



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

Request for Quotation

RFQ NUMBER
DEP14515

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF
CHUCK BOWMAN
304-558-2157

RFQ COPY
TYPE NAME/ADDRESS HERE

Tetra Tech NUS
 661 Andersen Drive
 Pittsburgh, PA 15220

ENVIRONMENTAL PROTECTION
DEPARTMENT OF
OFFICE OF AML&R
601 57TH STREET SE
CHARLESTON, WV
25304 **304-926-0499**

DATE PRINTED	TERMS OF SALE	SHIP VIA	FOB	FREIGHT TERMS
12/17/2008				

BID OPENING DATE: **01/21/2009** BID OPENING TIME **01:30PM**

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	JB		906-29	NA	NA
<p>BROWNTON (MCCORD) LANDSLIDE DESIGN</p> <p>EXPRESSION OF INTEREST</p> <p>THE WEST VIRGINIA PURCHASING DIVISION, FOR THE AGENCY, THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION, IS SOLICITING EXPRESSIONS OF INTEREST FOR PROFESSIONAL ENGINEERING DESIGN SERVICES AND CONSTRUCTION MONITORING SERVICES AT THE BROWNTON (MCCORD) LANDSLIDE PROJECT IN BARBOUR COUNTY, WV, PER THE FOLLOWING BID REQUIREMENTS AND ATTACHED SPECIFICATIONS.</p> <p>BANKRUPTCY: IN THE EVENT THE VENDOR/CONTRACTOR FILES FOR BANKRUPTCY PROTECTION, THIS CONTRACT IS AUTOMATICALLY NULL AND VOID AND IS TERMINATED WITHOUT FURTHER ORDER.</p>						
<p>***** THIS IS THE END OF RFQ DEP14515 ***** TOTAL:</p>						<p>RECEIVED</p> <p>2009 JAN 21 AM 10:27</p> <p>WV PURCHASING DIVISION</p> <p>NA</p>

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE <i>Mh [Signature]</i>	TELEPHONE 412-921-8916	DATE January 20, 2009
TITLE Pittsburgh Operations Manager	FEIN 95-4660169	ADDRESS CHANGES TO BE NOTED ABOVE

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



TETRA TECH

Mark Speranza, PE
Pittsburgh Operations Manager

January 20, 2008

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

Subject: **RFQ# DEP14515**
Expression of Interest (EOI) for Professional Engineering Design Services and Construction Monitoring Services at the Brownton (McCord) Landslide project in Barbour County, West Virginia; Tetra Tech Vendor ID : 317151437

Dear Mr. Bowman:

Tetra Tech NUS, Inc. (Tetra Tech) is pleased to present the State of West Virginia, Department of Administration Purchasing Division (State) and the West Virginia Department of Environmental Protection (WVDEP), Office of Abandoned Mine Lands & Reclamation (AML) our Expression of Interest (EOI) to provide engineering and construction monitoring services for the Brownton Landslide project. This submittal includes one original plus one copy of our EOI. As requested, the EOI contains a concise summary of Tetra Tech's corporate history and the experience, qualifications, and performance data of our staff as summarized in a completed "AML Consultant Confidential Qualification Questionnaire" (CCQQ) and the "AML and Related Project Experience Matrix" (RPEM).

Tetra Tech specializes in the mining related application of engineering and environmental consulting, remediation, geotechnical services, mine related groundwater management and geochemical characterization.

Our AML specific experience includes projects located throughout the United States and South America. Our proposed key personnel, Thomas Gray, PE and Biff Cummings, PE have a combined 62 years of engineering experience with over 38 associated with mining and AML related projects. Both have worked with a multitude of AML related problems throughout the Appalachian coal fields. These projects are similar to those identified at the Brownton Landslide project. Mr. Gray co-authored Chapter 8.7 of the SME's Mining Engineering Handbook that addresses "*Mine Closure, Sealing, and Abandonment.*"

In addition to the large staff in our Pittsburgh office, Tetra Tech also provides services, water resources, watershed and water quality assessment, watershed modeling, and Total Maximum Daily Load (TMDL) development services in support of the WVDEP, Division of Water and Waste Management (DWWM) out of our Charleston, WV office.

Tetra Tech NUS, Inc.
661 Andersen Drive, Pittsburgh, PA 15220
Tel 412.921.8746 Fax 412.921.40404 www.ttnus.com



TETRA TECH

Mr. Chuck Bowman, Buyer
January 20, Page 2 of 2

Supplementing Tetra Tech will be Triad Engineering, Inc. from their Morgantown, WV office; and, consultant Richard (Dick) Gray, PG, of DiGioia, Gray and Associates, LLC. Triad is experienced with WV AML projects and will support Tetra Tech in the areas of surveying, mapping, and geotechnical drilling. Mr. Richard Gray will provide expert review of the project, attending the project start-up meeting, assist in selecting efficient and effective solutions, and provide a review of the plans and specifications.

Tetra Tech appreciates the opportunity to submit our qualifications to you for this project. If you have any questions about the information provided, please contact Mr. Thomas Gray at 412.921.8794.

Very Truly Yours,

Mark P. Speranza, PE
Pittsburgh Operations Manager

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

Enclosures

**WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
AML CONSULTANT CONFIDENTIAL QUALIFICATION QUESTIONNAIRE Attachment "B"**

PROJECT NAME
Brownston (McCord) Landslide Design Services

DATE (DAY, MONTH, YEAR)
19/01/2009

FEIN **95-4660169**
DUNS # **04-967-1456**

1. FIRM NAME
Tetra Tech NUS, Inc. - Pittsburgh, PA

2. HOME OFFICE BUSINESS ADDRESS
**Foster Plaza 7 - 661 Andersen Drive
Pittsburgh, PA 15220-2745**

3. FORMER FIRM NAME
NA

4. HOME OFFICE TELEPHONE
412-921-7090

5. ESTABLISHED (YEAR)
1966

6. TYPE OWNERSHIP
Individual Corporation
Partnership Joint-Venture

6a. WV REGISTERED DBE
(Disadvantaged Business Enterprise)
YES NO

7. PRIMARY AML DESIGN OFFICE: ADDRESS/ TELEPHONE/ PERSON IN CHARGE/ NO. AML DESIGN PERSONNEL EACH OFFICE
Foster Plaza 7 - 661 Andersen Drive Pittsburgh, PA 15220-2745/412-921-7090/Tom Gray/20

8. NAMES OF PRINCIPAL OFFICERS OR MEMBERS OF FIRM
Mark Speranza, PE - Operations Manager

8a. NAME, TITLE, & TELEPHONE NUMBER - OTHER PRINCIPALS
**Mark Perry, PE - Regional Manager (Mining Engineer)
412-921-7090**

9. PERSONNEL BY DISCIPLINE

32 ADMINISTRATIVE	2 ECOLOGISTS	LANDSCAPE ARCHITECTS	1 STRUCTURAL ENGINEERS
ARCHITECTS	ECONOMISTS	MECHANICAL ENGINEERS	SURVEYORS
4 BIOLOGIST	1 ELECTRICAL ENGINEERS	3 MINING ENGINEERS	TRAFFIC ENGINEERS
8 CADD OPERATORS	10 ENVIRONMENTALISTS	PHOTOGRAMMETRISTS	45 OTHER
12 CHEMICAL ENGINEERS	1 ESTIMATORS	PLANNERS: URBAN/REGIONAL	
19 CIVIL ENGINEERS	15 GEOLOGISTS	2 SANITARY ENGINEERS	
3 CONSTRUCTION INSPECTORS	HISTORIANS	1 SOILS ENGINEERS SPECIFICATION	
DESIGNERS	4 HYDROLOGISTS	WRITERS	
DRAFTSMEN			166 TOTAL PERSONNEL

TOTAL NUMBER OF WV REGISTERED PROFESSIONAL ENGINEERS IN PRIMARY OFFICE: 4
 *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? YES NO NA

11. OUTSIDE KEY CONSULTANTS/SUB-CONSULTANTS ANTICIPATED TO BE USED. Attach "AML Consultant Confidential Qualification Questionnaire".

<p>NAME AND ADDRESS: Triad Engineering, Inc. 219 Hartman Run Road Morgantown, WV 26505</p>	<p>SPECIALTY: Surveying, Mapping, Geotechnical Drilling, and Sampling</p>	<p>WORKED WITH BEFORE <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>NAME AND ADDRESS: DiGioia, Gray and Associates, LLC 570 Beatty Road Monroeville, PA 15146</p>	<p>SPECIALTY: AML Expert Support</p>	<p>WORKED WITH BEFORE <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>NAME AND ADDRESS:</p>	<p>SPECIALTY:</p>	<p>WORKED WITH BEFORE <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>NAME AND ADDRESS:</p>	<p>SPECIALTY:</p>	<p>WORKED WITH BEFORE <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>NAME AND ADDRESS:</p>	<p>SPECIALTY:</p>	<p>WORKED WITH BEFORE <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>NAME AND ADDRESS:</p>	<p>SPECIALTY:</p>	<p>WORKED WITH BEFORE <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>NAME AND ADDRESS:</p>	<p>SPECIALTY:</p>	<p>WORKED WITH BEFORE <input type="checkbox"/> Yes <input type="checkbox"/> No</p>

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

YES Description and Number of Projects: Tetra Tech staff and consultants have completed over 100 abandoned mine land projects. The listing in Attachment C is only a partial listing. Thomas Gray has been working on abandoned mine reclamation projects for the past 21 years, many in West Virginia. Our consultant, Richard Gray, has been involved with mine reclamation since the early 1980s. He has completed over 100 projects in West Virginia for the WVDEP. They worked together on many of these projects. Tetra Tech has been involved with mine reclamation for many years in the western U.S. and has been providing similar services in the Appalachian coalfields since 2007. Our office in Charleston, WV will provide support as needed.

NO

B. Is your firm experienced in Soil Analysis?

YES Description and Number of Projects: Tetra Tech has conducted thousands of soil investigations worldwide that included sampling and analysis. Along with this site work we have provided thousands of reports presenting the results of the investigations. We have extensive specialized experience and technical competence in providing soil sampling and analysis services, including performing more than 6,000 environmental site characterizations, including mining sites, and more than 1000 geotechnical investigations. Tetra Tech has trained and experienced field sampling crews available in our lead design office.

NO

C. Is your firm experienced in hydrology and hydraulics?

YES Description and Number of Projects: Tetra Tech has over three decades of corporate experience in hydrology and hydraulics. Our expertise and knowledge in evaluating hydrologic systems is applied to specific water resource project types including; water resource and flood damage assessment, flood control design (including channels, levees, detention basins and bank protection, hydraulic structure designs, erosion/sedimentation studies, stream restoration and wetland design projects, dam and levee safety evaluations, reservoir operation/optimization studies, flood-control and floodplain management studies and mapping, development of flood warning systems, dam break flood studies and contingency planning, stormwater drainage design, surface and groundwater supply analysis. The basis of these hydrologic studies is the application of HEC software such as; **HEC-HMS, GeoHMS, HECFFA, HEC-SSP, HEC-DSSVue, HEC-Ressim, CWMS and legacy software such as HEC-1, HEC-5, HEC-DSS, and COED.**

NO

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

YES Description and Number of Projects

NO Tetra Tech regularly subcontracts these activities and has teamed with Triad Engineering, Inc. to provide these services

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 has extensive expertise with modeling, designing, and constructing water distribution systems. Our experience encompasses all aspects of transmission and distribution systems, including large diameter water mains, distribution piping, booster pumping stations, storage tanks, and metering facilities. Tetra Tech's has performed domestic waterline design projects for the hundreds of municipalities and water authorities.

NO

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

YES Description and Number of Projects: Tetra Tech staff anticipated for this project is currently involved with three acid mine drainage projects. The Gladden discharge project is a passive treatment design for an acidic discharge that averages over 900 gpm. Our current staff has also been involved with many other AMD evaluation projects and abatement designs with other firms.

NO

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: 23	YEARS OF AML RELATED DESIGN EXPERIENCE: 34
Gray, PE, Thomas A. Project Manager		YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE: 16

Brief Explanation of Responsibilities:

Mr. Gray will serve as the project manager. He is an experienced mining engineer and has been involved with abandoned mine reclamation for the past 23 years. He is currently working on the reclamation design of the Gladden mine discharge in western Pennsylvania. Other Tetra Tech mine reclamation projects in which he is involved are the treatment of an acidic discharge for Penn DOT, subsidence evaluation for a mine in Colorado, and pipeline design for a mine in Pennsylvania and mine portal closures in Tunnelton, WV and Weston, WV for the WVDEP. He managed an office in Charleston, WV office in the 1990s. Since 2000, Mr. Gray has managed or was a senior consultant on 53 projects involving reclamation of abandoned mines. This includes 30 projects that he managed for the Office of Surface Mining. He also managed open end design contracts for the PADEP and the Maryland Bureau of Mines. A letter attesting to Mr. Gray's work with these agencies is attached to this submittal. Mr. Gray has also consulted to WV DOH on mining issues, most recently on a project site in Harrison County in 2007. Projects for the WVDEP that Mr. Gray was involved in (while at other consulting firms) include Omega mine grouting, Owings mine reclamation, Majesty mine reclamation, Godby Branch water supply extension, and Left Hand Fork Refuse fire control. He has published over 30 articles related to mining and reclamation, including the chapter entitled, "Mine Closure, Sealing, and Abandonment" in SME's Mining Engineering Handbook.

EDUCATION (Degree, Year, Specialization) BS, 1973, Mining Engineering Masters Business Administration, 1977	REGISTRATION (Type, Year, State) Professional Engineer 26978-E, 1978, Pennsylvania Professional Engineer 17048, 1989, Maryland Professional Engineer 11628, 1980, Virginia Professional Engineer 10523, 1988, West Virginia
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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: 1	YEARS OF AML RELATED DESIGN EXPERIENCE: 1
Berenbrok, PE, Allan R. Civil Design Engineer		YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE: 28

Brief Explanation of Responsibilities:

Mr. Berenbrok will serve as the civil design engineer. He has 28 years of site design and construction management experience. He is currently working on the Gladden project in South Fayette Township, PA, Bear Run Reclamation project in Indiana, PA and the Tunnelton and Fisher Run Mine Portal closures for the WVDEP. Relevant design experience includes preparation of bid packages and contract documents, cost estimating, bid phase services, shop drawing review, construction inspection and construction management.

EDUCATION (Degree, Year, Specialization) BS, 1980, Civil Engineering MS, 1984, Systems Management	REGISTRATION (Type, Year, State) Professional Engineer 037262-E, 1988 Pennsylvania
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MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:
NAIOP, ICSC

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.) Cummings, PE, Biff D. Senior Geotechnical Engineer	YEARS OF AML DESIGN EXPERIENCE: 15	YEARS OF AML RELATED DESIGN EXPERIENCE: 29	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE: 0
	YEARS OF EXPERIENCE		

Brief Explanation of Responsibilities:

Mr. Cummings will serve as the senior geotechnical engineer for this project. He is a registered professional engineer with over 29 years of experience specializing in geotechnical, and geo-environmental engineering. Mr. Cummings has expertise in mine reclamation, waste and soil consolidation, slope stability, settlement analysis, mine subsidence, fill placement, mine drainage and seals, regrading and vegetation of spoil piles, landslide investigation and abatement, mine and spoil fires, and stream channel restoration. Mr. Cummings has performed AML related activities under contracts in West Virginia, Ohio, Maryland, and Virginia, and performed subsidence evaluations for private companies and OSM in Pennsylvania, West Virginia, Ohio, and Maryland. His experience also includes design, mine permitting, and closure of waste disposal areas such as lagoons, landfills, and coal refuse dams.

EDUCATION (Degree, Year, Specialization) BS, 1978, Civil Engineering
Graduate Studies in Geotechnical Engineering, University of Pittsburgh

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:
American Society of Civil Engineers

REGISTRATION (Type, Year, State)
Professional Engineer 032338-E, 1984 Pennsylvania
Professional Engineer 062.059306, 2006, Illinois
Professional Engineer 21197-E, 2005, Alabama
Professional Engineer 015871, 2004, West Virginia
Professional Engineer 10403586, 2004 Indiana
Professional Engineer 57675, 1994, Ohio

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.) Ludwig, Jon - Environmental Scientist	YEARS OF AML DESIGN EXPERIENCE: 8	YEARS OF AML RELATED DESIGN EXPERIENCE: 10	YEARS OF DOMESTIC WATERLINE DESIGN EXPERIENCE: 0
	YEARS OF EXPERIENCE		

Brief Explanation of Responsibilities:

Mr. Ludwig is the manager of the Charleston, WV office of Tetra Tech's TMDL and Water Resources Center. He will serve as the senior environmental scientist. He has over 10 years experience providing technical and management support to federal, state, regional, and private clients in the areas of water resources, watershed and water quality assessment, watershed modeling, and Total Maximum Daily Load (TMDL) development. In support of EPA Region 3 and West Virginia Department of Environmental Protection Division of Water and Waste Management (WVDEP DWMM), he has served as project manager in the development of over 1,900 EPA approved TMDLs in West Virginia. Currently, he serves as project manager for the existing TMDL contract with WVDEP DWMM that includes the development of TMDLs for total iron, total manganese, dissolved aluminum, pH, selenium, fecal coliform bacteria, and biological impairments throughout the state of West Virginia. Mr. Ludwig also oversees development of a stressor identification process for biologically impacted streams throughout West Virginia including development of macroinvertebrate tolerance values. Mr. Ludwig also has extensive experience implementing various hydrologic and water quality models, including EFDC, SWMM, BASINS, HEC-2, HEC-RAS, LSPC, GWLF, HSPF, WASP, and DESC-R. He is familiar with the watershed in which the project is planned.

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

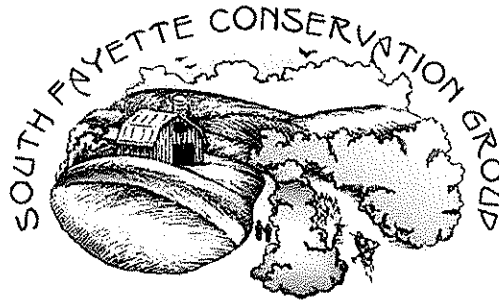
PROJECT NAME, TYPE AND LOCATION	NAME AND ADDRESS OF OWNER	NATURE OF YOUR FIRM'S RESPONSIBILITY	ESTIMATED CONSTRUCTION COST	PERCENT COMPLETE
Gladden Mine Drainage; Passive Treatment Design; South Fayette Township, Allegheny County, PA	South Fayette Conservation Group 515 Millers Run Road Morgan, PA 15064	Investigation and passive treatment system design, including surveying, wetland delineation, H&H evaluation, plans and specifications	\$500,000	30%
Bauxite Residue Seepage Assessment, Subsurface Investigation and Groundwater/Surface Water Assessment from tailing dam on previously mined land, Bauxite, AR	Alcoa Arkansas Reclamation 1401 Bauxite Cutoff Rd Bauxite, Arkansas 72015	Perform a subsurface investigation and install wells and piezometers to assess groundwater conditions and flow patterns. Installed manometers and performed flow measurements in surrounding streams to determine flow and chemical characteristics of surface water. Design surface and groundwater containment systems.	\$1,000,000	80%
SPL Consolidation, Closure Design Project, Listerhill, AL	Alcoa, Inc 201 Isabella Street Pittsburgh, PA 15212	Develop/design a closure plan to consolidate and cap residual materials from past process activities at a closed aluminum manufacturing plant.	\$600,000	20%
Seal Design of Three Mine Openings, Eastern Ohio	Confidential Client Ohio	Designed mine seals consisting of structural concrete to resist uplift pressure of a hydraulic gradient.	\$300,000	95%

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
Jonathan Run Acid Rock treatment plant design; Snowshoe, PA	Consulting	Penn DOT Clearfield, PA	December, 2008	\$130,000	Review of design and technically assist during the design process.

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)	
SWMU Closure Feasibility Study and Design including cover design for South End Landfill, New Martinsville, WV	Bayer Corporation State Route 2 New Martinsville, WV 26155	1,200,000	2004	NO	
Mud Lake Reclamation involving slope regrading, revegetation, and stream relocation, Listerhill, AL	Alcoa Remediation Management, Inc. 201 Isabella Street Pittsburgh, PA 15212	650,000	2006	YES	
East St Louis, Site Remediation Design and Oversight of waste removal and disposal. East St. Louis, IL	Alcoa Remediation Management, Inc. 201 Isabella Street Pittsburgh, PA 15212	250,000	2006	YES	
Bauxite Residue Disposal Area seepage assessment and subsurface drainage collection system design and construction oversight, Hurricane Creek, Bauxite, AR	Alcoa Arkansas Reclamation 1401 Bauxite Cutoff Rd Bauxite, Arkansas 72015	500,000	2004	YES	
Sherwin Dike Upgrade, collect soil samples, performed testing and analysis and grading plans associated with efforts to stabilize and heighten 3.5 mile dike, Corpus Christi, TX	Alcoa Remediation Management, Inc. 201 Isabella Street Pittsburgh, PA 15212	2,500,000	2006	YES	

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
NA					
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. SEE ATTACHED LETTERS OF RECOMMENDATION FOR TOM GRAY, PE, FROM PADEP AND MARYLAND DEPT OF THE ENVIRONMENT SEE PROJECT DESCRIPTIONS ATTACHED TO ATTACHMENT C					
20. The foregoing is a statement of facts. Signature: <u>Mark P. Speranza</u> Title: Pittsburgh Operations Manager Date: <u>January 20, 2009</u> Printed Name: <u>Mark P. Speranza, PE</u>					



September 5, 2008

To whom it may concern,

I want to express my appreciation to both Tom Gray and Tetra Tech NUS, Inc. for their ongoing efforts to design an abandoned mine discharge passive treatment system that the South Fayette Conservation Group will be able to submit for Growing Greener funding in 2009. The meeting of August 28th, held to discuss the design of the settlement ponds with Rich Beam of Pa. DEP BAMR, was insightful and informative. As the result of the meeting, a smart strategy has been decided upon for moving forward with this project.

I would recommend both Tom and Tetra Tech to anyone considering undertaking an AMD project. Tom was the designer of our recently completed Fishing Run Restoration/Maude Mine Reclamation Project. The project won the South Fayette Conservation Group a 2008 Western Pa. Environmental Award. The project has also won a 2008 Office of Surface Mining Reclamation Award for the Bureau of Abandoned Mine Reclamation.

Tom and everyone at Tetra Tech is always very responsive to our needs as we tackle permitting issues, adjacent landowner concerns, grant paperwork requests and the coordination of all project partners. Tetra Tech has also been willing to work with us financially in order to help us achieve our required 15% cost match for the grant funds.

As we continue to tackle the problems of abandoned mine drainage within our township, we look forward to maintaining a strong working relationship with Tom and all of the employees at Tetra Tech NUS, Inc.

Sincerely,

Amy Smith
President, South Fayette Conservation Group

Working to conserve, protect and enhance our natural and recreational resources.

515 Millers Run Road, Morgan, PA. 15064



Pennsylvania Department of Environmental Protection

286 Industrial Park Road
Ebensburg, PA 15931-4119
September 3, 2008

Bureau of Abandoned Mine Reclamation

814-472-1800

Tetra Tech NUS, Inc.
661 Andersen Drive
Pittsburgh, PA 15220-2745

Re: Consulting Work

To Whom It May Concern:

This letter is to verify that Thomas Gray, while with his former employer GAI, provided consulting work to PA-DEP, Bureau of Abandoned Mine Reclamation. Most recently, Mr. Gray was involved in a technical evaluation of the potential use of ten mine pools for water storage, with treatment and discharge during low-flow conditions. I was the DEP's project coordinator for this evaluation.

Mr. Gray and his staff were responsive, professional, and completed all work in a timely manner and under budget. All items in the scope of work were fully addressed.

Please contact me at the above phone number if you would like to further discuss this project and Mr. Gray's involvement.

Sincerely,

Pamela J. Milavec, Chief
Environmental Services Section
Cambria Office



MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Boulevard • Baltimore MD 21230

410-537-3000 • 1-800-633-6101

Martin O'Malley
Governor

Water Management Administration
Mining Program – Bureau of Mines
160 South Water Street
Frostburg, Maryland 21532

Shari T. Wilson
Secretary

Anthony G. Brown
Lieutenant Governor

Bob Summers
Deputy Secretary

February 14, 2008

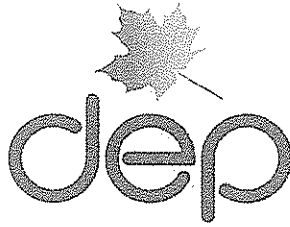
To Whom It May Concern:

I have worked with Mr. Tom Gray since 2002 as the contract monitor for the Maryland Bureau of Mine's technical service contract and the Chief of the Maryland Abandoned Mine Land Program. During that time, Mr. Gray was assigned tasks to perform technical services related to coal mining and coal mine reclamation. In general, the work consisted of geotechnical evaluations, acid mine drainage evaluations, water supply evaluations and acid mine drainage treatment system enhancements.

Mr. Gray's work was always of the highest quality and completed within the assigned time frame. I attribute his success to his experience and ability to understand a wide range of issues. He communicated effectively by providing work updates and was able to resolve a variety of technical and administrative issues before committing time and resources, maximizing the value of his services to the State. I would recommend him to any person or agency considering contracting for his services. If you have any questions, please feel free to contact me at (301)689-1460 or by email at mgarner@allconet.org.

Sincerely,

Michael P. Garner, Chief
Abandoned Mine Land Program
Maryland Bureau of Mines



west virginia department of environmental protection

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

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

September 17, 2008

To whom it may concern:

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

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

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

Sincerely,

David A. Montali
TMDL Program Manger



The South Fayette Conservation Group, in conjunction with the Pennsylvania Department of Environmental Protection (DEP) Bureau of Abandoned Mine Reclamation, retained Tetra Tech for the design of a passive acid mine drainage treatment system. Millers Run, a warm water fishery, flows into Chartiers Creek, also a warm water fishery. The abandoned mine portal discharges approximately 1,000 gallons per minute of acid mine drainage into Millers Run. With the aeration and mixing of the flow the pH rises and the iron oxide is precipitated out of the flow, resulting in several miles of iron oxide precipitation and low oxygenated water.

In support of the design, Tetra Tech surveyed the site and prepared a topographic map, installed monitoring wells to monitor the mine pool elevation, delineated wetlands, evaluated several alternative site configurations. One of the sites evaluated had an unstable highwall. Tetra Tech is currently conducting a geotechnical evaluation of the site, performing a hydrologic evaluation of the floodplain, and preparing the site layout and grading plan design. Tetra Tech is also preparing construction drawings, specifications, construction cost estimates and applicable Pennsylvania DEP permits.

The design consists of the excavation of a 3-acre basin on private property adjacent to a four-lane highway, railroad right-of-way, and an adjacent property owner. The treatment will consist of a directional bore into the mine to allow gravity flow of the mine drainage into a limestone bed and into the 3-acre holding basin. The basin area will be over-excavated to remove the underlying coal bed. The basin will be constructed at a horizontal distance far enough away from the existing mine to prevent a blowout. The existing discharge will remain behind a small check dam to eliminate the discharge but will be used as an outlet control if the mine pool would rise. The basin will consist of three cells to increase holding time and allow for each cell to be isolated for the removal of iron oxide from the cell for commercial use. The basin will discharge through a riser structure into man-made wetland areas for additional treatment prior to flowing into Millers Run and ultimately Chartiers Creek.



Client Name
South Fayette Conservation Group

Project Highlights

- Restore 5+ miles of stream
- Passive treatment of AMD
- Hydrologic investigation of flood plain
- Prepared plans and specifications

Project Cost
\$1,000,000 (est.)

Completion Date
On-going



The Bear Run abandoned mine land consists of a 20-acre abandoned mine site that previously served as coal transfer station, located near Indiana, Pennsylvania. The coal refuse that remained on site at the completion of the mining operation was graded and abandoned. Approximately 10,000 tons of coal refuse remained on site in three different areas. A small unnamed tributary to Bear Run flows through the refuse area and has severely eroded and exposed the coal refuse. A mine discharge flows directly into Bear Run. The Susquehanna River Basin



Commission received grant funding through the Pennsylvania Watershed Renaissance Initiative to reclaim this 20-acre site. The project is managed through the Indiana County Conservation District. The Conservation District retained Tetra Tech to prepare the design and permit applications for the reclamation of this site.

Client Name
Indiana County
Conservation District

Project Highlights

- Will reclaim 20 acres of abandoned mining
- Will passively treat AMD
- Will restore 1,000 feet of stream

Project Cost
\$250,000 (est.)

Completion Date
On-going

The mine discharge average flow rate is 500 gallons per minute. Two ponds are being designed to passively treat the alkaline drainage prior to it entering Bear Run. A wetland delineation has been performed to identify the limits of the existing wetland area prior to the start of design. Approximately 10,000 tons of coal refuse will be excavated and removed from the site.

The passive treatment design and the coal refuse removal is being coordinated during the design process to create a final grading plan to shape the 20-acre site to adequately convey storm water runoff into the stream. The excavation plan required Tetra Tech to prepare a local erosion and sediment control permit along with final site grading plans. The removal of the coal refuse will reduce runoff contamination into the ground water and stream.

Approximately 1,000 linear feet of stream will be restored to accommodate the coal refuse removal and to create stable stream banks for the unnamed tributary. An existing stream crossing will be removed and replaced with a permitted structure to allow access into the site. A HEC-RAS model will be prepared and studied to prepare the necessary PaDEP documents to permit the stream crossing. The work includes a topographical field survey to create the site grading plan and prepare detailed cross sections of the stream bank restoration. Upon completion of the reclamation the remaining soils will be analyzed to determine the necessary nutrients to be added to the soil to stimulate growth of native grasses. The site currently contains sporadic areas of grass and vegetation.



Tetra Tech conducted an engineering evaluation of alternatives to restore reaches of Powderly Creek impacted by acid mine drainage (AMD). The creek had been impounded, choked with fine sediments, and buried by mine tailings. Tetra Tech collected soil, water, and aquatic biology samples to assess the aquatic and riparian habitat, and prepared a detailed HEC-RAS hydraulic model to help evaluate stream restoration alternatives.

Because impacts to stream flows, floodplains, bank and bed materials, and stream location had been severely impacted by coal mining activities, geomorphologic modeling was essential for the successful development of stable stream restoration designs. Overland and in-stream sediment loads, hydraulics, bed forms, stream profile, impoundment and wetland impacts, and potential management practices were evaluated to fully describe site geomorphology with and without the restoration projects. Geomorphic resources included USACE documents such as EM 1110-2-4000, EM 1110-2-1418, ERDC-CHL TR-01-28, and the "WES Stream Investigation and "Streambank Stabilization Handbook."

Tetra Tech prepared restoration options including wetland improvements, wetland creation, stream restoration, stream channel relocation, development of floodplains that appropriately link to the restored stream, low head floodwalls, potential breaching of other low head dams, and creation of stormwater BMPs. Passive systems for treating acid mine drainage (AMD) were incorporated into the designs with treatment units located in the riparian corridor. The detailed designs of the selected alternative to restore the Powderly Creek watershed included a geomorphic evaluation, sediment load study, MCACES costs, construction documents, dam modifications, and passive AMD treatment systems.

Client Name

Baltimore District U.S. Army Corps of Engineers

Project Highlights

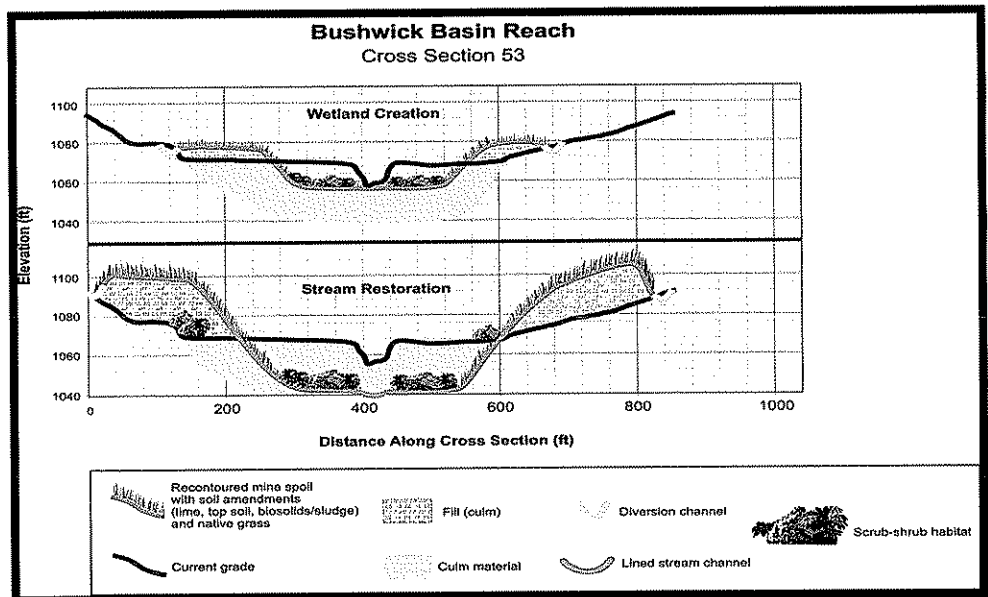
- Geomorphic modeling and sediment load analysis
- HEC-RAS hydraulic modeling
 - Passive AMD treatment alternatives evaluated
- MCACES cost estimate and preparation of construction documents

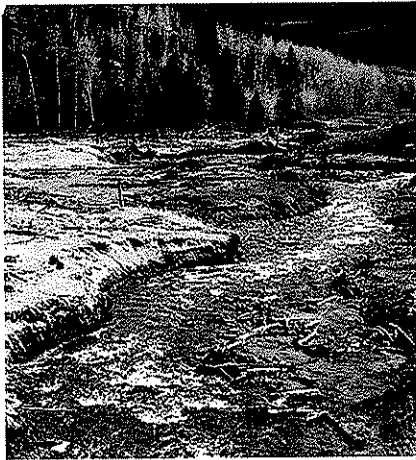
Project Cost

\$335,000

Completion Date

2005





Before



Restored

By working together, representatives from government, private industry, and the public have developed and are implementing proactive and expedited watershed-based solutions to the environmental effects of historical mining and milling in the Bonanza Mining District.

Tetra Tech managed the project on behalf of the Bonanza Group and provided the necessary environmental science and engineering services to complete the site characterization, acquire necessary permits and authorizations, and implement response actions.

Client Name

ASARCO Incorporated

Project Highlights

- *Stream channel segment restored to stable meander pattern after removal of valley-fill tailings impoundment*
- *Numerous in-place closures of fluvially-deposited tailings*
- *Consolidation and capping of selected tailing deposits and impoundments*
- *Numerous stream bank stabilization measures*

Project Cost

Confidential

Completion Date

1999

Response actions include in-place and on-site tailings and mine waste consolidation and closure, storm water controls, stream rehabilitation and riparian zone enhancements, revegetation, control of acid mine drainage, and passive water treatment.

As part of the project, stream banks have been stabilized and riparian zones restored along approximately four miles of Kerber Creek impacted by historic tailing impoundments and fluvially deposited tailings. This stream rehabilitation work has included relocating a one-half mile long segment of the creek to a new, stable, meandering channel after removal of a valley-fill tailings impoundment.

Stream stabilization measures include placement of rock barbs, vortex weirs, log revetments, and riparian trees and shrubs. The riparian zone enhancements and revegetation of the areas have served to both stabilize stream banks and improve water quality.



TETRA TECH

**Sediment Control/Mine Waste Pile Remediation
Clear Creek/Central City Superfund Site**

Gilpin County, Colorado



Tetra Tech performed professional engineering and surveying services for the planning and design of water quality improvements in the North Clear Creek watershed. The Clear Creek/Central City Superfund Site encompasses many mine waste rock piles dating back to the mid-19th century gold rush days. Abandoned waste rock piles contaminated the watershed with acid mine drainage and contaminated sediments. This project reduces runoff contact with the waste rock, collects sediments for future removal, and provides flood control to Central City and the Town of Black Hawk.

Key project elements include:

Client Name
*Colorado Department of Public
Health and Environment*

Project Highlights

- *Dam and Channel Design*
 - *Geotechnical Design*
 - *Construction Documents*
- *Construction Administration*

Project Cost
\$1,400,000

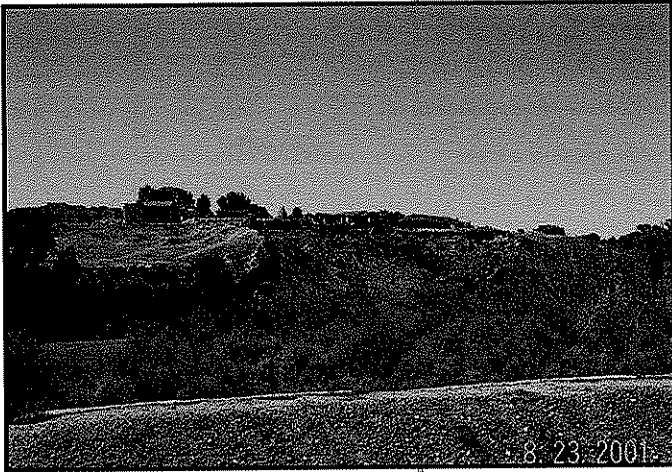
Completion Date
2007

- Hydraulic and geotechnical design of two rock fill dams with heights exceeding 25 feet
- A soil nail wall with a natural stone veneer to protect Gregory Gulch
- Design of runoff and runoff control ditches to minimize water contact with five waste rock piles
- Stone protection of waste rock pile toes adjacent to the creeks
- Construction observation and administration
- Interfacing with the Colorado Department of Public Health and Environment, the Environmental Protection Agency, and local municipalities
- Iron oxide recovery plan

complex world



Tetra Tech conducted a geotechnical investigation of the cause of a landslide adjacent to the south bank of the Colorado River in the Redlands area of Grand Junction, Colorado.



The study included a geotechnical field investigation, site exploration and periodic surveying of the landslide, a general geological investigation, laboratory testing of samples of soil and bedrock obtained from the site, determination of the potential erosive effects of the river, and review of historic land usage and grading.

The landslide failure plane was identified from the slope inclinometer data and correlated with a low strength zone in the continuous core sample obtained at the site. The investigation concluded that the initial failure occurred due

to sliding of a block near the toe of the landslide along a zone of very soft shale and interbedded sandstone. The stability analyses confirmed that failure of the slope initiated near the toe of the slope, but well above and independently of the Colorado River.

Tetra Tech determined that when the resistance to sliding of the toe mass was removed; the factor of safety of the uphill soil mass was reduced to 1.0, and subsequently failed as well. The failure was determined to be a progressive block failure, with each episode of failure triggering movement of another block of bedrock and soil behind it.

Client Name

Vanatta, Sullan, Sandgrund and Sullan, P. C.

Project Highlights

- Determination of the complex block-slide mechanism of failure
- Provided a slope stability investigation of the landslide which included a field investigation, instrumenting the landslide to detect landslide movements, laboratory testing, and stability analyses of progressive failures





Tetra Tech developed and implemented a Standard Operating Procedure (SOP) for landslide forensic investigation. Procedures were specific to timberland in

northern California and were developed to guide reconnaissance-level forensic assessments on storm-triggered landslides to identify potential causal mechanisms and the possible links to land management activities.

As part of the project, Tetra Tech created a standardized field inventory procedure for assessing and documenting characteristics of landslides.

The SOP included instructions and data sheets for conducting landslide forensics in the field. These procedures were successfully implemented on 40 storm-triggered landslides.



Damaged areas

Client Name
Confidential Client

Project Highlights

- *Developed procedures for a reconnaissance-level approach for characterizing landslide causal mechanisms and potential linkage to land management activities.*
- *Conducted landslide field data collection and evaluation on 40 landslides using the SOP and data sheets.*

Completion Date
2003



Uprooted trees

STATE OF WEST VIRGINIA
Purchasing Division**PURCHASING AFFIDAVIT****VENDOR OWING A DEBT TO THE STATE:**

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

PUBLIC IMPROVEMENT CONTRACTS & DRUG-FREE WORKPLACE ACT:

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

ANTITRUST:

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

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


LICENSING:

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

CONFIDENTIALITY:

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

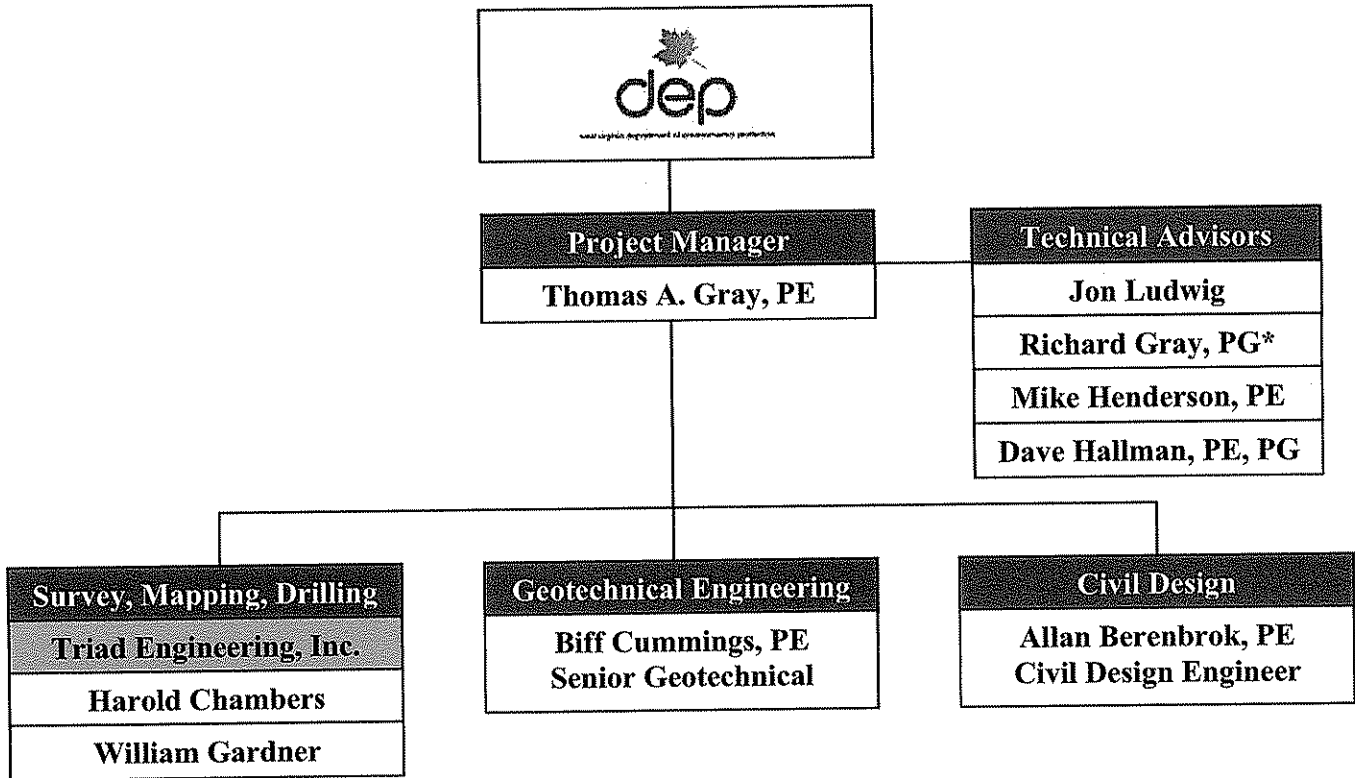
Under penalty of law for false swearing (West Virginia Code §61-5-3), it is hereby certified that the vendor acknowledges the information in this said affidavit and is in compliance with the requirements as stated.

Vendor's Name: Tetra Tech NUS, Inc.Authorized Signature: Date: January 20, 2009

Appendix A

Resumes

Tetra Tech
Project Organizational Chart



*DGA Consulting Engineers and

THOMAS A. GRAY, PE

Project Manager

Education

BS, Mining Engineering; the Pennsylvania State University; 1973
MBA, Business Administration; University of Pittsburgh; 1977

Professional Registration/ Certifications

Professional Engineer Pennsylvania, 26978-E, 1978
Professional Engineer, Maryland, 17048, 1989
Professional Engineer, Virginia, 11628 1980
Professional Engineer, West Virginia, 10523 1988

Qualifications

Mr. Gray has 34 years total years of professional experience. His 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, including use of abandoned mine pools as storage reservoirs for combined sewage overflows; use of stored water from abandoned deep mine pools as replacement flow during drought conditions in the Susquehanna River basin; program manager for U. S Department of Interior's Office of Surface Mining emergency response program in Pennsylvania, Maryland, Michigan, Kentucky and Georgia; investigating and preparation of construction plans and specifications for the control of a large abandoned mine fire in the anthracite region of Pennsylvania; power plant site selection and preliminary design of waste disposal site for Dominion Resources in Southwest Virginia; investigating, preparing design documents and construction oversight for mitigating mine subsidence potential at a new power plant site in Indiana for Duke Power; project planning to utilize CO2 emission trading to fund abandoned mine fire control; managed two large acid mine drainage and subsidence control projects though injection of alkaline coal combustion ash; principal author of general evaluation report for the U.S. Army Corps of Engineers for the restoration of the aquatic ecosystem of the South Branch of Blacklick Creek in Pennsylvania.

Experience of Interest

Contract Manager; Geotechnical Engineering Services; Office of Surface Mining; Pittsburgh, PA. Served as Contract Manager and Principal Investigator for 30 projects for the Office of Surface Mining, Pittsburgh office over a five year period. The projects included 8 mine subsidence projects; 4 mine and refuse fires; 2 hazardous mine entries; 2 mine gas investigations; 6 acid mine drainage and mine blow outs; and 8 landslides, unstable highwalls, and unstable refuse bank investigations and mitigations. Projects were completed in Pennsylvania, Maryland, Michigan, Tennessee, and Georgia. Generally, the projects involved an initial site reconnaissance to assess a reported abandoned mining problem. This would be followed by a geotechnical investigation including drilling, rock and material testing, and an analysis of various reclamation alternatives. Once a reclamation method was selected and approved by OSM, a project design with plans, specifications, and cost estimates were prepared. Prebid and cost construction meetings were attended. After the completion of this contract, Mr. Gray became the lead Contract Management/Principal Investigator for similar new contracts with OSM's Pittsburgh, Wilkes Barre and Ashland, Kentucky offices.

Project Manager; Gladden Discharge Mitigation Design; South Fayette Township; Allegheny County, PA. Served as Project Manager for the South Fayette Conservation Group, in conjunction with the Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Reclamation for the design of a passive treatment system. The site has difficult construction conditions. The mine discharge varies to as much as 2000

gpm and is located beside Millers Run, a stocked trout stream above the discharge. The mitigation site, chosen by Mr. Gray in a previous project, was located across a four-lane highway from the discharge and was adjacent to Millers Run. Other issues that must be considered during the design include floodplain encroachment, railroad right-of-way, adverse adjacent property owner, surface mining of available coal in the construction zone, and maintaining mine pool elevation to prevent mine blowouts. Alternative plans were evaluated. The floodplain encroachment is being evaluated by conducting a hydraulic study of the floodway. A geotechnical evaluation, including drilling, is being conducted. Construction drawings, specifications, and a design report are being completed.

Project Manager; Abandoned Mine Lands Program; Maryland Bureau of Mines; Frostburg, MD. Served as Manager and Principal Investigator in support of the Maryland Bureau of Mines (BOM) active and abandoned mine land program. The contract called for providing mining engineering and mine reclamation assistance on an as-needed basis. Generally, the work entailed conducting and supervising studies and analysis to support agency activities including permitting and monitoring active mine sites, restoration of prelaw abandoned sites, and reclamation of acid mine discharge problems. During emergency situations a 24-hour response time was maintained. Over a 2-year period seven projects were completed, including:

- Evaluating and recommending actions for a mine blow out at the McDonald Mine
- Evaluating residential well water contamination from adjacent mining at the Pee Wee Hill site
- Developing mine treatment options for mine closure at a bond forfeited mine site (Buffalo Coal Permit 422)
- Preparing air photos at all active coal mining sites in Maryland
- Evaluation and suggesting improvements to the water treatment system at the Kempton site
- Evaluating power supply alternatives at the Kempton water treatment site (including solar, wind, diesel, and the construction of a new power line)
- Evaluating drinking water supply pollution within the Mill Run watershed

Senior Project Manager, 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.

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

Senior Project Manager, Dominion Resources, St Paul, VA. Performed a siting investigation to determine the best location for a new coal fired power plant in Southwestern Virginia. A regulatory fatal flaw analysis was performed on potential solid waste disposal sites. Preliminary designs and permit documents were prepared, including a hydro geologic investigation.

Senior Project Manager, University of Pittsburgh in conjunction with the Pennsylvania Department of Highways, 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, Paint Creek Watershed Association in association with the Pennsylvania Department of Environmental Protection, 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.

Senior Project Manager, South Fayette Conservation Group in association with the Pennsylvania Department of Environmental Protection, 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 the Pennsylvania Department of Environmental Protection 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, Maryland 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 Consultant, National Institute for Occupational Safety and Health, 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.

Senior Project Manager, Chartiers Nature Conservancy in association with the Pennsylvania Department of Environmental Protection, 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, Township of Upper St. Clair, Pittsburgh, PA in conjunction with Pennsylvania Department of Environmental Protection, Three Rivers Wet Weather Development Corporation, the U.S. Environmental Protection Agency, and the Heinz Foundation. Investigated the feasibility of eliminating wastewater overflows by diverting the flow into a pumped down abandoned underground coal mine pool as a temporary storage reservoir. After the 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 Department of Energy'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, 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.

Senior Project Manager, Municipality of Monroeville, Monroeville, PA. Prepared a watershed restoration project for Thompson Run, a tributary of Turtle Creek in Allegheny County, Pennsylvania. Responsible for assessing the adverse impacts of acid mine drainage on the 16-square-mile watershed and developing a realistic restoration plan.

Project Engineer, American Electric Power, Mitchell Power Plant, Moundsville, WV. Completed a site selection evaluation of a new solid waste (FGD) landfill at a coal-fired electric generating facility. The site was underlain by coal that had been deep mined using room and pillar mining.

Senior Project Manager, CTC Foundation, Washington, DC. Evaluated the injection of alkaline coal ash into the 537-acre Valley No. 2 Mine to mitigate an acid mine drainage (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 the Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Reclamation, the Kiski-Conemaugh Coalition, Blacklick Creek Watershed Association, Reliant Energy, the

Western Pennsylvania Watershed Protection Project, St. Clair Township, and the Pennsylvania Department of Conservation and Natural Resources.

Senior Project Manager, 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.

Senior Project Manager, 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, 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, U.S. Army Corps of Engineers, 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, 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.

Senior Project Manager, 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, 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.

Project Manager, BethEnergy Mines, Inc., 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 for the final design and construction oversight of a pilot test treatment system.

Project Consultant, 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 Pennsylvania Department of Conservation and Natural Resources (DCNR) Rivers Conservation Program.

Project Manager, Southern Ohio Coal Company (subsidiary to American Electric Power), Athens, OH., Prepared a permit application for the extension of a longwall mine in eastern Ohio.

Project Consultant, West Virginia Division of Environmental Protection, Charleston, WV. Reclamation design of an abandoned mine site comprising old mine structures, open mine portals, refuse piles and numerous acid mine drainage (AMD) producing discharges. Evaluated water quality and designed a passive AMD treatment system design at the Owings Mine Complex site. Awarded: James E. "Pete" Pitsenbarger Abandoned Mine Land Award North, 1999 West Virginia Reclamation Awards.

Project Manager, West Virginia Division of Environmental Protection, Monongalia County, WV. This research and demonstration project injected coal combustion byproduct based grout into 25 acres of abandoned mine workings to reduce the generation of acid mine drainage 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, the U.S. Department of Energy, Consol Inc. and the Electric Power Research Institute.

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

Project Manager, Cannelton Industries, Inc., Charleston, WV. Conducted time and motion studies for surface mining equipment at a mountain top removal operation, including draglines, off road trucks and hydraulic excavators.

Project Advisor, World Bank, 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 Advisor, West Virginia Division of Environmental Protection, Logan County, WV. Prepared construction documents for a water supply extension project.

Project Manager, 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.

Project Advisor, West Virginia Division of Environmental Protection, Nicholas County, WV. Evaluated construction documents for the Gauley River and Heizer/Manila Creek water line extension projects.

Project Advisor, West Virginia Division of Environmental Protection, Chapmanville, Logan Count, WV. Designed a water supply system to service approximately 800 residents of the Mill Creek-Isom Community along Godby Branch watershed.

Project Manager, Cambria Township Water Authority, in conjunction with Inter-Power/AlCon Partners, Colver, PA. Responsible for designing and providing 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.

Project Manager, New Warwick Mining Company, Greene County, PA. Evaluated the 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 Manager, Tennessee Valley Authority, Johnsonville, TN. Developed an ash management plan, including ash haulback, for TVA's Johnsonville Station.

Project Manager, Cannelton Industries, Inc. Charleston, WV. Evaluated permit and environmental compliance of a subcontracted surface mine operator, including preparation of an expert witness legal report.

Project Manager, Mettiki Coal Company, Western Maryland. Completed a mine drainage study to determine the feasibility of eliminating acid mine drainage (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.

Project Manager, Maryland Department of Natural Resources, 1991-1992. Prepared guidelines for the disposal of coal ash in surface mines.

Project Manager, Duquesne Light Company, Greene County, PA, 1991-1992. 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 Manager, US Steel Corporation, Washington County, PA, 1990-1991. Developed a plan to re-open an abandoned shaft in an adjacent mine for ventilation purposes in an active coal mine.

Project Engineer, Capels Resources, Inc. (Subsidiary to Berwind Corporation), McDowell County, WV, 1990-1991. Preliminary subsidence assessment project for underground coal mining property being proposed as a sanitary landfill.

Project Manager, Island Creek Corporation, Grant County WV, 1991-1992. Prepared a cumulative hydrologic impact assessment of the Alpine Number 2 refuse disposal area.

Project Engineer, Chambers Development Company, Johnstown, PA, 1991. Completed a quarrying and crushing feasibility study to determine if daily soil cover could be manufactured onsite at a municipal waste landfill.

Project Manager, Duquesne Light Company, Greensboro, PA, 1992. Evaluated suitability of a mine seal at the Gray's Landing Lock and Dam being constructed on the Monongahela River by the U.S. Army Corps of Engineers.

Project Manager, Island Creek Coal Corporation (subsidiary to Occidental Petroleum), Bayard, WV, 1990. Completed mine development plans, 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.

Project Manager, Island Creek Coal Corporation (subsidiary to Occidental Petroleum), Grant and Tucker Counties, WV, 1989. 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, Maple Coal Company, Colver, PA, 1990-1991. Prepared technical specifications for reducing the potential for spontaneous heating at the Colver coal refuse pile.

Project Manager, Greene County Development Authority, Waynesburg, PA, 1989. 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..

Project Engineer, Pennsylvania Power Corporation, Western Pennsylvania, 1988. Investigated a ground-water contaminant plume from a coal stockpile that was impacting a nearby stream. Responsible for the formulation of a conceptual remedial design which included the identification of feasible remedial alternatives and the numerical modeling and capture zone analysis of the aquifer/stream system to optimize design a groundwater recovery and treatment system.

Project Engineer, Chambers Development Corporation, Western Pennsylvania, 1988-1989. Provided design and permitting services for the three municipal waste landfills in western Pennsylvania, the Southern Alleghenies Landfill, Davidsville, PA, the Monroeville Landfill, Monroeville, PA and the Arden Landfill, Washington County, PA.

Project Engineer, Inter-Power of New York, Inc., Colver, PA, 1988-1989. Completed a potential environmental liabilities assessment of a large property. Provided a water treatment plant preliminary design and associated cost estimates. Evaluated the 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.

Project Engineer, U. S. Department of Energy, Carlsbad, NM, 1984-1985. 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.

Mining Engineer, U.S. Steel Corporation, Greene County, PA, 1976. 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 Engineer, UGI Corporation, Wilkes-Barre, PA, 1988. Responsible for design and permitting to expand the ash disposal site at the Hunlock Power station.

Professional Affiliations

Society for Mining, Metallurgy, and Exploration, Inc., (SME)
Past Chairman of Pittsburgh Section
1997 Distinguished Member Award
Society of American Military Engineers
Engineering Society of Western Pennsylvania

Publications/Presentations

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

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. "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.

Biff D. Cummings, PE

Senior Geotechnical Engineer

Education

Present Candidate for M.S.C.E., Geotechnical Engineering - University of Pittsburgh
BS, Civil Engineering, Pennsylvania State University 1978

Professional Registration/ Certifications

Professional Engineer: Pennsylvania
Professional Engineer: Ohio
Professional Engineer: West Virginia
Professional Engineer: Indiana
Professional Engineer: Illinois
Professional Engineer: Alabama
National Council of Examiners for Engineers and Surveyors
40-hr OSHA HAZWOPER, 1983
8-hr OSHA HAZWOPER Refresher May 2007

Qualifications

Mr. Cummings has over 29 years of professional experience in the engineering civil, geotechnical, and geo-environmental engineering in design, consulting, construction and project management. He has particular expertise with remedial design and remedial actions that include closure plans, synthetic and clay caps, leachate collection, slurry and sheet pile walls, groundwater collection systems, waste removal, and in-situ stabilization. His experience also includes waste disposal areas such as lagoons, landfills and coal tailings dams. Additionally, Mr. Cummings is experienced in geotechnical engineering and investigations to include building foundations, waste and soil consolidation, slope stability, mine subsidence, and fill placement. His experience also includes the full range of civil site design (land development) and abandoned mine land reclamation (mine drainage and seals, regarding and vegetation of spoil piles, landside investigation and abatement, subsidence abatement, mine and spoil fires, and stream channel restoration).

Experience of Interest

Barton Mine Fire, MD. The purpose of this project is to design the abatement plan for a fire within an existing deep mine using a cutoff trench. The site is located approximately 2.5 miles east of Barton, Maryland. The area was initially strip mined approximately 6,000 feet along the outcrop with the deep mine entries developed in the coal seam at the base of the highwall. The mine fire has extended about 200 feet into the deep mine at various locations along the strip mine highwall. Present preliminary designs and associated quantities and cost estimates for comment by Maryland Bureau of Mines personnel. Develop final construction design drawings and technical specifications. Prepare final construction cost estimates.

Barnabus Refuse Piles, WV. Sealing of approximately five deep mine openings and development of reclamation plans. Site contained unstable, eroding refuse piles and open abandoned portals with attendant drainage. Services performed included: Detailed field reconnaissance, collection and laboratory analysis of refuse and soil samples, ground control survey, reclamation designs, hydrologic and hydraulic analyses, designs for wet and dry mine seals, evaluation of areas as direct-seeded growth medium because of limited borrow areas.

Parkway Center Mall Foundation Rehabilitation, Pittsburgh, Pennsylvania. Project manager and senior engineer for the investigation, design, and construction program for the rehabilitation of the foundation system of \$30 million shopping mall including deep mine grouting. The mall was settling leading to severe structural damage due to differential settlement and subsidence. Mr. Cummings developed subsurface exploration plans, analyzed the data obtained, designed methods to support the mall without restricting business operations, and managed construction oversight of the foundation correction methods.

AEP Southern Ohio Coal Company - Barnes Landslide Litigation. Project manager and senior engineer for a landslide/mine subsidence litigation case. It was contended by a homeowner that mine subsidence led to a landslide that was damaging his home and the coal company hired ICF Kaiser to support its defense. Mr. Cummings developed plans for the installation of slope monitors, supervised long-term data collection, analyzed data, evaluated seasonal hydrogeologic conditions, and provided documentation for use in court to defend the coal company.

PPG Industries, Inc. - Lime Lake #3 and #5 Reclamation, Project, Barberton, Ohio. Senior Project Engineer provided engineering RI support, permitting services, and design for PPG Industries' Lime Lake #3 and #5 Reclamation Project in Barberton, Ohio. The work was done as part of PPG's efforts to reclaim land occupied by lime spoils generated from the commercial manufacturing of soda ash. The objective of the work was to obtain a permit to utilize municipal wastewater treatment plant (WWTP) sludge to mix with the lime waste to form an artificial soil.

Pine Creek Impoundment. Senior project manager responsible for the evaluation and design of a 165-foot-high expansion of an upstream constructed coal tailings impoundment to store an additional 18 million tons of waste material. Project tasks included subsurface investigation and piezometer installation, physical testing including static and cyclic triaxial shear tests, hydrologic and hydraulic evaluations of drainage facilities, a seismic evaluation and liquefaction analysis, consolidation pressure analysis, stability analysis, and development of plans and specifications.

CH2M Hill – Prairie Waters Project - City of Aurora, Colorado. Senior Project Engineer responsible for performing Flood Hazard Study for a 5 mile stretch of the South Platte River between Brighton and Fort Lupton, Colorado. The study was performed to help locate structures, develop structural requirements and building elevations, and provide a baseline for evaluating the impacts of project development. Models were developed using the U.S. Army Corp of Engineers River Analysis System, HEC-RAS. Development of the models was aided with the use of a program developed by Boss International, Inc. called RiverCAD RMSTM, which operates as a graphical pre- and post-processor to HEC-RAS inside of AutoCAD SoftDeskTM. The project also involved the development of a Flood Hazard Permit for submission to the county.

ALCOA, Davenport Works – Outfall 002 Reconstruction, Davenport, Iowa. Project Manager /Engineer responsible for evaluating, designing, and oversight for the installation of a 600 foot long, 5 foot deep outfall channel from the plant to the Mississippi River. The unique design included a geomembrane liner system which prevented infiltration of LNALP impacted groundwater into the outfall along with a fabric-form concrete liner which protects the geomembrane from damage and uplift. The project also included the installation of a 54 inch diameter flap valve at the channels outfall pipe to prevent backflow into the channel during seasonal river flooding. This work was performed as a Non-Time Critical Removal Action under an Administrative Order of Content with USEPA.

Alcoa, Inc. – Hurricane Creek Leachate Collection Drain, Bauxite, Arkansas. Project Manager/Engineer responsible for the evaluation, design, and construction oversight of a 18 foot deep – 2,700 foot long trench drain for collection of high pH leachate seepage from the bauxite residue deposit area (BRDA) at the former Reynold's Metal Company, Hurricane Creek processing facility. The work included several phases of investigation to help define both the problem and the solution. Investigations included installation of wells and piezometers, geotechnical borings, pump draw-down tests, geophysical testing, geotechnical testing, and a stream survey. Final construction included the installation of six sumps and cleanouts, a 2 foot wide sand-backfilled trench with a 6 inch diameter slotted HDPE pipe. Due to high groundwater conditions and the presences of flowable sand in the excavation, a specialty contractor using a "one-pass" trenching machine installed the drain system.

Alcoa, Inc. – Bauxite Residue Disposal Area (BRDA) Maintenance Project, Listerhill, Alabama. Project Engineer responsible for the evaluation, design, and oversight of activities associated with the maintenance of a closed 100 acre BRDA. Evaluation activities included preliminary designs along with cost and technical feasibilities of alternatives. Maintenance activities included: the removal of vegetation and trees from the surface and sides of the BRDA; the stabilization of embankment slopes through the relocation of approximately 2,000 feet of perimeter ditch and the buttressing/flattening of unstable slopes, and; the filling of depressions on the

BRDA to promote drainage and reduce infiltration. Construction work included approximately 30,000 cubic yards of earthwork and the installation of 1,500 feet of internal drainage.

Howmet Castings – Landfill Closure Report, LaPorte, Indiana. Project Manager/Engineer of Record for the evaluation and preparation of a closure certification for the foundry waste landfill at the Howmet Castings Facility in LaPorte, Indiana. Tasks associated with the project included a subsurface investigation of the Site consisting of 19 test borings, preparation of a survey map (including filing with the County Recorder of Deeds), and preparation of a report for submission and approval to Indiana Department of Environmental Management (IDEM).

PPG Industries, Inc. - Lake Dorothy Dam Rehabilitation, PPG Barbarton, Ohio. Senior project manager responsible for the evaluation and design of measures to repair a debilitated sluice gate outlet system and protect the 30-foot-high earthen embankment against overtopping during the occurrence of the probable maximum flood (PMF). The design incorporated an innovative approach by using a Roller-Compacted Concrete (RCC) shell on the dams downstream face in lieu of more conventional erosion protection methods.

Greenfield Landfill Siting Study. Senior engineer responsible the geotechnical evaluation for a landfill siting study. He has also developed the operational plan for a municipal waste incinerator ash disposal landfill which included plans for material handling, liner construction, groundwater monitoring and testing, leachate management and contingency plans.

Tri-County Commerce Park. Senior project manager and engineer-of-record for the design, contractor procurement, and construction management/monitoring efforts for an 115-acre industrial park which included three separate construction contracts: general site work, 1.2-mile water line extension, and a 150,000-gallon-per-day sewage treatment plant.

Robinson Town Centre. Senior project manager for construction monitoring and design activities for the 200-acre, \$60 million regional shopping center. Work on the project included development of grading plans for the 3.5-million-cubic-yard earthwork operation, erosion and sedimentation control, stormwater management, roadways and parking areas, and utility layout. This effort also included construction monitoring and inspection for all earthwork activities, Campbell's Run bridge installation, and pavement installations.

PPG Industries, Inc. - BHC Storage Pile, Natruim, West Virginia. Senior Project Engineer responsible for the design of the soil cover system for an 3.5 acre Solid Waste Management Unit (SWMU) at an operating plant. Also provided technical support to negotiations to stem agency requirements and eliminate the need for a RCRA cap. The design effort included an evaluation of various cover alternatives including the beneficial use of fly ash; a by-product of the facilities coal fired power plant.

USACE - Aberdeen Proving Ground - Old "O-Field", Edgewood, Maryland. Senior Project Engineer responsible for the multi-discipline design effort and construction support for the Permeable Infiltration Unit (PIU) cap and ancillary systems. Old O-Field was a landfill area used by the Army for storage, handling, disposal and destruction of chemical warfare materials, and decontaminating chemicals. It also contained white phosphorous along with exploded and unexploded ordnance. The unique PIU design consists of four components. These components include a blast resistant sand cover, an air monitoring system, a subsurface trickling system for the application of treatment solutions, and a surface sprinkler system including a 500,000 gallon water tank and emergency pump system. The entire system was designed to: mitigate the effects from exploding ordnance; detect the discharge of chemical agents; saturate the sand cover layer in order to suppress discharges from the cap. Due to the extreme hazards at the site, initial construction activities were, and were designed to be performed using radio controlled remotely operated earth moving equipment and onsite monitoring equipment.

PPG Industries, Inc. – Feasibility Study of UST Closure, Oakcreek, Wisconsin. Project Engineer responsible for evaluating the feasibility of four closure scenarios of underground storage tank (USTs) without impact to operations and active above ground tanks (AST), roads, or structures. Also identified and evaluate alternatives to alleviate any geotechnical concerns. Provided recommendations.

Union Pacific Railroad Company - Toyota Parcel Remediation, Long Beach, California. Senior Engineer responsible for the geotechnical evaluation and technical design review of remedial activities at the 31-acre

Toyota Parcel. Responsibilities included establishing parameters for construction of a cap and pavement over the site, which consisted of swamps containing oil field production waste. Also developed an investigation program consisting of cone penetrometer, standard test boring and geotechnical test to evaluate potential the potential subsidence at the site due to the increase in loading cause by site grading operations. Evaluated material stabilization and oil drainage collection systems.

Urban Redevelopment Authority - Herr's Island Remediation Project, Pittsburgh, Pennsylvania. Senior Project Manager responsible for design and construction management activities involving the construction of a 1.5-acre double-lined landfill cell and the removal and disposal PCB contaminated materials. Responsibilities included management of on-site personnel, project staffing, budgeting, invoicing, and client interface.

Alcoa - Vancouver Works, Vancouver, Washington. Senior Project Manager responsible for the design and construction/bid package preparation for a "clean closure" cap at the site of three reclaimed spent potlining piles. Also served in a similar capacity on the preparation of a package for the relining of a five-acre stormwater/sludge lagoon.

Alcoa Rockdale Works - Cell No. 1 & 2 Closure Caps, Rockdale, Texas. Senior Project Manager responsible for the design of a nine-acre RCRA cap covering two spent potliner landfills. The design incorporated the use of bottom ash from the facilities coal-fired power plant as permeable material in the cap drainage layer.

U.S Air Force - Landfill 2 Cell Closure Plan, Andersen Air Force Base, Guam. Responsible for the preliminary design and feasibility study of the project which involved the delineation of waste containment cells, preparation of preliminary plans and construction details, and a technical and economic feasibility analysis of several capping alternatives.

Babst, Calland, Clements and Zomnir. Senior project manager responsible for the preparation of an expert report regarding design and construction of clay lined industrial waste landfill cells, and the appropriateness and effectiveness of remedial actions performed at the site under the NCP. Also investigated the causes of subsidence in a drainage pipe located beneath the cells.

Chloride Greenfield Landfill Siting Study: Geotechnical Investigation, Becancour, Quebec. Senior technical reviewer for the geotechnical investigation and assessment of foundation conditions for the project which included the preliminary geotechnical investigation and evaluation for two 400-acre landfill sites. Elements of work included; performing a subsurface exploration program, chemical and physical testing of soil samples, evaluation of bearing capacities, potential settlements and a report containing conclusions and recommendations for the development of the landfill.

Edgewater Plant Solid Waste Landfill, Lorain, Ohio. Responsible for design and preparation of construction documents for the project which involved the design for the expansion of a 50-acre ash landfill. Elements of the work included: evaluations to maximize disposal life, hydrologic and hydraulic analysis, geotechnical investigations and stability analyses, stormwater control through development of wetlands, and development of closure requirements. The final submittal for the project included drawings, specifications, operational requirements and construction cost estimates.

Vicon Sunderland Landfill. Task manager responsible for the preparation of the Operational Plan for a 25-acre municipal waste incinerator ash landfill. Elements of the plan include waste handling and placement, surface water and leachate management, monitoring, contingency plans, and closure activities.

ALCOA Rockdale Works - Cell No. 5. Senior project manager responsible for the design of a four-acre double-lined lagoon/landfill for disposal of calcium-fluoride waste product.

Allan Berenbrok, PE

Civil Design Engineer

Education

BS Civil Engineering, Virginia Military Institute
MS Systems Management, University of Southern California

Professional Registration/ Certifications

Professional Engineer: Pennsylvania
40-hr OSHA HAZWOPER
8-hr OSHA HAZWOPER Refresher

Qualifications

Mr. Allan R. Berenbrok has 28 total years of professional experience in civil design, project management and construction management as an officer in the United States Air Force, public works, and in private industry. Experience ranging from supervision of staff, management of budgets and schedules to commercial site development, private site development, municipal services, airport layout, airport pavement design and maintenance, street and roadway geometric design, pavement design and maintenance, computerized storm water runoff and drainage analysis and design, erosion and sediment control permits, NPDES permits, water line design, sanitary collection design and system modeling, package treatment plant operation, sanitary lift station design, hazardous waste clean up, brownfield development, construction management and design/build projects..

Experience of Interest

Gladden Discharge Mitigation Design; South Fayette Township; Allegheny County, PA. Project Design Engineer for the design of a passive treatment system for the South Fayette Conservation Group, in conjunction with the Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Land Reclamation. The site has difficult construction conditions due to the close proximity of a four-lane highway, flood plain encroachment, railroad right-of-way, adverse adjacent property owner, surface mining of available coal in the construction zone, and maintaining mine pool elevation to prevent mine blowouts. A 3 acre holding basin is under design to accommodate the necessary holding time for treatment of the acid mine drainage. The basin will consist of three cells separated by interior dikes to increase the water holding time and to allow for the closure of a cell for the drying and removal of iron precipitates for use by the owner. The existing mine will be connected to the basin through directional drilling from the excavated basin. Construction drawings, specifications, construction cost estimates and applicable PaDEP permits are being prepared.

Tunnelton Mine Portal Closure Design; Tunnelton, WV. Mr. Berenbrok serves as the Project Design Engineer/Project Manager for the investigation and design of closure of two existing mine portals on two separate private parcels. Project includes coordination of a drilling contractor and surveyor to determine the overburden material and water surface elevation in each portal and survey of the land area adjacent to the portal for site grading and closing of the portals. The portals currently allow acid mine drainage to exit and flow into a small stream. A hydrologic and hydraulic analysis of the receiving stream was performed to determine the effect on the stream due to site grading. Construction drawings, specifications, construction cost estimates and erosion and sediment control permits are being prepared for public bidding of the project by the West Virginia Department of Environmental Protection/Office of AML&R.

Fisher Run Portal Closure Design; Weston, WV. Mr. Berenbrok serves as the Project Design Engineer/Project Manager for the investigation and design of closure of four existing mine portals on private property. A bat gate will be installed on one mine portal. Project includes coordination of a drilling contractor and surveyor to determine the overburden material and water surface elevation in each portal and survey of the land area adjacent to the portal for site grading and closing of the portals. The portals currently allow acid mine drainage to exit and flow into a small stream. A hydrologic and hydraulic analysis of the receiving stream was performed to

determine the reshaping of the stream due to site grading. Design drawings, erosion and sediment control permits and contract specifications were prepared for public bidding of the project by the West Virginia Department of Environmental Protection/Office of AML&R.

Coal Mine Air Shaft Closure Design; Eastern OH. Mr. Berenbrok provided quality assurance and quality control reviews for the structural concrete mine opening seals. The existing mine air shafts are to be sealed with a concrete cap to eliminate the escape of acid mine drainage from the air shaft when the hydraulic grade line in the mine exceeds the top elevation of the shaft. A potential water surface elevation was provided by the client to calculate an uplift pressure to determine the size and weight of the seal to resist the uplift forces. An air release valve assembly was designed to release air and intake air as the mine water surface elevation fluctuated over time to release pressure on the concrete seal cap.

Bear Run Phase II; Abandoned Mine Land Restoration; Indiana County, PA. As the Project Design Engineer/Project Manager, Mr. Berenbrok is responsible for the preparation and submission of a site grading plan and the erosion and sediment control permit. He is also responsible for the NPDES permit for storm water discharges associated with construction activities for a 30-acre privately owned AML. In addition, he is preparing hydrologic and hydraulic calculations to design a new culvert stream crossing to replace the existing crossing. Mr. Berenbrok is coordinating the field survey and geotechnical investigation with a third party to excavate and install the final site grading operations for the installation of a passive AMD treatment system, the Bear Run stream bank restoration and the excavation of three areas of coal pile refuse. A Pennsylvania Government Funded Construction Contract (GFCC) will be prepared that includes the erosion/sediment control and U.S. Army Corps of Engineers wetlands and stream bank permitting. The project includes the preparation of contract drawings, specifications and contract bidding documents.

Program Manager/Client Manager; Majestic Star Casino; Bergman Walls Associates; Pittsburgh, PA. Client manager and lead technical design engineer for the development of a brown field site located on the north shore of Pittsburgh. Prepared and coordinated site development design and acquired PaDEP stormwater management and Allegheny County Erosion and Sediment Control permits for the site construction, coordinated design/build features of the site and facility design directly with the architect and the Owner for the \$600 million dollar Casino.

Project Manager; Wal-Mart Stores; Western Pennsylvania. Project Manager and client manager for the site development and site design for multiple Wal-Mart stores in western Pennsylvania. Prepared design drawings, coordinated onsite and offsite utilities, attended zoning hearing board meetings, local jurisdictional council meetings, prepared land development applications and permits through local jurisdictional entities, coordinated with architects on site design, direct client manager with Wal-Mart design manager, prepared erosion and sediment control permits through local counties and NPDES permits through the PaDEP.

Project Manager; Walgreens Stores; Western Pennsylvania. Project Manager and client manager for the site development and site design for multiple Walgreens stores in western Pennsylvania. Prepared design drawings, coordinated onsite and offsite utilities, attended zoning hearing board meetings, local jurisdictional council meetings, prepared land development applications and permits through local jurisdictional entities, coordinated with architects on site design, prepared erosion and sediment control permits through local counties and NPDES permits through the PaDEP.

Project Manager; Conceptual and Preliminary Site Development; Piedmont Triad Airport; Greensboro, NC. Project Manager for conceptual and preliminary design services to create a program to develop 600 acres of airport property into a cargo hub facility. Developed preliminary airfield design and layout of a proposed runway, taxiways, apron and relocation of an existing state roadway. Developed a detailed program design and construction schedule for the five-year project duration. Utilized Microsoft Project to develop detailed construction durations including earthwork haul scenarios to move approximately 3 million cubic yards of material. Developed detailed mass haul diagrams and multiple fill scenarios to evaluate third party facility construction start dates and analyze construction schedule conflicts.

Project Manager; U.S. Army Reserve Center; U.S. Army Corps of Engineers; Wheeling, WV. Assistant Project Manager for the preparation of design build level construction drawings for the construction of

approximately one mile of two lane asphalt roadway, earthwork, associated drainage, stormwater management, erosion and sedimentation control permits and supporting utilities. The Reserve Center consists of a training center and a vehicle maintenance center along with supporting parking and vehicle storage areas.

Jon C. Ludwig

Technical Advisor

Education

MS, Environmental Pollution Control, The Pennsylvania State University, 1997
BS, Environmental Science, Widener University, 1995

Qualifications

Mr. Ludwig is the director of the Charleston, WV office of Tetra Tech's Water Resources Groups. He is a senior environmental scientist with over 10 years experience providing technical and management support to federal, state, regional, and private clients in the areas of water resources, stormwater management, watershed and water quality assessment, watershed modeling, NPDES permitting, and Total Maximum Daily Load (TMDL) development. In support of EPA Region 3 and West Virginia Department of Environmental Protection Division of Water and Waste Management (WVDEP DWWM), he has served as project manager in the development of over 1,900 EPA approved TMDLs in West Virginia. These projects included detailed modeling analyses to assigned "implementable" wasteload allocations to MS4 communities throughout West Virginia. Currently, he serves as project manager for the existing TMDL contract with WVDEP DWWM that includes the development of TMDLs for total iron, total manganese, dissolved aluminum, pH, selenium, fecal coliform bacteria, and biological impairments throughout the state of West Virginia. Mr. Ludwig also has extensive experience implementing various hydrologic and water quality models, including EFDC, SWMM, BASINS, HEC-2, HEC-RAS, LSPC, GWLF, HSPF, WASP, and DESC-R. Mr. Ludwig has played instrumental role in the technical development of the Mining Data Analysis System (MDAS), a dynamic watershed tool that has been customized for watershed assessment and TMDL development efforts in West Virginia. Additionally, he has reviewed National Pollutant Discharge Elimination System (NPDES) permits and assessed measures taken to model the effects of discharge to stream systems. He has also conducted a series of training courses to support EPA and various state agencies in modeling and TMDL development. Courses included bacteria, sediment, mining, and TMDL report writing.

Experience of Interest

West Virginia TMDL Development for Hydrologic Groups A, B, C, and D. Under contract with WV DWWM, currently serving as project manager for more than 950 metals (iron, dissolved aluminum, manganese, and selenium), pH, fecal coliform bacteria, and biological TMDL in the Upper Kanawha River, Upper Ohio North, Lower Kanawha River, North Branch/Potomac River, Coal River, Gauley River, Potomac River Direct Drains, Greenbrier River, New River, Little Kanawha River, and James River watersheds. These impairments were modeled using various EPA approved models and methodologies such as, MDAS and DESC-R for metals and fecal coliform bacteria. A strength-of-evidence stressor identification methodology was used to identify the likely stressors to the biological community and TMDLs were developed for these stressors. To further define biological impairments, macroinvertebrate tolerance values and a new modeling approach ("dirty reference modeling") were developed using observed data collected throughout the state. The "dirty reference modeling" is a new approach that uses a known impaired site as a "reference" for each type of impairment to which all other sites are compared. A similarity matrix is calculated for each impairment and sites that group together may be impaired for that particular parameter. The "dirty reference modeling" is showing promising results and coupled with tolerance values and the EPA SI approach demonstrate a tremendous strength of evidence for determining biological stressors in biological impaired streams.

WV TMDL Development Support for EPA Region 3. For EPA Region 3, served as project manager for the development of over 1,000 pH and metals TMDLs in West Virginia including the Monongahela River, West Fork River, Tug Fork River, and Guyandotte watersheds. Provided lead role both technically and administratively in the evaluation of data and pollutant sources to assess and determine relationships between acid mine drainage and in-stream metals concentrations. Developed various technical approaches related to mining impacts (nonpoint and point sources) on metals loading and applied the Mining Data Analysis System (MDAS), a dynamic watershed

modeling tool, to develop TMDLs throughout West Virginia. TMDL development addressed a variety of case-specific requirements related to water quality criteria, water use designations, source pollution conveyance methods, and permitting in large-scale watersheds. Applied the Environmental Fluid Dynamics Code (EFDC), a 3 dimensional hydrodynamic model, to develop TMDLs for the Monongahela River mainstem. Applied DESC-R to dynamically simulate the fate and transport of dissolved aluminum in the Guyandotte watershed. Documented the technical approaches and compiled TMDL results in a final report. Led public meetings and prepared responses to written public comments.

Mining NPDES Permit Support for WVDEP Over the past few years, Tetra Tech has supported WVDEP in the development of metals TMDL development for the Coal River watershed. During the course of TMDL development, EPA approved a revision to the West Virginia Water Quality Standards that altered the zone of applicability of the manganese water quality criterion for the public water supply designated use. The criterion is now applicable only in the five-mile zone upstream of known public or private water supply intakes used for human consumption. The revision resulted many request letters from coal companies to “back-slide” their current manganese effluent limits to technology-based limits. At the request of WVDEP, Tetra Tech conducted a comprehensive analysis to determine the cumulative effect of this backsliding at various downstream locations in the Coal River watershed where the revised manganese criterion is applicable.

Mr. Ludwig served as the project manager and technical lead for this project that utilized the calibrated watershed model that was constructed for TMDL development (MDAS) to provide solutions and guidance as to which areas of the Coal River watershed could sustain manganese technology-based effluent limits while maintaining compliance with water quality criteria in the effective zones. Results were summarized into graphical displays in an easy to use format so that WVDEP DMR permit writers can address the above mentioned request letters and issue/re-issue permits quickly and efficiently. This project was completed without additional funding even though this project was not within the original scope of the Coal River watershed TMDL development.

Reactive Transport Modeling for California Gulch, Colorado. In support of Colorado Department of Human Health and Environment (CDPHE), serving as Project Manager for dissolved metals transport modeling in the California Gulch watershed. Tetra Tech has developed an in-stream chemical transport model to evaluate remedial effectiveness scenarios of various CERCLA reclamation activities in the California Gulch watershed. The customized in-stream model includes 1-D transport model equipped with sediment transport routines coupled with a dynamic chemical speciation model to simulate dissolved zinc and cadmium in California Gulch and the Upper Arkansas River.

Left Hand Creek Watershed TMDL and Remediation Alternatives Analysis, Colorado. Supporting USEPA Region 8 and CDPHE, served as project manager to develop metals TMDLs for the Left Hand Creek watershed. Tasks included developing an in-stream chemical transport model to simulated water quality under critical flow conditions and assign loading to specific abandoned mine sources. The customized in-stream model includes 1-D transport model was used to dynamically simulate dissolved zinc, cadmium, copper, and lead in three reaches of the Lefthand Creek watershed. The calibrated model was also used to evaluate remedial alternatives scenarios for multiple abandoned mine sites.

Lower Silver Creek Load Reduction Alternative Assessment and Analysis, Park City, Utah. Supporting USEPA Region 8 and Utah Department of Environmental Quality (UDEQ), serving as project manager to develop metals (load reduction alternatives for the Lower Silver Creek watershed. This goal of this study is to develop and apply a scientifically-based approach to selecting the optimal combination of management options that maximize the efficiencies (pollution reduction and cost) of restoration efforts in the watershed. Tetra Tech is currently developing a dynamic management tool that includes an in-stream chemical transport model that will allow for targeted identification of the most significant sources of metal loadings and to Silver Creek; quantification of pollutant loads (cadmium, lead, and zinc); development of a matrix of source controls and their expected load reduction; evaluation cost and effectiveness of multiple source control alternatives.

Professional Affiliations

American Water Resources Association
Water Environment Federation

Publications/Presentations

Ludwig, J., J. Beckman, and D. Montali. 2007. Accounting for Construction Stormwater in TMDL development for Sediment Impaired Streams in Rapidly Growing Residential Areas. Kentucky Water Resources Annual Symposium

Ludwig, J. and D. Montali. 2005. Total Maximum Daily Load Development for Mining Impaired Waterbodies in West Virginia.. Kentucky Water Resources Annual Symposium.

Burton, J., J. Bailey, C. Boschen, J. Ferrites, B. Lowman, J. Ludwig, D. Montali, S. Wilkes, J. Wirts, L. Zheng. 2004. Inferring causes of biological impairment in Appalachian streams (1): Watershed-based problem formulation. Society of Environmental Toxicology and Chemistry Annual Conference.

Zheng, L., J. Bailey, C. Boschen, J. Gerritsen, B. Lowman, J. Ludwig, D. Montali, S. Wilkes, J. Wirts. 2004. Inferring causes of biological impairment in Appalachian streams (2): empirical model development to identify multiple stressors.

Gerritsen, J., Bailey, C. Boschen, J. Gerritsen, B. Lowman, J. Ludwig, D. Montali, S. Wilkes, J. Wirts. 2004. Inferring causes of biological impairment in Appalachian streams (3): integrating multiple lines of evidence. Society of Environmental Toxicology and Chemistry Annual Conference.

Henry, T., J. Ludwig, C. Barreto Acobe, D. Montali, P. Campbell, K. Ruhl. 2002. Mining Related TMDL Issues Tug Fork River Watershed, West Virginia. American Water Resources Association's 2002 Annual Water Resources Conference.

Henry, T., J. Ludwig, C. Barreto Acobe, D. Montali, P. Campbell, J. Greenfield. 2002. West Virginia Mining TMDLs Inter jurisdictional Issues: Tug Fork River Watershed. Water Environment Federation TMDL Conference.

Henry, T., J. Ludwig, M. Beck, P. Campbell, D. Montali, J. Shen, A. Parker. 2002. Metals and pH TMDL Development for the Tygart Valley River Watershed, West Virginia. Water Environment Federation Watershed 2002 Conference.

Henry, T., J. Shen, M. Lahlou, L. Shoemaker, A. Parker, J. Ouyang, H. Yang, and J. Ludwig. 2002. Mining Data Analysis System (MDAS). Water Environment Federation Watershed 2002 Conference. Ludwig, J. 1997. Influence of settling agents (FeCl₃/SiO₂) on effluent quality of recycle papermill wastewater. M.S. thesis, Environmental Pollution Control, The Pennsylvania State University.

Dave Hallman, PE, PG

Principal Geotechnical Engineer

Education

BS, Geological Engineering, Colorado School of Mines, 1983

Professional Registration/ Certifications

Professional Engineer: Colorado (#26076, 1989), Alaska (CE-8086, 1990), Missouri (E-26685, 1994), Idaho (#8350, 1996), Texas (#90421, 2002), Wyoming (PE-9495, 2002)

Professional Geologist: Wyoming (PG-3536, 2004)

40-hr OSHA HAZWOPER, 1990

OSHA Confined Space Entry, 2003

Qualifications

Mr. Hallman has over 20 years of experience specializing in geotechnical engineering and construction on a variety of mining and civil engineering projects throughout the world. His technical expertise includes static and dynamic stability of embankments and natural slopes, landslide evaluation, rock slope stability, seismic risk assessments, liquefaction evaluations, dynamic deformation analyses, liner and seepage cutoff system design and evaluation, tailings and water dam design and construction, and design and construction of heap leach and landfill facilities.

Experience of Interest

Geologic Hazards (pit stability, landslides, rock slides, subsidence and seismic hazards)

Coal Mine Subsidence Evaluation and Mitigation, Rock Springs, WY. Principal Engineer responsible for project management, coordination and senior geotechnical review for multi-disciplinary technical teams evaluating and mitigating subsidence risk over extensive historic underground room and pillar coal mines in developed and undeveloped areas within the City of Rock Springs. Project required extensive use of GIS systems to process and assimilate large volumes of existing data, monitoring of active ground movements and participation in public information meetings. (2007 to present)

Brisas Del Cuyuni Pit Slope Design Review, Las Brisas, Venezuela. Principal Engineer responsible for project management, coordination and senior geotechnical review for pit slope design at this proposed gold mine in Venezuela. The proposed mine pit is roughly 2.4 kilometers long, 1.4 kilometers wide and 570 meters deep, extending nearly 400 meters below sea level, with more than 100 meters of saprolite in the upper portions of the pit wall; shallow groundwater conditions; and a dipping ore body which posed technical challenges. A state-of-the-art acoustic televiwer system was coupled with oriented core drilling and data from more than 200,000 meters of exploration core holes to provide suitable geomechanical input data for analysis and overcome these challenges. (2005 to 2007)

Sunrise Mine Subsidence Potential/Reclamation Measure Evaluations, Guernsey, WY. Technical Specialist responsible for evaluation of subsidence potential and reclamation measures of large subsidence features associated with block caving practices at this historic iron mine. Assessed landslide-induced wave action associated with potential failure of a large open pit filled with water. Developed automated slope monitoring system to provide warning of impending failure(s) to protect potential downstream inundation zones. (2003 to 2005)

Gravel Quarry Silt Pond Embankment Failure, Henderson, CO. Project Manager responsible for evaluation of cause and design of remedial measures for failure of the embankment for a wash fines containment pond at a gravel quarry operation. Failure of the embankment was attributed to overestimation of the shear strength in fill materials in analyses prepared by the previous designer and time-dependent degradation and strength loss in shale bedrock coupled with high groundwater levels in the embankment. Temporary remedial measures included design and installation of dewatering wells and horizontal drains to alleviate groundwater pressures acting on the slope.

Long-term remedial design included cost-benefit analyses for comparison of various alternatives. Final design provides for partial relief of excess pore water pressures under rapid drawdown conditions to ensure adequate stability. Slide mass reactivated during construction required close monitoring and control of excavation versus fill placement to avoid further mass slope failure. (2001 to 2004)

Thunder Mountain Project Geotechnical Engineering Design, Central Idaho. Project Manager responsible for project management, engineering design, and technical direction for a proposed mining project in central Idaho. Project includes facility development within the limits of a large historic landslide developed in residual soils and weathered tuffaceous bedrock of the Challis Formation. Geotechnical design included detailed back analysis of the landslide and comparison to conditions elsewhere at the site and proposed project development plans. Analyses included assessment of access road and blasting operation vibrations on landslide stability and two-dimensional finite difference consolidation analyses to evaluate development and dissipation of excess pore pressures in the foundation materials during and following construction of the project facilities. (1994 to 1996)

Ten-Mile Pass Limestone Quarry Rock Slope Stability Assessment, Soda Springs, ID. As the Project Geotechnical Engineer, performed a preliminary assessment of rock slope stability for this proposed limestone quarry as part of an overall mine plan evaluation. Subsequent access road development included rock slope excavations, which exceeded recommended slope angles and triggered slope failures necessitating remedial design. (1996)

Trans Alaska Gas System Foundation/Rock Slope Stability Evaluation, Valdez, AK. Field Manager for geotechnical evaluation of the foundation and rock slope stability for the marine terminal and natural gas liquefaction facilities at Port Valdez and rock slope evaluation for the Keystone Canyon segment of the pipeline route. Involved helicopter-supported, oriented core drilling, instrumentation, and detailed outcrop mapping. Duties included landslide hazard mapping and preparation of site conditions and engineering recommendations reports. (1990)

Florida Canyon Mine Rock Slope Stability Evaluation, Winnemucca, NV. Staff Engineer responsible for evaluating rock slope stability at this large operating open pit gold mine to determine safe slope angles for continued pit expansion. Analyses included assessment of weak, shattered rock masses. (1990)

Crystal Cave Geotechnical Evaluation, Jefferson County, CO. Senior Geotechnical Engineer responsible for project management and geotechnical evaluation of a natural cave exposed during aggregate quarry development. Provided recommendations to address public safety and liability concerns associated with reclamation and conversion of the quarry land to open space with attendant public access. (2001)

Dresden Cooling Tower Project Rock Wall Stability Evaluation, Dresden, IL. Senior Geotechnical Engineer responsible for evaluation of rock wall stability during excavation for twin 25-foot deep vertical cooling tower intake sumps in layered sandstone, shale, and limestone strata. (2000)

Tailings Dams

Engineering Design, Lucky Friday Pond 4, Northern Idaho. Principal Engineer/Project Manager responsible for engineering design for a proposed 16M ton tailings disposal facility for this lead-silver mine in the historic Wallace Mining District of Idaho. Facility designs include staged construction maximizing use of available on-site materials and the mine waste rock production schedule, an innovative low permeability core comprised of a geosynthetic clay liner and emergency spillway incorporating geotextile fabric formed revetments to control erosion on spillway slopes of 35 percent. (2005 to present)

Engineering Design, San Bartolome Project, Southern Bolivia. Project Manager responsible for project administration and engineering design for bankable feasibility design for a proposed 27M tonne silver mine in the historic Potosi Mining District of Bolivia. Facility designs include a staged 86-meter high cyclone sand tailings dam, a 12M tonne sand heap facility, and a 5M tonne tailings slimes disposal facility. Innovative design concepts incorporated into the project include the use of the heap to form, in part, the embankment for the slimes disposal dam. Responsible for direction and supervision of multidisciplinary design team and coordination with equipment manufacturer, contractor and owner. (1999)

St. Joe State Park Seismic Stability Remediation, Park Hills, MO. Engineer of Record for a \$5M construction project for seismic stability remediation measures for two large historic tailings dams currently utilized as part of a state park. Coordinated engineering design and permitting services and report preparation, and provided liaison between the owner and numerous regulatory agencies. Prepared technical specifications and bid documents for seismic stability and spillway retrofitting. Responsible for supervision of construction management and quality control activities, and construction certification with regulatory agency. Project was awarded the 1997 Association of State Dam Safety Officials National Rehabilitation Project of the Year Award for innovative use of onsite materials. (1990 to 1996)

Design and Evaluation for New Viburnum, Old Viburnum, Fletcher, Buick and Brushy Creek Tailings Disposal Facilities, New Lead Belt, MO. Principal Engineer responsible for evaluation of liquefaction potential, seismically induced settlement and associated dynamic stability for upstream raises of the tailings dams to increase tailings storage at these lead mines. Conducted dam safety inspections, audits, ongoing performance monitoring, and stability evaluations. Performed assessments of means to increase disposal capacity and coordinated engineering designs and permit submittals for expansion of the tailings dams and updated closure plans. (1990 to present)

Ridgeway Mine Tailings Dam Evaluation, Ridgeway, SC. As Design Engineer, performed detailed evaluation for a proposed upstream tailings dam raise construction. Included assessments of tailings liquefaction potential and consolidation of the tailings beneath the proposed dam raise. Cone penetration testing (CPT) of the tailings indicated relatively loose, under-consolidated tailings conditions, which required extensive analysis. Assessed geotechnical issues associated with final closure cap for the facility. Included detailed CPT/standard penetration testing of the tailings and finite difference modeling of post-closure tailings consolidation. (1996)

San Luis Project Upstream Tailings Dam Design, San Luis, CO. Project Manager responsible for design of upstream tailings dam raises founded on tailings, which included assessment of tailings liquefaction and dynamic stability evaluations under high levels of seismic loading. Prepared engineering design and construction documentation, performed professional engineer duties during tailings disposal facility expansion and provided liaison between client and regulatory agencies, which became substantial over the course of the construction. Installed monitor wells and conducted in-situ permeability testing, evaluated embankment stability and estimated seepage quantities and fate for the fully lined and drained tailings impoundment for this 12M ton gold mine. Designed the tailings slurry pipeline. Finalized closure design components as part of reclamation activities. Prepared construction drawings and specifications. (1990 to 1996)

Greens Creek Project Tailings Disposal Facilities Evaluations and Design, AK. Technical Specialist responsible for review of seismic hazard evaluations, liquefaction and dynamic stability analyses, and design for expansion of a dewatered tailings disposal facility and waste rock disposal facilities. (1997)

Kensington Project Seismic Hazard Evaluation/Dynamic Stability Analyses, Juneau, AK. Technical Specialist responsible for conducting a seismic hazard evaluation and dynamic stability analyses for a dry tailings disposal facility for this proposed gold mine 60 miles north of Juneau. High seismic loading conditions necessitated detailed two-dimensional finite element deformation analyses of the proposed structure using a large suite of ground motion records. (1997)

Heap Leach Facilities

Atlanta Gold Heap Leaching Project Design, Central Idaho. Principal Engineer/Project Manager responsible for project management and engineering design for a proposed gold heap leaching project in central Idaho. This site is located in an environmentally sensitive area tributary to the headwaters of the Middle Fork of the Boise River adjacent to the Sawtooth Wilderness Area. These aspects of the project result in considerable design constraints which, in conjunction with the steep rugged terrain, made alternatives evaluation difficult yet critical to optimize the project economics. Previous facility layouts developed by others were optimized to reduce capital construction costs of the heap facilities by 15 to 20 percent while at the same time reducing regulatory agency concerns. (2005 to 2006)

Thunder Mountain Gold Heap Leaching Project Engineering Design, Central Idaho. Project Manager responsible for engineering design and technical direction for a proposed 5M ton gold heap-leaching project in central Idaho. Project site is surrounded by the Frank Church River-of-no-Return Wilderness Area, which resulted in considerable design constraints and regulatory scrutiny. Project includes pit excavation and waste rock disposal facilities located within the limits of a large historic landslide developed in residual soils and weathered tuffaceous bedrock of the Challis Formation. Geotechnical design included detailed back analysis of the landslide and comparison to conditions elsewhere at the site and proposed project development plans. Analyses included assessment of access road and blasting operation vibrations on landslide stability. Detailed two-dimensional finite difference consolidation analyses were performed to evaluate development and dissipation of excess pore pressures in the foundation materials during and following construction of the waste rock disposal and heap leach facilities. Prepared design documents and coordinated multidisciplinary engineering analyses produced by professional staff in support of a plan of operations and environmental impact statement prepared for the USDA Forest Service under National Environmental Policy Act. (1994 to 1996)

Goldstrike Mine Leach Pad Closure Design, Elko, NV. As Senior Geotechnical Engineer, assisted with closure design for the AA Heap Leach Pad. Responsible for toe drain design and solution management to separate drain down flows from different portions of heap following closure. (2000)

Continuing Education

MSHA Part 48 Underground Mine Safety and Health Training, 1981

Earthquake Hazard Reduction in the Central U.S., USGS, and Central U.S. Earthquake Consortium, 1990

Cold Regions Engineering, University of Washington, 1990

Publications/Presentations

Castillo J, **Hallman D**, Byrne P, Parra D. 2006. Non-linear dynamic analysis of heap leach pad under high phreatic levels. In: 4th International FLAC Symposium; proceedings; 2006 May 29-31; Madrid, Spain.

Hallman DS, Dorey R. 1995. Mine tailings deposition practices, liquefaction potential, and stability implications. In: 3rd Third International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics; proceedings; 1995 Apr 2-7; St. Louis, MO. Vol. 1: 451-456.

Hallman DS, Hlinko MJ. 1991. Geosynthetics in heap-leach applications. Geotechnical Fabrics Report 9(8).

Hallman D, Henderson M, Castillo J. 2006. Acceleration attenuation for subduction zone earthquakes in Chile and Peru [poster session]. Seismological Society of America 2006 Annual Meeting, 100th Anniversary Earthquake Conference; 2006 Apr 18-22; San Francisco, CA.

Castillo J, **Hallman D**, Byrne P, Parra D. 2005. Dynamic analysis of heap leach pad under high phreatic levels. Paper TT-149, 27th Convención Minera, Arequipa, Peru, organized by Instituto de Ingenieros de Minas de Perú, Sep 12-16.

Mike Henderson, PE

Principal Geotechnical Engineer

Education

MS, Civil Engineering/Water Resources, University of Pittsburgh (1984)
BS, Civil Engineering, Colorado State University (1979)

Professional Registration/ Certifications

Professional Engineer: Arizona (#22687, 1988), Alaska (#8944, 1994), California (#41572, 1980), Colorado (#25531, 1988), Idaho (#6278, 1990), Montana (#10080, 1990), Nebraska (#E-10766, 2003), New Mexico (#10070, 1987), Nevada (#7611, 1987), Oklahoma (#18392, 1997), Oregon (#15324, 1990), Pennsylvania (#035232-E, 1986), South Dakota (#4465, 1987), South Carolina (#13652, 1990), Tennessee (#105992, 2000), Utah (#172210-2202, 1987), Washington (#25989, 1989), Wyoming (#8324, 1997)

Qualifications

Mr. Henderson has more than 25 years of experience providing civil and geotechnical engineering design services to the mining industry. He is responsible for senior review and leadership on a wide range of engineering projects, including tailings impoundments, water storage reservoirs, heap leach facilities, and mine planning. Mr. Henderson's technical background relating to designing mining facilities includes design-engineering experience on a wide range of projects in the US and overseas, operations experience at several large mines, mine research for the US Bureau of Mines and Department of Energy (DOE), and expert witness testimony related to mine waste management issues.

Experience of Interest

Geotechnics

Nickel Laterite Mine Development, Goro Nickel Project, New Caledonia. Principal Engineer/Project Manager on overall development of a large nickel laterite mine in the South Pacific. Areas of responsibility include resource evaluation; mine planning; equipment selection; materials handling; and design of tailings disposal facilities, water storage reservoirs, and waste disposal facilities.

Tailings and Heap Leach Facilities Designs, Southern Peru Copper, Peru. Senior Reviewer on siting and design of tailings facilities and heap leach facilities. Tailings facilities consisted of concrete-faced rockfill dams up to 300 meters in height.

Atlas Moab Uranium Closure Project, Moab, UT. Project Manager on geotechnical, geochemical and hydrologic issues supporting closure and reclamation of a 10-million ton uranium mill tailings impoundment located adjacent to the Colorado River.

Santa Rosa Diversion Dam Design, Morenci, AZ. Project Principal on a concrete dam designed to intercept pregnant leachate solution flows. Design included a pressure-grout curtain and grouted rock bolts.

BHP Navaho Mine Seepage Interception Design, NM. Principal Engineer for design of a seepage interception system for the Doby Pit project.

Walker Mine Tunnel Safety Inspections, Portola, CA. Project Manager, providing annual safety inspections of an abandoned, underground mine tunnel. Design work included mapping and designing a passive underground roof control system, which can provide for long life, high reliability, and low maintenance. Although pressure-treated timber was ultimately selected, steel sets, steel arches, rock bolts, and slip lining were fully evaluated.

Printer Boy Mine Development Services, Leadville, CO. As Project Engineer, developed plan of operations and state permit applications necessary for a gold mine development project.

Independence Mine Environmental Impact Statement (EIS), Elko, NV. Senior Geotechnical Engineer for preparation of the groundwater hydrology, waste dump stability, and closure and reclamation portions of the EIS.

Pittsburgh Research Center Regulatory Compliance, Pittsburgh, PA. Program Manager responsible for modifying facility program to bring it into compliance with the State and Federal CERCLA - Community Right-to-Know and Materials Safety Data Sheets Program.

Brookhaven National Laboratory Environmental Audit, Long Island, NY. As Project Manager, participated in a facility-wide environmental audit as part of a pre-tiger team inspection. Areas of responsibility included RCRA, Clean Water Act (National Pollution Discharge Elimination System), waste management practices, fuel storage, and mixed waste disposal.

Bureau of Mines Analytical Laboratory Supervision, Pittsburgh, PA. Project Manager responsible for supervising the US Bureau of Mines Analytical Laboratory, specifically including chemical analyses of acid rock drainage (ARD) treatment options and biologic treatment columns.

Benson Ridge Stabilization Project, Lake County, CA. Project Manager responsible for evaluating various methods to stabilize acidic wastes from the Geysers area geothermal projects. Processes evaluated included cement, flyash, and lime stabilization, and mechanical mixing of uncontaminated material.

Lone Tree Mine Sampling Program, Winnemucca, NV. Project Manager responsible for assisting with scoping a sampling program to adequately characterize various geologic units in a large open pit mine. Representative samples were identified via comparison with the Kriged mine model and were evaluated with static and kinetic geochemical tests to provide data for a geochemical model of the open pit.

Tennessee Valley Erosion Control Project, Lake County, CO. Project Engineer responsible for evaluating short- and long-term stream geomorphology and designing mitigation structures. The mitigation and control structures incorporated typical civil engineering applications like geosynthetics and gabions with "soft-science" approaches like root wads and selective rock placement to result in a stable stream environment.

Tailings Dams

Pascua Project Tailings Dam Design, Argentina and Chile. Project Manager for design of a 175-meter high tailings disposal facility and ancillary facilities in the high Andes. Developed a novel approach to dam construction, based upon asphaltic core construction techniques developed in Norway.

Mayflower, Tenmile, Robinson Tailings Dam Raise, Climax, CO. Project Engineer responsible for performing embankment designs, slope stability analyses, and support facility redesigns necessary for annual upstream dam raises.

McLaughlin Project Engineering Services, Clearlake, CA. Project Engineer responsible for performing engineering relating to site selections and embankment design on tailings dams and waste rock disposal sites.

Gold Bar Project Engineering Services, Eureka, NV. Project Manager responsible for geotechnical engineering, design, stability analyses, and hydrological investigation related to a tailings dam at this gold mine.

Kingston Project Engineering Services, Austin, NV. Project Manager responsible for geotechnical engineering and design services for retrofit of an existing tailings facility and for design of a new tailings structure.

Goldstrike Project Engineering Services, Elko, NV. Project Manager responsible for geotechnical engineering and design of a 225-foot-high, 12-million-cubic-yard embankment for an earthen tailings dam. The design aspects included hydrologic studies, dynamic and static stability analyses, a seismic evaluation, and permitting assistance.

Robinson Tailings Dam Design, Ely, NV. Principal Engineer on the siting and design of a 300-million-ton copper tailings disposal facility in eastern Nevada. The project included seismic and geotechnical investigations of various sites, planning for construction of the centerline embankment, and static and dynamic evaluation of the proposed structures.

Deming Tailings Dam Design, Deming, NM. Senior Reviewer on the siting, design, and permitting of a copper tailings dam in southern New Mexico.

Silver Peak Tailings Dam Design, Tonopah, NV. Senior Reviewer on the siting, design, and permitting of a new tailings impoundment. Previous work at the site included the design of several raises to an upstream tailings dam.

Sullivan Project Tailings Facility Design, Gabbs, NV. Senior Reviewer on the siting and design of a large tailings facility in central Nevada.

Marigold Project Tailings Facility Design, Valmy, NV. Project Manager responsible for siting studies and conceptual design of a tailings facility capable of storing 4 million tons of tailings.

Tonkin Springs Tailings Dam and Storage Reservoir Design, Eureka, NV. Project Manager) responsible for geotechnical design of a 4-million-ton storage capacity earthen tailings dam and storage reservoir for a new gold mine. Design aspects included a geotechnical investigation, a hydrologic study, static and dynamic stability assessments, and a seismic evaluation.

Goldstrike Mine Tailings Management Plan, Barrick Goldstrike Mines Inc., Elko, NV. Project Manager responsible for performing tailings management studies aimed at improving the efficiency of the tailings facility, with an emphasis on sub-aerial deposition. The study included a probabilistic assessment of the long-term precipitation events in addition to normal and upset operating conditions and influences from the design storm.

Hayden Hill Tailings Dam Design, Susanville, CA. Project Manager on the siting and design on a large tailings dam and heap leach facilities at this gold mine in northern California.

Mineria Las Cuevas, San Lius Potosi, Mexico. Senior Engineer on field investigation and subsequent design of a large fluor spar tailings impoundment in central Mexico. Construction drawings and technical specifications were written in English and Spanish.

Centralia Mine Tailings Impoundment Design, Washington. Senior Reviewer on this unique project which involves inducing liquefaction in a coal tailings impoundment followed by physical displacement to a final waste filtering/storage area. The project involved rheological testing of the tailings material, cone penetrometer testing of the relatively weak foundation material, and design of a passive filtering system.

Cyprus Tonopah Mine Tailings Impoundment Design, Tonopah, NV. Senior Reviewer on a significant upstream raise to this cyclone tailings impoundment. Addressed stability of the embankment under earthquake loading conditions and operational considerations associated with cyclone operations.

Tintaya Tailings Impoundment Design, Peru. Senior Reviewer on the expansion of an existing facility and design of a new tailings impoundment at the Tintaya Copper Mine. Issues included liquefaction potential assessment of the current facility, methods to speed consolidation, and cyclone operation.

Twin Creeks Pinion Tailings Impoundment, Winnemucca, NV. Senior Engineer on a program to evaluate the potential for speeding tailings consolidation using radial wick drainage. Project involved laboratory testing, numerical modeling, a pilot field demonstration project, and final design.

Erdenet Mine Tailings Facility Stability Assessment, Mongolia. Project Manager and Principal on stability assessment of the existing tailings facility at the Erdenet Mine. Included assessment of static and dynamic stability, and installation of inclinometers and additional piezometers.

Las Brisas Tailings Impoundment Design, Venezuela. Project Principal on a design of a tailings impoundment for a gold mine in Venezuela. Unique parameters or design concepts included high rainfall environment, lateritic soils, and the potential to utilize the Robinsky deposition method.

Mine Closure and Reclamation

San Manuel Mine Closure, AZ. Senior Reviewer on closure planning for this large underground and open pit copper mining facility.

Climax Molybdenum Mine Tailings Management Plan, Climax, CO. Project Manager on an overall plan to provide interim closure and reclamation of portions of the overall tailings disposal facilities, to redesign the tailings management practices to optimize beach construction and minimize mill water return pumping costs, and

to evaluate the effects of reclamation plans on the stability of the embankments. The project also included design of a haul road constructed on submerged tailings, redesign of a large mill water pumping station, and design of long-term diversion canals and spillways from the tailings impoundment surfaces.

Mine Reclamation Plan, Climax Molybdenum Co., Climax, CO. Professional Engineer responsible for updating the site reclamation plan, as administered by Colorado Mine Land Reclamation Board. Prepared and submitted notifications of disturbance for mining and construction activities to the US Army Corps of Engineers, under Section 404 of the Clean Water Act.

Mine Facility Closure, Darwin Project, Darwin, CA. Technical Reviewer on closure of a large mining facility in southern California. Issues included geochemical stability and stabilization, surface and underground environmental audits, and regulatory requirements.

Walker Mine Closure, Portola, CA. Project Manager on an abandoned copper mine closure and remediation project, under contract to the State of California. The project included three major aspects: (1) rehabilitation of an existing mine tunnel, (2) assessment and treatment of acid mine drainage, and (3) surface and groundwater assessment and control. The major portion of the project was the acid mine drainage issue, wherein the underground and surface mine zones were assessed for contributions to the overall problem, and remediation measures proposed. The specific remediation measures included chemical and biologic treatment of the mine discharge, waste disposal alternatives, and groundwater flow controls.

Waste Rock Dumps

Office of Surface Mining Dam Safety Project, Pittsburgh, PA. As Project Manager, supervised the design, testing, and analysis required to assess the stability and Office of Surface Mining regulations of large waste disposal embankments. This project included full-scale simulation of 500-foot embankments consisting of minus-24-inch material.

Coeur Rochester Mine Stability Assessment, Lovelock, NV. Project Manager on stability issues for the mine waste dumps at the Rochester Mine. Stability assessment included static, pseudo-static, and dynamic assessment, along with a drilling program to assess the actual rock strength.

Mining Application Technical Reviews, Nevada, California, Montana, and Idaho. As Technical Expert, performed technical review as to the suitability of various mining applications as related to environmental impacts. The technical reviews have primarily involved the adequacy of the proposed containment of mining wastes, acid mine drainage issues, and geotechnical considerations. Involved in Nevada and California in the development on State regulations dealing with the control of mining wastes.

Thompson Creek Molybdenum Mine Plan of Operations Review, Challis, ID. Senior Technical Reviewer under contract to the USDA Forest Service, evaluating the applicant's submitted plan of operations. Areas of concern evaluated included ARD potential from the tailings impoundment, waste rock dumps, and the open pit, and geotechnical stability of the tailings impoundment.

Geologic Hazards

Red Dog Mine Geologic Hazards, AK. Project Engineer on various projects designed to control ARD, mitigate impacts to the permafrost, and dust control.

Western Contra Costs Landfill, Richmond, CA. As Project Manager, provided expert regulatory guidance to the prime consultant relative to hazardous waste remediation and closure. The specific regulatory guidance and assistance included compliance with RCRA under Federal jurisdiction, and Titles 22 and 23 under the State of California. The specific agencies involved included the US Environmental Protection Agency (EPA) Region 9, California Water Quality Control Board, California Department of Health Services, and Bay Area Air Quality Management District.

Professional Affiliations

Society for Mining, Metallurgy and Exploration, Member
American Society of Professional Engineers, Member

National Society of Professional Engineers, Member
International Committee on Large Dams, Member
ICOLD Committee on Tailings Dams, Chairman of Tailings Dam Subcommittee

Continuing Education

Coursework for Ph.D., Civil/Geotechnical Engineering, Colorado State University
Mine Waste Facility Design Short Course, Arizona DEQ, 1998
Mine Closure Short Course, Arizona DEQ, 1997
Slope Stability Workshop, April 1997
Design of Geomembrane Liner Systems, Arizona DEQ, 1998

Publications/Presentations

Henderson M. Tailings dam design and risk analysis. International Committee on Large Dams (ICOLD), Tailings Subcommittee. Textbook; forthcoming.

Henderson M. 1997. Mining Environmental Handbook. In: Chapter entitled Heap and Dump Leach Design. Imperial College Press.

Henderson M. 1992. Mine Waste Management. In: Chapter 8, Closure. Lewis Publishers.

Henderson M. 1992. Hydraulic transport research facility: data analysis report. Textbook written for US Bureau of Mines. National Technical Information Service.

Henderson M. 1992. Electronic leak detection system. Heap Leaching Newsletter.

Henderson M. 1999. Wismut Uranium Tailings Closure Conference [invited speaker]. Germany.

Henderson M. 1998. Managing tailings consolidation. Colorado State University Tailings Management Conference; 1998 Jan.

Henderson M. 1998, 1994. Design of geomembrane liner systems. State of Arizona Department of Environmental Quality; 1998 Jul, 1994 May; Phoenix, AZ.

Henderson M, Easton K, Deloitte, Touche. 1995. Initial effects of natural resource damages on mine closure and company financial status. Nevada Mining Association Conference on Mine Closure.

Henderson M. 1995. Deterministic and probabilistic water balance modeling. Northwest Section of Society of Mining Engineers Annual Meeting.

Henderson M. 1995. Electronic leak detection system. Solid Waste Landfill Conference; Sardinia, Italy.

Henderson M. 1993. Environmental regulations for government contracting. Association of Contracts Managers; Seattle, WA.

Henderson M, Zyl V, Cobb B. 1990. Economic aspects of pad construction costs on heap leach projects. SME Conference.

Henderson M. 1988. Slurry pipelines: present and future. American Society of Civil Engineers, Hydraulic Fill Structures Conference.

Henderson M. 1983. Initial experimental studies on the hydraulic transport of coarse coal by pipeline. 8th International Technical Conference on Slurry Transportation; 1983 Mar 15-18; San Francisco, CA. Report T-08.



Richard E. Gray

Technical Advisor

Richard E. Gray is a Principal of DiGioia, Gray and Associates, LLC, Monroeville, PA. A Civil Engineering graduate of Carnegie Mellon University in 1956 with extensive graduate study in Geology, Mr. Gray previously had been with GAI Consultants for over 40 years in various capacities including Senior Vice President.

Mr. Gray is a specialist in soil and rock mechanics, engineering geology, and foundation engineering. His consulting experience includes numerous geotechnical studies of sites for large industrial developments, such as steel mills and fossil-fuel, hydroelectric, and nuclear power plants. He has been responsible for numerous studies of slope stability, subsidence, seismicity, ground water, mineral evaluation and waste disposal, and the design of dams, foundations and tunnels. Mr. Gray has also published and presented to technical organizations and college seminars numerous papers on engineering geology and geotechnical engineering.

In July 1977, following a study of landslides in the Japanese Alps, and while chairman of the U. S. National Committee of the *International Society of Soil Mechanics and Foundation Engineering (ISSMFE)*, Mr. Gray was co-chairman of the main session and presented a paper at the Second International Symposium on Landslide Control in Tokyo. He also presented a paper at the *International Association of Engineering Geology (IAEG) Symposium on Landslides and Other Mass Movements*, September 1977, in Prague. By invitation limited to 72 experts from North America, Europe, and Asia, he participated in the Penrose Conference on Landslides in Vail, Colorado, in October 1977. In October 1980, at the invitation of the Japan Society of Landslides, Mr. Gray participated in a two-week study tour of slope stability problems in Japan. In May 1983, Mr. Gray led a portion of the Third Japan-American Landslide Field Conference sponsored by the *U. S. Geological Survey (USGS)* in conjunction with the *Japan Landslide Society*. In February 1999, he was one of 14 United States landslide consultants invited by the USGS to serve as an advisor to the National Initiative for Landslide Hazards Mitigation.

Mr. Gray has also participated in field studies of landslides in British Columbia, and Alberta, Canada, Czechoslovakia, Spain, Wales, Switzerland, Norway, Peru, Ecuador, El Salvador, Honduras, Australia, New Zealand, and California, Colorado, Kentucky, Maryland, Ohio, Oregon, Pennsylvania, Virginia, Washington, West Virginia, and Wyoming in the United States.

A Registered Professional Geologist and Certified Engineering Geologist, Mr. Gray is a recent Past Vice President for North America of the *International Association of Engineering Geology and Environment (IAEG)*. Mr. Gray is Past Chairman of the Pittsburgh Section of the *Society of Mining Engineers (SME)*, Past President of the Pittsburgh Section of the *American Society of Civil Engineers (ASCE)*, Past Chairman of ASCE's Geotechnical Engineering Division, Past Chairman of the U. S. National Committee of the ISSMFE, and former First Vice Chairman of the *American Society of Testing and Materials (ASTM) Committee on Soil and Rock*. Mr. Gray is also Past Chairman of the U. S. Committee for the IAEG, Past President of the *Association of Engineering Geologists (AEG)*, and former Chairman of the Engineering Geology Division of the *Geological Society of America (GSA)*, Past Chairman of the ASCE-GSA-AEG Committee on Engineering Geology, former Chairman of ASTM's Subcommittee D18.01 on Surface and Subsurface Reconnaissance, a former member of the ASCE Underground Technology Research Council, and a former member of the U. S. National Committee on Tunneling Technology.

Mr. Gray is an Honorary Member of the American Society of Civil Engineers and the Association of Environmental Geologists, and a Distinguished Member of the Society of Mining Engineers. He has received the American Society of Testing and Materials (ASTM) Award of Merit and is an Honorary Member of ASTM's Committee D-18, Soil and Rock. He is also a recipient of GSA's Engineering Geology Division's Distinguished Practice Award.

Harold W. Chambers
Survey Department Manager

EDUCATION

B.S. Mining Engineering

West Virginia University
Morgantown, WV 1981

REGISTRATIONS AND LICENSES

WV Association of Land Surveyors
OSHA HAZWOPER Annual Certification
MSHA Annual Certification

DIRECT WORK EXPERIENCE AND PRIMARY RESPONSIBILITIES

Triad Engineering, Inc.
Morgantown, WV

Surveying Services Manager
1984-Present

Mountain State Surveying
Kingwood, WV

Permit Specialist/Surveyor
1981-1984

CURRENT POSITION RESPONSIBILITIES

Mr. Chambers has 25 years of diversified surveying experience. His expertise includes development of permits, topographic mapping, highway design surveys, surface and underground mine surveys and project administration. Mr. Chambers has performed engineering/design services for numerous environmental and reclamation projects. He has been active in numerous projects involving the mining industry, state and federal agencies. Mr. Chambers has responsibility for the management of Morgantown's in-house surveying department. Mr. Chambers duties involve client contacts, proposal preparation, contract negotiation, project coordination, document / data management, staff supervision, site reconnaissance, field surveys and data reduction.

PROJECT EXPERIENCE SUMMARY

International Coal Group (ICG), Inc., Morgantown, WV

As Project Manager/Engineer/Surveyor for surface and underground coal mine projects since 1986, Mr. Chambers has provided varying levels of services to the planning, permitting and operational stages of projects. Services provided include, surveying, site reconnaissance, site development design, drainage design and field engineering, and permitting services. Mr. Chambers worked in the design and development of the Sycamore, Lake Floyd, Spruce 2 and Spruce 3 deep mine facilities, as well as, the planning for expansion of the coarse coal refuse piles at Hawthorne and Philippi Development.

Morgantown Energy Associates / Dominion Resources, Morgantown, WV

As Project Manager and Party Chief, Mr. Chambers provided coordination of resources for emergency surveying services required to monitor movement of a coal silo which had experienced an internal bin failure resulting in a fatality. Monitoring was provided during the rescue, recovery and demolition phases of this incident. As Party Chief, provided shift supervision and data reduction, evaluation and reporting.

Consolidation Coal Company, McElroy Mine, Moundsville, WV

As Party Chief, Mr. Chambers provided field crew supervision and data reduction for the planned expansion of the load out harbor facility. River soundings were performed utilizing Real Time Kinematic GPS surveying methods. Borehole locations for the river cell were staked on shore with references provided to the correct river locations.

Dominion Resources, Delmont, PA

As Project Manager and Party Chief, Mr. Chambers provided project administration, coordination of resources and data reduction/report preparation for the subsidence monitoring of pipeline TL-342 in Greene County, PA, during underground coal mine longwall subsidence events since 1992. Strain gages were installed along this pipeline with regular measurements of same performed to ascertain any change

in strain along this pipeline. Survey data was also obtained to determine the maximum amount and cessation of subsidence.

DMJM Harris, Inc., Pittsburgh, PA

As Project Manager, for this WV Department of Transportation, Division of Highways project in Monongalia County, WV, the Mon Fayette Expressway, Mr. Chambers provided project administration and coordination of resources to complete assigned work tasks for the design of an interstate interchange, new exit, mainline roadway and local access roads. Project mapping was edited and formatted to current WVDOH CADD standards.

Mt. Storm Wind Force, Bayard, WV

As Project Manager/Engineer/Surveyor, Mr. Chambers provided property line reconnaissance and supervision of survey field crews for the development of an ALTA land survey and topographic mapping for a project area spread over several thousand acres. Additionally, Mr. Chambers provided drainage design for the plans included in the storm water management permit required by WVDEP.

Parsons Brickerhoff, Fairmont, WV

As Project Manager, for this WV Department of Transportation, Division of Highways Corridor H project in Tucker County, WV, Mr. Chambers provided project administration and coordination of resources to complete assigned work tasks for the design of an interchange, mainline roadway and local access roads. Project mapping was edited and formatted to current WVDOH CADD standards.

William M. Gardner
Senior Geologist / Drilling Manager

EDUCATION

B.S. Geology

West Virginia Univ., Morgantown, WV 1976

REGISTRATION AND LICENSES

Licensed Well Driller

WV (No. 00061)

OHSA 40 Hour Hazwoper Training

OHSA 8 Hour Hazwoper Site Supervisor Training

DIRECT WORK EXPERIENCE AND PRIMARY RESPONSIBILITIES

Triad Engineering Inc.
Morgantown, WV

Drilling Manager/Senior Engineering Geologist
1982 to Present

Triad Engineering, Inc.
Morgantown, WV

Staff Geologist
1977 to 1983

Halliburton Services
Zanesville, Ohio

Field Engineer
January 1977 to October 1977

CURRENT POSITION RESPONSIBILITIES

Mr. Gardner has over 29 years of experience as a geologist with Triad Engineering, Inc. (TRIAD) and has managed the Morgantown, WV Drilling operations since 1982. During this time he has been involved with almost all drilling-related projects performed by TRIAD at this office. While employed at TRIAD, the firm has grown from having no in-house drilling capabilities to presently operating 12 drilling rigs. He is experienced with all phases of drilling and sampling operations required for the completion of mineral reserve projects, as well as those for geotechnical, environmental, and construction-related projects. He has been involved with numerous projects which required specialized drilling techniques such as river borings, sampling in slurry impoundments, various instrument installations, tie back anchor installations, drilling projects conducted within structures, and underground horizontal degasification drilling projects. In addition, Mr. Gardner has been responsible for design and installation of many groundwater monitoring wells, and for training of drill crews for proper monitoring well installation procedures. These monitoring wells have ranged from shallow depths to depths over 350 feet. Some of the projects requiring monitoring well installation have included sites considered for dams, landfills, areas affected by both past and future mining activities, service station sites, and other sites having environmental concerns. Many of the sites requiring groundwater monitoring wells have been on projects closely monitored by the West Virginia Division of Environmental Protection, Office of Waste Management.

PROJECT EXPERIENCE SUMMARY

Consolidation Coal Company Mineral Reserve Evaluations for Dents Run Mine Site, Robinson Run Mine Site, and Blacksville # 1 Mine Site, Morgantown, WV

Responsible for supervision of seven (7) drill rigs for core drilling and sampling activities required for mineral reserve evaluation. Logged all rock core, developed geologic sections, and evaluated roof conditions for future mining operations.

US Bureau of Mines Degasification Projects at Federal # 2 Mine, Grant Town, WV, Marianna Mine Site at Marianna, PA, and Keyser Steel Mine. Sunnyside, Utah

Developed horizontal degasification techniques and equipment for horizontal drilling in coal seams in underground mines. Responsible for providing drilling supervision, methane sampling and monitoring, instrument readings for drill string orientation, and development of permanent venting of methane gas from mining operations. Also submitted final reports to the US Bureau of Mines.

West Virginia University Hospital, Morgantown, WV

Performed a subsurface investigation inside the existing hospital to evaluate distress problems being experienced by the hospital structure. This project required drilling inside the hospital while the hospital was conducting normal business operations. Provided project and drilling supervision, logging of all core, evaluation of data, and prepared a geotechnical report of findings.

Drilling Services for Vindex Energy Mine Site, Mt. Storm, WV

Installed numerous monitoring wells required for obtaining mining related permits. These monitoring wells ranged from depths of 50 feet to over 300 feet deep. Also performed core borings to evaluate quality, thickness, and mining depths of coal seam.

Consol Energy McElroy Preparation Plant and Harbor Upgrade, Cresap, WV

Developed drilling operations which consisted of core borings on land and in the Ohio River for evaluation of site. River borings required drilling off of a barge to depths of approximately 60 feet.

Consolidation Coal Hughes Hollow Impoundment Stage II Construction, Greene County, PA

Installed monitoring wells and piezometers as required by MSHA permit specifications. Some of these piezometers consisted of Multilevel Cassagrande Piezometer Installations to 100 foot depths.

WBOY Tower Foundation and Anchor Evaluation, Clarksburg, WV

Project involved drilling along side existing tower foundations and through existing anchor foundations to determine size of foundations and the allowable bearing capacity of foundation bearing materials for future additions to the tower. Logged all samples, provided analysis and developed a geotechnical report which provided recommendations to allow construction of the new tower facilities.

Backbone Mountain Wind Turbine Project, Thomas, West Virginia

Performed geotechnical drilling services for approximately 44 wind turbine sites to be constructed over 6 miles on Backbone Mountain. In addition to the drilling, resistivity testing was conducted at each Wind Turbine Site for grounding design. Supervised all data collection, performed resistivity calculations and submitted final report of resistivity results.

Davis to Bismark Section 6 Corridor H, Davis, West Virginia

Provided drilling services required for design of Corridor H Section 6. This project consisted of drilling numerous core borings in sensitive environmental conditions (wetlands).

MYP Diamond Site, Uniontown, PA

Provided core drilling services in an underground limestone mine for evaluation of mine floor conditions for permit requirements.

Consolidation Coal Company Robena Mine Slurry Impoundment, Alicia, PA

Installed numerous piezometers as required by MSHA. Several of these piezometers were pneumatic piezometers requiring special drilling and/or installation techniques.

Cadiz Street Project 2 Stabilization Project, Cadiz, Ohio

Performed core borings as required by the Ohio Department of Natural Resources to evaluate previous grouting activities conducted to remediate mine subsidence effected areas from underground coal mining activities.

CSXT M.6 Post 2.2 to 2.4, AMEC Associates, Monaca, PA

Provided drilling services for evaluation of landslides along existing railroad tracks. This project involved very difficult access due to both the limited railway access to the site, and from the damage the landslides had caused along side the tracks. Performed drilling and sampling operations in coordination with CSX normal operations.

Gali Lab Facilities, West Virginia University Engineering Building, Morgantown, WV

Responsible for developing drilling and sampling operations inside the WVU Engineering Building to evaluate existing foundations for possible support of new lab facilities. Supervised all drilling activities, logged samples, performed analysis, and provided a geotechnical report outlining subsurface conditions encountered, and provided recommendations for foundation support of the proposed facilities.

Port Perry Bridge/Tunnel Modifications Milepost JP-2.51

Responsible for drilling horizontal core borings inside an existing railroad tunnel for geotechnical evaluation necessary for future enlargement of the tunnel. The drilling equipment had to be modified such that it could be supported by high-rail equipment. Modifications also had to be made to shorten the drill derrick and to the drill controls to allow horizontal drill operation. Support scaffolding had to be constructed at each boring location to guide the drill string. This route was a very heavily traveled route drilling work was conducted in coordination with the Norfolk Southern Railroad train schedules.