sampling test results and data were combined with statistical analysis to determine proper values for use as a basis of design taking into consideration the planned diversion of surface runoff by comparing past rainfall data to peak outflows on the same dates.

The preliminary collection system designed by Tetra Tech includes seep collectors, underdrains, conveyance pipes, six pumping stations, and numerous open limestone channels to convey AMD by gravity and pressure from the various sources to the anticipated treatment system location. Diversion ditches and grading is also required to eliminate impounded water and reduce the amount of surface water runoff entering the treatment system. During review of the preliminary design with the WVLSC and WVDEP, the design team concluded the clarifiers should be contained within a protective treatment structure due to the severe winter weather and heavy snowfall anticipated; the nearby municipality is called Mount Storm for a reason. The final active treatment design therefore includes three trains of reaction and flocculation basins followed by rectangular concrete clarifiers. Effluent monitoring and automated chemical feed adjustment, sludge removal and pumping, and primary treatment using hydrated lime slurry with silo storage and polymer addition for enhanced settling were also provided.



TETRA TECH

LaRosa Fuels Inc.
Mine Drainage Study and Treatment Design

CLIENT

West Virginia Land Stewardship Corporation

LOCATION

Jordan, West Virginia

DURATION

October 2016 - Present

COST

$136,000

PROJECT TEAM

Tom Gray, PE – Sr. Project Manager

Greg Hynes, PE – Project Manager

Terry Smith, PE – Senior Engineer

REFERENCE

Ken Ellison, Manager
WVLSC
Morgantown, WV
Email: kellison@wvlsc.org

KEY FEATURES

- Site Characterization
- AMD Sampling and Flow Measurement
- Design of AMD Collection System
- Design of Active Treatment System

PROJECT DESCRIPTION

Tetra Tech was recently awarded a design engineering contract by the West Virginia Land Stewardship Corporation (WVLSC) for study and design of a mine water collection and treatment system for the LaRosa Fuels mine site, a reclaimed strip mine site. The project is the initial pilot project for the newly formed WVLSC, which was created to assist the Office of Special Reclamation of the West Virginia Department of Environmental Protection (WVDEP) in meeting its reclamation obligations and maximizing redevelopment potential for reclaimed lands. The LaRosa site is a 'bond forfeiture' site located near Jordan, WV along the boundary of Marion and Monongalia Counties. Acid mine drainage from the site flows untreated into the nearby Monongahela River in violation of NPDES permit requirements, resulting in the revocation of the site permit and forfeiture of its bond. The LaRosa Fuels mine was a surface mine of the Sewickley coal, however encroachments onto adjacent Sewickley and Pittsburgh coal deep mines also occurred. The proposed AMD treatment system was therefore required to address discharges associated with both seams.

The objective of this project is to design a treatment system to provide effluent meeting the existing NPDES water quality discharge standards for the site. Site investigations were performed included field reconnaissance, surveying, water sampling and laboratory testing, and flow measurement. From these investigations a basis for the design report and preliminary designs were prepared for a collection and active treatment system. When constructed, the treatment system is to be operated by the WVDEP. Due to the high levels of aluminum,

manganese, and iron present in the AMD, an active treatment system with lime application, flow equalization, settling ponds, and sludge settling was anticipated.

Site reconnaissance documented numerous seeps and mine water discharges, from which a sampling and flow monitoring plan was developed. Flows were field measured at each identified seep or discharge and samples collected. A field flow velocity sensor and recorder was installed in the discharge channel of the largest mine water contributor at the site, which was an abandoned open mine portal. The water sampling test results and flow measurements were combined with statistical analysis to determine proper values for use as a basis of design.

The preliminary collection system designed by Tetra Tech includes seep collectors, underdrains, conveyance pipes, and open limestone channels to convey AMD by gravity from the various sources to the anticipated treatment system location. Diversion ditches and grading is also required to eliminate impounded water and reduce the amount of surface water runoff entering the treatment system. During review of the preliminary design with the WVLSC and WVDEP, the design team concluded the initially anticipated lime treatment system was appropriate for the water chemistry but a slightly more rigorous treatment system would be more compatible with the flow observed and most importantly, would benefit from the sites proximity to other WVDEP treatment facilities. The final active treatment design therefore includes a concrete flocculation basin and clarifier, effluent monitoring and automated chemical feed adjustment, sludge removal and pumping, and primary treatment using lime slurry that is readily available, in addition to ponds for flow equalization, settling, and possible polishing.

Tetra Tech is currently working on the final design, with project documents including construction plans, technical specifications, final report, bid schedules, and construction costs due in the spring of 2017.

Wingfield Pines Inflow Reconstruction Project

KEY FEATURES

- Design Build Project
- Repair of subsidence induced failure of AMD system
- In conjunction with PA DEP Bureau of Abandoned Mine Reclamation and Allegheny Land Trust (owner)

PROJECT DESCRIPTION

Tetra Tech provided project management and engineering services to prepare design plans, drawings, specification, and construct a bulkhead to stop the uncontrolled water discharge that developed at the Wingfield Pines Conservation area. This water had previously been the inflow of a passive treatment system prior to discharge to Chartiers Creek. This project will establish a new discharge point for the mine water and re-establish the inflow water to the passive treatment system.

ENGINEERING SERVICES

Project Planning and Management

Tetra Tech performed site reconnaissance to verify existing conditions, provided a plan to seal the existing discharge, and provided project and construction management services to contractors utilized to perform the work.

Mine Pool Monitoring and Modeling

Tetra Tech provided monitoring of the mine pool elevations from the monitoring well in Boyce Mayview Park, along with monitoring of the mine outflow at the current outflow. This information will be utilized to model the mine discharge

CLIENT

Allegheny Land Trust

LOCATION

Upper St. Clair Township, Allegheny County, Pennsylvania

DURATION

1.5 Years

COST

$700,000

PROJECT TEAM

Farley Wood – Project Manager

Tom Gray – Program Manager

Katie Pugh- Project Scientist

REFERENCES

Emilie Rzotkiewicz

Vice President of Land Resources

Allegheny Land Trust

erotkiewcz@alleghenylandtrust.org

and determine the configuration of the normal and overflow discharge structures to be installed.

Engineering Design and Permitting

Tetra Tech provided site development plans for the project, and preparation of the necessary permit applications to perform the required repair work. Howard Concrete Pumping Company Inc. (Howard) was chosen as the contactor for the bulkhead installation. The drilling of rock cores will be conducted at the site of the proposed bulkhead construction to insure suitable conditions for construction. The ground conditions were evaluated to determine final design.

Lowering of Mine Pool

Tetra Tech designed and managed installation of boreholes and pumps into the existing underground mine to lower the elevation of the mine pool to the point that water was no longer discharging to Chartiers Creek at the northeast corner of the property.

Mine Bulkhead Installation

Tetra Tech designed and managed the installation of the bulkhead that prevented the flow of water to the current blowout location. The bulkhead was constructed in the two underground mine entries reporting to the surface at the northeast corner of the property. The concrete for the bulkhead was injected from surface into the mine entries; the concrete was allowed to cure; then pressure grouted to insure a secure seal with the roof, and ribs.

Gladden AMD Treatment Plant Project

KEY FEATURES

- Design Build Project
- Initial Median Flow 750 gpm of 100 PPM Iron Water, pH 6
- Final Median Flow 750 gpm of 0.9 PPM Iron Water, pH 7.5
- A DEP Bureau of Abandoned Mine Reclamation in Conjunction with South Fayette Conservation Group

PROJECT DESCRIPTION

Tetra Tech provided project management and engineering services to prepare design plans, drawings, specification, build, and operate the treatment facility for the Gladden Acid Mine Discharge for a one-year period. This project has restored the high quality of Millers Run and Chartiers Creek. This work supports the Commonwealth of Pennsylania's goal of abating legacy mine drainage improving water use and function.

Project Planning and Management

Tetra Tech performed site reconnaissance to verify existing conditions, and provided project and construction management services to contractors utilized to perform the work.

Mine Pool Monitoring and Modeling

Tetra Tech provided monitoring of multiple hydrologically connected mines that were mined in the 1800's through the early 1900's along with monitoring of the mine outflow at the current outflow. This information was utilized to model the mine discharge

CLIENT

South Fayette Conservation Group

LOCATION

South Fayette Township, Allegheny County, Pennsylvania

DURATION

15 Months

COST

$13,500,000

PROJECT TEAM

Farley Wood – Project Manager

Tom Gray – Program Manager

Michael Kearns - Project Engineer

REFERENCES

Stephen Frank, P.E.

President of South Fayette Conservation Group

southfayetteconservation.com

Engineering Design and Permitting

Tetra Tech provided site development plans for the project, and preparation of the necessary permit applications to perform the required construction. Chapman construction was chosen as the contractor for the treatment plant construction and John Kosky Contracting was chosen for the site civil construction.

Lowering of Mine Pool

Tetra Tech designed and managed installation of boreholes and pumps into the existing underground mine to lower the elevation of the mine pool to the point that water was no longer discharging to Millers Run.

TETRA TECH

Gas Well Pad Landslide Remediation

Client

Confidential Client

Location

Hannibal, Ohio

Duration

8 Months

Cost

$75,000

Project Team

Michael S. Kearns, P.E., M.S. – Project Engineer

References

Confidential Client

KEY FEATURES

- Subsidence Investigation
- Exploratory Drilling
- Develop Construction Remediation Plans for Slip
- Environmental Permitting.
- Construction Management Services.

PROJECT DESCRIPTION

A major landslide occurred following the construction of an oil gas well pad near Hannibal, Monroe County, Ohio. The size of the landslide was approximately 200 feet in height and approximately 700 feet in length. The slip area consisted of a very high content of clay material and extended to three branches of a perennial, intermittent and ephemeral streams.

A geotechnical investigation was performed which included three bore holes which extended approximately 250 feet within the slip area. Several issues were identified within the fill area located below the pad site:

- Issue 1 – Seven perched aquifers were identified within the fill area that had been covered by the fill operations.
- Issue 2 – Topsoil and vegetation were identified within the fill which had not been removed prior to the backfilling operation.
- Issue 3 – The resulting slip area consisted of fully saturated clay material and incorporated trees and vegetation in the lower part of the slip area.

Soil sampling was performed during the geotechnical investigation phase of the project. Soil testing was performed to attain design parameters of the existing soils. Slope analyses were conducted in order attain a minimum static factor of safety of 1.5. for the final designed slopes. The final designed slopes consisted of the following:

- Item 1 – Final configuration of the slopes were 3:1 slopes, with 25-foot benches every 50 feet.
- Item 2 – A rock-toe buttress with toe key were included within the design of the final configuration.
- Item 3 – Underdrains and piping system were designed to be installed at the location of the seven (7) perch aquifer locations. One of the perched aquifers had a discharge of 70 gpm.
- Item 4 – Fill was compacted in eight (8) inch lifts to 95% Standard Proctor.

In order to attain a more desirable soil blend, shales located adjacent to the existing pad site were excavated and blended with the existing clay material during the backfilling operation.

TETRA TECH

Slide Mitigations
Various Clients, PA, OH and WV

Client

Confidential Client

Location

PA, OH and WV

Duration

2017 to Present

Cost

$ varies per project

KEY FEATURES

- Slide Mitigations (Engineering Design and Construction Oversight) - PA, OH and WV
- Subsurface Explorations
- Stability Assessments
- Plans and/or Memos for Engineered Repaired plans
- Desktop Reviews of Public domain Records (historic and current)

PROJECT DESCRIPTION

Tetra Tech has completed multiple slide mitigation engineering plans and assessments for various clients throughout Pennsylvania, Ohio, and West Virginia. Tetra Tech staff performs desktop reviews of Public Domain Records (historic and current) prior to onsite visits to evaluate the current conditions to support in determining the potential cause. During site visits our staff will take necessary samples or will initiate a more robust exploratory program if deemed necessary. Our staff includes experts in slope stability and slide mitigation efforts, with experience in engineering and design of slide mitigation and construction oversight.

Additionally, Tetra Tech is well-versed in mitigation techniques such as using special ground cover, erosion control mat, (ECM/ECB), granular drains & stabilization trenches, rock / riprap berms and buttresses, Geocells – sloped or Stacked, Gabion Baskets and Reno Mattresses, Articulated Concrete Block (ACB), Geosynthetic-Reinforcement, Soil Nail Reinforcement, Anchored Reaction Blocks, In-Situ Ground Improvements (e.g. Stone Columns & Geopiers), and Soldier Pile (driven or drilled) & Timber Lagging

Retaining Walls. Additionally, Tetra Tech's experience includes slope stability analyses and the design of the most practical stabilization methods to determine the best approach to move forward.

Kempton Sludge Disposal Line

CLIENT

Maryland Department of General Services

LOCATION

Garrett County, Maryland

DURATION

2 Years

COST

$497,500

PROJECT TEAM

Farley Wood – Project Manager

Katie Pugh- Project Scientist

REFERENCES

Tim Miller

Regulatory and Compliance Engineer

Maryland Department of the Environment

tim.miller@maryland.gov

KEY FEATURES

- Design Build Project
- Construction of a Sludge Disposal Injection System into Abandoned Mine workings
- In conjunction with Maryland Department of the Environmental Abandoned Mine Land Division

PROJECT DESCRIPTION

Tetra Tech provided project management and engineering services to prepare design plans, drawings, specification, and construct a fines removal and sludge delivery line to pump sludge from the existing Kempton Treatment System into underground mine workings.

ENGINEERING SERVICES

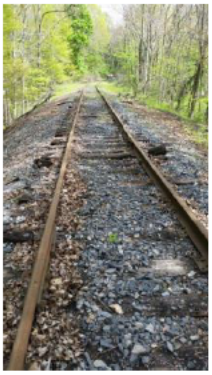
Project Planning and Management

Tetra Tech performed site reconnaissance to verify existing conditions, provided a plan a route for the sludge line, designed pumping and piping system, located boreholes for injection of sludge into the mine and provided project and construction management services to contractors utilized to perform the work.

Engineering Design and Permitting

Tetra Tech provided site development plans for the project, detailed construction drawings, and preparation of the necessary permit applications to perform the required repair work. The permit applications included state construction stormwater and a joint waterways permit.

Scenic Railroad Mine Subsidence Evaluation



FEATURES

- Subsidence Investigation
- Exploratory Drilling
- Categorized Areas by Subsidence Risk
- Developed Conceptual Mitigation Plan

PROJECT DESCRIPTION

The first two miles of the Western Maryland Scenic Railroad from Frostburg to Cumberland is undermined by one coal seam and partially by two coal seams. Mining is shallow and signs of subsidence have been seen by Maryland Department of the Environment (MDE) staff. Tetra Tech investigated the probabilities of subsidence and prepared a preliminary remediation plan and cost estimate.

CLIENT

Maryland Department of the Environment – Bureau of Mines

LOCATION

Frostburg, MD

DURATION

3 Months

COST

$120,000

PROJECT TEAM

Thomas Gray, P.E. – Sr Project Manager
Farley Wood, P.E. – Project Manager
Jim Goroncy, P.E. – Project Engineer
Katie Pugh – Environmental Scientist

REFERENCE

Mr. Mike Garner
MDE, Bureau of Mines
301-689-1460
mgarner@allconet.org

Tetra Tech reviewed in detail the mine maps and categorized mining zones into one of the three general categories, as follows:

- Category 1 - Subsidence probably occurred during or soon after mining.
- Category 2 - Support area where subsidence is unlikely.
- Category 3 - Area where subsidence may occur in the future if it has not already occurred.

Since mining and the available mine maps were old, exploratory drilling was used to increase our site knowledge and to improve our confidence in predicting the future subsidence potential.

A field reconnaissance of the study area was performed by Tetra Tech field staff experienced in identifying subsidence features. The reconnaissance was performed along the railroad and on both sides for a minimum of 50 feet. Potential subsidence features such as cracks, depressions, or landslides were field-located using GPS technology, marked with flagging, and photographed.

An elevation profile was generated for the portion of the railroad under investigation. The profile was used to identify evidence of subsidence based on unusual or subtle changes in railroad grade elevation. An area of subsidence may be evidenced by a drop in elevation that is not consistent with the local topography, especially if it correlates with the location of mine workings under the railroad bed.

Based on the results of the mine map review, the field reconnaissance and the profile survey, test borings were located and drilled near the railroad tracks to determine subsurface conditions down to the base of the Big Vein Coal Seam. A borehole camera was lowered into each boring to provide a more detailed assessment of subsurface conditions (such as void locations and thickness) where mining had occurred.

Tetra Tech utilized the information obtained in the investigation and provided the MDE with a written report of findings and recommendations. Tetra Tech categorized all of the railroad's line that lies over mined area as low, medium, or high risk subsidence potential. Remedial options were discussed and a recommendation of a mitigation technique was provided.

TETRA TECH

Blacklick Creek
Mine Drainage Treatment and Reclamation

CLIENT

Pennsylvania Department of Environmental Protection

LOCATION

Indiana and Cambria Counties, Pennsylvania

DURATION

October 2014 to Present

COST

$523,687

PROJECT TEAM

Thomas Gray, PE – Sr. Project Manager
Heather Trexler, PG – Project Manager
Terry Smith, PE
John Casey, PE
Eric Perry, PhD
Joseph Herbstritt
Keith Lutz

REFERENCES

Scott Poborsky, Geologic Specialist
PADEP-BAMR
814-472-1807
scpoborsky@pa.gov

KEY FEATURES

- Reclamation of abandoned mine sites
- Abatement of legacy mine drainage from multiple sources
- Closure of mine openings
- Subsidence potential
- Collection and analysis of mining, geologic and hydrologic data
- Mine drainage conveyance design
- Mine pool characterization and management
- Sludge disposal feasibility

PROJECT DESCRIPTION

Tetra Tech was awarded a design engineering contract for preliminary studies and reclamation of three of the largest discharges and greatest sources of acid mine drainage loading in the Blacklick Creek watershed, in Indiana and Cambria Counties, Pennsylvania. The scope of work included mine pool characterization and management, and collection and conveyance measures to reclaim and abate pollution from multiple abandoned underground mines. The work supports the Commonwealth of Pennsylvania's goals of abating legacy mine drainage and improving watershed use and function.

Mine Pool Evaluation

Tetra Tech established weirs and transducers for continual recording of mine-pool outflow from three mines; Wehrum, Vinton No.6 and Commercial No.16, that currently contribute pollution to Blacklick Creek. The discharge monitoring has collected one and half years of data, and is ongoing. Due to site conditions, flows from Vinton No.6 were estimated based on an analysis of similar adjacent mines and hydrogeologic settings. Design flow rates were established, accounting for seasonal variation, and extraction and conveyance systems from the three mines were designed based on the monitoring data. Tetra Tech also developed a mine pool management plan with

recommended mine pool operating water levels and treatment flow rates. The plan is based on the estimated mine-pool storage capacity and recharge rate. Storage volumes were derived from a detailed analysis of mine maps and hydrogeologic data.

Two other mines, Diamond Mines No.2 and No.3, were initially considered as a location for underground disposal of treatment sludge. A mine pool exists within these mines but no significant discharge had been located and PADEP was concerned about the addition of sludge to the mine pool. Tetra Tech conducted site evaluations including field searches for indicators of mine discharges, and also performed a pollution loading study for the Conemaugh River. The Conemaugh River flows adjacent to the southern and down-dip boundary of the Diamond Mine complex and was considered a potential discharge area for the Diamond mines. Tetra Tech established transects for flow and water quality data collection. The evaluation found no significant mine water discharges from the Diamond Mines.

Sludge Disposal Feasibility

This project also included assessing the underground sludge disposal capacity for three mines. Tetra Tech selected potential sludge injection locations within the Wehrum, Vinton No.1 and Diamond Mines based on estimated storage capacity derived from mine geometry, surface features, pipeline path from the mine water treatment plant and calculated operating life of the preferred injection location.

Subsidence Review

Tetra Tech evaluated underground mine subsidence hazard for two potential treatment plant locations. Detailed mine maps of the Wehrum Mine were reviewed to categorize the potential for subsidence based on review of mine workings, overburden thickness and stratigraphy. Tetra Tech prepared recommendations for siting and construction of treatment plant facilities over the mine workings.

Reclamation, Closure of Mine Openings

Tetra Tech designed abandonment plans for existing discharges from a shaft and boreholes from the Wehrum and Vinton No.6 mines. The shaft and boreholes are currently open to the mine works and discharge mine water under artesian conditions. Tetra Tech designed a grouting plan to close the mine openings. Three artesian boreholes are within the Blacklick Creek stream channel. The reclamation plan included specifications for a cofferdam to work in dry conditions and minimize effects on the stream during borehole sealing.

Tetra Tech prepared a regrading and revegetation plan for an abandoned coal refuse pile with the assumption that most of the coal refuse material will be taken off site.

Permitting

Federal, state and local permits and clearance with PA Historical and Museum Commission are in preparation for the planned extraction, conveyance and reclamation sites.

TETRA TECH

Dolph Mine Fire Project

KEY FEATURES

- Exploratory Drilling for Refuse/Mine Fire Investigation
- Mitigation Planning
- Conceptual Extinguishment Plan

PROJECT DESCRIPTION

An abandoned refuse/mine fire is located in Olyphant Borough, Lackawanna County, Pennsylvania, less than a mile south of Exit 2 of US Route 6 East (known locally as Casey Highway) and about 3 miles northeast of Scranton and Dunmore.

There are two coal seams that were both underground and surface mined. The higher No. 2 Dunmore Seam was surface mined for most of the area of the fire but was not reported to be on fire in 2006. This seam outcrops several hundred feet to the southeast of the fire area. The No. 3 Dunmore lies about 30 to 40 feet below the No. 2 Dunmore. A small area of the No. 3 Dunmore north of the mine fire was surface mined. Both seam dips in a northwest direction from the fire area. The fire was found in 2006 to be spreading in this seam.

CLIENT

PADEP Bureau of Abandoned Mine Reclamation

LOCATION

Scranton, PA

DURATION

2016-2017

COST

$150,000

PROJECT TEAM

Thomas Gray, P.E. – Sr. Project Manager
Tim Connolly, P.E – Project Manager
Gary Zurawski, EIT
Mike Korb, P.E. – Project Engineer

REFERENCE

Thomas Raskiewicz – Project Designer
PADEP BAMR
570-830-3190
traskiewic@pa.gov

To contain the fire a cutoff trench down to the base of the No. 3 Dunmore was designed to act as a barrier along the south, west, and north perimeters of the active fire zone at that time. An approximately 15 acre site would remain where the fire could actively burn. The cutoff trenches were constructed in 2007.

Tetra Tech evaluated previous studies at the Dolph mine fire and is supplementing the data with additional drilling by our sub-consultant AWK to better characterize and differentiate the previously burned areas. Tetra Tech is currently developing a conceptual plan for the Dolph mine fire remediation based on information obtained from mine fire monitoring equipment. Preliminary designs will be included that show work areas at the site and how any excavated materials will be handled. A construction sequence and schedule will be prepared along with the plan and cost estimate.

TETRA TECH

Palo Alto North
Mine Drainage Project Design

CLIENT

Pennsylvania Department of Environmental Protection

LOCATION

Schuylkill County, Pennsylvania

DURATION

2013 - 2020

COST

$186,000

PROJECT TEAM

Timothy Connolly, PE – Project Manager

Gary Zurawski, EIT

REFERENCES

Gregg Davis, Project Designer
PADEP - BAMR
570-830-3195
Email: greggdavis@pa.gov

KEY FEATURES

- Site Survey of Existing Conditions
- PennDOT HOP Permitting for pipe crossing
- Prepare Design Plans and Specifications for Bidding

PROJECT DESCRIPTION

Tetra Tech was awarded an engineering contract for design and permitting of a storm water collection system to direct uncontrolled mine drainage from an existing tunnel to the Schuylkill River, located in Palo Alto Borough, Schuylkill County, Pennsylvania. Since the 1970's numerous complaints have been reported to state and federal agencies concerning water flowing into the garage at 302 W. Savory Street. An abandoned mine drainage tunnel that was blocked during the 1970's has caused repeated flooding of the garage and W. Savory Street for many years. Tetra Tech reviewed the DEP preferred pipe alignment and made recommendations for an alternate pipe route. The alternate route is financially more desirable for the Department due to elimination of costly pipe work within the PennDOT right of way. Additionally, the alternate route will be easier to maintain and discharges directly to the Schuylkill River through a larger existing outfall pipe. Tetra Tech also reviewed past PADEP work projects, conducted field review of surface features, completed additional test borings on Savory Street and assisted Department personnel with Borough meetings and individual property owner rights of way. Phase 1 of the Project Plans and Specifications are at 95% complete, are under review by the Department and public bidding is anticipated in the spring of 2021.

TETRA TECH

Rausch Creek Treatment Plant
Design for Upgrades

CLIENT

Pennsylvania DEP - BAMR

LOCATION

Schuylkill Co., Pennsylvania

DURATION

2016 - 2017

COST

$129,400

PROJECT TEAM

Farley Wood, PE – Project Manager

John Casey, PE – Project Engineer

REFERENCES

Thomas Matinas
570-830-3172
tmatinas@pa.gov

KEY FEATURES

- Evaluation of existing AMD treatment plant
- Water supply system redesign
- Backup generator upgrade design
- Polymer system upgrade design
- Construction specifications, contract documents, and cost estimate

PROJECT DESCRIPTION

Tetra Tech was selected to provide design engineering services for the upgrade of the Rausch Creek AMD Treatment Plan located just south of Valley View, Pennsylvania. The plant was built in 1972 to treat the entire flow of Rausch Creek which had been severely impacted with acid mine drainage from earlier mining in the watershed. The creek is intercepted and the flow is diverted to the treatment plant. The plant support systems and components date from the time of original construction. Tetra Tech was selected to develop plans for upgrading the water supply, emergency generator and polymer batching system. This entailed generating design bases for each to take into account changes and developments since 1972.

The plant water supply system as originally installed included a 100,000 gallon capacity steel elevated tower, 125-ft tall, which is fed by a well. Over the years, the tower integrity deteriorated to the point that the water supply system needed to be replaced. As part of the project, Tetra Tech performed a needs assessment to determine what the current and expected future water demands would be, e.g., chemical make-up, washdown etc. This formed the design basis for the water supply system. Considerations were given to rehabilitation and replacement, however, the existing structure was beyond repair. As a result, Tetra Tech developed a plan to install a new variable frequency drive pump coupled with a bladder tank to allow the plant to meet its maximum and average water demands without having to maintain a large elevated storage tank.

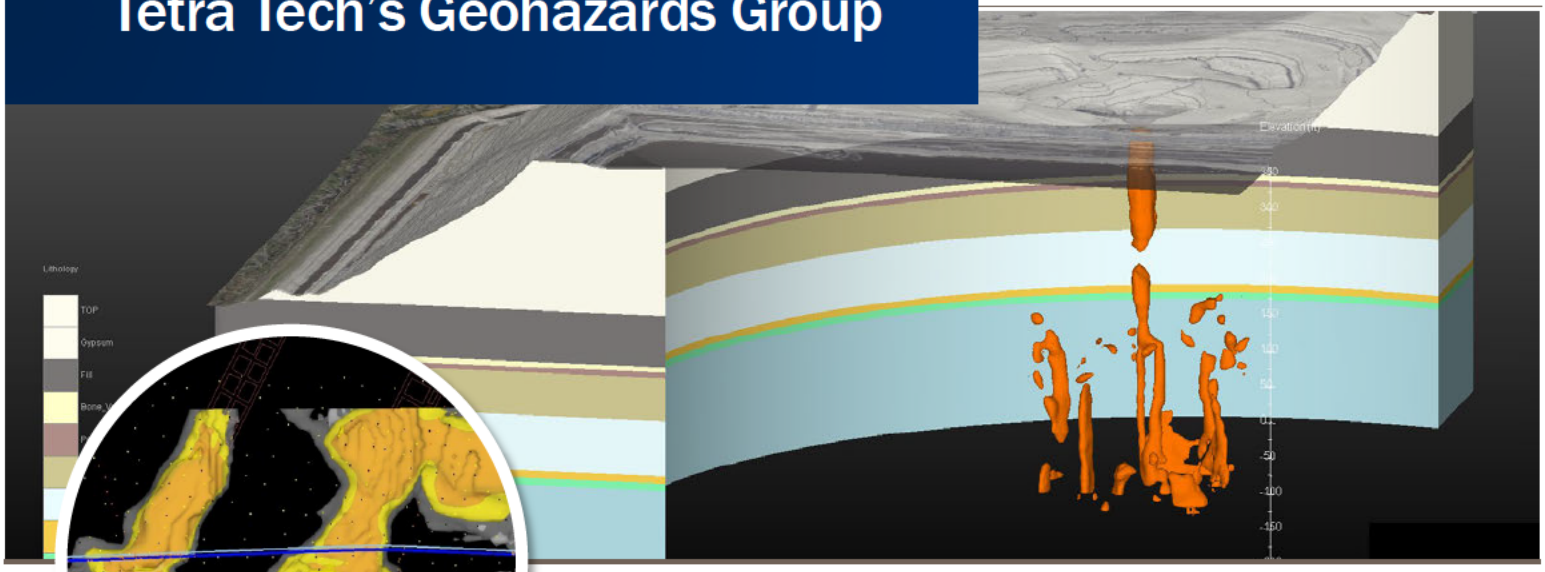
The plant was built with a diesel driven emergency generator to provide power when the local power supply would fail. The existing generator was supplied with the plant installation. Over time it became costly to operate and find parts. It was also a major consumer of plant water. Tetra Tech performed a needs assessment to determine emergency power needs. The design basis was developed from the needs assessment. Tetra Tech investigated several emergency generators and with the BCR selected the type of generator needed by the plant.

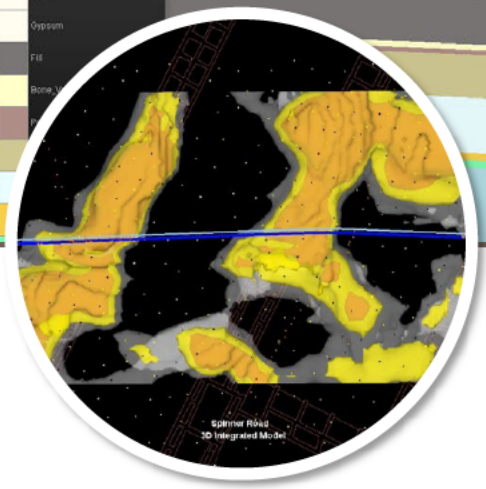
The existing polymer batching system is a manual system that requires operator attention to make-up batches of polymer. This is time consuming and labor intensive as the batching may occur more than once per day. In order to free up the operators for other duties, Tetra Tech developed an automatic polymer batching system that will allow the plant personnel to fill the unit with dry polymer once or twice a week. The batching system will then automatically make-up batches of polymer over the course of the week. In order to implement the upgrades, Tetra Tech developed preliminary plans for each upgrade and presented these plans along with a cost estimate of the work. After review and approval of the preliminary plans, Tetra Tech prepared construction drawings, specifications, contract documents, and an engineer's cost estimate.

The upgraded systems will allow the plant to run more efficiently and safely.

TETRA TECH

Tetra Tech's Geohazards Group





Geohazards and Geophysics Team

The Tetra Tech Geohazards Group develops unique and innovative client solutions using state-of-the-industry integrated site characterization, geohazards analysis, and 3D site modeling. The Geophysics Team specializes in high-resolution 3D seismic and gravity imaging for various applications including detection of mine voids, subsurface karst imaging, fracture and fault mapping, hydrological and environmental applications, mining applications, structural monitoring, earthquake engineering inputs, and ground motion prediction. Key members of the group have considerable experience in geologic interpretation of seismic data, integrated geologic modeling, fault characterization, seismic hazard assessment and modeling, electromagnetics, electrical resistivity, gravity, and 3D modeling of data and interpreted results.

Our proprietary high-resolution 3D imaging provides unparalleled imaging of subsurface conditions, which means more accurate site characterizations, better understanding of risk, and more accurate construction estimates

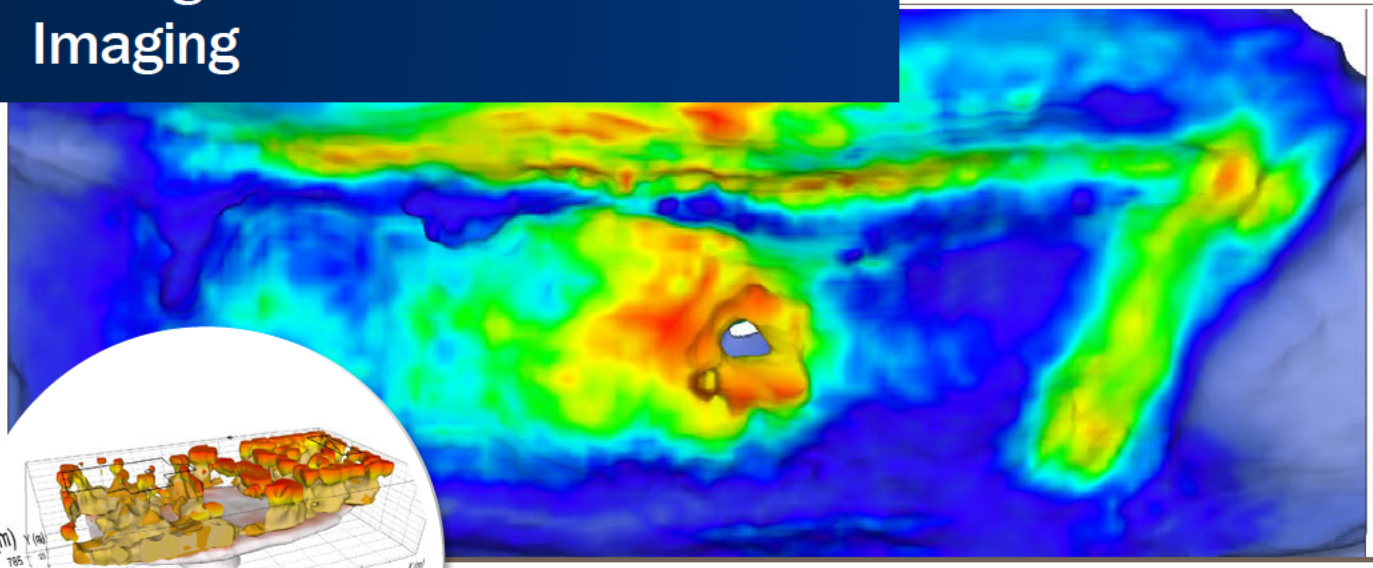
Site Investigation & Characterization

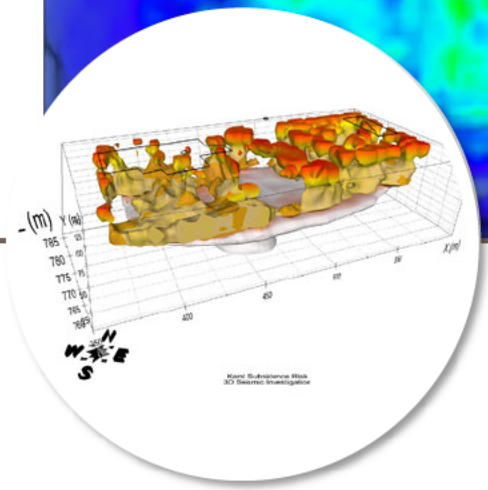
- 3D Seismic Karst Mapping
- Abandoned Underground Mines
- Infrastructure Risk Evaluations
- Levee Characterization
- Transmission Corridors
- Liquefaction Susceptibility
- Foundation Characterization
- Paleoflood/Tsunami Modeling
- Onshore, Transition Zone and Marine Seismic Imaging
- HDD Alignments

Compliance & Monitoring

- Seismic Hazard Assessment
- Ground Motions
- Neotectonics and Paleoseismology
- Dam Foundations
- FERC pipeline required geophysics (electrical resistivity for cathode protection, HDD crossings, etc.)
- Remote seismicity monitoring (new Oklahoma O&G regulations, California geothermal regulations)
- Focused subsidence monitoring
- Regional subsidence monitoring

3D High Resolution Seismic Imaging





Proprietary High-Resolution 3D Seismic Imaging

The Tetra Tech Geohazards Group uses state-of-the-industry seismic acquisition equipment and proprietary high-resolution acquisition design and post-processing algorithms and workflows to obtain seamless near-surface to depth imaging. This approach has demonstrated recent success in imaging open air- and water-filled mine voids at abandoned mine sites and along proposed HDD alignments and open karst under proposed industrial facilities. The approach provides a cost-effective way to identify borehole targets at subsurface anomalies and provides inputs to engineer remediation approaches. High-Res 3D seismic imaging applications also include fracture and fault mapping, hydrological and environmental, mining, structural monitoring, earthquake engineering inputs, and ground motion prediction. Key members of the group have considerable experience in geologic interpretation of seismic data, integrated geologic modeling, fault characterization, integrated borehole analysis, and probabilistic analysis methods.

Our proprietary high-resolution 3D seismic imaging provides unparalleled imaging of subsurface conditions, which means more accurate site characterizations, better understanding of risk, and more accurate construction estimates

3D Seismic Applications

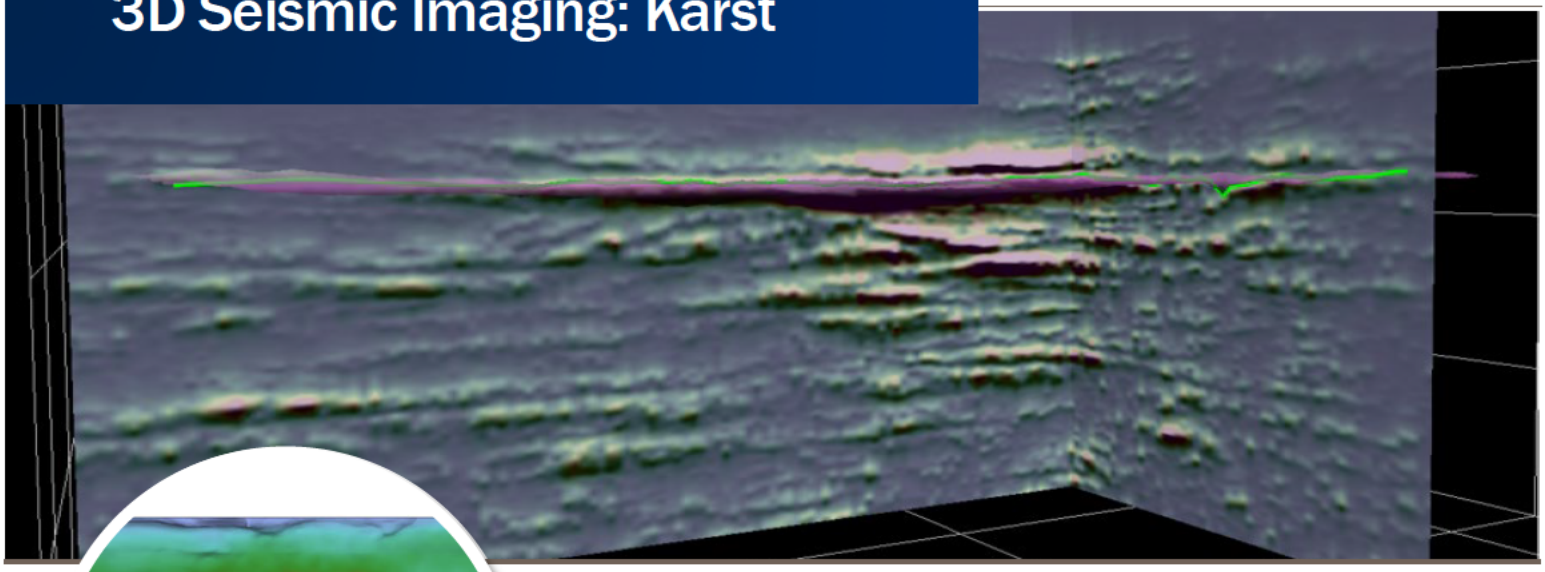
- 3D Seismic Karst Mapping
- Abandoned Underground Mines
- Infrastructure Risk Evaluations
- Levee Characterization
- Transmission Corridors
- Liquefaction Susceptibility
- Foundation Characterization
- Transition Zone and Marine Seismic Imaging
- HDD Alignments
- Fault Characterization / Neotetonics
- Structural Resonance / FEM

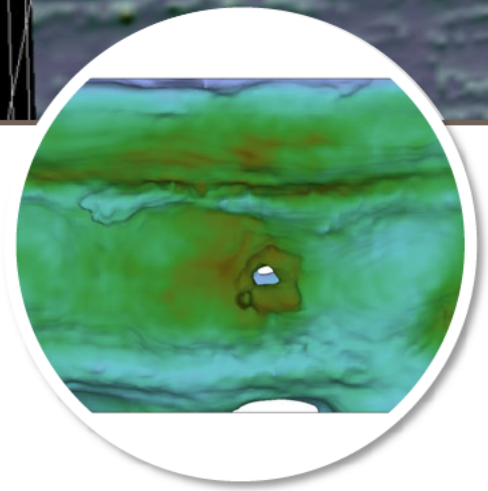
Compliance & Monitoring

- Seismic Hazard Assessment
- Ground Motions
- Neotectonics and Paleoseismology
- Dam Foundations
- FERC Pipeline Required Hazard Assessments for Fault Crossings
- Remote seismicity monitoring (new Oklahoma O&G regulations, California geothermal regulations)
- Structural Subsidence Monitoring

TETRA TECH

3D Seismic Imaging: Karst





Our proprietary high-resolution 3D seismic imaging provides unparalleled imaging of subsurface conditions, which means more accurate site characterizations, better understanding of risk, more accurate construction estimates, and pre-construction subsurface remediation in karst terrains

3D Seismic Imaging for Industrial Mine Tailings Greenfield Sites Over Karst

The Tetra Tech Geohazards Group uses state-of-the-industry seismic acquisition equipment with proprietary high-resolution acquisition design and post-processing algorithms and workflows to obtain seamless near-surface to depth imaging. This approach has demonstrated recent success in imaging open water-filled open karst voids at proposed greenfield sites for planned 400-foot-tall tailings and waste piles and acidic fluids. The approach provides a cost-effective way to identify borehole targets at subsurface anomalies and provides inputs to engineer remediation approaches prior to potential post-construction subsidence or karst-related collapse. The seismic data interpretations were able to identify open karst voids which were proven by targeted boreholes. Remediation with grouting is planned for the construction permit process. The results informed where remediation is required and potentially protected the operator from unforeseen monetary losses, the underlying aquifer and potential environmental damage.

3D Seismic Karst Imaging

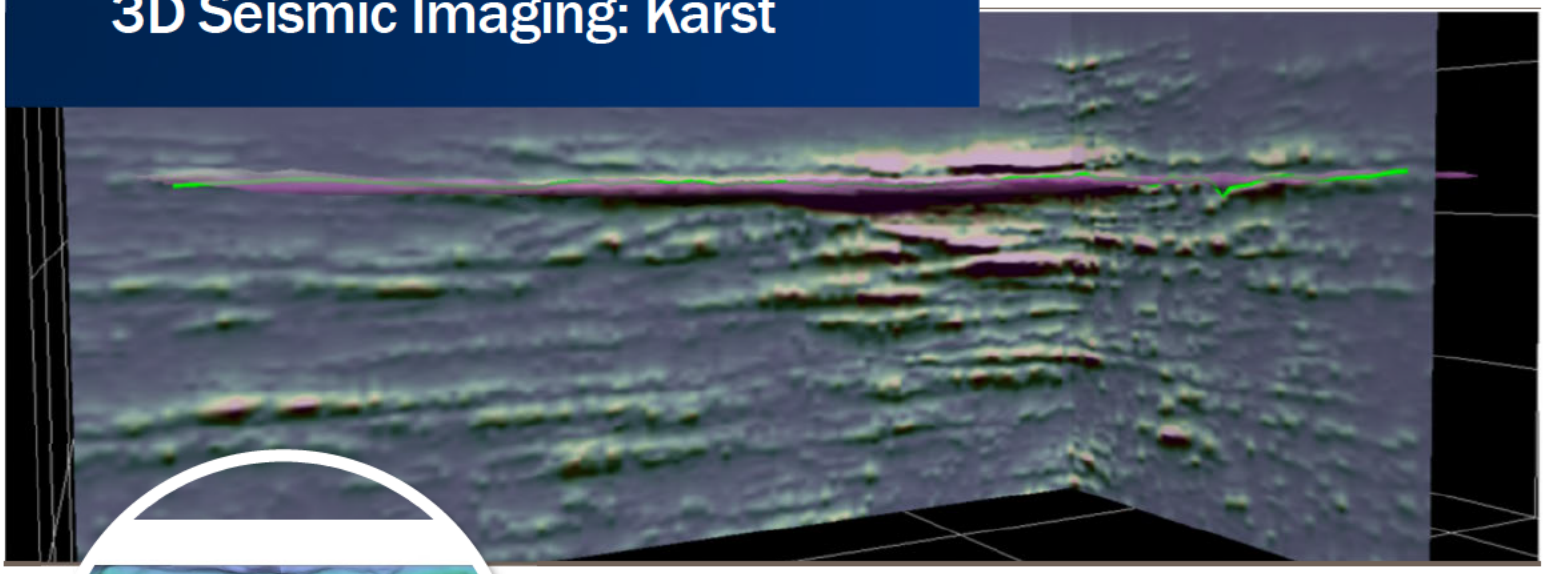
- 3D Seismic Anomalies Mapped and Targets Identified for Subsequent Borehole Investigations
- Remediation Targets Defined to Meet Environmental and Project Permitting Requirements for Regulatory Agencies
- Prevent Toxic Fluid Losses to the Underlying Aquifer
- 3D Subsurface Mapping and Boreholes, Stratigraphy, and Voids Integrated into 3D Interactive Site Subsurface Model

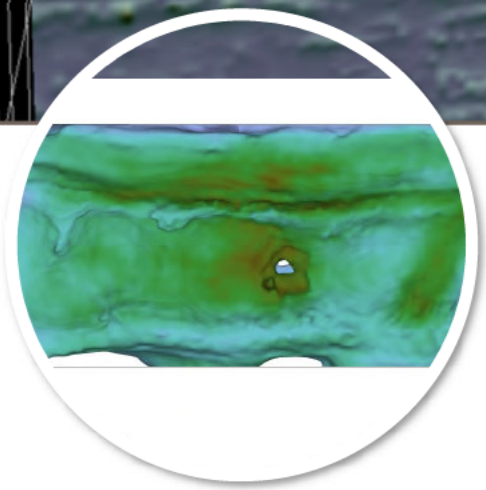
Compliance & Monitoring

- Pre-Construction Subsurface Imaging to Remediate Known Voids
- Save Project Costs by Remediation Prior to Project Shutdown Due to Environmental Non-compliance
- Regulatory Agency Compliance for Construction Permit

TETRA TECH

3D Seismic Imaging: Karst





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Compliance & Monitoring

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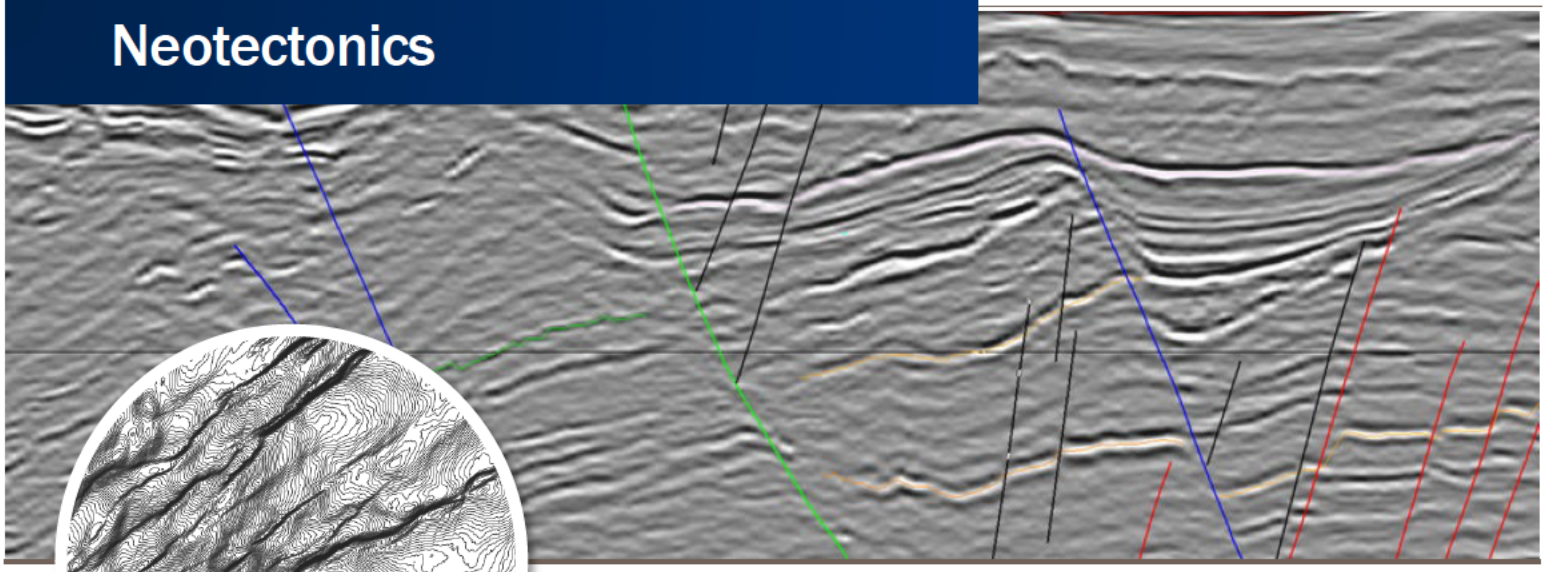
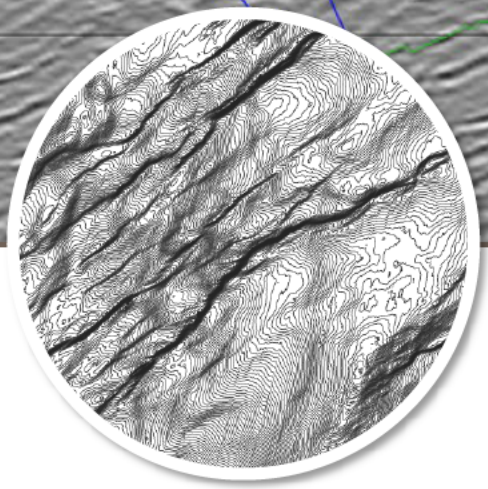
- Save Project Costs by Remediation Prior to Project Shutdown Due to Environmental Non-compliance
- Regulatory Agency Compliance for Construction Permit

TETRA TECH

Fault Characterization and Neotectonics





Geohazards Team

The Tetra Tech Geohazards Group develops unique and innovative client solutions using state-of-the-industry integrated site characterization, geohazards analysis, and 3D site modeling. The Geophysics Team specializes in high-resolution 3D seismic and gravity imaging, geomorphic and bathymetric analysis for neotectonic, ground motions, and fault characterization applications. fracture and fault mapping, hydrological and environmental applications, mining applications, structural monitoring, earthquake engineering inputs, and ground motion prediction. Key members of the group have considerable experience in geologic interpretation of seismic data, integrated geologic modeling, fault characterization, seismic hazard assessment and modeling, electromagnetics, electrical resistivity, gravity, and 3D modeling of data and interpreted results, Probabilistic Seismic Hazard Assessment (PSHA), and Probabilistic Fault Displacement Hazard Analysis (PFDHA).

Our proprietary high-resolution 3D imaging provides unparalleled imaging of subsurface conditions, which means more accurate site characterizations, better understanding of risk, and regulatory compliance for construction and operating permits

Site Investigation & Characterization

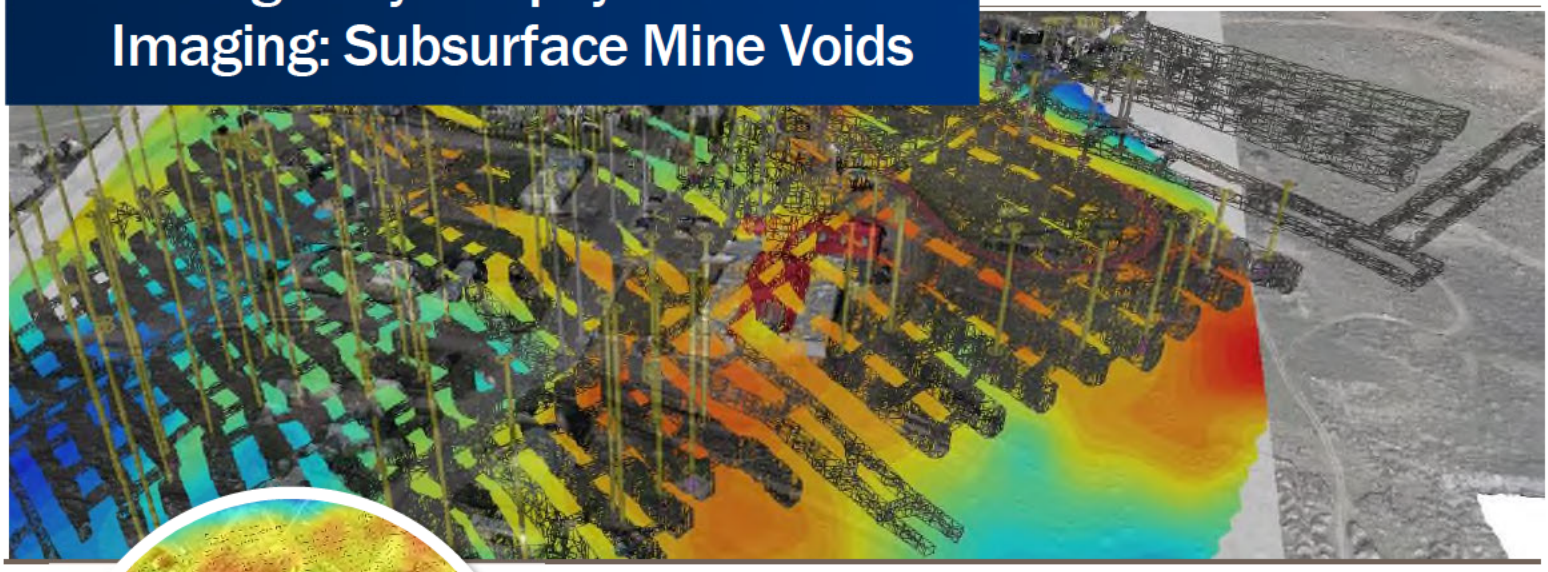
- 3D Seismic Fault Mapping
- Microgravity Geophysical Imaging
- Paleoseismology
- Infrastructure Risk Evaluations
- Levee Characterization
- Transmission Corridors
- Liquefaction Susceptibility
- Foundation Characterization
- Paleoflood/Tsunami Modeling
- Onshore, Transition Zone and Marine Seismic Imaging
- HDD Alignments
- Fault Crossings
- Oil and Gas Well Placement

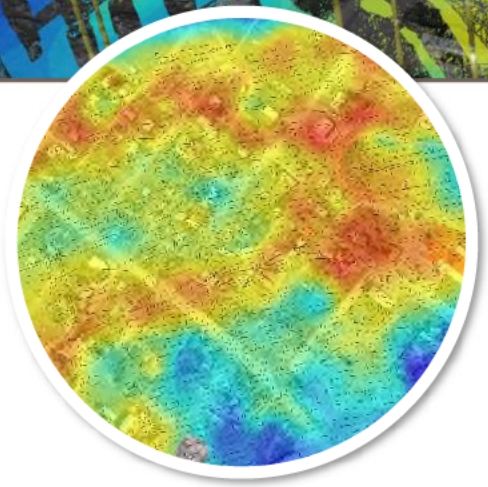
Compliance & Monitoring

- Seismic Hazard Assessment
- Ground Motions
- Neotectonics and Paleoseismology
- Dam Foundation Investigations
- FERC pipeline required geophysics (electrical resistivity for cathode protection, HDD crossings, etc.)
- Remote seismicity monitoring (new Oklahoma O&G regulations, California geothermal regulations)
- Focused subsidence monitoring
- Regional subsidence monitoring
- NEHRP Soil Site Classification
- PSHA and PFDHA

TETRA TECH

Microgravity Geophysical Imaging: Subsurface Mine Voids





Our proprietary high-resolution microgravity imaging provides unparalleled imaging of subsurface conditions, which means more accurate site characterizations, better understanding of risk, more precise remediation targets, and more accurate estimates of remediation costs.

Microgravity Geophysical Imaging for Identifying Subsurface Coal Mine Voids

The Tetra Tech Geohazards Group uses state-of-the-industry gravimetry equipment with proprietary forward-modeling algorithms for calibrated data acquisition design and proprietary post-processing algorithms for subsurface geophysical gravity imaging. This approach has demonstrated recent success in mapping water-filled voids at an abandoned mine site that underlies a >600-acre town. These methods provided a cost-effective and non-invasive way to screen the subsurface beneath the entire populated area—including houses, the fire station, and Elementary School—that overlies open and actively subsiding coal mine workings. The cutting-edge methods were able to identify open voids and rubble zones, which were subsequently targeted and confirmed by boreholes, efficiently setting the stage for grouting, remediation, and mitigation of future subsidence risk. This project demonstrated success in defining targeted remediation locations within a large, populated area, and the results could potentially protect life and losses to property and infrastructure.

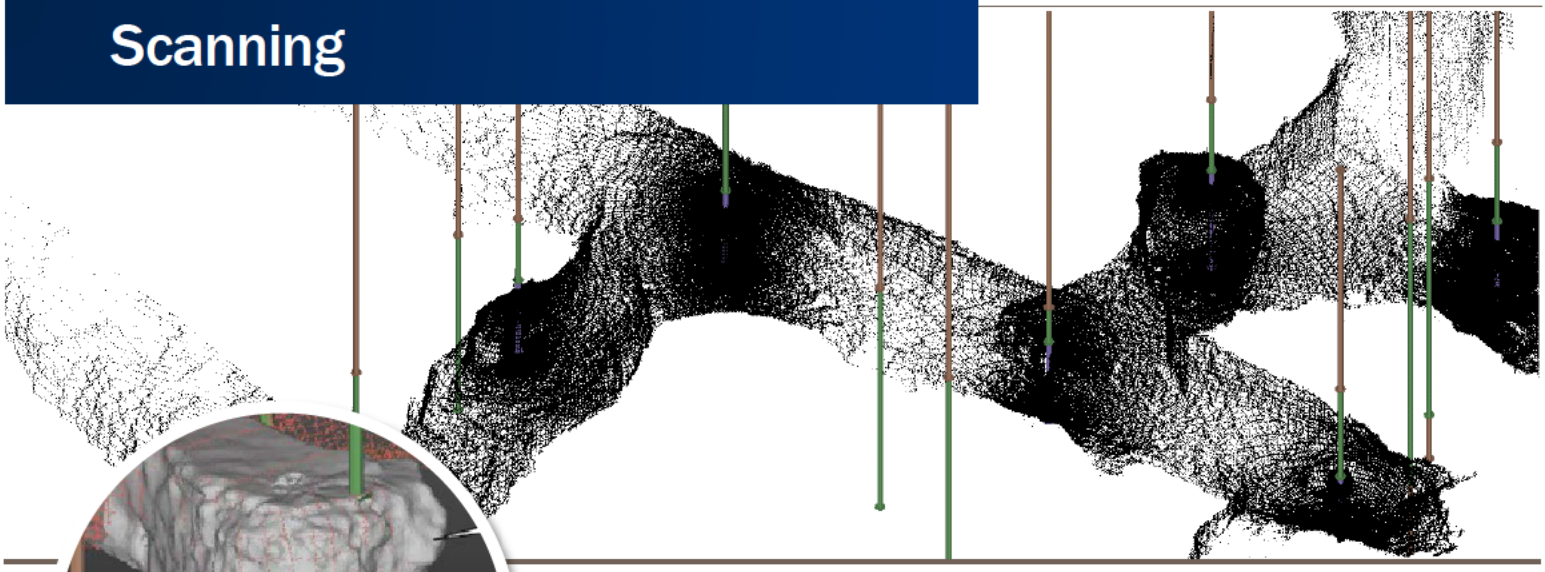
Compliance & Monitoring

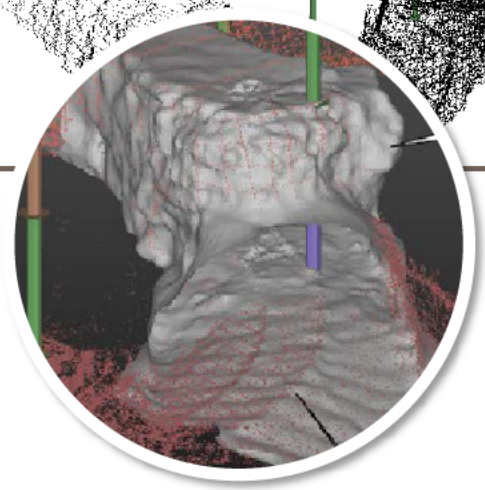
- Grouting Remediation to Protect Property and Infrastructure
- Prevent Ongoing Subsidence and Related Potential Loss of Life and Property Damages
- Mitigate Risks by Screening Known Abandoned Mine Workings
- Target Remediation Boreholes
- Verify and Quantify Success of Grouting and Other Remediation

Microgravity Geophysical Survey Applications

- Mine Void Mapping
- Karst Imaging for Remediation and Pre-Construction Assessment and Mitigation
- Targeting of Extraction/Injection Wells
- Subsidence Risk Evaluation
- Fault Zone Characterization and Imaging
- Geothermal and Hydrogeologic Characterization
- 3D Site Modeling

Subsurface Void Detection and Scanning





Void Detection and Scanning

The Tetra Tech Geohazards Group uses state-of-the-industry seismic acquisition for subsurface void detection applications. This approach has demonstrated recent success in imaging open air- and water-filled mine voids and karst features at abandoned mine sites, along proposed HDD alignments, and open karst under proposed industrial facilities. The approach provides a cost-effective way to identify borehole targets at subsurface anomalies. Once the subsurface void network is accessed through a borehole, borehole scanning systems are deployed down a wireline for high-precision void scanning. The void scan data measure the volume and orientation of the subsurface network, including tunnel intersections, collapse and rubble zones, and karst networks. This integrated approach provides value for engineering appropriate remediation approaches, grout volumes, or excavation and backfill.

Our proprietary high-resolution 3D seismic imaging provides targeted imaging of subsurface conditions, followed by high-precision void scanning, which means more accurate site characterizations, better understanding of risk, and more accurate construction or remediation estimates

Void Detection and Scanning

- 3D Seismic Karst Voids
- Abandoned Underground Mines
- Levee Characterization
- Transmission Corridors
- Foundation Characterization
- HDD Alignments
- Subsurface Remediation Engineering Inputs
- Post-Remediation Quality Assessments
- Hazardous or Inaccessible Confined Space Scanning

Compliance & Monitoring

- Subsidence Hazard Assessment
- Subsidence Prevention
- Prevent Loss of Life and Property
- Dam Foundation and Drain Scanning
- Mine Shaft Scanning

TETRA TECH

Geotechnical Laboratory Services

Tetra Tech provides soils and materials laboratory testing in our state-of-the-art laboratory located in Morgantown, WV. Our technicians bring decades of experience and knowledge working with soils and construction materials along with intimate familiarity with AASHTO and ASTM standards.

By providing this service in-house, Tetra Tech can better serve our clients through quicker turnarounds on laboratory testing while maintaining a consistent level of quality.

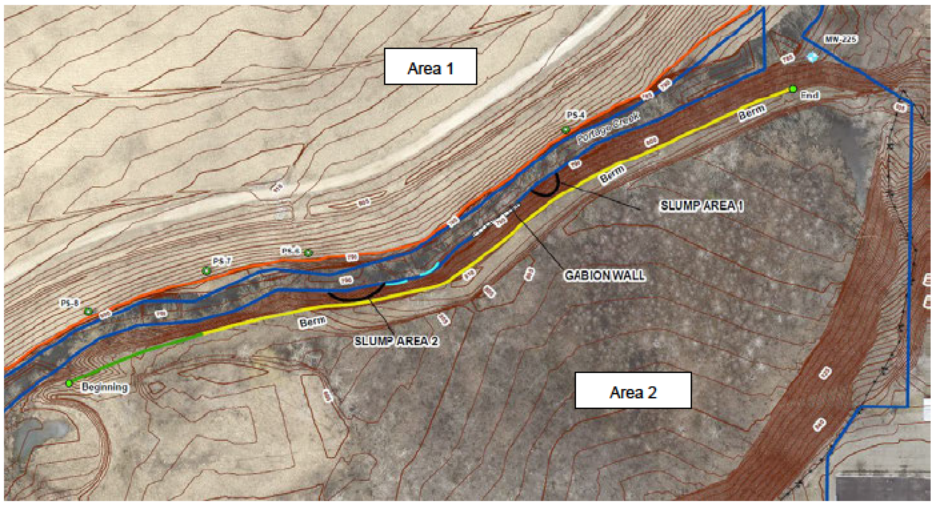
This laboratory allows our geotechnical and construction inspection teams to support projects more efficiently. It supports civil and geotechnical engineers on highway, solar, mining, land development, and solid waste projects with material and quality control testing. The laboratory performs soil index tests such as determination of moisture content and density, particle-size analysis (gradation), compaction (Proctor), Atterberg Limits and USCS classification of soils as well as unconfined compressive strength on soil, rock, and concrete. The laboratory tests and reports are individually reviewed by Tetra Tech's licensed geotechnical engineering staff, who have extensive experience providing quality control of these services.

For assistance with testing please contact Matthew Ridgway at 304.212.3600 or matthew.ridgway@tetratech.com

TETRA TECH

947 Canyon Rd
Morgantown, WV
304-212-3600

Sheet Pile Installations to Mitigate Potential Soil Berm Failure at a Waste Water Impoundment



CLIENT

Confidential Client

LOCATION

West Michigan

DURATION

2019

COST

$1,550,000

KEY FEATURES

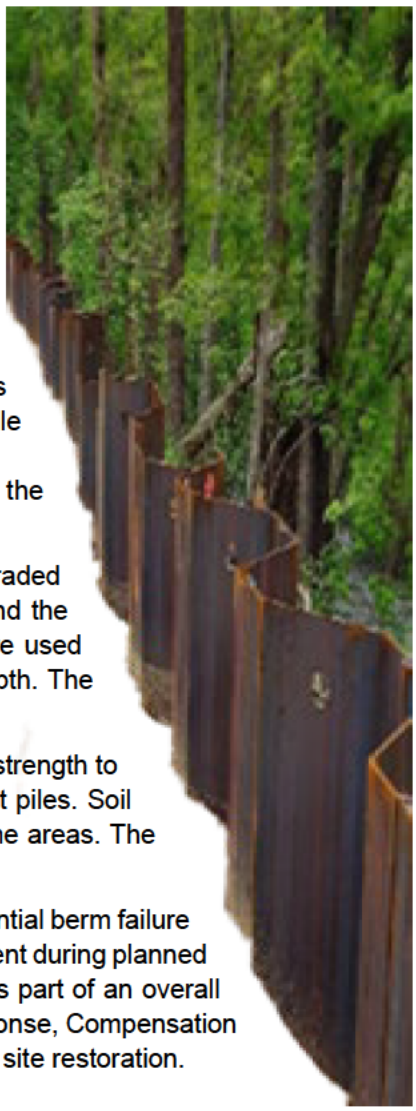
- Identified potential risk of impoundment berm failure based high stream flows in adjacent stream and observed soil erosion
- Designed and installed sheet piles to mitigate soil berm failure to along top of berm to protect local stream from potential polychlorinated biphenyls (PCB) and per- and poly-fluorinated alkylated (fluoroalkyl) substance (PFAS) impacts
- Expedited schedule to design, bid and install the sheet piles within less than two months
- Installed 843 linear feet of piles 30 to 40 feet below grade

PROJECT DESCRIPTION

In Spring of 2019, Tetra Tech completed the work to stabilize the soil berm at a former waste water impoundment at a Site in West Michigan.

Tetra Tech reported observations of active erosion of the berm to our confidential client (Client) in February 2019 and provided options in March 2019 to mitigate the potential catastrophic failure of the berm. Tetra Tech recommended that sheet piles be installed along the northern side of the impoundment as soon as possible to stabilize the berm and prevent potential failure that could release wastes containing PCBs and PFAS compounds into the adjacent creek.

Tetra Tech reviewed existing geotechnical data and soil boring logs to prepare engineering designs for the sheet pile installation and supporting earthwork activities for site access, soil berm grading, and erosion and sedimentation controls. The design process included sheet pile evaluation and modeling, preparation of plan, profile and detail drawings, and preparation of sheet pile and earthwork specifications. The drawings and specifications were provided to prospective sheet pile and earthwork subcontractors for solicitation of construction bids.



Tetra Tech served as the general contractor and subcontracted the vegetative clearing, earthwork and sheet pile installation to three different subcontractors. A timetable and description of activities completed by Tetra Tech is provided below.

- March 25 to April 12, 2019 – Completed sheet pile and earthwork designs, prepared subcontractor bid specifications, attended subcontractor bid walks, and awarded the work;
- April 3 to 10, 2019 – Obtained permits for Soil Erosion and Sedimentation Control and Site Access Traffic Management.
- April 15 to 25, 2019 – Provided oversight of subcontractor installation of soil erosion and sedimentation controls, surface grading, and access road installation on the soil berm in preparation for the sheet pile installation.
- May 7 to 16, 2019 – Provided oversight of subcontractor installation of the sheet piles to stabilize the soil berm.

The installed sheet piles measured 843 linear feet along the north edge of the graded soil berm. The western 152 feet of the wall consisted of 30-foot-deep piles and the remaining 691 feet consisted of 40-foot-deep piles. The 30-foot-long piles were used along the upstream portion of the berm to achieve the desired embedment depth. The surface area of the piles covered 32,200 square feet.

The surface of the soil berm required grading and stabilization to add sufficient strength to support the vibratory pile driving and crane equipment used to install the sheet piles. Soil stabilization included the use of geotextiles and cobble rock placements in some areas. The completed access road is approximately 20 feet wide.

The sheet pile installations were performed as a preliminary task to mitigate potential berm failure due to erosion, but the piles will also provide stabilizing support to the impoundment during planned remedial action to remove impacted residuals from this area along the creek as part of an overall remedial action to be performed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) for this Superfund site as part of future cleanup and site restoration.

Attachment A – AML Consultant Qualifications

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
AML CONSULTANT QUALIFICATION QUESTIONNAIRE Attachment "A"

PROJECT NAME	DATE (DAY, MONTH, YEAR)	FEIN
2021 Design Group C Projects	14, September, 2021	95-4148514

1. FIRM NAME	2. HOME OFFICE BUSINESS ADDRESS	3. FORMER FIRM NAME
Tetra Tech, Inc	947 Canyon Rd, Morgantown, WV 26508	

4. HOME OFFICE TELEPHONE	5. ESTABLISHED (YEAR)	6. TYPE OWNERSHIP	6a. WV REGISTERED DBE (Disadvantaged Business Enterprise)
304-212-3600	1966	Corporation	NO

7. PRIMARY AML DESIGN OFFICE: ADDRESS/ TELEPHONE/ PERSON IN CHARGE/ NO. AML DESIGN PERSONNEL EACH OFFICE
Pittsburgh, 661 Andersen Dr, Pittsburgh, PA 15220/412-921-7090/Mark Speranza, PE/ 116 People

8. NAMES OF PRINCIPAL OFFICERS OR MEMBERS OF FIRM	8a. NAME, TITLE, & TELEPHONE NUMBER - OTHER PRINCIPALS
Mr. Mark Perry, PE - Unit President	Mr. Farley Wood, PE - Project Manager - 304-350-2804

9. PERSONNEL BY DISCIPLINE

— ADMINISTRATIVE 2012	— ECOLOGISTS 152	— LANDSCAPE ARCHITECTS 19	— STRUCTURAL ENGINEERS 98
— ARCHITECTS 130	— ECONOMISTS 138	— MECHANICAL ENGINEERS 70	— **SURVEYORS 60**
— **BIOLOGIST 300**	— ELECTRICAL ENGINEERS 60	— **MINING ENGINEERS 70**	— TRAFFIC ENGINEERS
— **CADD OPERATORS 170**	— ENVIRONMENTALISTS 746	— PHOTOGRAMMETRISTS 12	— OTHER 13,714
— CHEMICAL ENGINEERS 304	— ESTIMATORS 271	— PLANNERS:	
— **CIVIL ENGINEERS 588**	— **GEOLOGISTS 367**	URBAN/REGIONAL96	
— CONSTRUCTION INSPECTORS61	— HISTORIANS 3	— SANITARY ENGINEERS70	
— DESIGNERS	— HYDROLOGISTS 115	— SOILS ENGINEERS 34	— TOTAL PERSONNELL 20,000
— DRAFTSMEN 200		— SPECIFICATION WRITERS 140	Personnel Company Wide

TOTAL NUMBER OF WV REGISTERED PROFESSIONAL ENGINEERS IN PRIMARY OFFICE: 5
***RPEs other than Civil and Mining must provide supporting documentation that qualifies them to supervise and perform this type of work.**

10. HAS THIS JOINT-VENTURE WORKED TOGETHER BEFORE? XX YES ☐ NO

11. OUTSIDE KEY CONSULTANTS/SUB-CONSULTANTS ANTICIPATED TO BE USED. Attach "AML Consultant Qualification Questionnaire".		
NAME AND ADDRESS: Dieffenbauch & Hritz LLC 1095 Chaplin Road Suite 200 Morgantown, WV 26501	SPECIALTY: Surveying Services	WORKED WITH BEFORE ___X__ Yes _____No
NAME AND ADDRESS: Core Drilling, LLC 620 Lincoln Avenue Bentleyville, PA 15314	SPECIALTY: Geotechnical Drilling	WORKED WITH BEFORE __X___ Yes _____No
NAME AND ADDRESS: Geotechnics 544 Braddock Avenue East Pittsburgh, PA 15112	SPECIALTY: Soil Testing	WORKED WITH BEFORE __X___ Yes _____No
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ Yes _____No
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ Yes _____No
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ Yes _____No
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ Yes _____No
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ Yes _____No
NAME AND ADDRESS:	SPECIALTY:	WORKED WITH BEFORE _____ Yes _____No

12. A. Is your firm's personnel experienced in Abandoned Mine Lands Remediation/Mine Reclamation Engineering?

YES Description and Number of Projects: Tetra Tech has extensive experience with AML/Mine Reclamation Engineering. Tetra Tech is currently working on several AML projects in several states. Tetra Tech has also worked on AML related projects within the state of West Virginia. In the last 5 years Tetra Tech has performed 20+ of these types of projects.

B. Is your firm experienced in Soil Analysis?

YES Description and Number of Projects: Tetra Tech has a whole team dedicated to Geotechnical investigations including soil analysis. In the last 5 year this team has performed 20+ projects specifically associated with Soil Analysis.

C. Is your firm experienced in hydrology and hydraulics?

YES Description and Number of Projects: Tetra Tech has performed several project looking at hydrology and hydraulics, specifically Tetra Tech specializes in mine pool analysis and AMD treatment systems. In the last 5 years Tetra Tech has performed 20+ projects looking at hydrology and hydraulics.

D. Does your firm produce its own Aerial Photography and Develop Contour Mapping?

YES Description and Number of Projects: Tetra Tech does produce its own Aerial Photography with the use of drone technology and we use that photography to develop contour mapping. We use this service across all disciplines and industries with hundreds of flights and maps developed on a yearly basis.

E. Is your firm experienced in domestic waterline design? (Include any experience your firm has in evaluation of aquifer degradation as a result of mining.)

YES Description and Number of Projects: Tetra Tech's large size and extensive resources provides for skilled individuals in various disciplines, Tetra Tech does have experience in domestic waterline design in conjunction with other projects. Tetra Tech also has on staff PhD hydrologist Eric Perry who retired from Office of Surface Mining where his responsibility was hydraulic monitoring of mine pools and effects of mining on aquifers.

F. Is your firm experienced in Acid Mine Drainage Evaluation and Abatement Design?

YES Description and Number of Projects: Tetra Tech has a whole team dedicated to Acid Mine Drainage projects, we are currently working on 5 projects specifically looking at AMD treatment with 10+ projects completed in the last 5 years.

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES **RESPONSIBLE FOR AML PROJECT DESIGN** (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
Gray, Thomas A. PE	46	46	

Brief Explanation of Responsibilities

Mr. Gray has more than 40 years of professional experience. He is a technical expert in mining engineering, mine reclamation, coal ash disposal and utilization, watershed and ecosystem restoration, mine subsidence, acid mine drainage remediation, mine stabilization via grouting and abandoned mine fire mitigation. Mr. Gray specializes in active and abandoned mining projects and with infrastructure projects that have mining related concerns. His project management responsibility has included construction, engineering, regulatory compliance, and research and development. He has been responsible for the successful completion of many unique projects.

EDUCATION (Degree, Year, Specialization)
BS, 1973 Mining Engineering/MS 1977 MBA

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS	REGISTRATION (Type, Year, State)
SME	PE in WV (1988), PA (1978), OH (2009), MD (1989), VA (1980)

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES **RESPONSIBLE FOR AML PROJECT DESIGN** (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
Wood, Farley R. P.E.	35	35	

Brief Explanation of Responsibilities

Farley Wood has over 35 years of diverse experience in the mining industry. His experience includes engineering, operations, project management, environmental and safety compliance, permitting, regulatory compliance, construction management, and capital projects.

EDUCATION (Degree, Year, Specialization)
BS, 1984 Mining Engineer

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS	REGISTRATION (Type, Year, State)
SME	PE in WV (1998), PA (1993), OH (1998)

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES **RESPONSIBLE FOR AML PROJECT DESIGN** (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
Kearns, Michael PE,MS. -Project Manager	25	25	40

Brief Explanation of Responsibilities

Mr. Kearns has 40 years of professional engineering experience including diverse experience in the mining industry, utility pipelines, abandoned mine land reclamation. Additionally, he has designed and permitted numerous mine surface facilities, oil and gas well pad sites, potable water distribution systems, stormwater conveyance systems, sanitary sewerage systems, site development for industrial and commercial facilities, slope remediation analyses and has developed E&S control plans for hundreds of facilities.

EDUCATION (Degree, Year, Specialization)

BS Civil Engineering 1977, MS Civil Engineering 1982

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS	REGISTRATION (Type, Year, State)
ASCE(Life Member), NSPE	PE - WV (1981), OH (1991), PA (1992)

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES **RESPONSIBLE FOR AML PROJECT DESIGN** (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC

Brief Explanation of Responsibilities

EDUCATION (Degree, Year, Specialization)

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS	REGISTRATION (Type, Year, State)

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES **RESPONSIBLE FOR AML PROJECT DESIGN** (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
Hynes, Greg,	25	25	33

Brief Explanation of Responsibilities

Mr. Hynes has 33 years of professional engineering experience including utility pipelines and abandoned mine land reclamation. Additionally, he has designed and permitted numerous mine surface facilities, oil and gas well pad sites, potable water distribution systems, stormwater conveyance systems, sanitary sewerage systems, and developed E&S control plans.

EDUCATION (Degree, Year, Specialization)

BS Civil Engineering 1987, MS Civil Engineering 1997

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS	REGISTRATION (Type, Year, State)
	PE – WV (1997), OH (1997), PA (1993)

13. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES **RESPONSIBLE FOR AML PROJECT DESIGN** (Furnish complete data but keep to essentials)

NAME & TITLE (Last, First, Middle Int.)	YEARS OF EXPERIENCE		
	YEARS OF AML DESIGN EXPERIENCE:	YEARS OF AML RELATED DESIGN EXPERIENCE:	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE:
Matthew Ridgway	7	7	3

Brief Explanation of Responsibilities

Mr. Ridgway is a Civil Engineer with more than 6 years of engineering experience, including managing the design and construction of complex construction projects. His professional focus has been on geotechnical engineering and his expertise includes preliminary site investigation, design, and construction oversight.

EDUCATION (Degree, Year, Specialization)

BS Civil engineering & BS Mining Engineering 2013

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS	REGISTRATION (Type, Year, State)
ASCE, SME, ASHE	PE – WV (2019), PA (2019), VA (2019), MD (2019), CO (2019), WY (2019)

14. PROVIDE A LIST OF SOFTWARE AND EQUIPMENT AVAILABLE IN THE PRIMARY OFFICE WHICH WILL BE USED TO COMPLETE AML DESIGN SERVICES
Microsoft Office Professional and Microsoft Project
Bentley Pond Pack (Haestad methods)
Adobe Photoshop
Adobe Acrobat
AutoCAD Map 3D
AutoDesk Civil 3D
ESRI ArcGIS
ESRI ArcView
Bently Flow Master (Haested Methods)
Bentley HEC-Pack
STBL5M
Groundwater Vistas
GMS
Autodesk Storm and Sanitary Analysis
Hydro CAD
SLIDE II STABILITY ANALYSIS PROGRAM

15. CURRENT ACTIVITIES ON WHICH YOUR FIRM IS THE DESIGNATED ENGINEER OF RECORD

PROJECT NAME, TYPE AND LOCATION	NAME AND ADDRESS OF OWNER	NATURE OF YOUR FIRM'S RESPONSIBILITY	ESTIMATED CONSTRUCTION COST	PERCENT COMPLETE
Kempton Sludge Disposal Line Garrett County MD	Maryland Department of the Environment 160 S Water Street Frostburg, MD 21532	Prime Contractor	$385,000	100%
Wingfield Pines Inflow Reconstruction Project, Upper St. Clair Township, Allegheny County PA	Allegheny Land Trust 416 Thorn Street Sewickley, PA 15143	Prime Contractor	$1 Million	100%
Gladden AMD Treatment Plant, South Fayette Township, Allegheny County PA	South Fayette Conservation Group 515 Millers Run Road Morgan, PA 15064	Prime Contractor	$13.5 Million	95%
WVDEP OSR Royal Coal Bond Forfeiture Fayette County WV	WVDEP OSR 1159 Nick Rahall Greenway Fayetteville, WV 25840	Prime Contractor	$250,000	95%
Glenn Springs Holdings Bird Mine Treatment, Tire Hill Pennsylvania	Glenn Springs Holdings 5 Greenway Plaza, Suite 10 Houston, TX 77046	Prime Contractor	Confidential	Ongoing
Quakake Treatment Plant Carbon County Pennsylvania	PADEP BAMR 2 Public Square 5th Floor Wilkes-Barre, Pennsylvania 18701	Prime Contractor	$1.2 Million	60%
Blacklick Creek Treatment Facility	PADEP BAMR 400 Market Street Harrisburg, PA 17106	Prime Contractor	$160,000	75%

TOTAL NUMBER OF PROJECTS: Tetra Tech is currently conducting thousands or projects nationwide for the purpose of the EOA only a sample is provided	TOTAL ESTIMATED CONSTRUCTION COSTS: $+15 Million

16. CURRENT ACTIVITIES ON WHICH YOUR FIRM IS SERVING AS A SUB-CONSULTANT TO OTHERS

PROJECT NAME, TYPE AND LOCATION	NATURE OF FIRMS RESPONSIBILITY	NAME AND ADDRESS OF OWNER	ESTIMATED COMPLETION DATE	ESTIMATED CONSTRUCTION COST	
				ENTIRE PROJECT	YOUR FIRMS RESPONSIBILITY
NA	NA	NA	NA	NA	NA

17. COMPLETED WORK WITHIN LAST 5 YEARS ON WHICH YOUR FIRM WAS THE DESIGNATED ENGINEER OF RECORD				
PROJECT NAME, TYPE AND LOCATION	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST	YEAR	CONSTRUCTED (YES OR NO)
WV Land Stewardship Larosa Fuels Marion County WV	WV Land Stewardship Corporation 709 Beechurst Ave Morgantown, WV 26505	$136,000	2018	Yes
Dolph Underground Mine Fire, Lackawanna County, PA	PADEP BAMR 400 Market Street Harrisburg, PA 17106	$15 Million	2018	Yes
Scenic Rail Road Subsidence Evaluation Garrett County Maryland	Maryland Department of the Environment 160 S Water Street Frostburg, MD 21532	$114,000	2017	Yes
Pipeline Slip Investigation Belmont County Ohio	Confidential Client	Confidential	2017 & 2018	Yes
Frush Enterprises Bond Forfeiture Harrison County WV	WVDEP OSR 1159 Nick Rahall Greenway Fayetteville, WV 25840	$152,000	2017	Yes
Buffalo Coal Mt. Storm, WV	WV Land Stewardship Corporation 709 Beechurst Ave Morgantown, WV 26505	$269,170	2018	Yes
Rasuch Creek Treatment Plant Upgrades Schuykill County PA	PADEP BAMR 2 Public Square 5th Floor Wilkes-Barre, Pennsylvania 18701	$200,000	2018	Yes
Tetra Tech had conducted thousands or projects nationwide for the purpose of the EOA only a sample is provided				

18. COMPLETED WORK WITHIN LAST 5 YEARS ON WHICH YOUR FIRM HAS BEEN A SUB-CONSULTANT TO OTHER FIRMS (INDICATE PHASE OF WORK FOR WHICH YOUR FIRM WAS RESPONSIBLE)

PROJECT NAME, TYPE AND LOCATION	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST OF YOUR FIRM'S PORTION	YEAR	CONSTRUCTED (YES OR NO)	FIRM ASSOCIATED WITH

19. Use this space to provide any additional information or description of resources supporting your firm's qualifications to perform work for the West Virginia Abandoned Mine Lands Program.

Tetra Tech has extensive knowledge and vast resources to allow for a comprehensive approach to any problem. Tetra Tech works extensively with Abandoned Mine Lands and is well versed on solutions to any problem. Tetra tech has a strong presence in West Virginia in Fairmont and Charleston, with offices in Pittsburgh, PA and St. Clairsville, OH regularly performing work in the state. The Tetra Tech Pittsburgh office has worked with WVDEP on several Special Reclamation projects throughout the state.

20. The foregoing is a statement of facts.

Signature: _____ Title: Project Manager

Printed Name: Michael S. Kearns

Date: 9-13-2021

Attachment B – AML Related Project Experience

AML and RELATED PROJECT EXPERIENCE MATRIX

PROJECT	Exp. Basis C=Corp. P=Personnel *	Additional Info Provided in Section (s) **	PROJECT EXPERIENCE REQUIREMENTS															PRIMARY STAFF PARTICIPATION/CAPACITY *** M=Management P=Professional					
			Abandoned Surface Mine Reclamation	Abandoned Deep Mine Reclamation	Portal/Shaft Closure	Hydrologic/Hydraulic Design/Eval.	Remining Evaluation	Mine/Refuse Fire Abatement	Subsidence Investigation Mitigation	Hazardous Waste Disposal	Project Specifications	Water Quality Evaluation/Nitigation/Replacement	Construction Inspection/Management	Water Treatment	Eq:uipment/Structure Removal	Stream Restoration	Geotechnical/Stability	Tom Gray, PE	Farley Wood, PE	Michaeal Kearns PE	Matthew Ridgeway	Other Project Team Personnel	Other Tetra Tech Personnel
PADEP Gladden Acid Mine Drainage Treatment Plant	C&P	Yes		X		X					X	X	X	X		x		M	P	P		P	M
Wingfiield Pines Inflow Reconstruction	C&P	Yes				X					X	X	X	X				M	P	P		P	M
WVDEP OSR Royal Coal Bond Forfeture	C&P	Yes	x								x						X	M	P	P		P	M
Kempton Sludge Disposal Line	C&P	Yes												X				M	P			P	M
MDE Scenic Rail Road Subsidence Evaluation	C&P	Yes							X								X	M	P			P	M
PADEP Black Lick Creek	C&P	Yes												X				M				P	M
PADEP Dolph Mine Fire	C&P	Yes						X										M				P	P
PADEP Rausch Creek	C&P	Yes												X	X			M	P			P	P
WVDEP OSR Frush Enterprises Bond Forfeture	C&P	Yes	X														X	M	P			P	P
WVLSC Larosa Fuels	C&P	Yes	X											X				M				P	P
Glenn Springs Holdins Bird Mine Treatment	C&P	NO									X	X	X	X				M				P	P
Quakake Treatment Plant	C&P	NO										X		X				M				P	P
WVLSC Buffalo Coal	C&P	No	X															M				P	P

*** List whether project experience is corporate or personnel based or both.**

**** Use this area to provide specific sections or pages if needed for reference.**

***** List Primary Design personnel and their functional capacity for the projects listed.**

Attachment "B"