David J. Demko, PG

PROFILE

David Demko has 34 years of experience supervising and performing remedial investigations and rapid response actions, implementing remedial measures, and obtaining closure at sites exhibiting a diverse array of organic and inorganic chemical contaminants under a wide range of geologic and hydrogeologic conditions. He develops work programs and negotiates with regulatory officials and impacted third parties for practical response efforts and site closure approvals.

David's fields of expertise include groundwater contaminant assessment and remediation, CERCLA, RCRA, Oil Pollution Act, SPCC, stormwater compliance, risk assessment, remedial technology, feasibility and performance evaluation, expert testimony, real estate valuation and environmental planning, anthracite coal mining permitting and resource valuation, and spring/bottled water business site development.

REPRESENTATIVE PROJECTS

Aquifer Testing for Groundwater Control and Recovery (throughout PA including Tioga County) – Conducted more than 50 groundwater remediation projects in varied geologic settings throughout PA. Each site required aquifer testing to size groundwater pumping systems for comprehensive groundwater control and recovery.

Water-Supply Development for Production Well Sizing (PA and GA) – Performed water-supply development for a number of private companies to determine specification for production well sizing and construction for industrial water-supply use. Also determined feasibility for bottled-water-supply businesses.

Groundwater Remediation of Drinking-Water Aquifer (Lehigh County, PA) – As project coordinator, negotiated, designed, and implemented interim remedial action program under a US EPA CWA section 311(C) unilateral order. Completed groundwater remediation of a drinking-water aquifer and initiated site soil and groundwater attainment data documentation and submittal to PADEP for PA Act 2 site closure.

Groundwater Remediation Program at Manufacturing Facility (Williamsport, PA) – Served as site coordinator for the implementation of a facility-wide groundwater remediation program under a US EPA 106 administrative order.

Rapid Response to Pipeline Release at Airport (Queens, NY) – Served as project coordinator for an emergency response to a high-volume subsurface gasoline loss at an active airport runway. Coordinated remedial efforts between the pipeline company and the airport managing authority, state regulators, the Federal Aviation Administration, and the US Coast Guard to establish a 24/7 remedial response operation sanctioned by all entities. Remedial efforts have initially recovered 100,000 gallons of gasoline and eliminated the impact to the nearby surface-water body.

POSITION

Principal hydrogeologist

PROFESSIONAL HISTORY

Environmental & Real Estate Restoration (Owner)

VP of project management at Groundwater Technology, Inc.

EDUCATION

BA, geology – Temple University

REGISTRATIONS

Professional geologist – AL, AR, FL, IA, IN, KY, PA, SC, TN, and TX

TRAINING

Loss Prevention System (LPS)

OSHA HAZWOPER – initial and refresher

Improving Hydrogeologic Analysis of Fractured Bedrock Systems – UNLV and US DOE

Evaluation of Indoor Inhalation Pathways – Risk Assessment & Management Group

Competent Person Certification, Excavation & Trenching Safety – OSHA

Underground Storage and Subsurface Evaluator Seminar – Rutgers University

Federal Publications, Inc., Environmental Insurance – Georgetown University

Management Training Seminars – Executive Ventures

Response to Catastrophic Pipeline Release (Northumberland County, PA) – Served as project coordinator managing rapid response activities in response to a large-volume catastrophic pipeline loss of a high octane gasoline, resulting in vapor impacts to homes. Designed and implemented an impact assessment program to produce a summary report to PADEP characterizing the loss for presentation to the public. Initiated a vapor recovery/soils remediation pilot program for PADEP evaluation.

Consent Order Negotiation at Superfund Site (Bridgeport, NJ) – Served as technical leader and chief strategist for a multi-corporation PRP technical committee and legal council. Work included negotiation of a consent order with the US Department of Justice and US EPA Region II for the design, implementation, and completion of a RI/FS. The resulting RI/FS produced a ROD for the remediation of groundwater and wetlands impacted by chlorinated organics, PCBs, and metals.

Remediation at Rail Yard Superfund Site (Paoli, PA) – Served as project coordinator for the groundwater remediation portion of this project for RD/RA activities.

DOJ-Ordered Interim Action at Rail Yard Facility (Elkhart, IN) – Served as project coordinator/principal-in-charge as the client's representative for implementation of an interim action under a Department of Justice 106 order. The order required fast-tracked design and construction of a groundwater extraction and treatment system for removal of carbon tetrachloride and trichloroethene from a sole source aquifer and extension of a municipal water supply to impacted domestic users. Conducted assessment activities to determine extent and magnitude of source contamination. Results were used to support percentage contribution characterization in negotiation with former facility owners for financial cleanup responsibility.

Reporting at Landfill Superfund Site (York, PA) – Served as principal-in-charge and project coordinator for completion and submittal of a RI/FS report for this site. Results of the RI/FS were presented to a US EPA Region II technical committee to aid in timely issuance of a ROD and to respond to public commentary.

AFFILIATIONS

Association of American Railroads

ChemPharma – Philadelphia Chapter

National Ground Water Association

Society of Mining Engineers

Water Pollution Control Association of PA

PRESENTATIONS AND SEMINARS

Demko, D.J. " Improving Remediation Well Performance" 22nd National Tanks Conference & Expo Boston, MA (2010)

Demko, D.J. "A Conceptual Site Model (CSM) and a Remedial Strategy for Implementing Emergency Response Actions in Response to Gasoline Vapor Impacts in Residential Homes Located Atop Anthracite Deep Mines in Central Pennsylvania," PCPG Remedial Technology Seminar (2008).

Demko, D.J. "Management of HWA and Restoration of Hemlock Health," Third Symposium on Hemlock Woolly Adelgid in the Eastern US," Asheville, NC (2005).

Demko, D.J. "Restoration of Water Quality in a Multi-Aquifer System via In Situ Bioremediation of Organic Contaminants," Fifth National Symposium on Aquifer

Restoration, Houston, TX (1987).

Demko, D.J. "Assessment and Remediation Technology Selection for Organic and Inorganic Contaminants in the Environment," Course Instructor, Georgia Institute of Technology, spring semesters, (1987-90).

Demko, D.J. "Video: Comprehensive Aquifer Restoration," Producer/Director, (1986).

Demko, D.J. "Hydrocarbon Contamination of Carbonate Aquifers," NWWA Third National Symposium on Aquifer Restoration, Houston, TX (1985).

Richard T. Wardrop, PG

PROFILE

Richard Wardrop has over 25 years of experience providing hydrogeologic and environmental consulting services for the industrial and electric utility sectors and local, state, and federal governments. He joined GES in 2011. He has managed or directed over 20 major programs valued at over $25 million for some of the nation's largest corporations. He has managed site investigations and cleanups under state voluntary cleanup programs, US EPA RCRA Corrective Action and CERCLA, and CERCLA-equivalent state regulatory programs.

Over the past few years, Richard has managed and directed projects associated with oil and gas exploration and production (E&P) activities in the northeastern US, including developing water supplies for fracking, stray gas migration incidents, characterization and the cleanup of drilling, development, and production water releases at well pads. He has been responsible for siting, designing, and permitting new groundwater supplies and source-water protection programs under various regulatory authorities.

REPRESENTATIVE PROJECTS

Environmental Remediation Consulting – Site Investigation and Cleanup

Rapid Response for Ash Basin Failure: Eastern US Electric Utility – Served as lead geoscientist responsible for rapid response investigations in the aftermath of a major ash basin release into a larger river. Work included investigation of carbonate bedrock aquifer downgradient of failed basin and of a second, older ash basin that was affected by cleanup operations in the river. Investigations required assessment of local geology, groundwater monitoring program design and implementation, geophysical studies, geotechnical study of basin dyke stability, river sampling studies, and geochemical assessment to document fate and transport of metals in local groundwater.

Ash Landfill Assessment (DE) – Served as lead hydrogeologist/project manager for assessing fate and transport of metals in groundwater, surface water, and sediment from a fly ash basin that completely encompasses a tidally-affected peninsula. Existing groundwater monitoring program was assessed and upgraded including design and installation several new monitoring wells at various depths. Surface-water and monitoring well points were continuously monitored for one month using data loggers to record fluctuations of water levels and salinity over tidal cycles. Density of groundwater was assessed in terms of flow barriers for migration of metals in freshwater aquifer underlying the peninsula. Net metal transport rates and directions were determined, illustrating a limited impact on sediment close to the shoreline. Conclusions were consistent with work being

POSITION

Principal hydrogeologist

LOCATION

Exton, PA

PROFESSIONAL HISTORY

Client program manager/senior hydrogeologist at Shaw Environmental, Inc.

Office manager/senior hydrogeologist at US Filter

Vice president/senior hydrogeologist at Nittany Geoscience, Inc.

EDUCATION

MS, geology (emphasis in hydrogeology) – Pennsylvania State University (PSU)

BA, geology – Bucknell University

REGISTRATIONS

Professional geologist – PA

TRAINING

Loss Prevention System (LPS)

OSHA HAZWOPER – initial and refresher

SafeLand USA Training

RCRA Training

DOT Training

Western Anthracite Belt – 80th Annual Field Conference of Pennsylvania Geologists

Improving Hydrogeologic Analysis of Fractured Bedrock Systems (2015) – Midwest Geoscience/PCPG

Marcellus and Utica Shale Water Management 2015 Conference – Amer. Business Conferences

Geology on the Edge – 68th

performed by Delaware regulators who were employing a different procedure. The findings greatly reduced the client's liability by showing limited impacts.

Environmental Corporate Purchasing Agreement Lead for Major Electric Company – Responsible for obtaining and managing Corporate Purchasing Agreements (CPAs). Under this program, served as project director, project manager, and lead senior technical consultant for a number of high-profile projects including RCRA corrective action projects for the company's Corporate Research and Development; Plastics Division; and former electronics manufacturing facilities. Work included study and remediation of dense non-aqueous phase liquids (DNAPLs) in fractured and solution-prone bedrock settings. Other important projects included studies associated with former uranium mining operations in New Mexico; led teams that modeled fate and transport of radionuclides, performed bench-scale treatment studies, and participated in public relations with Native American communities. For the real estate division, led development and implementation of rapid environmental and health and safety assessment program for portfolio of 60 light commercial properties. Follow-up work included Phase II investigations at sites in GA and TX. Developed professional relationships with the company's Corporate Environmental Program managers.

Coal-Source Groundwater and Surface-Water Impact Study: Electric Utility Company (western PA) – Led PA Act 2 program field studies to assess site-wide groundwater and surface-water impacts from coal pile management and other potential sources across site. Project included assessment of combined effects of NPDES permitted discharges and groundwater discharge to Conemaugh River.

Groundwater Quality Assessment at Nuclear Power Test Reactor Site (western PA) – Responsible for updating groundwater monitoring program of this facility and associated landfill. Exhaustive reviews of files from historic site studies and of more current groundwater monitoring data were used to develop a conceptual site model for groundwater flow and fate and transport of radionuclides. Model was inconsistent with past interpretations and a select number of new monitoring wells needed to be installed to fill in water-level and radionuclide concentration data gaps. Based on these actions, client has been able to perform select strategic soil removal actions to reduce liability.

RCRA Corrective Action: Pharmaceutical Research and Development (R&D) Facility (Lansdale, PA) – Served as project director, project manager, and lead hydrogeologist for RCRA Corrective Action program at R&D complex. This included RCRA facility investigation, feasibility study, and corrective measures study. Program involved assessment and remediation of DNAPL (TCE and chloroform) released into a fractured Triassic Basin rock aquifer that is heavily used as a potable water supply by local public water companies. Further complexity was added to the program because similar DNAPL releases from other industries local to the site were well-documented. Assisted facility in conducting pumping tests and obtaining

Annual Field Conference of Pennsylvania Geologists

UIC Stakeholders – MSC Class II UIC Work Group

Shale Exchange Conference – Gas Technology Institute

Water Issues Associated with Hydraulic Fracturing – Groundwater Protection Council

Injection Induced Seismicity – Baltimore Section of AEEG

Stray Gas Occurrence, Investigation, and Remediation

Continuing the Efforts to Streamline RCRA Corrective Action – RCRA Corrective Action Conference

Updates to PA's Land Recycling Program – PA Environmental Compliance Course

Water and Energy in a Changing Climate – Groundwater Protection Council

Pennsylvania's Carbon Sequestration Program – PADEP

Marcellus Gas Play – Centre County Chamber of Business and Industry

Water Quality Impacts From Natural Gas Drilling – PSU

Development of the Marcellus Shale Formation in the Susquehanna River Basin – PSU

Uniform Environmental Covenants Act (UECA) – PADEP

Nuclear Plant Groundwater Monitoring – EPRI/NEI

Groundwater Flow and Contaminant Transport in Fractured Rock – Carnegie Mellon Univ.

Brownfields Grant Workshop – US EPA Region 3

Water Resources Symposium, Policy, Stewardship, and the

Delaware River Basin water withdrawal permit for new production well.

Rapid Response to Pipeline Release Sites: Major US Fuel Pipeline Company (central and southeastern PA) – Served as lead hydrogeologic consultant for rapid response studies at two hydrocarbon fuel pipeline release sites. One release occurred in central PA on the side of a mountain into fractured bedrock. Local geologic structure (bedding planes and two joint sets) has been used to explain anisotropy in hydraulic conductivity of bedrock and associated direction of dissolved phase migration, which is different from topographic gradient. Extent of contamination, both horizontal and vertical, has been demonstrated to be limited to a few springs at base of the mountain, not out into the valley, greatly limiting the client's liability.

Environmental Consulting – General

Multi-Site Critical Environmental System Risk Assessments (CESRAs): Two East Coast Electric Utility Companies – Served as geotechnical expert on environmental audit team that performed facility-wide environmental risk assessments for two power companies. Work included audits of six coal-fired power plants and one nuclear generating facility. Audit team would visit each power generation facility for a period of one week and collect detailed information concerning all aspects of a facility's operations. Role included assessment of environmental compliance and potential failure of systems associated with ash basins, regulated dams and impoundments, fuel tank storage areas, and landfills. Work included detailed evaluation of groundwater and surface-water monitoring programs and historic results. At each site, team collected and evaluated information, identified types and number of safeguards protecting those systems, and calculated relative risk of high-consequence event. Preliminary report was presented to facility officials at end of audit week and more complete report was delivered to corporate environmental department within one month of audit completion. After all facility audits were complete, a comprehensive fleet-wide risk assessment report was produced, which illustrated to client areas of environmental risk that persisted across all corporate holdings. One major benefit of CESRAs to client was quick identification of low-cost fixes that had a large effect on risk rankings. Programs provided pathway for future capital expenditures to reduce long-term risks.

Real World – PCPG

Acid Pollution Control Along Highways – PSU

The New Age of Water Resource Planning in PA – Act 220 Symposium

AFFILIATIONS

National Ground Water Association

Shale Alliance for Energy Research of Pennsylvania (SAFER PA) – Board of Directors

Pennsylvania Council of Professional Geologists – Board of Directors

Marcellus Shale Coalition – Water Resources and Waste Management Committee

Marcellus Shale Coalition – UIC Well Workgroup

Penn State Dept. of Geosciences Advisory Committee

Upper/Middle Susquehanna River Basin Act 220 (State Water Plan) Water Resources Committee

Spring Creek Watershed Monitoring Committee, Centre County

Facility Environmental Compliance Audits: Oil & Gas Field Wastewater Management Company (OH) – Served as lead consultant for performing over 20 environmental site assessments (ESAs) at Class II injection wells, wastewater treatment plants, and equipment staging areas. Desktop determinations of compliance were conducted prior to a one-day site visit and interview with site personnel. Sites were inspected for compliance with PPC SPCC, NPDES, and health and safety training requirements. Client received report of findings one week following site visits. At project completion, client received matrix listing all facilities and levels of compliance. Company-wide areas of concern could be identified and addressed.

Waste Facility Screening and Auditing Program: Unconventional Gas Operator (north-central PA) – Led project

to develop system to screen potential gas field waste management facilities proximal to well pad sites. Screening process identified four brine recrystallization plants and two landfills for which ESAs were performed. Also performed ESAs at Class II injection wells in CO and TX. Results of ESAs were used by client to assure facilities were in compliance with environmental regulations prior to bringing gas field wastes to facilities.

Commercial Property Environmental Compliance Auditing (nationwide) – Served as project manager for environmental compliance/health and safety audit program for one of nation's largest real estate investment companies. Portfolio of properties included over 100 locations throughout US. Coordinated with another firm and developed audit template and protocol. Assembled team of auditors located across US and directed completion of all audits within a one-month period. Completed all reporting one month after on-site audits were performed.

Environmental Consulting – Water

Groundwater Monitoring Program for Ash Basins at Steam Electric Station (SES) (PA) – Responsible for preparing annual groundwater monitoring program documents for two ash basins at a SES, including annual reports, well abandonment plans, and post-closure sampling and analysis plans for approval by PADEP. Developed PADEP-approved post-closure groundwater monitoring exit program for each basin, using background and downgradient population comparisons and trend analyses. Presently applying strategy to systematically reduce post-closure parameter list upon submittal of annual reports.

Regional Source Water Assessment: National Unconventional Gas Operator (central PA) – Served as lead hydrogeologist/project manager for assessing availability of fresh water sources for hydro-fracturing Marcellus shale on client-owned leases. Process included scientific assessment of the viability of each source, transportation options and costs, public relations and a ranking of the sources. The work included establishing a suitable radius from the leased lands for the study area, examining existing sources used by other operators in the region and assessing potential undeveloped stream and lake based sources. Due to the lease locations, most potential sources required consideration of Susquehanna River Basin Commission (SRBC) requirements. SRBC and United States Geological Survey (USGS) web based tools were used to assess expected sustainable flow rates for ungauged streams. Other factors taken into consideration were client access, the ability to pipe water from certain locations, public relations and the likelihood of successfully obtaining an SRBC permit. The final product includes a ranking of potential water sources including 17 new stream sources, 2 new lake sources, 7 existing stream sources, and 15 public water supplies.

Susquehanna River Basin Commission (SRBC) Permit Audits: National Oil and Gas Operator (south-central PA) – Served as lead auditor/author of audit report concerning status of compliance with SRBC water management permit requirements. Permits were transferred from two original sponsors who sold assets to client. These included two surface-water withdrawal permits for establishing water-taking points, three into-basin diversion permits allowing for use of public water supplies outside of basin, and 15 approval-by-rules for allowing use of water at well pads. Areas of compliance/non-compliance were communicated using a three-color scheme: green (requirements have been met or activities are underway and nearly complete); yellow (requirements were incomplete but planned for and required less than six months to complete); red (requirements were incomplete, may or may not have been planned for, and will require greater than six months to complete). Executive summary for audit report included table of results listing all of the permits using color coding for succinct communication to upper-level management.

Ash Basin Groundwater Quality Assessments: Electric Utility Company (PA) – Led team that performed PADEP groundwater quality assessments for eight ash basins at three sites. Reviewed historic groundwater quality data. Current condition of each impoundment was assessed and reported, and recommendations were given for modifications to existing groundwater monitoring program in terms of analytical parameter lists, monitoring well locations/design, wells to be abandoned, new wells to be installed, frequency of monitoring, reporting requirements, and strategies to reduce or eventually eliminate monitoring based on statistical analysis of data.

Environmental Consulting – Waste

Gas Field Waste Reporting Study: National Unconventional Gas Operator (central and north-central PA) – Client is required by PADEP to collect and perform chemical analysis of production water, flowback water and sand, flowback filters, and drill cuttings on an annual basis at each pad at which wastes have been produced. Leading team to assure all data are accurately entered into client database and data are complete. Process is challenged by a few different laboratory reporting deliverables used over sampling period. Once database quality is assured, data are used to create statistics for each parameter, for each of the media, to illustrate those parameters and media for which the parameter is rarely detected or is always detected at a trace amount. This information will be presented to obtain PADEP agreement that parameter list can be significantly reduced. Team is creating a series of regional isoconcentration maps for select parameters and media for client's internal use.

PUBLICATIONS

Wardrop, R. T. "Pennsylvania Water Well Handbook," Shale Alliance for Energy Research of Pennsylvania (SAFER PA), lead technical editor (2014).

Wardrop, R.T. "Source of Anomalous Barium in Groundwater Supplies of Indiana County, Pennsylvania," Masters Thesis, Pennsylvania State University (1988).

PRESENTATIONS AND SEMINARS

Wardrop, R. T. "Class II UIC Wells in Pennsylvania," Pennsylvania Counsel of Professional Geologists Seminar, Harrisburg, PA, Nov. 14, 2015.

Wardrop, R. T. "Shallow Subsurface Pathways," Gas Technology Institute, Shale Exchange Conference, Pittsburgh, PA, Oct. 30, 2014.

Wardrop, R.T. and J. Casey, "Seismicity Risk Assessment of Select Class II Injection Wells in Ohio," Heckmann Water Resources and GES, Marcellus Shale Coalition Meeting, Feb. 20, 2013.

Wardrop, R. T., et. al, "Occurrence and Variability of Methane in Domestic Water Wells in Pennsylvania," Chesapeake Energy and GES, presented at five conferences in 2012 and 2013.

Wardrop, R.T. "Act 2 – Statewide Health Standards," Fundamentals of Pennsylvania Environmental Law Compliance Course, Hershey, PA (1998).

Wardrop, R.T. "Licensing of Professional Geologists in Pennsylvania," Northeast Section of the Geological Society of America Conference, King of Prussia, PA (1997).

Wardrop, R.T. "Environmental Update Seminar," Pennsylvania Chemical Industries Council, King of Prussia, PA (1994).

AVA ELLEN BERKLITE, PG, PMP, EIT
PROJECT ENGINEER/GEOLOGIST
DENVER, COLORADO

EDUCATION: B.S. Geology, Mississippi State University
M.S. Environmental Engineering Sciences, University of Mississippi

Tetra Tech (REI) Denver, CO (May, 2014 – August, 2016)

Oil and Gas Experience

- Coordinated with Tt Environmental in the application of Environmental Permitting Requirements to the Engineering Design and Routing of the Sunoco Mariner East 2 Pipeline.
- Managed Geotech Program for ME2 and incorporated the resulting field information into the HDD Designs. Applied Geotechnical Information into the Inadvertent Return Drilling Plan.
- Managed Geophysical Studies at Sinkhole Issues at Montello for preferable pipeline conventional route.
- Reviewed West Virginia mining operations for hierarchical ranking of Follansbee Injection Site.
- Prepared Mining and Karst Mitigation Plan for Conventional Installation, Bores, and HDDs.
- Reviewed and applied engineering design to road bore and driveway crossing designs as a response to State and Local application review comments.
- Coordinated with land and surveying for tree clearing, driveway land owner acquisition and permitting.
- Managed the Stormwater Design Program for ME2 Valve Sites.

Tetra Tech (OGA) Pittsburgh, PA (September, 2009 – May, 2014)

Oil and Gas Experience

- Prepared Land Development Municipal Packages and developed Storm Water Management Plans for multiple Oil and Gas Clients, including Sunoco ME1.
- Prepared Erosion and Sediment (E&S) Control Plans for multiple Oil and Gas Clients, including Sunoco ME1.
- Designed Secondary Containment and process layout and acquired municipal building code permits for Mud Mixing Facility for Oil and Gas Wells in Ohio.
- Designed erosion and sediment (E&S) and storm water controls for well pads and access roads in Ohio and Pennsylvania for permits related to O&G.
- Performed environmental and geotechnical siting studies for gas compressor stations. Evaluated alternative pipeline gas and waterline route from impoundment to compressor station with constructability scenarios for different routes.
- Performed technical well review of 30 oil and gas wells for the potential use of operating brine water injection wells. Provided oversight and troubleshooting of various rates and pressures for injection brine water at Oil and Gas Injection Wells.

Remediation Experience

- Managed Environmental Investigations for Federal, industrial, and commercial clients for due diligence and compliance under Superfund, RCRA, CERCLA, UST, Brownfields, NPDES, and PA ACT 2 programs. Supervised Field Geological Investigation Operations. Designed, selected, and implemented remediation alternatives for site restoration.

Mactec Pittsburgh, PA (June, 2006 – June, 2009)

Remediation Experience

- Investigated Industrial Park Multi-Industrial Groundwater Contamination in Fractured Bedrock and Stormwater Piping via extensive subsurface investigations and aquifer testing.
- Monitored Managed Quarterly efficiency of air stripping remediation at Aircraft Facility and prepared Annual Operation and Maintenance reports and recommendations.
- Managed Environmental Investigations and Remediation at ARG Refinery, Bradford, PA.

Other Experience (10 years) BCM Engineers, ENSCO, and Mississippi U.S. Geological Survey

- Ten years of field supervision and scheduling of subcontractors.
- Geologist - Hinds/Rankin/Madison Tri-County Landfill Feasibility Study; MS. Performed a Tri-County Landfill Feasibility Study for Hinds/Rankin/Madison Counties.
- Geologist - Completed multiple EAs and Remedial Investigations for petroleum storage and transportation facilities.
- Geologist/Engineer - Participated in compliance meetings with clients and state and federal regulators for Investigation and Remediation alternatives.
- Quarterly monitoring of groundwater monitoring wells, air monitoring discharge points, and surface water discharge points for fulfilling permitting requirements. Performed laboratory analyses to fulfill ENSCO's National Permit Discharge Elimination System (NPDES) requirements.
- Engineer - Investigated the stability of bridges during high stormwater events.

Ralph Boedeker, PE

Senior Program/Project Manager / Geotechnical Engineer\Environmental Engineer

EXPERIENCE SUMMARY

Mr. Boedeker has 31 years of professional experience in the engineering field. He is a Senior Project Manager/Engineer for Environmental and Geotechnical projects and manages a Geotechnical Engineering and Construction Materials Testing and Inspection Department. Mr. Boedeker has a vast amount of experience in geotechnical engineering including geotechnical subsurface investigations, SPT boring and rock coring drilling, laboratory and field material testing, construction QC/QA inspection/testing and monitoring, International Building Code testing/inspection/certification requirements for building construction, geosynthetic design, slope stability and embankment design, earthen dam design and inspections, settlement analysis, foundation analysis (shallow and deep foundations), deep foundation installations, retaining structures, excavation support systems, flexible pavement design, investigation and evaluation of adverse earthwork conditions, landfill closure systems and field consulting. Mr. Boedeker also has over 25 years experience in construction management/administration on Federal, State, Local and private consruction projects. Mr. Boedeker is also a senior project manager/engineer in the environmental engineering field. He has over 25 years' experience in environmental engineering remedial design and construction, including Federal (EPA, ACE, and DOD) and State Superfund site remediation design and corrective action, landfill cap closure design, landfill gas mitigation, remedial investigations, engineering feasibility studies, UST removals and remediation, AST installations, and construction QA/QC services. He also has over 25 years' experience in construction management and technical oversight, managing construction of environmental remedial action projects. Substantial experience working with federal and state regulatory agencies (e.g., DOT, EPA, DNREC, PADEP, VADEQ, Army Corps of Engineers, DOD, etc.) with a comprehensive knowledge of regulatory rules, regulations, standards, guidance documents, and permitting requirements. Mr. Boedeker has comprehensive experience in preparing budget proposals, managing subcontracts and field/technical staff; generating work plans and design reports, preparing construction bid documents (drawings and specifications), and substantial technical report writing. Mr. Boedeker has successfully managed multiple projects and tasks with a strong focus on client service, providing a balance of technical knowledge and business management skills.

RELEVANT EXPERIENCE

Geotechnical and Construction Services

Program Director/Manager for Sanitary Sewer Assets Construction Management/Administration and Inspection Projects, New Castle County Department of Special Services; Ongoing. Project manager for

EDUCATION

ME, Civil Engineering (specializing in geotechnical engineering), University of Delaware, Newark, Delaware, 1988

BS, Construction Engineering, Iowa State University, Ames, Iowa, 1982

AREAS OF EXPERTISE

Project and Program Management

Construction Inspection and Testing

Constructin Management and Administration

Geotechnical Engineering

Environmental Investigations, Feasibility Studies, Remedial Design, Remedial Construction, Operation and Maintenance

REGISTRATIONS/ AFFILIATIONS

Registered Professional Engineer, Delaware (#7789, 1989), + 5 Other States

KEY TRAINING/ CERTIFICATIONS

OSHA 1910.120 40-Hour HAZWOPER Training; April 1989

OSHA 1910.120 8-Hour Annual Refresher Training

YEARS OF EXPERIENCE

31

CONTACT

302-275-4506

ralph.boedeker@tetratech.com

performance of construction administration and inspection projects for New Castle County, Delaware, on sanitary sewer asset installation and rehabilitation construction projects. Numerous projects have been successfully completed, and several on-going, and included construction administration, engineering review of Contractor submittals, full-time construction inspection of Contractor's work by an experienced team of construction inspection staff, coordinating and chairing pre-construction and routine progress meetings, review and disposition of change order requests and payment applications by Contractors, addressing issues during construction, and performance of conditional and final inspections/punch lists at completion of projects. Projects completed for New Castle County in the past several years have included Edgemoor Gardens Sewer Reconstruction, Hyde Run Interceptor Sanitary Sewer Replacement (various sections and projects), Little Mill Manhole Rehabilitation, White Clay Interceptor Manhole Rehabilitation, Turkey Run Interceptor Improvements – Phase II-A (2015-Present), Sewer Pipe Encasement Repairs, Arden/Ardencroft/Holly Oak, Replacement of South Delaware Interceptor & Relief-Section 4, Sanitary Sewer Rehabilitation For Todd Estates, Palace Avenue Sewer Rehabilitation, Augustine Beach Sanitary Sewer Upgrade, and ND-13 Cleanout Installations.

Project Geotechnical Engineer/Project Manager; Performance of Over 500 Geotechnical Subsurface Investigations; Ongoing. Reporting on subsurface conditions, foundation recommendations, design criteria for proposed structures, and providing pertinent site recommendations for construction. The scope of the investigations generally included a standard penetration test boring program, geotechnical laboratory testing of representative soil samples, engineering analysis of available data and preparation of a geotechnical subsurface investigation report. Projects ranged from residential housing to commercial facilities to industrial production facilities and to the oil and gas industry. Included engineering analysis of structural and soil data to determine feasible foundation types (shallow spread/continuous, mat, driven pile, auger cast, caissons, etc.), and determination of foundation design criteria (soil bearing capacity, estimated settlements, seismic classification, earth pressure parameters, subgrade reaction, allowable pile load capacity, pavement design, etc.). Reports also provide pertinent construction recommendations. Select project examples are provided in subsequent paragraphs.

Construction Geotechnical Materials Testing and Inspections – Department Manager; Ongoing. Managed hundreds of construction materials testing and inspection projects. Projects ranged from commercial to industrial facilities, as well as State and Federal facilities. Managing a team of seven geotechnical materials technicians performing, site preparation; subgrade inspection for foundations, slabs and roadway pavement areas; subgrade proof-rolling inspection; in-place density testing of structural fills/backfills utilizing nuclear gauge; in-place density testing of utility trench backfill and roadway pavement sections (aggregate and asphalt); in-place density testing during construction of stormwater management facilities; earthwork construction monitoring; foundation construction monitoring; pre-slab inspections; concrete reinforcement inspection; concrete quality control testing (slump, temperature, air-entrainment, test cylinders); masonry inspection and grout/mortar testing; structural steel bolt testing/inspection; structural steel weld inspections; cold form steel inspections, base course and asphalt inspection and testing; laboratory testing of soils, aggregates and concrete; certified construction review (CCR), field consultation, and preparation of field notes and sketches. Mr. Boedeker is well versed in reporting and certification requirements, and has developed a system to readily document field and laboratory tests and field inspections on a daily basis for eventual certification of construction work by a professional engineer. Inspections and testing is geared towards fulfilling requirements of the International Building Code. Select project examples are provided in subsequent paragraphs.

Project Manager/Engineer; Geotechnical Subsurface Investigations, Sunoco Mariner East Pipeline Project, ME1 (throughout Pennsylvania), 2012 to 2014: Conducted over 12 geotechnical investigations at pump station facilities across Pennsylvania, and performed geotechnical investigations at 13 horizontal drilling locations for an approximate 50 mile pipeline project. Utilized Standard Penetration Test boring techniques during field exploratory drilling to characterize subsurface soil, rock, and groundwater conditions. Evaluations included Standard Penetration Test boring programs, sampling and testing of representative soil samples, engineering analysis of the available data, and preparation of geotechnical engineering reports. Based on the extensive field

and laboratory testing performed, a full array of foundation types were analyzed and implemented. Depending on the project site and proposed structural design, foundation types included shallow spread and continuous foundation systems, mat foundations, and deep pier foundation systems, including provision of bearing capacity, estimated settlement, seismic classification, subgrade reaction, lateral earth pressures, etc.

Project Manager/Engineer; Geotechnical Subsurface Investigations, Sunoco Mariner East Pipeline Project, ME2 (from Western Ohio to Eastern Pennsylvania), 2014 to Present (on-going):

- Performed geotechnical investigations and reporting in support of horizontal directional drill (HDD) designs across 350 miles of the Mariner East Pipeline project, from eastern Ohio to eastern Pennsylvania. Utilized Standard Penetration Test (SPT) boring and rock coring techniques during field exploratory drilling to characterize subsurface soil, rock, and groundwater conditions. Over 300 SPT borings were advanced at over 100 HDD locations. Evaluations included field test borings, geotechnical laboratory testing of collected representative soil and rock samples, review of regional geology data, and preparation of HDD geotechnical reports. Geotechnical evaluations included HDDs locations designed to go below lakes, rivers, roads and highways, wetlands, and severe mountainous terrain.
- Conducted over 16 geotechnical investigations at pump and injection stations, and electrical substations, throughout Ohio, West Virginia, and Pennsylvania. Utilized SPT boring and rock coring techniques during field exploratory drilling to characterize subsurface soil, rock, and groundwater conditions. Evaluations included SPT borings, geotechnical laboratory testing of collected soil and rock samples, engineering analysis of the available data, and preparation of geotechnical engineering reports. Based on the field and laboratory testing performed, a full array of foundation types were evaluated and implemented. Depending on the project site and proposed structural design, foundation types included shallow spread and continuous foundation systems, ring walls, mat foundations of all sizes, and drilled shaft and H-pile foundation systems. Evaluations included provision of soil and rock allowable bearing capacity, estimated settlement, allowable pile axial and lateral capacities, subgrade reaction, lateral earth pressures, seismic classification, etc. and provided pertinent recommendations for construction of earthworks and foundations. Development features for which foundations were designed for included 95 feet diameter fire water tanks; >70 feet diameter butane and propane storage spheres; PDC enclosures; flare stacks; transfer, booster and injection pumps; knockout drums; propane tanks; pipe rack and cable tray systems; launchers, receivers, provers and meters; high voltage line dead-end structures; transformers; metering structures; electrical control rooms; and electrical switches, breakers, and lightning arrestors.
- Conducted 17 geotechnical investigations at valve sites throughout Ohio, West Virginia, and Pennsylvania. Utilized SPT boring and rock coring techniques during field exploratory drilling to characterize subsurface soil, rock, and groundwater conditions. Evaluations included SPT borings, geotechnical laboratory testing of collected soil and rock samples, engineering analysis of the available data, and preparation of geotechnical engineering reports. Based on the field and laboratory testing performed, evaluated and recommended mat, spread, and drilled shaft foundations for PDC enclosures and pipe supports, and utility slabs. Evaluations included provision of soil and rock allowable bearing capacity, estimated settlement, allowable drilled shaft capacities, subgrade reaction, lateral earth pressures, seismic classification, etc. and provided pertinent recommendations for construction of earthworks and foundations.
- Conducted extensive infiltration testing in support of above valve site and pump station stormwater management designs and permitting. Work included double-ring constant head and single ring falling head infiltration testing, provision of recommended infiltration rates, and reporting.
- Conducted extensive geophysical and geoprobe investigations at the Sunoco Montello facility to determine optimum path of proposed pipelines through an area known for karst and sink-hole conditions. Geophysics included seismic refraction and surface-wave surveys along potential open-cut and HDD pipe routes.

Project Manager/Geotechnical Engineer, Academy Street Dining and Residence Complex, University of Delaware, Newark, DE, 2013 to Present. Responsible for performing construction inspection and material testing services during construction at the University of Delaware Academy Street Dining and Residence project site. This project includes a 50,000 square-foot dining hall and a 100,000 square-foot residence hall complex. Services include, evaluation of construction methods and materials; subgrade proof-rolling inspections and subgrade inspections during foundation, slab, and pavement construction; earthwork construction monitoring, including in-place density testing of structural fills and backfills during bulk grading, foundation construction, and utility trench construction; evaluation of adverse earthwork conditions and providing solutions; pre-slab inspections and foundation construction monitoring; concrete reinforcement inspection and concrete quality control testing (slump, temperature, air-entrainment, and casting of cylinder for compressive strength testing; masonry inspections and mortar/grout sampling and testing; structural steel inspection, including welded and bolted connection inspections and ultra-sonic weld testing of moment arm connections; substantial structural cold-formed steel inspections; geotechnical laboratory testing of soils, aggregates, and concrete compressive strength; pavement inspection (bituminous, concrete, and pavers) and testing; and field inspection and testing reporting.

Project Manager/Geotechnical Engineer, Carpenter Sports Building Addition, University of Delaware, Newark, DE, 2012 to 2013. Responsible for performing construction inspection and material testing services during construction at the University of Delaware Carpenter Sports Building Addition project site. This project included a three-story 45,000 square-foot addition. Services include, evaluation of construction methods and materials; subgrade proof-rolling inspections and subgrade inspections during foundation, slab, and pavement construction; earthwork construction monitoring, including in-place density testing of structural fills and backfills during bulk grading, foundation construction, and utility trench construction; evaluation of adverse earthwork conditions and providing solutions; pre-slab inspections and foundation construction monitoring; concrete reinforcement inspection and concrete quality control testing (slump, temperature, air-entrainment, and casting of cylinder for compressive strength testing; masonry inspections and mortar/grout sampling and testing; structural steel inspection, including welded and bolted connection inspections and ultra-sonic weld testing of moment arm connections; structural cold-formed steel inspections; geotechnical laboratory testing of soils, aggregates, and concrete compressive strength; pavement inspection (bituminous, concrete, and pavers) and testing; and field inspection and testing reporting.

Project Manager/Geotechnical Engineer, Howard R. Young Correctional Institute Kitchen Addition, State of Delaware OMB/DFM, Wilmington, DE, 2012 to 2014. Responsible for performing construction inspection and material testing services during construction of a two-story 31,000 square-foot kitchen addition at the at the Howard R. Young Correctional Institute. Services include, evaluation of construction methods and materials; H-Pile foundation inspections and monitoring; subgrade proof-rolling inspections and subgrade inspections during pile cap foundation, slab, and pavement construction; earthwork construction monitoring, including in-place density testing of structural fills and backfills during bulk grading, foundation construction, and utility trench construction; evaluation of adverse earthwork conditions and providing solutions; pre-slab inspections and foundation construction monitoring; concrete reinforcement inspection and concrete quality control testing (slump, temperature, air-entrainment, and casting of cylinder for compressive strength testing; additional concrete testing (destructive and non-destructive) and consulting resulting from placed concrete that did not meet compressive strength requirements; masonry inspections and mortar/grout sampling and testing; structural steel inspection, including welded and bolted connection inspections and ultra-sonic weld testing of moment arm connections; geotechnical laboratory testing of soils, aggregates, and concrete compressive strength; pavement inspection (bituminous) and testing; and field inspection and testing reporting.

Project Manager/Engineer; Geotechnical Investigations, Ciba-Geigy Pigments Plant (Newport, Delaware). Conducted over 10 geotechnical investigations using SPT borings (approximately 500 LF of sampling). Ciba underwent extensive expansion of their pigment manufacturing facilities and construction of elaborate stormwater collection and pumping systems. Development at the site included a new power house, 5-story manufacturing building, tank farm expansion, large underground stormwater management sumps and pumping systems, multiple

above ground storage tanks including a 1.2M gallon stormwater storage tank. Investigations included a Standard Penetration Test boring programs, sampling and testing of representative disturbed and undisturbed soil samples, engineering analysis of the available data, and preparation of geotechnical engineering reports. Based on the extensive field and laboratory testing performed, a full array of foundation types were analyzed and implemented. Depending on the project site and proposed structural design, foundation types included shallow spread and continuous foundation systems, mat foundations, and deep driven pile foundation systems. Tetra Tech also provided geotechnical QC/QA monitoring and field testing during construction of foundation systems and earthworks.

Project Geotechnical Engineer, Expansion of a Large Irrigation Pond, Wilmington Country Club (Wilmington, Delaware). The project included the design of a 26 to 40 feet high earthen embankment (dam), retaining 26 feet head of storage water. Design included a geotechnical subsurface investigation to determine bearing capacity of embankment foundation, determine groundwater conditions and to determine engineering properties of existing embankments and foundations for use during construction of the new embankment. Project included inspections of existing embankments, reporting on existing conditions and concerns, laboratory testing of soil samples collected during the field investigation for determination of engineering properties of embankment foundation and embankment borrow material, extensive slope stability analyses evaluating embankment factor of safety for critical slopes (effective and total stress analyses), design of embankment drains and toe drains, preparation of technical specifications for construction of the embankment and liner systems, and development of design drawing details.

Project Manager/Geotechnical Engineer, Croda Inc., New Castle, DE, 2011 ($30K). Responsibilities included performance of a subsurface investigation for a major facility tank farm expansion effort at this industrial facility. Investigations were located within numerous areas of the facility, including within environmentally sensitive areas. The investigation included over 25 SPT test borings, collection of representative soils samples, and performance of geotechnical laboratory testing. Engineering evaluations were performed within each tank farm development area and recommendations provided for suitable foundation types (mat and grout injected auger piles), including provision of bearing capacity, estimated settlement, seismic classification, subgrade reaction, lateral earth pressures, etc. Due to the extensive “unsuitable” soils encountered at several of the areas, recommendations were provided to account for these poor bearing soils, providing the best suitable foundation system.

Project Manager/Engineer; Geotechnical Investigation, Six Story Office and Parking Garage Building, Delaware Transit Corporation, Wilmington, DE. Tetra Tech performed a geotechnical investigation for a proposed 6-story office/parking garage complex located in Wilmington, Delaware. The purpose of this study was to investigate subsurface conditions within the project site, formulate foundation and pavement design criteria for the proposed structure, and provide pertinent geotechnical site recommendations for construction. The site evaluation included a SPT boring (ASTM D1586) investigation (11 borings with over 600 lf of drilling), 40 lineal feet of rock core drilling (ASTM D2113), geotechnical laboratory testing of representative soil and rock samples, engineering evaluation of the collected data, and preparation of a geotechnical engineering report. Evaluations included foundation alternatives, bearing capacity, estimated settlement, modulus of subgrade reaction for slab design, RQD evaluation and recommendations, retaining wall earth pressures, and IBC seismic classification. Foundation recommendations included caissons or non-displacement H-piles placed directly on intact bedrock underlying the site.

Project Manager/Geotechnical Engineer, Smyrna School District, Smyrna, DE, 2005 to 2012. Responsible for construction and inspection services for seven new school projects for the Smyrna School district between 2005 and 2012 including Elementary School Additions (3 separate schools), Smyrna Middle School, Sunnyside Elementary School, Smyrna High School, and the Clayton Elementary School District. Services included performance of subsurface soil investigations (for several schools), and performance of quality control construction inspection and testing services, including inspection of building and foundations soil subgrades, in-place density testing of engineered fills/backfills, geotechnical laboratory testing (e.g., proctors, grain-size analysis), concrete reinforcement inspections (foundations, slabs, piers, columns, etc.), concrete testing (e.g.,

slump, temperature, air-entrainment, cylinders), testing of concrete cylinders for compressive strength, masonry inspection and testing of mortar/grout for compressive strength, cold form steel inspection, structural steel weld and bolt testing and inspections, and pavement construction inspection and density testing.

Project Manager/Geotechnical Engineer, Colonial School District, New Castle County, DE. Responsible for construction and inspection services for the new Southern District Elementary School (~153K SF) and the Kathleen Wilbur Elementary Schools (~153K SF), 2006 and 2007. Services included performance of subsurface soil investigations and performance of quality control construction inspection and testing services, including inspection of building and foundations soil subgrades, in-place density testing of engineered fills/backfills, geotechnical laboratory testing (e.g., proctors, grain-size analysis), concrete reinforcement inspections (foundations, slabs, piers, columns, etc.), concrete testing (e.g., slump, temperature, air-entrainment, cylinders), testing of concrete cylinders for compressive strength, masonry inspection and testing of mortar/grout for compressive strength, cold form steel inspection, structural steel weld and bolt testing and inspections, and pavement construction inspection and density testing.

Project Manager/Geotechnical Engineer, Christina School District, New Castle County, DE, **2010 and 2011**. Responsible for construction and inspection services for the new Delaware School for the Deaf Facility and Residence Hall, located in Newark, DE. Services included performance of quality control construction inspection and testing services, including inspection of building and foundations soil subgrades, in-place density testing of engineered fills/backfills, geotechnical laboratory testing (e.g., proctors, grain-size analysis), concrete reinforcement inspections (foundations, slabs, piers, columns, etc.), concrete testing (e.g., slump, temperature, air-entrainment, cylinders), testing of concrete cylinders for compressive strength, masonry inspection and testing of mortar/grout for compressive strength, cold form steel inspection, structural steel weld and bolt testing and inspections, and pavement construction inspection and density testing.

Project Manager/Geotechnical Engineer, Bear-Glasgow YMCA, Bear, DE, 2007, Responsible for performance of a subsurface soil investigation and performance of quality control construction inspection and testing services for a new YMCA facility located in Bear, DE. Services including inspection of building and foundations soil subgrades, in-place density testing of engineered fills/backfills, geotechnical laboratory testing (e.g., proctors, grain-size analysis), concrete reinforcement inspections (foundations, slabs, piers, columns, etc.), concrete testing (e.g., slump, temperature, air-entrainment, cylinders), testing of concrete cylinders for compressive strength, masonry inspection and testing of mortar/grout for compressive strength, cold form steel inspection, structural steel weld and bolt testing and inspections, and pavement construction inspection and density testing.

Project Manager/Geotechnical Engineer, Brandywine School District, Brandywood Elementary School, Wilmington, DE, 2011. Responsible for performance of a subsurface soil investigation and performance of quality control construction inspection and testing services for a new and first “Green” elementary school constructed in Delaware. Services including inspection of building and foundations soil subgrades, in-place density testing of engineered fills/backfills, geotechnical laboratory testing (e.g., proctors, grain-size analysis), concrete reinforcement inspections (foundations, slabs, piers, columns, etc.), concrete testing (e.g., slump, temperature, air-entrainment, cylinders), testing of concrete cylinders for compressive strength, masonry inspection and testing of mortar/grout for compressive strength, cold form steel inspection, structural steel weld and bolt testing and inspections, and pavement construction inspection and density testing.

Project Manager/Geotechnical Engineer, Cecil College Gymnasium Facility, Cecil County, MD. Responsible for performance of quality control construction inspection and testing services for a new Gymnasium Complex and Sport Fields. Services including inspection of building and foundations soil subgrades, in-place density testing of engineered fills/backfills, geotechnical laboratory testing (e.g., proctors, grain-size analysis), concrete reinforcement inspections (foundations, slabs, piers, columns, etc.), concrete testing (e.g., slump, temperature, air-entrainment, cylinders), testing of concrete cylinders for compressive strength, masonry inspection and testing of mortar/grout for compressive strength, cold form steel inspection, structural steel weld

and bolt testing and inspections, and pavement (roads, parking lots, tennis courts) construction inspection and density testing.

Project Manager/Engineer: QC Inspection and Testing during Construction of the Newark Reservoir (Newark, Delaware), 2005. QC Inspection and Testing during Construction of the Newark Reservoir, Newark, Delaware: Project manager providing QC inspection and testing services during construction of reservoir embankments and geomembrane liner system to ensure construction conformance to the project specifications and drawings. Testing of reservoir embankments included sieve analyses, maximum dry density analyses, and in-field density testing as embankment fill was placed and properly compacted in thin lifts. Also performed inspection and conformance testing of embankment geomembrane liner system.

Geotechnical Engineer for Task Order under AFCEE 4P, AE Services, Add/Alter Fitness Center, Dover Air Force Base, DE (2005) Responsible for geotechnical subsurface investigation for the site which included a Standard Penetration Resistance (ASTM D1586) test boring investigation program, laboratory testing of representative soil samples, engineering analysis of available data, and preparation of a geotechnical investigation report. Engineering analysis included analysis of structural and soil/groundwater data to determine feasible foundation types and determination of foundation design criteria, including bearing capacity and settlements.

Geotechnical Engineer for Task Order Under AFCEE 4P AE Services - C-17 Flight Simulator Facility, Dover Air Force Base, DE (2005) Responsible for geotechnical subsurface investigation for the site which included a Standard Penetration Resistance (ASTM D1586) test boring investigation program, laboratory testing of representative soil samples, engineering analysis of available data, and preparation of a geotechnical investigation report. Engineering analysis included analysis of structural and soil/groundwater data to determine feasible foundation types and determination of foundation design criteria, including bearing capacity and settlements.

Geotechnical Engineer for Task Order under AFCEE 4P AE - Engine Storage Facility Dover Air Force Base, DE (2005) Responsible for geotechnical subsurface investigation for the site which included a Standard Penetration Resistance (ASTM D1586) test boring investigation program, laboratory testing of representative soil samples, engineering analysis of available data, and preparation of a geotechnical investigation report. Engineering analysis included analysis of structural and soil/groundwater data to determine feasible foundation types and determination of foundation design criteria, including bearing capacity and settlements.

Geotechnical Engineer for Task Order under AFCEE 4P AE - Life Support Facility Dover Air Force Base, DE (2005) Responsible for geotechnical subsurface investigation for the site which included a Standard Penetration Resistance (ASTM D1586) test boring investigation program, laboratory testing of representative soil samples, engineering analysis of available data, and preparation of a geotechnical investigation report. Engineering analysis included analysis of structural and soil/groundwater data to determine feasible foundation types and determination of foundation design criteria, including bearing capacity and settlements.

Project Engineer for Technical Review of McClintic Dam No. 23, McClintic Wildlife Area Reservoir, Robinson Township (Mason County, West Virginia). Project Engineer for Technical Review of McClintic Dam No. 23, McClintic Wildlife Area Reservoir, Robinson Township, Mason County, WV: Performed technical review of this 750 foot long earthen embankment dam which retained a reservoir head of approximately 20 feet, and contained a principal spillway. Reviewed design drawings and technical specifications for proper approach, analysis, design, and completeness.

Project Geotechnical Engineer Powell's Creek Regional Stormwater Management Lake, Prince William County, VA. Performed geotechnical stability analyses of earthen dam and prepared fill specifications and compaction standards.

Project Engineer, Inniscrone Golf Course and Adjoining Residential Community, (Avondale, Pennsylvania). Geotechnical engineer for several large waste water/irrigation lagoons (dams) with retained

water heads ranging from 11 to 21 feet. Included performance of geotechnical subsurface investigations to determine suitable bearing capacity and settlement properties and embankment slope stability analyses (effective and total stress analysis). Also provided QC inspection and testing services during construction to confirm that the earthen lagoons were constructed in accordance with the project specifications. Embankment testing included performance of sieve analyses, maximum dry density analyses, and in-field density testing as embankment fill was placed and properly compacted in thin lifts. Also performed inspection and conformance testing of lagoon geosynthetic clay liner system.

Program Management

Program Manager; State of Delaware Hazardous Substance Control Act (HSCA) Remedial Management Services Contract (New Castle, Delaware); 2006 to 2016. State of Delaware Hazardous Substance Control Act (HSCA) Remedial Management Services Contract, New Castle, DE. Managing day-to-day efforts of a comprehensive remedial support contract for the State of Delaware. Assignments have been varied, and have included: remedial design and remedial action at various sites (including landfill capping, park restoration, marsh and wetland restoration, in-situ chemical oxidation, enhanced bioremediation, free-product recovery, and large volume waste disposal); community relations; remedial investigation/feasibility studies; brownfields assessment; conference planning, and other administrative and technical tasks related to waste site cleanup. Tetra Tech has provided technical support of over 60 assignments to date, including Facility Evaluations, Remedial Investigation/Feasibility Studies, Remedial Design/Remedial Actions, Guidance Document Development assignments, Brownfields Programs, Responsible Party Oversight assignments, Environmental Assessment Assignments, Operations and Maintenance Assignments, Community Relations assignments, and Health and Safety Program assignments.

Remedial Investigation/Feasibility Studies (RI/FS)

Project Manager, Remedial Investigation/Feasibility Study, USEPA RAC Contract, Watson Johnson Landfill Superfund Site, (Quakertown, Pennsylvania), 2002 to 2003. Responsibilities included a $1.3M RI/FS project for the Watson Johnson Landfill Superfund site. The project entailed management of 5 subcontractors as part of a field program consisting of the installation of over 35 groundwater monitoring wells, landfill delineation activities, landfill drum investigation, site surveying, landfill soil gas investigation, surface soil and surface water/sediment characterization of over 60 locations, groundwater sampling, ecological assessment, human health risk assessment and a comprehensive hydrogeological assessment (including packer testing, geophysical logging and down hole flow measurements). Prepared a comprehensive Remedial Investigation Report for the site. Also managed an In Situ Chemical Oxidation Injection pilot study at the site using potassium permanganate. Prepared a Feasibility Study for the site, evaluating various landfill cap remedial alternatives and remedial alternatives to address contaminated groundwater at the site, including in-situ groundwater remediation. Also provided technical support to EPA during preparation of the site Record of Decision.

Project Engineer, Remedial Investigation/Feasibility Study, USEPA RAC Contract, Kim Stan Landfill (Selma, VA), 2001 to 2003. Responsibilities included performance of a detailed engineering Feasibility Study for a 24-acre landfill site, which included a multilayer soil and geosynthetic landfill cap, methane gas management system, stormwater management, and a 1,250 feet long leachate collection trench and leachate pretreatment system. Performed feasibility analysis for various alternatives to remediate this landfill site, including criteria analysis and cost estimates for implementation of remedial alternatives. Also provided technical support to EPA during preparation of the site Record of Decision.

Project Manager, Remedial Investigation/Feasibility Study, Delaware State Police Troop 1 UST Site, (Wilmington, Delaware), 1993 to 1995. The project site and surrounding residential area ground water had

become contaminated with gasoline as a result of a ruptured gasoline UST. Planned, directed and managed hydrogeological investigation and focused feasibility study for selection of clean-up alternatives. The selected remedy included a passive groundwater collection trench and groundwater collection and treatment system.

Project Manager/Engineer, Two City Parks Remediation Feasibility Study, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2004. Responsibilities included performance of an engineering feasibility study for the remediation of two city parks (HSCA sites) in Wilmington, Delaware. The purpose of the study was to develop and evaluate several remedial alternatives to address surface and subsurface soil contamination (lead and arsenic) at the two parks and provide construction cost estimates for each of the alternatives. The selected remedial alternative for the site included placement of a soil cap across the two sites and reconstruction of ball fields over the cap.

Project Engineer, WB Clerk Site Remedial Feasibility Study, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), Month/Year to Month/Year. 2004. Responsibilities included performance of an engineering feasibility study for the remediation of a HSCA site in Wilmington, Delaware. The purpose of the study was to develop and evaluate several remedial alternatives to address surface and subsurface soil contamination (arsenic) at the site and provide construction cost estimates for each of the alternatives.

Project Engineer, Dravo Shipyard, Brownfields Preliminary Assessment, Remedial Cost Estimate, DNREC, (Wilmington, Delaware). 1998. Developed three separate remedial cost estimates (Amer site, Harbor Associates site, and Sardo and Sons site) to support the planning of remedial activities at a former 120-acre shipyard site, which were slated for Brownfield redevelopment activities.

Project Manager/Engineer, Kruse Playground Site Feasibility Study, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2007. Responsibilities included performance of an engineering feasibility study for the remediation of this City of Wilmington playground park. The purpose of the study was to develop and evaluate several remedial alternatives to address surface and subsurface soil contamination (PAHs and arsenic) at the site and provide construction cost estimates for each of the alternatives. The final selected remedy alternative included placement of a soil cap across the playground site and reconstruction of the playground over the cap.

Technical and Field Support, Remedial Investigation Tasks, USEPA ARCS Contract, McAdoo Site, (McAdoo, Pennsylvania); Havertown PCP Site, (Havertown, Pennsylvania); West Virginia Ordnance Works Site, (Point Pleasant, West Virginia); Publicker Site, (Philadelphia, Pennsylvania); Zellwood Ground-Water Contamination Site, (Zellwood, Florida); and East Mount Zion Landfill, (York County, Pennsylvania), 1990 to 2000. Work included soil, sediment, stream and/or ground-water sampling.

Remedial Design

Project Manager/Engineer, Remedial Design for the Healthways Site, State of Delaware Department of Natural Resources and Environmental Control, Healthways HSCA Site (Odessa, Delaware), 2000. Responsibilities included remedial design. Work at this HSCA site included; Building demolition and selective demolition of site features; Removal and restoration of localized soil contamination “hot-spots” (lead, TPH and PAHs) on the site as well as on adjacent private properties; Monitoring well abandonment, modifications, and installations; Underground storage tank removals; Excavation of existing land filled soils and debris, relocating to other portions of site; Borrow fill/backfill; Selective segregation of encountered targeted site materials (i.e., tires, utility poles, batteries, truck parts, oily debris, oil saturated soils, etc.) for off-site disposal; Site grading to establish a base for installation of site cap; Installation of a multi-layered site cap comprising borrow soil and geosynthectic layers; landscaping; and tidal marsh restoration. The remedial design included predesign field studies (i.e., hot-

spot delineation, delineation of wastes, and surveying), community relations and public meeting presentation, obtaining permits (wetlands, subaqueous, DOT, and sediment and erosion control). Planned and designed the landfill cap system providing engineering analysis, gas collection/venting requirements and performance of slope stability analysis. Prepared contract drawings, technical specifications, bid documents and a design analysis report. Coordinated and managed bid-phase of the project, including the prequalification of potential Contractors. Developed an Operation and Maintenance Plan for the site. Performed a public meeting describing the proposed remedial action to members of the community.

Project Engineer, Remedial Design, USEPA RAC Contract, Kim Stan Landfill Superfund Site (Selma, Virginia), 2003 to 2004. Performed a remedial design for a 24-acre landfill, including the design of a multilayer soil and geosynthetic cap, methane gas management system and 1,250 feet long leachate collection trench. Design included engineering analysis of cap, cap reinforcing analysis on steep slopes, slope stability analysis, passive gas vent design, evaluation of bio-slurry construction techniques of leachate collection trench, and development of engineered wetlands to pretreat collected leachate. Performed coordination with in-house engineers during completion of grading plans and erosion and sediment controls/stormwater management controls. Prepared contract drawings, technical specifications, and assisted with preparation of design analysis report. Also assisted in preparation of detailed construction cost estimate and prepared a draft O&M Plan for this Superfund landfill site.

Project Manager, Remedial Design, USEPA RAC Contract, Watson Johnson Landfill Superfund Site, (Quakertown, Pennsylvania), 2009 to 2013. Responsibilities included performance of a $1.2M remedial design for the Watson Johnson Landfill Superfund site, including pre-design investigation activities. The project including preparation of separate design documents for the site groundwater remedy (groundwater contaminated with chlorinated solvents) and the landfill remedy. The groundwater remedy included in-situ chemical oxidation utilizing potassium permanganate; and the landfill remedy included a 21 acre multi-layer soil and geosynthetic landfill cap, stormwater management, landfill gas management and wetlands enhancement/restoration. Work included extensive pre-design investigations, including the installation and sampling/monitoring of 15 additional site groundwater monitoring wells, performance of additional sediment and soil sampling/characterization activities in areas of ecological concern, a detailed wetlands delineation and evaluation, a threatened and endangered species survey and bog turtle habitat assessment, and performance of a PA Bureau of Historic Preservation Determination. Project included the design and preparation of construction contract drawings and technical specifications, and preparation of a detailed construction cost estimate, Construction Quality Assurance Plan, Basis of Design Report, and O&M Plan. Also provided EPA technical support in development of project required property easements (temporary and permanent). Responsibilities also included additional groundwater evaluations and groundwater modeling efforts.

Project Manager, Remedial Design, Delaware State Police Troop 1 UST Site, (Wilmington, Delaware), 1995 to 1996. The project site and surrounding residential area ground water had become contaminated with gasoline as a result of a ruptured UST. Responsibilities included preparation of a remediation design, and preparation of construction drawings, specifications, and bid documents for ground-water remediation. Design included installation of a 340 feet long by 22 feet deep ground-water collector drain trench with a central pumping station, and installation of an on-site ground-water treatment system. Coordinated and conducted public bid phase for construction.

Lead Project Engineer, Remedial Design, USEPA ARCS Contract, East Mount Zion Landfill Superfund Site, Springettsbury Township (York County, Pennsylvania), 1995. Responsibilities included closure of a 10+-acre landfill. Planned and designed the landfill cap system providing engineering analysis, slope design, settlement analysis and preparation of details and specifications for each of the cap's soil and geosynthetic constituents. Prepared project Design Analysis Report. Provided engineering support and submittal review for the US Army Corps of Engineers during construction. In addition, prepared an extensive and detailed site Operation & Maintenance Plan for the US Army Corps of Engineers.

Lead Project Engineer, Russell Road Landfill, Marine Corps Combat Development Command (Quantico, Virginia), 2001. Responsibilities included field investigation, assessment and remedial design for off-site methane gas migration. Work also included field screening of vents and gas monitoring wells; geotechnical borings and laboratory testing of subsurface soils to characterize subsurface conditions; a soil gas field survey to determine the source, extent of migration, concentration, and direction of methane migration; an assessment of available landfill asbuilt conditions; and recommendations/details for corrective action. Provided engineering support during implementation of recommendations. Methane gas has ceased to migrate off-site.

Project Engineer, Closure of Solid Waste Landfill, Vandenberg AFB, 1997. Responsibilities included preliminary design for closure of this solid waste landfill. Performed extensive slope stability analyses of large fill embankments and cut slopes. Designed gravity retaining walls and reinforced embankments to maximize landfill space, thereby extending the operating life of the landfill.

Project Manager/Engineer, Remedial Design Technical Oversight, USEPA RAC Contract, Bush Valley Landfill Superfund Site, Abington, Maryland. 1999 to 2001. Provided technical review and oversight for the USEPA during the design of the Bush Valley Landfill closure. The project included capping of a 45-acre landfill, stormwater controls, perimeter and landfill gas collection and venting. Work included preparation of oversight health and safety plan, sampling and analysis plan, and technical oversight during pre-design field investigations including split-sampling, technical review of design submittals including a Remedial Design Work plan, and Preliminary, 30%, Prefinal and Final Design Documents, and the review of an O&M Plan.

Project Geotechnical Engineer, Closure of the Gardena Valley Landfills (Carson, California). 1998. Responsibilities included design of the landfill soil/geosynthectic cap system including slope stability analyses, settlement analyses, engineering analysis of the various cap components and the preparation of design details and technical specifications.

Project Engineer, Industrial Solid Waste Landfill Closure Design for a Pharmaceutical Manufacturing Facility. 1996. Planned and designed the landfill cap system providing engineering analysis, details, and specifications for each of the cap's soil and geosynthetic constituents, as well as the gas collection/venting system. Performed global and cap slope stability analysis. Work also included planning, coordinating and implementing field investigation work.

Project Manager/Engineer, Two City Parks Remedial Design, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2006. Responsibilities included performance of a design for the remediation of two city parks (Christina Park and Joe White Memorial Ballfield) in Wilmington, Delaware. The remedy selected by DNREC included placement of a soil cap across the two sites and reconstruction of ball fields over the cap. Manager/Engineer for the design of remediation at the site and prepared contract drawings, technical specifications, and construction bid documents. Coordinated and managed the public bid-phase of the project.

Project Manager/Engineer, Kruse Playground Site Remedial Design, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2007. Performed a remedial design for the Kruse Playground Site (HSCA site) which contained elevated levels of PAHs and arsenic in surface and subsurface soils. The selected remedial alternative for the site included placement of a soil cap across the playground site and reconstruction of the playground over the cap. Manager/Engineer for the design of remediation at the site and prepared contract drawings, technical specifications, and construction bid documents. Coordinated and managed public bid-phase of the project.

Project Manager/Engineer, Hamilton Park Remedial Design, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2007 to 2008. Performed a remedial design for residential properties at the Hamilton Park residential development (HSCA Site). The remedy consisted of removal of the upper two feet of soils contaminated with lead, and replacing them with a two-foot protective barrier (18 inches of select borrow and 6 inches of topsoil). The purpose of the protective barrier was to be

protective of human health by controlling potential human contact (dermal and ingestion) with the underlying potentially contaminated soil. Prepared remedial design drawings, technical specifications and construction bid documents.

Project Manager, Meco Drive Site Remedial Design, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2004 to 2005. Performed a remedial design for the Meco Drive (HSCA site). The remedial design at the Meco Drive site included the installation of 340 feet long by approximately 9-feet deep collector trench to intercept LNAPL contaminated groundwater. The purpose of the collector trench was to prevent flow of LNAPL to an adjacent drainage swale. Collected groundwater and LNAPL gravity-feeds to and is treated by a terminal Oil-Water Separator. Treated water is routed via a pump station and force main pipe and is discharged to the New Castle County sewer system. Prepared contract drawings, technical specifications, and construction bid documents. Coordinated and managed public bid-phase of the project. Coordinated and obtained permits with DelDOT and New Castle County.

Project Engineer, Remedial Design, USEPA ARCS Contract at Zellwood Superfund Site (Zellwood, FL), 1989. Responsibilities included performance of a remedial design for ground-water contamination at this superfund site located in Zellwood, Orange County, Florida. Provided planning and design for the remediation of surface soil contamination utilizing soil solidification techniques. Work included providing drawings and specifications for construction, and the preparation of no less than six project planning reports. Conducted public bid phase of the project.

Project Geotechnical Engineer, Design of Landfill Cap, (McConnell AFB, Kansas), 1998. Responsible for the design of a 30 acre Subtitle D landfill cover system utilizing clay borrow excavated from an ongoing drainage improvement project.

Technical Support, West Virginia Ordnance Works Superfund Site, (Point Pleasant, West Virginia). 1988. Responsible for design review of various closure caps and conducted closeout inspections during construction.

Project Engineer, Propane Recovery System, Motiva, New Castle, Delaware. 1993. Responsible for design of a propane recovery system to capture propane leaking from a frozen earth storage pit using a geomembrane cap shroud. Work included preparation of drawings and specifications.

Project Engineer, Design and Removal of Two 4,000 Gallon USTs, Colonial School District, (New Castle County, Delaware). 1996. Responsible for the design and removal of two 4,000-gallon USTs and replacement with a 12,000 gallon dual storage (gasoline/diesel) AST, and the removal and replacement of two gasoline USTs with 500-gallon ASTs. Prepared contract drawings and specifications, bid documents, and managed bid phase of projects.

Remediation Construction

Project Manager/Engineer, Remedial Action, USEPA RAC Contract, Kim Stan Landfill Superfund Site (Selma, Virginia), 2008 to 2010. Responsibilities included managing remedial action construction ($12M) for the Kim Stan Landfill Superfund site (Phase 3 – Landfill Cap and Leachate Collection Trench). Tetra Tech was the prime general contractor for the USEPA, subcontracted the remedial action construction, and managed all phases of the project. Work included massive grading of the landfill and construction of a 24-acre multilayer soil and geosynthetic cap, methane gas management system, stormwater management and 1,250 feet long leachate collection trench and associated leachate collection and pre-treatment system (engineered wetland ponds). Responsibilities included a value engineering evaluation of the construction bid documents, updating of the construction documents, publically bidding remedial action construction, engineering support during construction, full time oversight during construction (2 years), providing construction management services, and interfacing between the Contractor, USEPA and the Commonwealth of Virginia. Work included preparation of an up-front

Construction Quality Assurance Plan and Sampling and Analysis Plan. At completion, responsibilities also included preparation of a Remedial Action Completion Report and detailed O&M Manual for the site.

Project Manager/Engineer, Remedial Action, USEPA RAC Contract, Watson Johnson Landfill Superfund Site Groundwater Remedy (Quakertown, Pennsylvania), 2015 to Present. Responsibilities included managing remedial construction ($1.4M) for remediation of bedrock groundwater using in-situ chemical oxidation utilizing sodium permanganate. Work includes installation of access roads to new site wells, installation of 7 new groundwater monitoring wells, and installation of 10 groundwater injection wells, packer testing, borehole geophysics, determination of injection zones, sodium permanganate injections, and performance monitoring. Access road construction to commence spring 2016. Managing 4 subcontractors as part of the remedial action, and supporting EPA in obtaining property easements.

Project Manager/Engineer, Remedial Action, USEPA RAC Contract, Watson Johnson Landfill Superfund Site Landfill Remedy (Quakertown, Pennsylvania), 2015 to Present. Responsibilities included providing USEPA technical support during construction of a landfill cap and wetlands mitigation, and providing technical support to EPA obtaining temporary construction easements.

Project Manager/Engineer, Remedial Construction for the Healthways Site, State of Delaware Department of Natural Resources and Environmental Control, (Odessa, Delaware), 2002 to 2003. Work at this site included; Building demolition and selective demolition of site features; Removal and restoration of localized soil contamination “hot-spots” (lead, TPH and PAHs) on the site as well as on adjacent private properties; Monitoring well abandonment, modifications, and installations; Underground storage tank removals; Excavation of existing land filled soils and debris, relocating to other portions of site; Borrow fill/backfill; Selective segregation of encountered targeted site materials (i.e., tires, utility poles, batteries, truck parts, oily debris, oil saturated soils, etc.) for off-site disposal; Site grading to establish a base for installation of site cap; Installation of a multi-layered site cap comprising borrow soil and geosynthectic layers; Landscaping; and Tidal marsh restoration. Coordinated and managed bid-phase of the project including the prequalification of potential Contractors. Providing full-time construction management, oversight, and CQC/CQA services. Work included managing construction, providing oversight of all aspects of the work, coordinating with the contractor, performing any required CQC services including testing of earthwork, engineering support, hot-spot attainment sampling, technical review of construction contractor’s submittals for compliance with the construction drawings and specifications, CQA services during cap installation, and interfacing between the Contractor, the State, regulatory agencies, and area residents. Also prepared a Remedial Action Certification Report and O&M Plan for the site.

Project Manager, Construction Quality Assurance, Army Creek Landfill Superfund Site, (New Castle, Delaware), 1991. Planned, directed, and managed construction, survey, and health and safety QA services ($750K) for the installation of a 45(+) acre landfill cap. Services included providing multi-disciplinary technical support on an as-needed basis and construction management support.

Project Manager, Construction Quality Assurance, Tybout's Corner Landfill Superfund Site, (New Castle, Delaware), 1993. Planned, directed, and managed construction, survey, and health and safety QA services ($1.25M) for the installation of a 45(+) acre landfill cap, 3,125 feet long slurry trench, and the construction of a wastewater treatment facility. Services included providing multi-disciplinary technical support on an as-needed basis and construction management support.

Project Manager, Remediation Construction, Delaware State Police Troop 1 UST Site, (Wilmington, Delaware), 1996 to 1997. The project site and surrounding residential area ground water had become contaminated with gasoline as a result of a ruptured UST. The design included installation of a 340 feet long by 22 feet deep ground-water collector drain trench with a central pumping station, and installation of an on-site ground-water treatment system. Coordinated and conducted public bid phase for construction and provided construction management and oversight/inspection during installation of the ground-water collection/treatment system. Also responsible for permitting and maintaining community public relations. Currently performing operation and maintenance activities at the site.

Project Manager/Engineer, Two City Parks Remediation Action, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2006 to 2007. The selected remedial alternative for these two city park sites (Christina Park and Joe White Memorial Ballfield) included placement of a soil cap across the two sites and reconstruction of ball fields over the cap. Responsibilities included coordinating and managing public bid-phase of the project, and providing full-time construction management, oversight, and CQC/CQA services. Work included managing construction, providing oversight of all aspects of the work, coordinating with the contractor, performing any required CQC services including testing of earthwork, engineering support, technical review of construction contractor's submittals for compliance with the construction drawings and specifications, CQA services during soil cap installation, and interfacing between the Contractor, the State, regulatory agencies, and area residents. Also prepared a Remedial Action Completion Report and site Operation and Maintenance Plan.

Project Manager/Engineer, Kruse Playground Site Remedial Action, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2008. The selected remedial alternative for the site included placement of a soil cap across the playground site and reconstruction of the playground over the cap. Responsibilities included coordinating and managing the public bid phase of the project, and providing full-time construction management, oversight, and CQC/CQA services. Work included managing construction, providing oversight of all aspects of the work, coordinating with the contractor, performing any required CQC services including testing of earthwork, engineering support, technical review of construction contractor's submittals for compliance with the construction drawings and specifications, CQA services during soil cap installation, and interfacing between the Contractor, the State, regulatory agencies, and area residents. Also prepared a Remedial Action Completion Report and a site Operation and Maintenance Plan.

Project Manager/Engineer, Hamilton Park Remedial Design and Remedial Action, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2008 to 2009. This project involved remediating seven residential properties at the Hamilton Park residential development (HSCA Site) that had elevated levels of lead and arsenic in surface and subsurface soils. The remedy consisted of removal of the upper two feet of soils contaminated with lead, and replacing them with a two-foot protective barrier (18 inches of select borrow and 6 inches of topsoil). Tetra Tech held the responsibility as the prime contractor, subcontracting remedial construction. Responsibilities included managing construction, providing oversight of all aspects of the work, coordinating with the subcontractor, performing any required CQC services including testing of earthwork, engineering support, technical review of construction contractor's submittals for compliance with the construction drawings and specifications, and interfacing between the Contractor, the State, regulatory agencies, and area residents during remedial construction. Also prepared a Remedial Action Completion Report and a site Operation and Maintenance Plan.

Project Manager, Meco Drive Site Remedial Action, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2008. The remedial design at the Meco Drive site included the installation of 340 feet long by approximately 9-feet deep collector trench to intercept LNAPL contaminated groundwater. The purpose of the collector trench is to prevent flow of LNAPL to the adjacent drainage swale. Collected groundwater and LNAPL gravity-feeds to and is treated by a terminal Oil-Water Separator. Treated water is routed via a pump station and force main pipe and is discharged to the New Castle County sewer system. Responsibilities included coordination and obtaining permits with DelDOT and New Castle County, and managing the public bid phase of the construction project, and provided full-time construction management and oversight services during remedial construction. Work included managing construction, providing oversight of all aspects of the work, coordinating with the contractor, engineering support, technical review of construction contractor's submittals for compliance with the construction drawings and specifications, start-up, and interfacing between the Contractor, the State, regulatory agencies, and area residents. Work also included preparation of a Remedial Action Completion Report and site O&M Plan.

Project Manager, Corrective Action Oversight, USEPA RAC Contract, Occidental Site, (Pottstown, Pennsylvania), 1996 to Present. Responsible for providing technical review, support and construction oversight

associated with the remediation of contaminated lagoon soils and the implementation of a bedrock ground-water pump and treat system. Provided technical oversight during installation of the groundwater pump and treat system (460 gpm). Directed the performance of a Human Health Risk Assessment of the lagoons and performed an evaluation of the completed bedrock ground-water pump and treat system. Also, completed remedial action oversight during remediation of the four earthen lagoons, which included removal of PVC sludge and off-site disposal. Currently providing technical support to EPA during a well field optimization program.

Lead Project Engineer, Remedial Action Oversight, USEPA ARCS Contract, East Mount Zion Landfill Superfund Site, Springettsbury Township (York County, Pennsylvania), 1995. Tetra Tech performed the remedial design for this project. Responsibilities included providing engineering support and engineering submittal review for the US Army Corps of Engineers during construction. In addition, prepared an extensive and detailed site Operation & Maintenance Plan for the US Army Corps of Engineers.

Project Manager/Engineer, Remedial Action Oversight, USEPA RAC Contract, Bush Valley Landfill Superfund Site, Abington, Maryland. 2001 to 2002. Provided technical review and oversight during the Bush Valley Landfill closure remedial action project. The project included capping of a 45-acre landfill, stormwater controls, perimeter and landfill gas collection and venting. Responsibilities included performance of technical oversight during construction of the landfill closure, technical review of construction submittals, periodic site inspections, and attendance at construction progress meetings.

Project Engineer, Remedial Action, USEPA ARCS Contract at Zellwood Superfund Site, Zellwood, FL, 1993. Responsibilities included assisting project manager during the site remedial action. Tetra Tech had prepared the remedial design documents which included remediation of surface soil contamination utilizing soil solidification techniques. Managed and provided technical support during public bid-phase of the project and construction management and technical support during remedial construction.

Project Engineer, Design and Removal of Two 4,000 Gallon USTs, Colonial School District, (New Castle County, Delaware). 1996. Responsible for the design and removal of two 4,000-gallon USTs and replacement with a 12,000 gallon dual storage (gasoline/diesel) AST, and the removal and replacement of two gasoline USTs with 500-gallon ASTs. Prepared contract drawings and specifications, bid documents, and managed bid phase of projects.

Project Manager, Remedial Action Oversight, USEPA ARCS Contract, Sharon Superfund Site, (Sharon, Pennsylvania). 1994. Provided technical support/oversight by reviewing project documents and work plans associated with the remediation of PCB contaminated transformer oil which was found to be floating on top of ground water.

Project Manager, Removal of USTs, Kirk Middle School, Brookside Elementary School, and Gallaher Elementary School, (Newark, Delaware), Month/Year to Month/Year. Responsible for removal of USTs. (1995)

Scheduling Engineer, Diablo Canyon Nuclear Power Plant Site, (Avila Beach, California), Limerick Power Station (Limerick, PA) and Hope Creek Generation Station, (Hancock's Bridge, New Jersey), 1983 to 1987. Responsible for coordination, planning and scheduling of construction, engineering, and start-up activities. Also performed field engineering services.

Operation and Maintenance (O&M)

Project Manager/Engineer, Operation and Maintenance Guidance Document, Delaware Department of Natural Resources and Environmental Control. 2003. Responsibilities included the development of an

Operation and Maintenance Guidance Document for Hazardous Substance Cleanup Act (HSCA) sites and Voluntary Cleanup Program (VCP) sites. The O&M Guidance is currently used in the State of Delaware.

Project Manager/Engineer, O&M, USEPA RAC Contract, Kim Stan Landfill Superfund Site (Selma, Virginia), 2010 to 2012. Responsibilities included providing O&M activities for the Kim Stan Landfill site to ensure that the implemented remedy is performing in accordance with the site final plan. Tetra Tech previously designed the remedy at this site (21-acre landfill cap and leachate collection/passive pretreatment system) and managed remedial action construction. O&M activities included quarterly site inspections, landfill gas monitoring, groundwater monitoring well sampling, and operating systems checks to ensure that pumping systems are operating as intended by the remedial design. Comprehensive quarterly reports were prepared for each quarterly monitoring and sampling event and issued to the USEPA and Commonwealth of Virginia.

Project Manager, O&M, Delaware State Police Troop 1 UST Site, (Wilmington, Delaware), 1997 to Present. Managed site operation and maintenance (O&M) activities at the Troop 1 site. Responsibilities included O&M of the site groundwater pump and treatment systems (i.e., collector trench extraction well, transfer systems, air-stripper and GAC for air polishing), groundwater monitoring well sampling, treatment system performance sampling, and historically, passive air-monitoring of area residential basements. Work also includes preparation of quarterly discharge reports to New Castle County for the discharge of treated groundwater to the county sewer system, and preparation of annual remedial action progress reports to DNREC.

Project Manager, Meco Drive Site O&M, Delaware Department of Natural Resources and Environmental Control, (Wilmington, Delaware), 2008 to 2014. Managed site operation and maintenance (O&M) activities at the Meco Drive site including O&M of the site groundwater collection and treatment system (passive collector trench, oil-water separator, and pump station), product recovery from site monitoring wells, and treatment system performance sampling. Work also includes preparation of quarterly discharge reports to New Castle County for the discharge of treated groundwater to the county sewer system.

Project Manager/Engineer, O&M for the Healthways Site, State of Delaware Department of Natural Resources and Environmental Control, (Odessa, Delaware), 2003 to 2008. Responsibilities included providing O&M activities for DNREC at the Healthways Site to ensure that the implemented remedy is performing in accordance with the site final plan. Tetra Tech previously designed the remedy at this site (landfill cap) and managed remedial action construction. O&M activities included quarterly site inspections, landfill gas monitoring, and groundwater monitoring well sampling. O&M activities were performed in accordance with the O&M Plan, previously prepared by Tetra Tech.

Project Manager/Engineer, 5-Year Review Fox Run Development Methane Gas Remediation, Delaware Department of Natural Resources and Environmental Control, (Bear, Delaware). 2003. Responsibilities included performance of a 5-year review for the Fox Run Methane Gas Remediation HSCA project. Work included monitoring 185 basements of residential homes for the presence of methane gas (source: from former underground debris pits), including subsurface investigations of homes that had detections of methane. Methane is no longer a problem at the site.

Project Manager/Engineer, Lackawanna Refuse 5-Year Review, USEPA RAC Contract, (Old Forge, Pennsylvania), 2004. Performed an inspection and evaluation of a 40+-acre superfund landfill site to determine if the environmental remedy (landfill cap) continues to be protective of human health and the environment.

Project Manager/Engineer, Occidental Site 5-Year Review, USEPA RAC Contractor (Pottstown, PA), 2014. Performed an inspection and evaluation of the Occidental Site Remedial Action Remedy (groundwater pump and treat system) and prepared a 5-Year Report summarizing review.

SCIENTIFIC/TECHNICAL PUBLICATIONS

Co-Author of paper, "*Geosynthetic Reinforced Soil Structures"* published in the *Journal of Geotechnical Engineering*, Vol.115, No.10, October 1989

ADDITIONAL TRAINING/CERTIFICATIONS

Registered Professional Engineer, Delaware (#7789, 1989),

Registered Professional Engineer, Maryland (#26156, 2001),

Registered Professional Engineer, Pennsylvania (#PE-058805-E, 2001),

Registered Professional Engineer, Virginia (#0402-36303, 2001),

Registered Professional Engineer, Ohio (#E-80480, 2015)

Registered Professional Engineer, West Virginia (#21558, 2015)

ADDITIONAL EXPERIENCE

MS Excel, MS Word, MS Outlook

EMPLOYMENT HISTORY

1988 - Present	Manager, Geotechnical Engineering and Construction Services Department, and Senior Project Manager, Tetra Tech, Inc., Newark, Delaware
1983 - 1985	Field Engineer; Bechtel Construction, Inc., San Francisco, California,

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License Status

Active

Initial License Date

01/05/1994

RICHARD THOMAS WARDROP
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License Number

PG000157G

Expiration Date

09/30/2017

Commissioner of Professional and Occupational Affairs

Richard T. Wardrop
Signature

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