

Qualifications Package for: Advancing Green Infrastructure in the Great Lakes Basin

Prepared For:
Great Lakes Protection Fund

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Introduction

GZA GeoEnvironmental, Inc. (GZA) is pleased to present this statement of qualifications to the Great Lakes Protection Fund focusing on our green infrastructure capabilities, experience, and innovations. GZA approaches green infrastructure from a unique collaborative and holistic perspective by integrating stormwater engineering with a strong attention to subsurface geotechnical properties, geologic conditions, and the dynamics of surface water-groundwater interaction. This multi-disciplined approach leads to more intelligent and sustainable green infrastructure designs, installation, and long-term performance. Through our broad spectrum of disciplines involving biological assessments, wetlands habitat, stream bank construction and stabilization, floating islands, and water quality improvement measures combined with our consideration of chemical factors such as phosphate, nitrate, and chloride loading and reduction measures, GZA is redefining best management practices (BMPs) in the region. Through our broad-disciplined expertise combined with our geographic distribution, GZA is well positioned throughout the Great Lakes region to support the goals and objectives of the Great Lakes Protection Fund as it seeks to build on its previous successes to further develop meaningful green infrastructure throughout the Great Lakes Basin.

Firm Overview

GZA is a full-service consulting firm established in 1964, providing environmental, natural resources consulting, and geotechnical engineering services, including brownfield redevelopment, integrated stormwater and green infrastructure design, comprehensive remedial investigation, and design and construction management; regulatory compliance auditing; permitting and training; ecological and human health risk assessments; and industrial hygiene services. Our combined staff of approximately 660 professionals operates out of 31 offices and includes environmental, chemical, civil, geotechnical, and mechanical engineers, as well as geologists, hydrogeologists, chemists, toxicologists, biologists, industrial hygienists, regulatory specialists, and other technical professionals.

Our more than 40,000 projects completed at GZA have taken place in all 50 states, as well as international destinations. Our focus is to provide cost-effective, engineered solutions to environmental, hydrologic, and geotechnical issues for our clients. To this end, we consider the total picture from our clients' viewpoint, providing either an integrated scope of services or specialized programs to meet their needs. Our specialty is responsiveness, integrity, quality, and development of innovative and pragmatic solutions.

GZA's Great Lakes Region

GZA's Great Lakes region consists of offices that are positioned throughout the Great Lakes, including the following locations:

- Milwaukee, Wisconsin;
- Brookfield, Wisconsin;
- Oak Brook, Illinois;



- Minneapolis, Minnesota;
- Livonia, Michigan;
- Grand Rapids, Michigan;
- Cincinnati, Ohio; and
- Buffalo, New York.

The Great Lakes region has a combined staff of approximately 130 professionals consisting of civil, geotechnical, environmental, and chemical engineers, as well as geologists, hydrologists, hydrogeologists, chemists, biologists, toxicologists, certified industrial hygienists, ecologists, regulatory specialists, and other technical professionals. Our Great Lakes senior technical staff have extensive experience and have worked on projects in more than 35 states, most Canadian provinces, Mexico, Brazil, and several other countries, and typically have 15 to more than 25 years of experience in the environmental and geotechnical engineering fields.

GZA's Great Lakes water practice, while being distributed throughout the Great Lakes region, is centered in the Global Water Center in Milwaukee where collaborative water projects involving urban stormwater, green infrastructure, watercourse engineering, and related services are performed. GZA has been engaged in key urban transformation projects that have included the conversion of City brownfield properties into a for-profit, urban farm with integrated green infrastructure and stormwater reuse. Through our presence at the Global Water Center, GZA staff has regular engagement with activities and emerging water innovations out of the University of Wisconsin-Milwaukee School of Freshwater Sciences.

GZA often works cooperatively with other professionals, such as teaming partners, architects and engineers, attorneys, lenders, other environmental consultants, community relations companies, and contractors. We represent our clients effectively at public hearings and in negotiations with regulatory agencies. We have developed and also maintain comprehensive programs for risk management, health and safety training, and quality assurance/quality control (QA/QC), including an approved Quality Assurance Project Plan (QAPP) with Region V of the United States Environmental Protection Agency (USEPA). We provide mandatory health and safety training, as well as medical monitoring for all staff members who work with hazardous materials. Our QA/QC procedures include ongoing technical training of personnel with senior staff involvement and review of every project.

To gain a better understanding of our firm, we provide the following comprehensive list of services commonly performed by GZA:

- Underground storage tank (UST) assessments, remediation, and site closure;
- Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) Agricultural Spill Cleanup Fund Program;
- Wisconsin's Dry Cleaner Economic Recovery Fund (DERF) Program;
- Phase I and Phase II Environmental Site Assessments (ESAs);
- Phase III remedial actions;

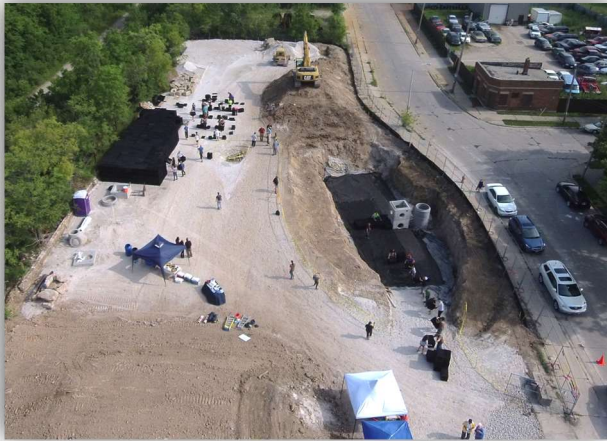


- Resource Conservation and Recovery Act (RCRA) and Superfund corrective action and closure;
- Mold characterization and mitigation;
- Indoor air quality;
- Asbestos and lead paint sampling and removal;
- Remedial technologies;
- Feasibility studies;
- Brownfield redevelopment, including acquisition of redevelopment grants;
- Site investigation and remediation under Wisconsin's Voluntary Party Liability Exemption (VPLE) Program;
- Regulatory compliance, permitting, and waste minimization services;
- Industrial hygiene services;
- Landfill design and management;
- Groundwater monitoring programs;
- Remedial action design and construction services;
- Wetlands/ecological assessments;
- Environmental impact assessments;
- Environmental safety training;
- Construction management;
- Shoreline erosion analyses and repair;
- Computer groundwater analysis and modeling;
- Brownfield redevelopment projects, including combined geotechnical and environmental assessments and corrective action while working in conjunction with developers and architects;
- Multi-media environmental compliance audits, compliance surveys, and strategic environmental management systems; and
- Geotechnical investigation and engineering.

Green Infrastructure Qualifications and Experience

GZA has provided green infrastructure concepts, designs, and maintenance for a variety of clients from municipal entities to industry and transportation agencies. Project descriptions, provided in Appendix A, describe bioswale, cistern, rainwater harvesting, filter strip, and rain garden experience.

As part of our contract with the Redevelopment Authority of the City of Milwaukee (RACM), GZA was asked to help utilize a USEPA brownfield grant to transform a 1.5-acre former industrial facility within the 30th Street Industrial Corridor into an urban farm. In light of the intended end-use, GZA prepared a



remedial and green infrastructure stormwater design that disposed of low-level polycyclic aromatic hydrocarbons (PAHs) and non-hazardous volatile organic compound (VOC)-impacted soil, capped existing soils, and managed stormwater runoff to be harvested in a 40,000-gallon underground cistern. The site's infrastructure was designed to easily monitor stormwater runoff from the site's green infrastructure and separated farm fields; a topic of high interest for state and local authorities interested in future regulations regarding agricultural stormwater runoff, as well as green infrastructure flow monitoring and management systems.

The plan incorporated a significant amount of collaborative design, diverse stakeholder input, and permitting that resulted in a project that could be a model for environmental remediation, brownfield redevelopment, community engagement, and green infrastructure. The site began farming operations in June 2015, with a collaborative community and local government commemorative first planting and green infrastructure installation event.

Stream bank erosion and nutrient loading are also issues within the Great Lakes watershed. For streams within the basin, including those undergoing naturalization projects with removal of concrete, ensuring the stabilization of the stream banks is essential. Water quality sampling presented related to green infrastructure and natural resource activities has included total suspended solids, total nitrogen, and total phosphorus levels that exceed USEPA water quality criteria at multiple locations throughout the Milwaukee Metropolitan Sewerage District (MMSD) planning area.

Case Study

The Case Study is based on our work with the Galesburg Sanitary District (GSD) in Galesburg, Illinois. The GSD maintains a trickling filter system with a daily average flow of 11 million gallons per day (mgd) and discharges to Cedar Creek. The GSD has combined sewer overflows (CSO) and has continued to provide a variety of processes to reduce and treat CSOs plus in-stream treatment. In-stream treatment includes the use of two ozone systems to supplement stream dissolved oxygen. Recently, under a Soil and Water Conservation grant, GSD installed a "floating island" and implemented a streambank stabilization project that used artificial substrate manufactured from Fiberbond.

Floating islands have been used in lagoons and retention ponds to reduce nutrients, but also provide habitat to aquatic biota. A buoyant egg crate-shaped mat forms the basis of the floating island, which is filled with a planting medium for long-rooted emergent aquatic plants. The roots of the emergent aquatic plants grow through the mat and into the water column allowing for an increase in nutrient uptake. The roots, mat, and subsequent biofilm that forms work to trap suspended solids. The shading and root growth of the floating island provide habitat to aquatic organisms, as well as amphibians and reptiles.



The streambank stabilization project was conducted on Cedar Creek downstream of the GSD plant. The banks of Cedar Creek had lost vegetation due to flash flooding that raised stream flow up the banks, scouring vegetation from the side slopes. This called for the installation of the Fiberbond material, which provided a stable planting medium for newly installed vegetation. Plants were installed into the material, allowing for root growth into the native soil banks stabilizing the slopes.

In addition to an overview of the GSD case, the presentation will include background information on floating islands, including materials, costs and construction, plant selection, siting and maintenance requirements, and a summary of the effectiveness of floating islands for nutrient removal.

Project Descriptions

Project descriptions in the areas of green infrastructure, water resources, stormwater management, and geotechnical services are provided in Appendix A.

Client-Oriented Problem-Solving Approach, An Example

One example of conflict occurred during the design of green infrastructure for I-294 related to satisfying the demands of the adjacent property owner and environmental groups. Expanding Interstate 294 (I-294) from six to eight lanes in Cook County required acquisition of land from the Forest Preserve District of Cook County (FPDCC). The FPDCC was in the process of establishing stormwater runoff guidance, but had not finalized any guidelines. The FPDCC was concerned about stormwater runoff quality onto its property and relinquishing property. Huff & Huff (H&H), a subsidiary of GZA, was tasked with working with FPDCC staff, environmental groups, and the Illinois Tollway to develop acceptable stormwater treatment methods while limiting land requirements. Timing for reaching consensus was critical to project construction, as the Cook County Board needed to approve the transfer or use of any FPDCC lands prior to any construction.

To reach consensus, a series of workshops with the stakeholders were conducted. Several bioswale design concepts over a 6-mile segment that were adapted to varying site conditions were proposed, including high water table near streams, recreational areas, and presence of a State-listed endangered snake (Massasauga). Additionally, the landscape design included limiting the percentage of invasive species. Monitoring of vegetative goals over time was included in working with the environmental groups and FPDCC. Transects of bioswales continue to be monitored and reported. A concept design manual outlining designs, vegetative goals, and maintenance schedules for the bioswales was accepted by both the environmental groups and FPDCC. Additionally, a groundwater and surface water monitoring program was established to confirm stormwater quality treatment. Resolution was achieved and the project was completed in 2009.

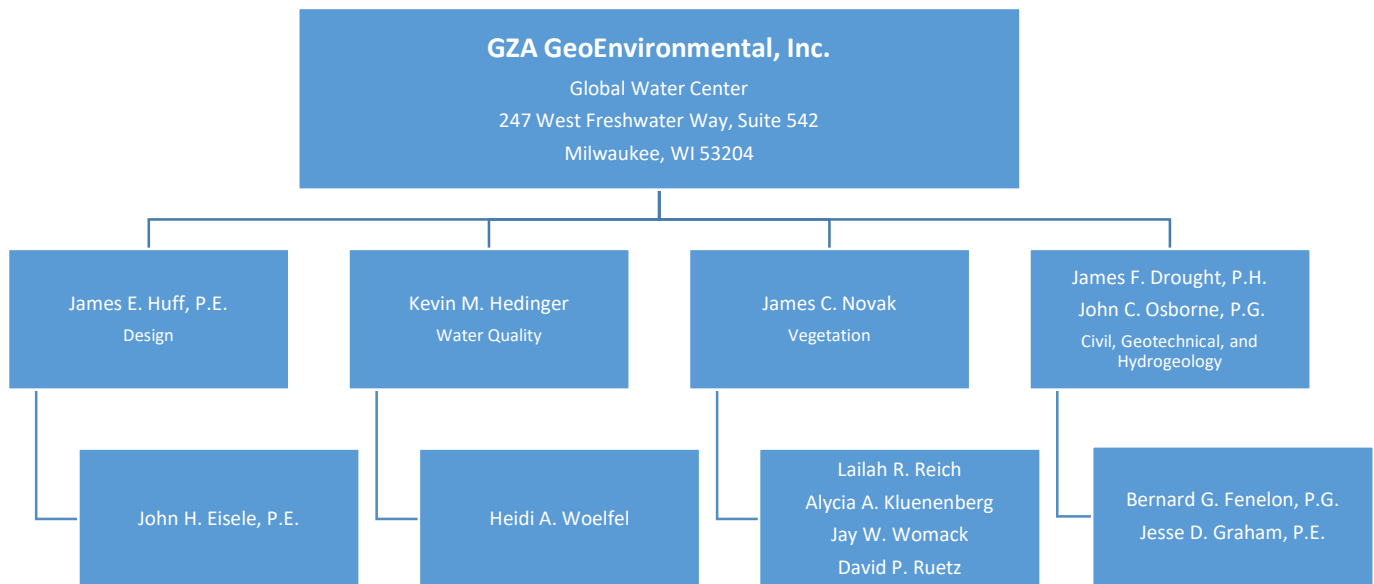
GZA and its subsidiary, H&H, have provided green infrastructure concepts and designs for a variety of clients from municipal entities to industry and transportation agencies. The proposed presentation focuses upon an option for stream bank stabilization and water quality improvement.



Project Management Team Qualifications

The GZA project team includes a combination of engineers and biologists with the necessary expertise to propose and design green infrastructure concepts. Additionally, because GZA staff truly appreciates the value of green infrastructure, several staff members have not only designed these techniques, but also have volunteered time to install and maintain several types of GI techniques.

Organization Chart



Individual key personnel resumes can be found in Appendix B.

Qualifications and Experience

GZA provides a comprehensive suite of environmental and geotechnical services. The following discussion focuses on our qualifications and experience in the technical practice areas specifically requested in the Request for Proposal (RFP), as follows:

- Phase I ESA;
- Phase II ESA, site investigation, and characterization;
- Phase III site remediation;
- Pre-demolition facility assessments;
- Asbestos and lead-based paint (LBP) abatement;
- Natural resource management;



- Geotechnical services;
- Shoreline and bluff erosion and recession analyses;
- Stormwater management; and
- General environmental regulatory services.

Our discussion of qualifications and experience also includes emphasis on other elements important to the City of Milwaukee, including:

- Experience and relationship with the Wisconsin Department of Natural Resources (WDNR), the Wisconsin Department of Health and Family Services (DHFS), and Federal environmental agencies;
- Experience navigating clients through the requirements of DERF and VPLE Programs;
- Brownfield redevelopment strategies and execution; and
- GZA's experience and success in seeking and obtaining financial assistance through State, Federal, and other similar mechanisms that facilitate urban revitalization grant programs.

The key service lines and interest elements are addressed in the following sections.

Geotechnical Services

Our attention to subsurface characteristics, such as geotechnical properties of soils and subsoils, provided enhanced green infrastructure designs with improved functionality and better anticipation of physical performance issues. To provide some exposure to GZA's breadth of geotechnical studies, we provide the following descriptions of typical services provided by our geotechnical practice group:

- Design of foundations;
- Design of dewatering systems;
- Embankment stability analyses;
- Instrumentation programs;
- Piles and caissons;
- Shafts and tunnels;
- Cofferdams;
- Slope stability analysis;
- Settlement analysis;
- Soil compaction studies;
- Pavement design;
- Field testing;
- Soil stabilization studies;



- Lateral support system design;
- Liquefaction potential evaluation;
- Impermeable liner selection;
- Soil and water sampling programs; and
- Seepage analyses.

Our Great Lakes staff also provides construction services that include:

- Earthwork QC;
- Construction management;
- Resident engineering;
- Site engineering;
- Foundation load testing;
- Material testing;
- Ground exploration and in-situ testing services; and
- Construction monitoring.

Our staff has experience and engineering expertise in geotechnical site investigations, development, expansion, closure, and post-closure monitoring of landfills. Additionally, GZA's Great Lakes offices have provided design and laboratory services associated with natural and man-made liners, leachate collection systems, capping alternatives, stability, and construction/remediation monitoring. For your familiarization, the following provides a general overview of the geotechnical engineering services routinely performed by our Great Lakes staff:

- *Soil Engineering.* Soil engineering involves evaluating soil behavior under the influence of both natural and man-made physical processes. We provide a wide variety of soil engineering services and the Great Lakes offices currently have many soils engineers on staff. These engineering professionals have received Bachelor and Master's degrees in civil engineering and have specialized in geotechnical, soils, and foundation engineering. Our geotechnical engineers are Registered Professional Engineers (P.E.s) or Engineers-in-Training (E.I.T.s) in several states.
- *Site Investigation Expertise.* We routinely complete site and subsurface investigations for foundation engineering projects. The investigations can include site history research, soil and rock borings, test pit explorations, collecting undisturbed soil samples, soil engineering studies, geologic mapping, groundwater level measurement, and prediction of aquifer flow characteristics. Geotechnical and geological data obtained during these investigations provide important information regarding proper building siting and foundation design criteria.
- *Foundation Design Expertise.* We have considerable experience in the analysis and design of both shallow and deep foundations and take into consideration such foundation engineering issues as soil type and composition; compressibility of soils and fill; chemical analysis of fill; building settlement potential; site stability criteria; seepage studies; erosion studies; and effects of construction on



surrounding structures. We have expertise in the design of varied foundation types, including piles, footings, caissons, compacted fill, pre-load/surcharge and mats. In addition, we can provide specification development and construction monitoring.

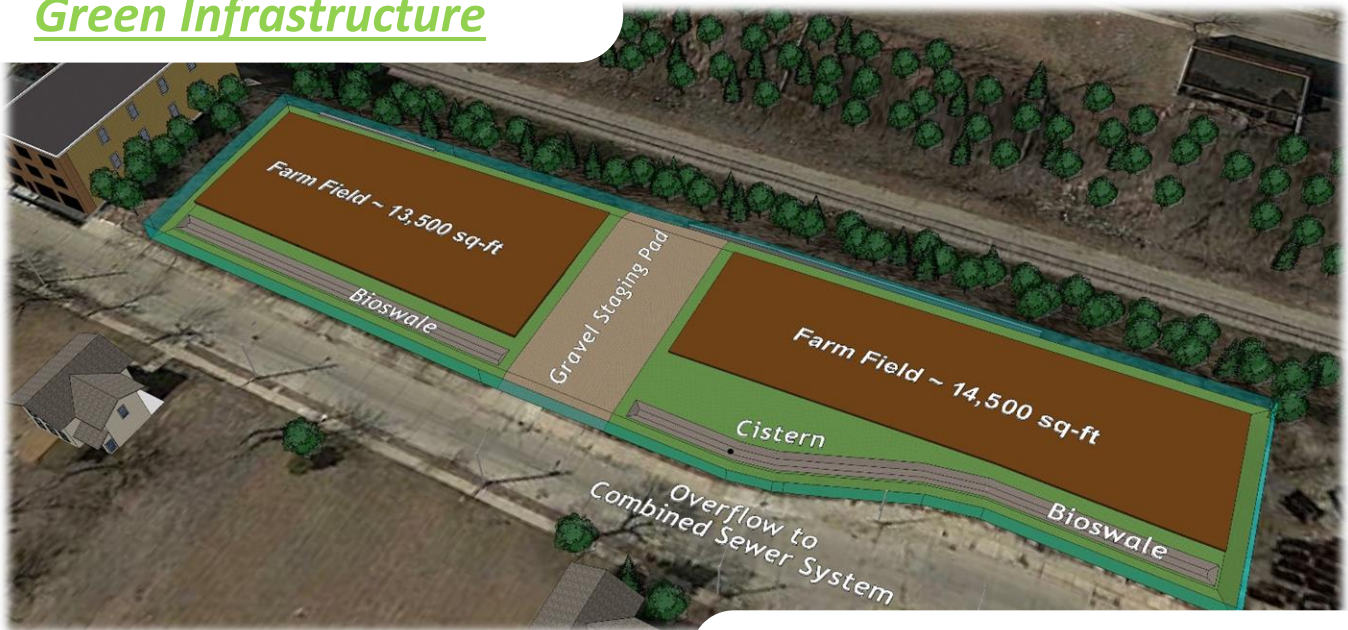
- *Dam/Flood Control Structure Investigation, Design and Repair Expertise.* Our multi-disciplinary professionals are experienced in the aspects of geotechnical and hydrologic investigations, and design and repair for flood control structures. In addition, company-wide, GZA has performed analysis, design, and construction observation services on more than 300 dams in the United States. We have extensive experience in performing dam safety inspections and stability evaluations and in providing remedial recommendations through several contracts with the United States Army Corps of Engineers (USACE), State, and local agencies and private owners.



APPENDIX A
Project Descriptions



Green Infrastructure



Project Experience: 30th Street Farm

CLIENT:

Redevelopment Authority of the City of Milwaukee (RACM)

LOCATION:

Milwaukee, Wisconsin

SERVICES:

Soil Remediation and Green Infrastructure Design and Installation

PROJECT LENGTH:

Initial Project Planning began in 2008, remedial planning and final site design finished in 2014/ 2015 with construction in the summer of 2015

HIGHLIGHTS

- Creatively redeveloped a blighted environmentally impacted site into a model for brownfield redevelopment
- Engaged a diverse stakeholder group and invited many non-traditional partners to participate in the site's redevelopment, increasing the magnitude of the project and raising significant funds from alternative sources.
- Designed and installed a 40,000-gallon underground cistern to collect and reuse stormwater for irrigating the site's urban farm fields.

The Redevelopment Authority of the City of Milwaukee (RACM) approached GZA to help utilize an EPA brownfield redevelopment grant to transform a 1.5-acre former industrial facility within the 30th Street Industrial Corridor into an urban farm. In light of the intended end-use, GZA prepared a remedial and green infrastructure stormwater design that disposed of low level polycyclic aromatic hydrocarbons (PAHs) and non-hazardous volatile organic compound (VOC)-impacted soil, capped existing soils, and managed stormwater runoff to be harvested in a 40,000-gallon underground cistern. The site's infrastructure was designed to easily monitor stormwater runoff from the site's green infrastructure and separated farm fields; a topic of high interest for state and local authorities interested in future regulations regarding agricultural stormwater runoff as well as green infrastructure flow monitoring and management systems.

The plan incorporated a significant amount of collaborative design, diverse stakeholder input, and permitting that resulted in a project that could be a model for environmental remediation, brownfield redevelopment, community engagement, and green infrastructure. The site began farming operations in June of 2015, with a collaborative community and local government commemorative first planting and green infrastructure installation event.





*Project Experience: **I-90/IL 47 Green Interchange** – Huntley, Illinois*

Huff & Huff, Inc. a Subsidiary of GZA assisted the Illinois Tollway with the unique challenge of developing a “green” interchange so that a variety of sustainable concepts could be evaluated for incorporation into future designs. The Illinois Tollway has incorporated some sustainable practices in recent designs; however, certain technologies had not been implemented, as there was no assurance that those concepts would be feasible for small-scale or large-scale projects. In a sense, the Illinois Route 47 Interchange was a “prototype” project, allowing the environmental benefits, economic benefits, and longer-term costs to be evaluated for these sustainable concepts. The process of selecting sustainable concepts included screening a variety of design features, developing life cycle assessments and assessing their feasibility.



Designing this interchange was an opportunity to apply a diverse array of sustainable concepts, and beyond that, the ongoing evaluation process gathered data on the benefits and challenges of maintaining such systems. Monitoring of energy usage and water quality in the storm water discharges provide data for performance evaluation and allow adaptive management of the sustainable practices. The practicability of green infrastructure, from concept to design to operation, is important so that designs can continue to be adapted and improved. Data from this site will be used to enhance future design elements of the Illinois Tollway’s ongoing infrastructure improvement program. The sustainable features installed resulted in a savings of 34,000 pounds of carbon dioxide (greenhouse gases) per year at this interchange due to the use of geothermal energy for the control building (and other features, such as the use of LED lighting), and monitoring of storm events has shown a significant reduction in suspended solids and heavy metals concentrations and corresponding improvement to water quality. This project provides the Tollway both a qualitative and quantitative assessment that demonstrates the implemented concepts achieve the desired goal of creating a “green” and sustainable interchange that will be a useful model to the Tollway for future projects. Additionally, this project received recognition in winning the 2015 ACEC Illinois Engineering Excellence Honor Award.

*Project Experience: **Stream Bank Stabilization & Floating Islands** – Galesburg, Illinois*



HIGHLIGHTS

- Completed erosion control design and stream bank re-vegetation
- Used Fiberbond technology to stabilize stream banks of Cedar Creek for the Galesburg Sanitary District and allow for successful re-vegetation. An in-stream floating island feature was also created.
- Installed synthetic floating mats with aquatic plants used for nutrient removal in slow flowing water. These floating islands also provide habitat for fish and aquatic animals, as well as trap fine suspended particulates to improve water quality.



*Project Experience: **I-294 Bioswales** – Cook County, Illinois*

In 2007, the Tollway tasked Huff & Huff (H&H) with development of a stormwater management system of bioswales that offset the use of 16 acres of Forest Preserve District of Cook County (FPDCC) lands, improved water quality, established methods of evaluating effectiveness, and could receive approval of the FPDCC Board in less than three months. This system was developed with input from stakeholder groups: the FPDCC staff, federal and state resource agencies, environmental groups, and Tollway staff.

CLIENT:
 Illinois Tollway

LOCATION:
 Cook County, Illinois

SERVICES:
 Stormwater management plan and design, bioswale research, water quality investigations, and development of various bioswale designs

PROJECT LENGTH:
 2007 to 2008

RECOGNITION:
 2008 ACEC Illinois Engineering Excellence Honor Award

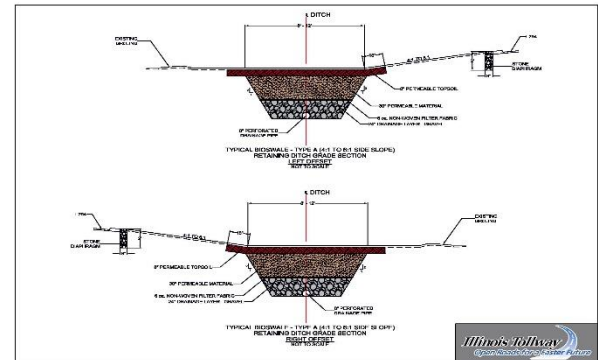
The bioswale design study is a first in terms of its magnitude (six miles), its use of consensus process, establishment of performance measures, methods for analyzing effectiveness, and a maintenance plan. The project area also encompassed known habitat for the Massasauga Rattlesnake (*Sistrurus catenatus*), a federal species of concern, and a state endangered species. The US Fish & Wildlife Service and the Illinois Department of Natural Resources were important stakeholders in the project and the bioswale designs were developed to improve habitat conditions yet discourage the migration of snakes towards the highway.

The implementation of bioswales provides an important sustainable solution in the following ways:

- A greater portion of the stormwater runoff will now infiltrate to the groundwater table, recharging the groundwater system.
- Plant diversity in the area currently receiving stormwater will be substantially increased.
- Plant density and the swale design will reduce sediment reaching the receiving stream thus, improving water quality.

These benefits will not only accrue to the forest preserve but also provide a

positive benefit to the Des Plaines River watershed, which drains approximately 400 square miles of land in the project area. This includes urban areas and FPDCC lands adjacent to sections of the waterway. The proposed project is an example of methods to improve storm water quality, which is an important environmental goal of the watershed. Improved water quality is one step toward the goal of greater aquatic and recreational use of the watershed.





Coastal Erosion Evaluation and Protection

GZA has a wealth of experience in shoreline erosion and coastal resiliency along Lake Michigan. GZA is a leader in local coastal services and offers expertise from geotechnical bluff stability evaluation, coastal protection structure design and evaluations, wave modeling, and bathymetric surveying. Through our various practice areas, we have gained the respect of the regulatory community for the impartial and high quality of services provided by our firm.



Bluff Slope Failure
(Ozaukee County)

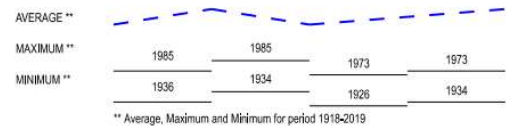
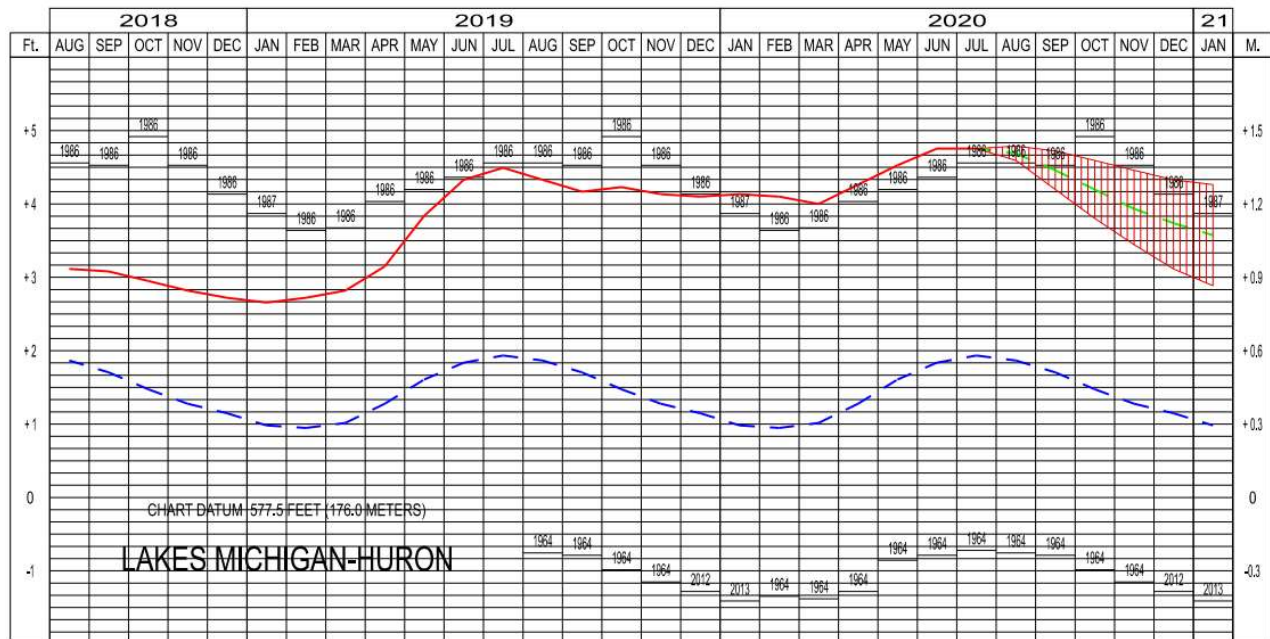


Failed Revetment and
Bluff Slope
(Milwaukee County)

Recent changes in the Lake Michigan water levels have led to destabilization along the Lake Michigan shoreline since April 2019. Based on information obtained by the United States Army Corps of Engineers (USACE), Lake Michigan water levels today are nearly 4 inches above the lake stage in September 2019, and reached stages nearing all-time record highs throughout the summer of 2020. More importantly, the nearshore effects on coastal erosion on protected and unprotected shorelines will continue well into and perhaps beyond 2020. An illustration of water levels and projections provided by the USACE is presented below:

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LAKES MICHIGAN-HURON WATER LEVELS - AUGUST 2020





We recently completed a coastal resiliency asset evaluation for Milwaukee County and are completing other coastal and off-shore engineering evaluations along Lake Michigan. The Milwaukee County resiliency asset evaluation consisted of GZA engineers visiting and documenting the condition of Milwaukee County's coastal breakwaters, bulkheads, revetments, and beaches. GZA's evaluation included structures located at prominent public parks such as downtown Milwaukee's McKinley Park and Marina, Bayview's South Shore Park, and South Milwaukee's Grant Park. The GZA final report will be used to allocate funds toward the repair and replacement of those structures in need.



Overtopped and Collapsed
Breakwater
(Milwaukee County)



GZA Engineer Conducting
Bathymetry Survey Via Kayak
(Ozaukee County)

Our typical coastal assessment includes evaluating the condition of existing shoreline protection, reviewing historical data, performing bathymetric surveys via boat or kayak, evaluating the coastal site setting and metocean buoy data, and creating shoreline protection recommendations and designs. We have performed this type of coastal assessment for projects ranging from small-scale residential sites on the order of 100 linear feet of shoreline to large-scale publicly owned sites on the order of 10,000+ feet of shoreline.



Geotechnical Services



Project Experience: 833 East Development

CLIENT:

Irgens Development, LLC.

LOCATION:

Milwaukee, Wisconsin

SERVICES:

Geotechnical Engineering – in-situ soil pressuremeter testing

PROJECT LENGTH:

October 2012 - Present

HIGHLIGHTS

- Provided engineering support for a 17-story building in downtown Milwaukee.
- Provided geotechnical evaluation and design of mat foundation.
- Estimated savings of **\$500,000** vs. conventional pile foundations



This project consists of a multi-tenant office tower with four levels of parking (three above and one below grade), a Galleria at lobby level and 13 stories of office above. The planned construction will be concrete and steel framing. The Site is located in the southeast quadrant of the intersection of North Cass Street and East Michigan Street at 833 East Michigan Street in a commercial area in downtown Milwaukee, Wisconsin. Previous studies conducted at the Site had considered the use of pile foundations which resulted in higher building costs. GZA's experience on many projects has shown that conventional laboratory tests only approximate the actual strength and settlement characteristics of soil and/or bedrock and that in-situ pressuremeter testing allows a better assessment of the actual parameters. Through the use of in-situ pressuremeter testing, GZA was able to evaluate the use of a mat foundation as a viable foundation alternative for the project.

Based on the results of the in-situ testing and analysis, the proposed structure will be supported by a combination of continuous perimeter strip footings, isolated interior columns and a mat foundation core.

It is estimated that the use of a mat foundation core will result in significant design/construction savings relative to the use of pile foundations.





*Project Experience: **North End Riverwalk** - Milwaukee, WI*

As part of redeveloping a former tannery into a mixed use residential/commercial development, the Milwaukee Riverwalk was extended through the North End development. This vital section of the Riverwalk connects the previously completed sections to the south with the Milwaukee River Trail to the north. GZA was asked to develop a design to protect the existing bulkhead wall and the proposed extension from the loads that would be imposed during construction and later when fire trucks required access to Riverwalk. GZA provided a geosynthetic wrap design for the backfill materials along the Riverwalk with the space between the soil and the wall filled with EPS GeoFoam.



HIGHLIGHTS

- Brownfield reclamation of an industrial Site along the Milwaukee River.
- Provides a vital link between the Riverwalk and the Milwaukee River Trail.
- Redesign of bulkhead backfill to reduce pressures.
- GZA involved in construction observation.



*Project Experience: **Lighthouse 4041** - Shorewood, WI*

This project consists of a multi-use development with underground parking, first floor retail, and four stories of apartments on one parcel of the site. A three story parking garage was constructed on the second parcel to provide parking for nearby businesses. The Site is located at 4041 Oakland Avenue in Shorewood, Wisconsin. GZA provided environmental and

geotechnical evaluation services in support of the development. The environmental services consisted of a Phase I and Phase II evaluation of the property. Geotechnical engineering services included foundation design, recommendations for temporary and permanent excavation support systems, underpinning of adjacent structures, groundwater control systems, pavement design and evaluation of GeoFoam fill. By combining geotechnical and environmental services, GZA was able to add value to an exciting development in the Shorewood neighborhood.

HIGHLIGHTS

- Multi-story, mixed used development in an exciting community on the north side of Milwaukee.
- Provided environmental and geotechnical evaluation of the property.
- Design included a cut and cover tunnel between portions of the development.

*Project Experience: **Center and Buffum Street Housing Development** - Milwaukee, WI*

HIGHLIGHTS

- Brownsfield reclamation of several parcels in Milwaukee.
- GZA involved with environmental and geotechnical evaluation of the property.

Heartland Housing is planning to develop several parcels in Milwaukee, Wisconsin into affordable housing. The proposed development includes a 3-story, multi-family residential building with a playground area and parking. GZA provided geotechnical and environmental services in support of the development. Environmental services at the Site included conducting a Phase I and Phase II environmental assessment. In addition, GZA developed a remedial action plan to facility proper management of soils during construction. Geotechnical engineering services included foundation, retaining wall and pavement design recommendations. Recommendations were also provided for helical piers and over-excavation to address soft soils at the site.



Stormwater Management



Project Experience: Industrial Stormwater Management

CLIENT:

Confidential Industrial Aggregate Supplier

LOCATION:

Northwestern Wisconsin

SERVICES:

Civil, Structural, Environmental, Geotechnical, Industrial, and Stormwater Engineering – Construction Management

PROJECT LENGTH:

Winter 2013 - Fall 2014

HIGHLIGHTS

- Designed and oversaw construction of stormwater Best Management Practices (BMPs).
- Improved stormwater quality before discharging to the Mississippi River.
- Inter-office collaboration.
- Creative stormwater planning and management.
- Proactive client communication and project management.
- Design and construction management.

This project came to GZA while a Spill Prevention, Control, and Countermeasure (SPCC) Plan was in works. GZA surveyed the site and identified multiple conditions with the site that lead to a high sediment load of sand to the Mississippi River during storm events. Pre-existing conditions at the site included sandy dirt roads which discharged into the Mississippi River. Stormwater improvements at the site were not designed to improve sediment discharge to the Mississippi River. The mine invested significant capital in improvements to add a stormwater management system that will reduce the sediment loading from the site to the Mississippi River. The following are site improvements GZA implemented to reduce sediment loadings to the Mississippi River: paving the haul road, adding stormwater catch basins, two stormwater detention ponds, and sediment traps utilized as a tire clean off for loaders. This site is a rare case where increasing the site’s imperviousness improved the environmental impact of the site. Flat real estate was minimal which made the design difficult. Space for contractors was restricting due to the steep slopes and highly erodible slopes. Creative solutions were used in the design and installation of the stormwater BMPs. GZA completed WDNR and local permitting, design work, and hydraulic modeling. Contractor management was provided to our client during critical stages of the project.



Newly installed road inside the mine portal

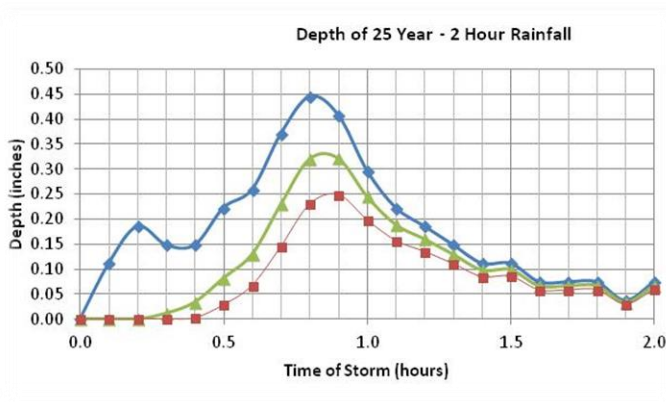
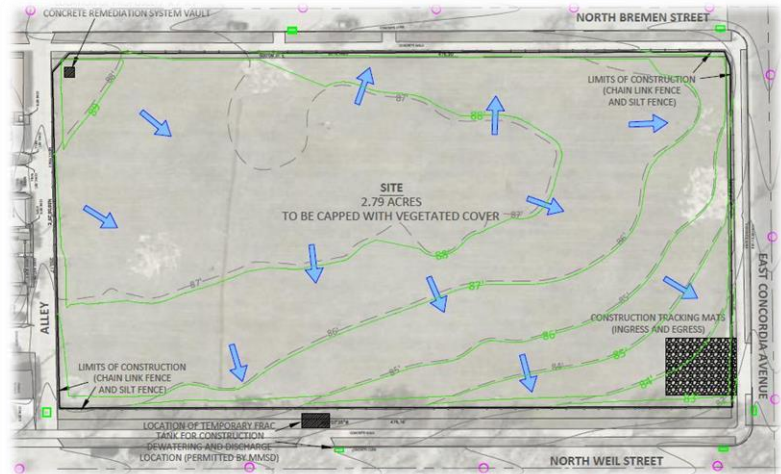


Installation of stormwater BMPs



*Project Experience: **Badger** – Milwaukee, WI*

Among other industrial activities, the Badger project site was formally used to manufacture batteries for several decades, while the surrounding Riverwest residential community began to grow up around it. After years of environmental investigation, GZA designed a remedial solution for the site that encompassed excavation of impacted soils, installation of a “green” remediation alternative to biologically reduce remaining impacts, and installation of a clean fill cap. The project was ultimately designed to be used by the local community as a new Milwaukee County Dog Park. During the planning of the project, GZA created the necessary City of Milwaukee stormwater pollution reduction plans and managed with the earthwork contractor the construction pollution reduction strategies. GZA’s whole system approach not only alleviated environmental concerns for our client, but also reduced the overall cost of remediation by over \$100,000 through the careful design and management of our green remediation alternative. The project’s true success not only came from saving the client money, but also by improving the local community through replacing an industrial property with a very much desired community recreational green space.



*Project Experience: **Legacy** – Milwaukee, WI*

GZA worked with the Redevelopment Authority of the City of Milwaukee and Stormwater Management Departments to plan the excavation of environmentally-impacted soils from a 3.5-acre site in the City of Milwaukee. The project included stripping the site of existing impervious surfaces, removing the impacted soils, and importing clean topsoil effectively removing sources of stormwater runoff pollution while providing an environmentally sound site for redevelopment. GZA successfully guided the project through the storm water management planning, regulatory approval process and construction implementation.

*Project Experience: **Algae for Biofuel Project** – Wooster, Ohio*

CLIENT:

Touchstone Research Laboratory

LOCATION:

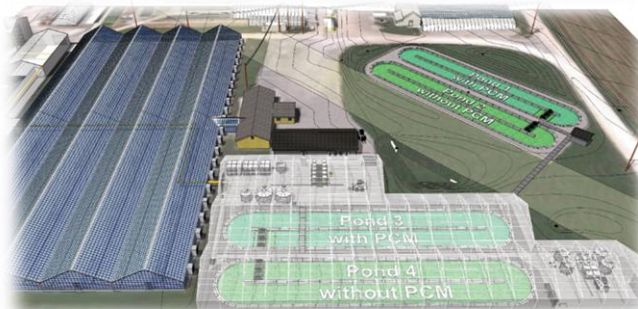
Wooster, Ohio

SERVICES:

Civil, Structural, Environmental, Geotechnical, Industrial, Process, and Stormwater Engineering – air quality control, construction management, facility and data collection design

PROJECT LENGTH:

Winter 2010 – Spring 2012

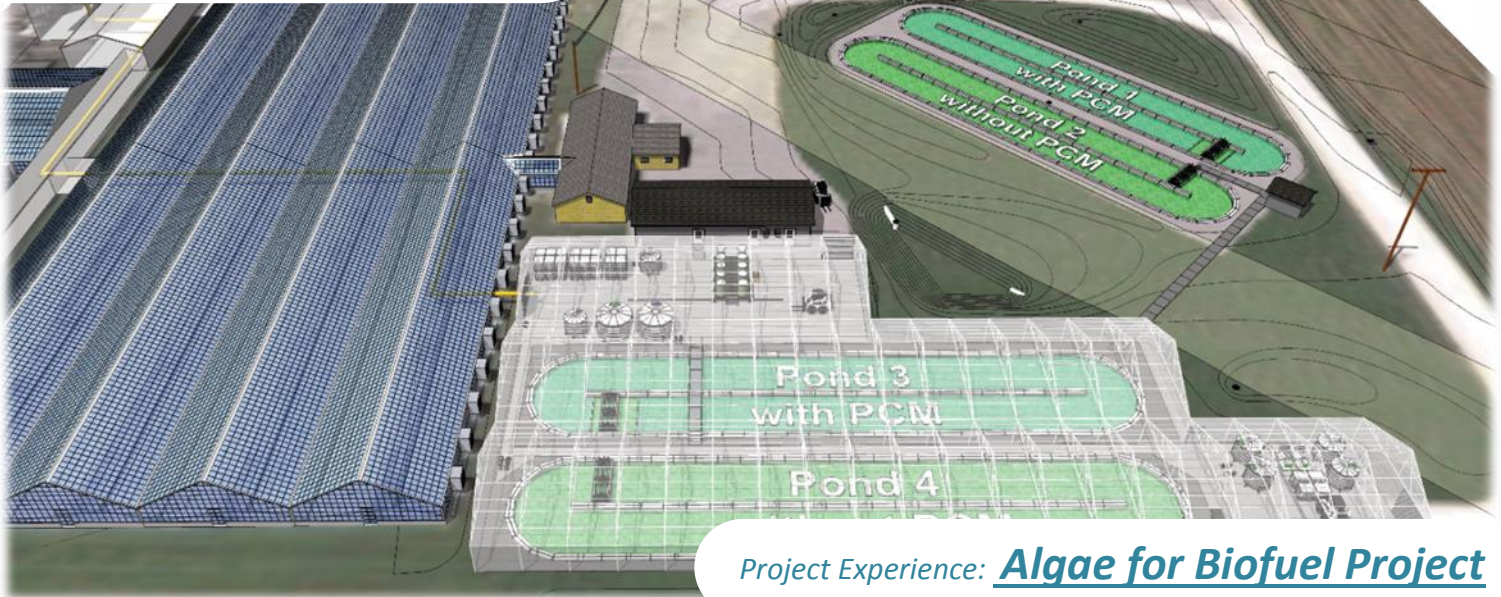


HIGHLIGHTS

- Designed and oversaw construction of an experimental algae for biofuel research facility
- Used innovative graphics and design techniques to assist in regulatory approval and construction.
- Designed and built a low cost and timely project that accommodated the needs of project stakeholders.



Water Resources



Project Experience: **Algae for Biofuel Project**

CLIENT:

Touchstone Research Laboratory

LOCATION:

Wooster, Ohio

SERVICES:

Civil, structural, environmental, geotechnical, industrial, process and stormwater engineering – Air quality control, construction management, facility and data collection design

PROJECT LENGTH:

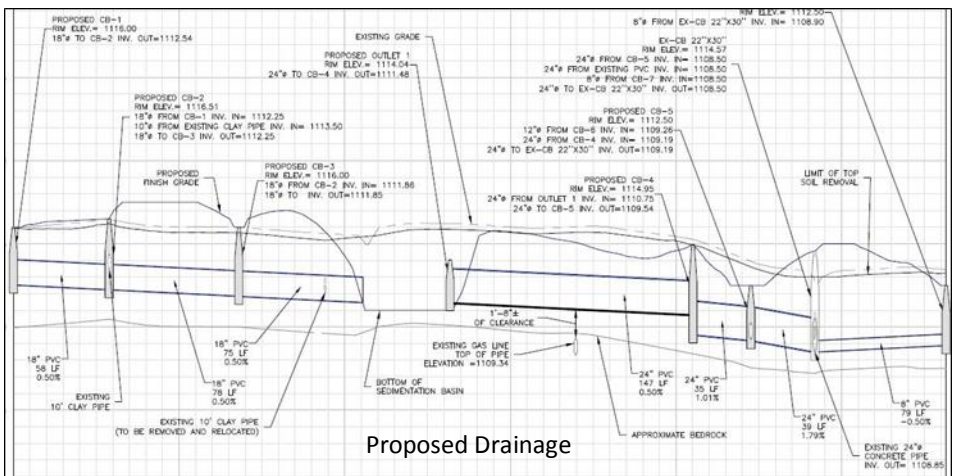
Winter 2010 – Spring 2012

HIGHLIGHTS

- Designed and oversaw construction of an experimental algae for biofuel research facility.
- Used innovative graphics and design techniques to assist in regulatory approval and construction.
- Designed and built a low cost and timely project that accommodated the needs of project stakeholders.



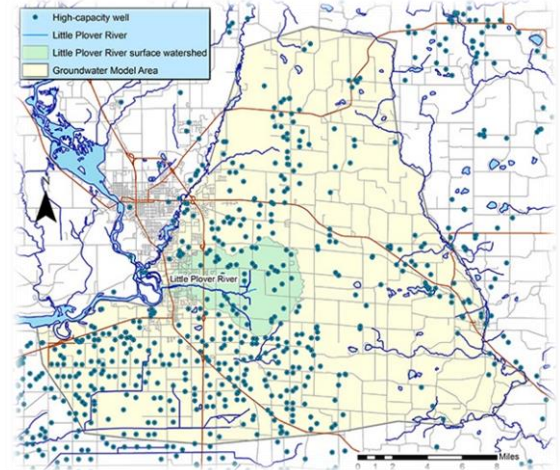
As part of the Department of Energy’s (DOE) search for viable alternative fuel sources, GZA-Waukesha and our client, Touchstone Research Labs, designed and built an experimental algae for biofuel facility in northeastern Ohio. The primary research objective was to test our client’s unique Phase Change Material’s (PCM) ability to enhance the cultivation of hydrocarbon rich algae. Secondary project objectives also incorporated the capture of CO2 from a commercial greenhouse’s coal-fired boiler, non-solvent based extraction of hydrocarbon lipids, and biogas generation from residual algae biomass at the University of Ohio’s local anaerobic digester facility. GZA-Waukesha provided our client full-service engineering support throughout the project’s design, construction and initial operational phases, ultimately bringing the project to completion on time and under budget. Among the many engineering services GZA provided, facility design and storm water management were crucial to the project’s early successes. The site was located on a flat, fallow section of farm land, bisected by a buried high pressure gas line. GZA was able to design the facility and storm water management system around the difficult site while also providing the construction management and post-construction best management practices necessary for regulatory approval.



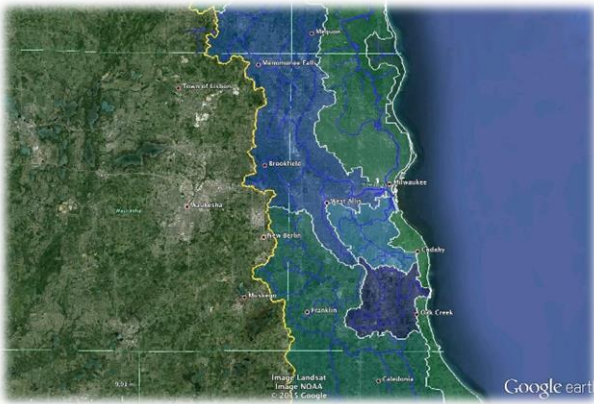


Project Experience: **High Capacity Well Modeling & Legislation** - Wisconsin

At the request of agricultural industry in Wisconsin, GZA utilized the United States Geological Survey (USGS) software, the USGS Groundwater Toolbox (<http://water.usgs.gov/ogw/gwtoolbox/>), to download and analyze streamflow data collected by The USGS at select gaging stations located in Wisconsin. Daily streamflow data, flow duration curves, and streamflow statistics such as Q90 and 7Q10 were obtained for the select gaging stations, where streamflow data are available. The daily streamflow data were compared to the Q90 and 7Q10, and were used to support and advance legislation relating to the use, permitting, and transfer of high-capacity wells.



Project Experience: **Alternative Water Supply Evaluation to Lake Michigan Diversion Request** – Waukesha, WI



The City of Waukesha (City) submitted an Application for Lake Michigan Supply to the Wisconsin Department of Natural Resources (WDNR) in May 2010, proposing to use Lake Michigan water with return flow to meet its long range water supply planning needs. The application was based on the City’s eligibility for a new Great Lakes diversion with return flow in accordance with the Great Lakes-St. Lawrence River Basin Water Resources Compact. GZA was retained to evaluate a local groundwater water supply alternative for the City of Waukesha, using the United States Geological Survey (USGS) Fox River model (<http://pubs.usgs.gov/sir/2012/5108/>) (Feinstein et al, 2012), which was implemented in USGS’s MODFLOW-NWT with the use of Environmental Simulations Inc.’s software, Groundwater Vista Version 6.

Project Experience: **Wetland Delineation** – Central Illinois



HIGHLIGHTS

- Provided wetlands delineation/ assessments of proposed mine expansion properties to assist in acquisition and property management planning.
- Created storm water management plans for mining activities including berm restoration, stream crossings and creation of lake habitats.
- Developing a future reclamation plan to create a “two-story” lake for cold and warm fish species after mining operations have terminated at the sandstone pit.



APPENDIX B

Resumes



James F. Drought, P.H.

Principal Hydrogeologist/Vice President

Education

B.S., Physical Geography and Biology,
Carroll College, 1982

M.S., Contaminant Hydrogeology and
Geosciences, University of Wisconsin-
Milwaukee, 1999

Licenses & Registrations

Professional Hydrologist, #45-111

Areas of Specialization

- Aquifer Characterization
- Surface and Groundwater Interactions
- Great Lakes Hydrology, Coastal Erosion, and Bluff Recession
- Fate, Transport, and Remediation of Chlorinated and Petroleum Hydrocarbons
- Fixed-Price, Liability Transfer, Environmental Trusts, and Insured Remediation Services
- Brownfield Remediation, Redevelopment, and Financing
- Litigation Support and Testimony
- Real Property Due Diligence
- State and Federal Regulatory Compliance

Summary of Experience

As Principal Hydrogeologist and Vice President at GZA, Mr. Drought is responsible for the development, management, and execution of the following services for the oil and gas, utility, manufacturing, retail, local and state government, and legal sectors throughout the United States:

- Hydrogeological evaluation and well design;
- Shoreline erosion and bluff recession;
- Surface water and groundwater evaluations;
- Regulatory affairs and environmental advocacy;
- Soil and groundwater investigation and remediation;
- Brownfield redevelopment and financing;
- Fixed-price contracting, liability transfer, and 468B environmental trust; and
- Litigation support and expert testimony.

Relevant Project Experience

Nitrate Evaluation in Drinking Water Aquifer, Agricultural, and Dairy Operations - Juneau and Wood Counties, Wisconsin. Project Director (2019 to Present) for the evaluation of nitrogen-affected soils and groundwater in an active litigation case involving operators of long-term agricultural and dairy operations. The services included an analysis of nutrient loading rates, nitrate partitioning and leaching, temporal soil and groundwater sampling, private well sampling, hydraulic modeling of an unconsolidated aquifer, solute transport modeling. Aquifer restoration and point-of-use treatment was also evaluated.

Milwaukee County Coastal Resiliency - Milwaukee County, Wisconsin. Project Director (2019 to 2020) for the coastal engineering inventory, evaluation, and assessment of County-owned assets located along the Lake Michigan shoreline in Milwaukee County, Wisconsin. With the increase in Lake Michigan water levels and the increased frequency and magnitude of recent storm events, many of these assets experienced accelerated degradation and/or increased risk of maintenance and repair. As part of Milwaukee County's ongoing maintenance and inventory work, the services included conducting an inventory, vulnerability assessment, and risk assignment of 30 County-owned assets. A web-based GIS database was created of the various assets, which included photographs, an existing condition assessment, and initial vulnerability and risk assessments to Milwaukee County.

2020 Coastal Assessment and Engineering Design Services - Southeastern Wisconsin. Project Director (2020 to Present) for approximately 30 coastal engineering and design projects for residential and commercial properties along Lake Michigan in Southeastern Wisconsin. Project activities include a site reconnaissance to observe erosional scour and bluff recession, topographic and bathymetric surveys, wave runup analyses to confirm wave elevations during different storm events, and preparation and regulatory permitting of alternative designs for shoreline protection.



James F. Drought, P.H.

Principal/Hydrogeologist/Vice President

Services include monthly meetings with the Wisconsin Department of Natural Resources (WDNR) Water Resources Engineer to discuss coastal engineering design and permitting projects. Several of the projects also include geotechnical explorations and slope stability analyses for bluff stabilization in addition to shoreline protection.

Former Metal Technology (Briggs and Stratton) Foundry - West Allis, Wisconsin. Project Director (2013 to 2016). This work included investigation, remediation, closure, and light-manufacturing redevelopment of the former Briggs and Stratton and Metal Technology foundry. Services performed included support in the sale and redevelopment of the facility to Midwest Rail and Demolition, which was facilitated with the innovative Remedial Action Plan (RAP), and subsequently to the City of West Allis for redevelopment. The site was featured in the December 2013 issue of WDNR's *RR Report*.

Wisconsin Potato and Vegetable Growers Association (WPVGA) - Antigo, Wisconsin. Project Director (2015 to Present). GZA was retained in 2015 by WPVGA to provide hydrogeologic support and validation of the MODFLOW groundwater modeling underway by the Wisconsin Geologic and Natural History Survey (WGNHS) of the Little Plover River Watershed, and also to provide environmental advocacy of the WPVGA with local, state, and federal units and agencies of government. Given the existing and pending economic and regulatory uncertainty, GZA has provided the following value and certainty to WPVGA:

- Understanding of and alternatives to reduce the cumulative impacts of pumping on drawdown, nearby wells and connected surface water features;
- Facilitating the permitting and optimization of high-capacity wells;
- Development of water quality stewardship practices and sustainable irrigation methods;
- Evaluation of the potential application of groundwater management districts for the management of surface water and groundwater; and
- Technical advocacy and representation of member interest on groundwater resources, environmental compliance, and permitting.

Titletown Site Engineering and Development - Green Bay, Wisconsin. Project Director (2014 to Present). The work consisted of developing and executing comprehensive environmental, geotechnical, and site civil engineering services for the Green Bay Packers for the redevelopment of the 24-acre Titletown Development located west of Lambeau Field. The proposed development plan was to create a year-round destination for visitors and residents of Green Bay consisting of retail and commercial structures. The conceptual design consisted of phases of development. Phase I began in 2015, and included construction of a six- or seven-story, five-star hotel, health spa, health and sport center, micro-brewery, and multi-level parking garage on the northeastern portion of the site. Parking and seasonal kiosks will be developed on the northern portion of the site, adjacent to Lombardi Avenue. A central plaza (esplanade) and public area will offer seasonal recreational amenities to visitors.

Groundwater Modeling Evaluation, Waukesha Water Supply Alternatives - Waukesha, Wisconsin. Project Director (2014 to Present). The City of Waukesha ("City") submitted an Application for Lake Michigan Supply to the WDNR in May 2010, proposing to use Lake Michigan water with return flow to meet its long-range water supply planning needs. The Application was based on the City's eligibility for a new Great Lakes diversion with return flow in accordance with the Great Lakes-St. Lawrence River Basin Water Resources Compact ("Compact"). The Application assumed an average water demand of 10.1 million gallons per day (mgd) and a peak water demand of 16.7 mgd. GZA was retained to perform performed modeling scenarios using the United States Geological Survey (USGS) Fox River model (Feinstein et al, 2012), which was implemented in USGS's MODFLOW-NWT with the use of Environmental Simulations Inc.'s software, Groundwater Vista Version 6, to evaluate the drawdown and base flow reduction in the shallow aquifer for Alternatives 1A and 1B, as follows:



James F. Drought, P.H.

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Alternatives	Water Sources	Average Water Demand (mgd)	Supply Facilities
1A (Average 10.1 mgd)	Deep Confined Aquifer	6.2	Existing 7 Wells
	Shallow Aquifer	1.4	Existing 3 Wells (Well Nos. 11-13)
	Fox River Alluvium	2.5	10 New Riverbank Inducement (RBI) Wells
1B (Average 8.5 mgd)	Deep Confined Aquifer	5.7	Existing 7 Wells
	Shallow Aquifer	1.0	Existing 3 Wells (Well Nos. 11-13)
	Fox River Alluvium	1.8	10 New RBI Wells

Royster Clark Agricultural Processing Brownfield Site - Madison, Wisconsin. Project Director (2013 to 2014). This work included investigation, remediation, and mixed-use redevelopment of the site. The investigation activities consisted of the advancement and sampling of deep piezometers in the sandstone bedrock above the confining Eau Claire shale unit using dual-tube drilling methods to define the extent of ammonia and nitrates. The NR 726 closure included modeling of retarded flow and multivariate statistics and regression analyses. The site was featured in the December 2013 issue of WDNR’s *RR Report*.

Former Entergy, Inc. Facility - Baton Rouge, Louisiana. Project Director (2013 to 2014). The work included soil and groundwater investigation and interim actions to facilitate preparation of an amended Voluntary Remedial Action Plan (VRAP) for submittal to the Louisiana Department of Environmental Quality (LDEQ) under the RECAP program. The 6-acre site was utilized as a lumber and coal yard in the early 1900s, an electrical generating facility from 1916 until the 1940s, and an electrical substation from the 1940s to the 1960s. The VRAP facilitated the acquisition and development of the site by the East Baton Rouge Redevelopment Authority.

190-Acre Parcel - Lake Charles, Louisiana. Project Director (2012 to 2014). This work included the investigation, remediation, construction, and industrial redevelopment for acquisition and development by G2X Energy, Inc. for use as an E-85 gasoline production facility. The site had historically been used for the deposition of maintenance-dredged materials from a turning basin created from the Calcasieu River. The investigation and remediation activities were conducted under the RECAP and Voluntary Party remediation requirements of LDEQ. The No Further Action letter issued by the LDEQ in October 2013, facilitated wetland mitigation, earthwork, and remedial construction services. The construction services included air permitting, natural resources, and earthwork services.

Tilot Oil, LLC vs. BP Products North America, Inc., Case No. 09-CV-210-JPS. Retained as an expert for the plaintiff in 2007, for the investigation and remediation of separate-phase product emanating from an adjacent and upgradient bulk petroleum facility in Green Bay, Wisconsin. Services included soil, groundwater, soil-gas, and ambient air sampling, evaluation of barrier wall remedial technologies, preparation of expert reports, depositions, mediation, and trial support, and meetings with the regulatory agency and responsible party. The case settled in 2012, and led to a settlement for the plaintiff, which was used, in part, to complete an extensive soil and groundwater remediation project.

16-Acre Property Owned by Kaukauna Utilities Adjacent to the Fox River - Appleton, Wisconsin. Project Director for the fixed-price remediation and liability transfer of chromium (III and VI) and sulfate-affected soils, bedrock, and groundwater on the property. The RAP was submitted to and approved by the WDNR in February 2007, approximately 60 days following contract completion. The active remediation activities were completed in November and December 2008, following WDNR approval of the remedial strategy in October 2008. The closure documents were submitted to the WDNR in March 2009. Site closure and the Certificate of Completion were issued by the WDNR in September and October 2009, respectively, approximately two years ahead of schedule. The expedited remediation and closure facilitated the \$75MM mixed-use redevelopment of the site.

35-Acre Tower Automotive West Plant Project (former A.O. Smith Facility) - City of Milwaukee, Wisconsin. Project Director (2004 to 2008). Performed the investigation, remedial design, and fixed-price remediation of the site. Approximately 25 acres of the 80-year-old facility were acquired and redeveloped as the City of Milwaukee Department of Public Works (DPW) facility. The site investigation identified the presence of petroleum- and chlorinated hydrocarbon-affected soil and groundwater. The remedial strategy included source removal, enhanced biodegradation, and use of the new development to improve remedial performance. The RAP was submitted to the WDNR on October 11 and approved on October 25, 2004. Supplemental investigation and



James F. Drought, P.H.

Principal/Hydrogeologist/Vice President

remediation activities were completed in 2005, and the closure letters were issued by the WDNR on January 24, 2006, and May 15, 2008. The expedited remediation and closure facilitated the \$100MM construction of the Harley Davidson museum at the location of the former City of Milwaukee DPW facility.

Experience Prior to GZA

Prior to joining GZA, Mr. Drought served as Vice President and Director of Remediation for Shaw Environmental, Inc., a CBI Company, from September 2004 to October 2014. Mr. Drought served as a Vice President and Principal Hydrogeologist for ARCADIS, a national and international engineering firm, from January 1995 to September 2004. Mr. Drought also served as the Assistant Environmental Department Manager at a national environmental and geotechnical consulting firm from 1989 through 1994, and was responsible for the supervision of professional and technical staff and the coordination of an analytical laboratory certified under Chapter NR 149 of the Wisconsin Administrative Code.

Mr. Drought served as an Assistant Environmental Planner at the Bay-Lake Regional Planning Commission (BLRPC) and the Southeastern Wisconsin Regional Planning Commission (SEWRPC) from 1985 through 1988. Mr. Drought's responsibilities included the preparation of resource management and environmental planning reports, and serving as a regulatory agency liaison between federal, state, county and local units and agencies of government.

University Teaching

Since 2006, Mr. Drought has served as an Associate Faculty Member in the Civil Engineering Department at Milwaukee School of Engineering (MSOE) in Milwaukee, Wisconsin, and has served as a graduate student advisor and taught the following courses:

- Solid Waste Engineering and Design (CV-430);
- Solid and Hazardous Waste Minimization (CV-730); and
- Soil Science and Remediation Technologies (CV-754).

Selected Publications

[A Case Study of a Natural Attenuation of a Mixed Hydrocarbon Plume](#), M.S. Thesis, University of Wisconsin-Milwaukee, June 1999.

[Fate of Tetrachloroethene and Benzene at a Dry Cleaning Facility](#), Proceedings of the In-Situ and On-Site Bioremediation - The Fifth International Symposium, Sheraton San Diego Hotel and Marina, San Diego, California; April, 1999.

Selected Presentations

[Advancing Water Management Strategies Using Groundwater Flow Models](#). Invited Speaker – Opening Session, University of Wisconsin Extension and Wisconsin Potato and Vegetable Growers Conference, Stevens Point, Wisconsin, February 2, 2016.

[Remediation Revisited: A Historical and Futuristic Perspective](#), Invited Speaker, University of Wisconsin – Milwaukee Environmental Science Exchange, Water Institute, Milwaukee, Wisconsin, September 17, 2014.

[Using Performance-Based Contracting for Brownfield Redevelopment](#), Invited Speaker, Breakout Session – Recovering from our Industrial Past, Oklahoma Brownfield's Conference, Oklahoma City, Oklahoma, May 22, 2012.

[A Celebration of Hydrogeology in Wisconsin - Recognition of Dr. Mary P. Anderson \(University of Wisconsin\) and Douglas Cherkauer \(University of Wisconsin – Milwaukee\)](#), Organizer and Moderator, Wisconsin Ground Water Association Annual Meeting, Pewaukee, Wisconsin, April 27, 2011.

[The NR 700 Administrative Code: Existing Regulations and Proposed Revisions](#), Organizer and Moderator, Wisconsin Ground Water Association Lecture Series, Pewaukee, Wisconsin, November 8, 2011.

[Remediation and Redevelopment of a Former Drilling Mud Facility](#), Wisconsin Ground Water Association Annual Meeting, Waukesha, Wisconsin, April 8, 2011.



James F. Drought, P.H.

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Using Performance-Based Contracting for Brownfield Redevelopment, Workshop Sponsored by the Environmental Law Institute Entitled: Overcoming Barriers to the Redevelopment of Petroleum Brownfield's and Other Vacant Properties: The Wisconsin Approach, Ambassador Hotel, Milwaukee, Wisconsin, May 18, 2010

Performance-Based Contracting to Facilitate Brownfield Redevelopment, Panel Participant at the Brownfield's 2009 Conference, New Orleans, Louisiana, November 17, 2009.

RiverHeath: Remediation and Redevelopment of Historic Riverine Industrial Site in Appleton, Wisconsin, Presentation at the Brownfield's 2009 Conference, New Orleans, Louisiana, November 17, 2009.

The Wisconsin Closure Protocol Study, Organizer and Moderator, Wisconsin Ground Water Association Lecture Series, Pewaukee, Wisconsin, November 12, 2009.

The Glacial and Bedrock Geology of Southeastern Wisconsin, Organizer and Facilitator, Wisconsin Ground Water Association Fall Field Trip, Waukesha County, Wisconsin, September 19, 2009.

Selected Training

- NGWA Summit, May 2014
- SIPP (Health and Safety) Training for Supervisors, February 2014
- FranklinCovey Management Training, December 2008
- NGWA Summit, April 2008
- RevenueStorm Sales Training, January 2003
- Leadership Development Training, December 2002
- Senn-Delaney Leadership Training, November 2002
- Advanced Management Training, 2000-2001

Affiliations/Memberships

- Federation of Environmental Technologies
- National Brownfield Association
- National Ground Water Association
- Wisconsin Fabricare Institute
- Wisconsin Ground Water Association
- University of Wisconsin-Milwaukee Geosciences Environmental Science Exchange
- Associate Faculty Member
- Civil Engineering Department
- Milwaukee School of Engineering, 2006-Present

Significant Appointments

- WDNR NR 16g Committee (DERP)
- WDNR NR 700 Focus Group
- WDNR Brownfields Committee
- COMM 47 Advisory Committee
- WGWA – Director and Past President (since 2010)
- Keep Greater Milwaukee Beautiful/Greening Milwaukee – Director (since 2011)
- University of Wisconsin Groundwater Research Advisory Council (since 2012)



John H. Eisele, P.E.

Senior Consultant

Summary of Experience

Mr. Eisele is a water, wastewater and municipal engineer with over 40 of experience in design, construction and management of water and wastewater projects. His design experience includes deep and shallow wells, water distribution systems, interceptor sewers, sanitary sewers, storm sewers, wastewater treatment plants and sludge dewatering facilities. Mr. Eisele's construction experience includes installation of the pumps and valves for one of the MWRDGC's Deep Tunnel pumping stations (largest pump is 17,000 horsepower) and installation of about 2 miles of 30-inch diameter water transmission main. His Municipal experience includes Village Engineer and Public Works Director for four communities. The scope of work included design and construction of municipal capital projects along with maintaining the roads and utility systems within the communities.

Mr. Eisele joined Huff & Huff in January 2008. Mr. Eisele specializes in water and wastewater treatment and design. Prior to joining Huff & Huff, Mr. Eisele provided various project management and engineering services for various municipalities and consulting firms.

Relevant Project Experience

- Building Demolition, Village of Oak Brook, IL
- Building Demolition, Village of Grayslake, IL
- Chemical Addition, Village of Barrington, IL
- Fuel Tank Removal and Replacement, Village of Winnetka, IL
- Fuel Tank Removal and Replacement, Village of Deerfield, IL
- Fuel Tank Removal and Replacement, Village of Oak Brook, IL
- Concrete Replacement, Village of Oak Brook, IL
- IGIG Grant Applications Galesburg, IL and Barrington, IL
- Residential Drainage Improvements, Northbrook, IL
- 1200 gpd Septic System, MA Center, La Fox, IL
- Asbestos Tile Removal, Village of Oak Brook, IL
- Fuel Management System Upgrade, Village of Oak Brook, IL
- Biological Phosphorous Removal, Village of Barrington, IL
- CMOM, Galesburg Sanitary District, Galesburg, IL
- SWPPP for Tier 4 Engine Development Center for Electro-Motive, McCook, IL
- Facility Plan for Treatment Plant expansion, Plants #2 and #3 for the Village of New Lenox, IL

Education

B.S., 1969, Civil Engineering, University of Illinois- Urbana

Licenses & Registrations

Professional Engineer – 1976, Illinois, #062-031898

Areas of Specialization

- Water Quality
- Municipal Engineering
- Wastewater
- Wastewater Design
- Water Distribution, Wells
- Sewer Design
- UST Removal and Replacement
- Resident Engineering
- IGIG Grant
- Sanitary Treatment Design
- UST Removal and Replacement
- Industrial Sewer Design
- Lake County DECI



John H. Eisele, P.E.

Senior Consultant

- NPDES required reports: PPP, O & M, CMOM and LTCP for the Village of Hinsdale, IL
- Wastewater Treatment Facility evaluation for Ashland Chemical, Calumet City, IL
- Wastewater Treatment Facility evaluation for WR Grace, East Chicago, IN
- Slug Control Plan for Ashland Chemical, Calumet City, IL
- Equalization Pond Cleaning for Ashland Chemical, Calumet City, IL
- Wet Weather Control Facility for the Village of Hinsdale, IL
- Site Restoration, Coal Transfer Facility. ARTCO, Camanche, IA
- IGIG Grant Applications, Deerfield, IL
- O'Hare Modernization Program, Bid Package #2, Erosion Control Estimate, Chicago, IL

Experience Prior to GZA

Rogina & Associates: Joliet, IL

- Managed a civil engineering group and was responsible for preparing the Facility Plan and design of a 1.25 MGD Wastewater Treatment Plant for the City of Wilmington, Illinois
- Prepared the Radium Compliance Study and the design of two shallow wells and well houses for the Village of Rockdale Perform all functions of Village Engineer, including Resident Engineer, for the Village of Rockdale
- Design approximately 11 miles of interceptor sewers and water mains for the Village of Elwood, Illinois
- Water distribution model for the City of Wilmington, Illinois
- STAG Grant research with City of Wilmington, Illinois

RJN Group: Wheaton, IL

- Managed a civil engineering group and was responsible for design of approximately 5 miles of new water main and 3/4 miles of sanitary sewer for Rock Cut State Park in Loves Park, Illinois
- Design for the sanitary sewer rehabilitation program for Rolling Meadows, IL
- Sanitary and storm sewer study for Glenview, IL
- Smoke testing study for the sanitary sewer system for Lake Forest, IL

Donohue and Associates: Schaumburg, IL

- Managed a civil engineering design group and was responsible for performing all functions of Village Engineer for the Village of Manhattan, Illinois
- Conducting the Village of Manhattan's review of its water main replacement and development program
- Coordinated underground utility design for the 200 acre Sears Merchandising Headquarters in Hoffman Estates

LARGE SANITARY TREATMENT PLANT DESIGN EXPERIENCE

- Metropolitan Water Reclamation District of Greater Chicago
- Designed District facilities including a 6 million gallon per day treatment plant and a sludge dewatering facility
- Completed preliminary process design for 300 ton digester facility



John H. Eisele, P.E.

Senior Consultant

MUNICIPAL EXPERIENCE

- Village of Oswego, IL
- Supervised Village maintenance and capital improvement projects including:
 - New 1000 gpm well, 1.5 million gallon water tower and connecting water mains
 - Implementation of new SCADA system
 - Review of new subdivision infrastructure for compliance with Village ordinances
 - Long range infrastructure planning for rapid growth of the community
 - Maintenance of water, sanitary, storm and roadway systems

Village of Round Lake Beach, IL

- Supervised Village maintenance projects including Water pumping/distribution systems, Storm and sanitary sewer systems, Roadway system, Park system

Village of Lemont, IL

- Supervised crews maintaining Village infrastructure
- Reviewed community development proposals

Village of Downers Grove, IL

- Responsible for design and management duties including a Manager of the Village Capital Improvement Program (\$6 million annual budget)
- Staff Liaison for Parking & Traffic Commission conducting traffic control studies
- Member of DuPage County Mayors & Managers Conference's Transportation Committee Managed contracted engineering services

INDUSTRIAL DESIGN EXPERIENCE

United States Steel Corporation

- Designed foundations and light steel structures used in major facility expansion programs
- Storm and sanitary sewers including lift stations for existing and new facilities

CONSTRUCTION AND RESIDENT ENGINEERING EXPERIENCE

T.B. Saxton Construction: New Lenox, IL

- Managed the installation of 30" diameter water transmission main for the DuPage Water Commission
- E.T. Paddock Enterprises & Double E Real Estate Development, Downers Grove, IL
- New home construction, residential additions and remodeling

A.J. Lowe Construction: Downers Grove, IL

- Coordinated installation of piping and equipment for the Mainstream Pumping Station of the Chicago Deep Tunnel Project



John H. Eisele, P.E.

Senior Consultant

Certifications/Training

- Lake County DECI

Affiliations/Memberships

- Illinois Society of Professional Engineers



Bernard G. Fenelon, P.G.

Senior Consultant/Hydrogeologist

Education

B.S., Geological Studies, University of Wisconsin-Milwaukee, 1983

M.S., Geological Services, University of Wisconsin-Milwaukee, 1987

Licenses & Registrations

Professional Geologist - Wisconsin, #751

Areas of Specialization

- Investigation and Remediation of Chlorinated and Petroleum Hydrocarbon Sites
- Vapor Intrusion
- Hydrogeological Assessments
- Groundwater-Use Impact Assessments
- Groundwater and Contaminant Flow Modeling
- Groundwater-Supply Investigations
- Geophysical Investigations

Summary of Experience

For the past 32 years, Mr. Fenelon has investigated and remediated chlorinated hydrocarbon and petroleum hydrocarbon sites across the eastern United States, participated in Brownfield redevelopments, conducted hydrogeological, vapor intrusion, and groundwater use impact assessments, mine dewatering assessments, supervised property transaction due diligence activities, conducted groundwater supply investigations, and performed geophysical investigations. Twenty-five of the 32 years of professional experience have been with GZA and the prior seven years were primarily with Layne.

Investigation and Remediation of soil and groundwater contamination have been performed for industrial, commercial, and landfill facilities related to chlorinated solvents, petroleum products, semi-volatile organic compounds (sVOCs), and metals. The scope of services performed include: 1) evaluating contaminant magnitude and extent in soil, soil vapor, and groundwater; 2) evaluating remedial options; 3) implementing remedial actions in soil and groundwater and supervising remedial system operation and maintenance (O&M); 4) supervising groundwater monitoring and performing contaminant trend evaluation in support of monitored natural attenuation (MNA) regulatory closure; 5) evaluating environmental risk and site liabilities as part of pre-acquisition due diligence activities for industry and law firms; and 6) redeveloping urban contaminated Brownfield properties. Applied remedial methods include: 1) enhanced reductive dechlorination (ERD); 2) thermal conductance heating; 3) MNA; 4) oxidation; 5) excavation and off-site disposal; 6) emulsified zero-valent iron (EZVI) reduction; 7) soil-vapor extraction; and 8) groundwater pump and treat.

Hydrogeological and groundwater-use impact assessments have been performed for the non-metallic mining industry related to dewatering requirements for aggregate extraction, municipalities, and industries related to use of groundwater from production wells, agricultural entities related to irrigation wells, and developers related to potable groundwater supply requirements and changes in drainage patterns and infiltration characteristics under post-development conditions. Services that have been provided include geologic and hydrogeologic research, soil boring and test well installations, aquifer testing, double-ring infiltrometer testing, groundwater modeling, presentations at zoning and plan commission meetings to provide technical information for projects and for the issuance of conditional use permits and answering public concerns regarding various types of proposed projects.

Groundwater supply investigations have been performed for municipalities, industry, developers, commercial entities, and golf courses throughout the upper Midwestern United States in a variety of geological environments, including sand and gravel, fractured bedrock (dolomite, limestone, granite, etc.), and sandstone utilizing hydrogeological, geophysical, and drilling exploration methods. Well-head protection services and groundwater modeling to optimize well-field development have also been conducted to aid water supply development.



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Relevant Project Experience

REMEDIATION INVESTIGATIONS AND CORRECTIVE ACTIONS

Senior Consultant, Site Investigation, Remediation and Monitoring, Confidential Client, Eastern Wisconsin. GZA is currently conducting a multi-million dollar, multi-year, thermal and ERD remedial action of a chlorinated solvent release of tetrachloroethene (PCE) at a manufacturing facility in eastern Wisconsin. The presence of two neighboring manufacturing facilities with similar soil and groundwater contamination issues, a railroad right-of-way adjacent to containing a portion of the PCE source, and solvents detected in a municipal well adjoining the site have complicated the investigation and remediation. The PCE source is bound in a 20-foot thick, partially saturated, low permeability clay overlying unsaturated sand and gravel with nearly continuous low mass loading to groundwater. In addition to the presence of solvent in the local water supply aquifer at concentrations above State drinking water standards, PCE has been detected in shallow groundwater beneath a residential neighborhood, resulting in potential vapor intrusion (VI) health risk to downgradient residents. The thermal portion of the remedial action began in December 2016 and continued until satisfactory soil concentrations were achieved in December 2017, with more than 99% reductions in total chlorinated VOCs (cVOCs). The ERD portion of the remedial action is expected to continue until at least 2027.

Senior Consultant, Site Investigation/Remediation, 20-Acre Former/Industrial Site, Confidential Client, Indiana. In 2008, GZA was asked by this client to review 20 years of soil and groundwater data gathered by other environmental consultants related to trichloroethene (TCE) releases at the site. The site underwent focused soil remediation and about 12 years of operation of a 750-gallon per minute (gpm) groundwater pump and treat remedial action under Indiana's voluntary remediation program (VRP). With groundwater remedial progress slowing and the remedial system aging and in need of significant repair, GZA was asked to evaluate the effectiveness of continued system operation and evaluate whether other remedial alternatives were necessary to bring the site to closure. As a result of TCE migration into residential neighborhoods and potential vapor inhalation risk, sub-slab soil gas and/or indoor air quality were evaluated in approximately 40 buildings overlying the shallow groundwater plume and 15 ventilation systems were installed in homes with indoor air TCE concentrations exceeding Indiana Department of Environmental Management (IDEM) screening levels. GZA conducted additional source remediation in 2015, and began implementation of ERD remediation in groundwater in 2017 and continuing into 2018. To date, the groundwater ERD remediation has consisted of the injection of more than 500,000 gallons of electron donor solution. Significant TCE reductions are currently being observed.

Senior Consultant, Site Investigation/Remediation, 21-Acre Former/Industrial Site, Confidential Client, Central Wisconsin. In 2014, GZA was asked by this client to review 25 years of soil and groundwater data gathered by other environmental consultants related to TCE releases at the site. After multiple phases of active soil and groundwater remediation, cVOC concentrations were increasing in various areas of the site and the chemical oxidation groundwater remediation being conducted was having only limited effect. GZA began altering the remedial approach to conduct ERD and addressed the immediate exposure pathway, VI in the site building. With sub-slab TCE vapor concentration exceeding the sub-slab vapor action level (VAL) by up to a factor of almost 1,000 and indoor air concentration exceeding the indoor air VAL by more than a factor of 10, GZA implemented vapor mitigation over nearly 100,000 square feet of the building to reduce indoor air TCE vapor concentrations by more than 95%. GZA began implementation of ERD remediation in groundwater in 2015, and currently peak TCE concentration have been reduced by more than 90% and downward cVOC trends exist across most of the site and at off-site locations.

Senior Consultant, Site Investigation/Remediation, 20-Acre Industrial Site, Confidential Client, Central Kentucky. GZA finished a comprehensive site characterization for the presence of TCE at an industrial facility in western Kentucky. TCE concentrations as high as 1,200 milligrams per liter (mg/l) have been detected in a 200- by 100-foot area of sandstone and shale bedrock. Due to the low-permeability bedrock conditions and lack of nearby receptors to the TCE contamination, a long-term remedial action consisting of ERD is being planned, consisting of placement of 10,000 to 20,000 pounds of organic carbon on the top of bedrock over the area of highly elevated TCE concentrations. Pilot testing for ERD effectiveness was conducted from 2011 to 2013. For the site building, sub-slab TCE vapor concentrations exceeded the United States Environmental Protection Agency (USEPA) sub-slab screening level by factors up to 26,000 times. An accessible portion of the TCE source beneath the site building was excavated for off-site disposal in 2018, and a sub-slab depressurization system was installed to address the VI pathway over an approximately 15,000 square-foot portion of the building. Following implementation of the source remediation and operation of



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the vapor mitigation system, indoor air concentrations were reduced by more than 90% and currently meet USEPA industrial indoor air screening levels. Full-scale ERD implementation is planned for 2020.

Senior Project Manager, Site Investigation/Remediation, Superfund Site, AO Smith Corporation, Ionia, Michigan. In 2003, GZA became the supervising contractor for one of the responsible parties (RPs) at a Superfund site in central Michigan. Initially, GZA evaluated data generated over 20 years by numerous consultants for the site that resulted in a significant shift in interpretation of site hydrogeological conditions which negated the planned move to more aggressive remedial action. Due to the change in understanding of site conditions, GZA made a formal presentation to the Michigan Department of Environmental Quality (MDEQ) and USEPA and eventually received agency concurrence and saved the RP \$1MM in capital costs to upgrade the groundwater remediation system. Following an extensive evaluation of the groundwater remedial action for compliance with the Consent Decree and Record of Decision (ROD), GZA proposed replacing the active groundwater remedial action with a MNA remedial scenario. The groundwater pumping system was shut off and groundwater monitoring performed during a one-year pilot test. Based on the results of the pilot test, the ROD was amended in 2011 to implement a MNA remedial action to meet mixing zone Groundwater-Surface Water Interface Criteria at the surface water discharge, establishment of Alternate Concentration Limits over the groundwater plume to the discharge point and institutional controls over the plume. By 2025, the amended ROD will have saved the RPs more than \$2.5MM.

Senior Project Manager, Site Investigation/Remediation, 70-Acre Brownfield/Industrial Site, Confidential Client, Central Pennsylvania. In 2012, GZA obtained closure for a 70-acre industrial facility with 100 years of industrial activity and more than 60 individual chlorinated solvent release areas. The closure was conducted under the Commonwealth of Pennsylvania Brownfield development program (Act 2) after conducting a comprehensive site characterization and MNA groundwater monitoring. Closure was obtained with minimal active site remediation due to demonstration of limited ecological and VI risk from widespread TCE contamination across the site and the implementation of institutional controls. Closure and client release of liability were obtained for a budget of less than \$1M compared to the \$6.5M pre-sale environmental reserve that had been established by another consultant at the time of sale. Subsequent recent environment activities in 2018 have included managing soil during site redevelopment and ensuring compliance with the conditions of closure.

Senior Project Manager, Remediation, 10-Acre Brownfield/Industrial Site, Confidential Client, Eastern Michigan. GZA has performed several phases of investigation and corrective action at a 10-acre Brownfield site that was formerly an industrial facility with about 60 years of industrial activity and subject to RCRA. The cleanup was performed under an Order of Consent from the USEPA. The site was prepared for development and the cleanup subject to State of Michigan Part 201 clean up criteria. The primary risk pathways applicable for the site consist of ecological risk due to metals in soil and metals and VOCs in groundwater discharging to the river that borders the site and VI risk related to VOCs, primarily TCE, in homes that border the site and possible future homes built on the site.

Senior Project Manager, Remediation and Monitoring, Former Cool City Cleaners, Two Rivers, Wisconsin. GZA performed remedial actions consisting of MNA groundwater monitoring, PCE vapor assessment and mitigation, and ERD using emulsified oil at a former dry cleaner under Wisconsin's Drycleaner Environmental Response Fund (DERF). Releases of Stoddard Solvent and migration of petroleum contamination onto the site provided organic carbon substrate for reductive dechlorination of PCE. However, following an increase in cVOCs in a monitoring well downgradient of the PCE source area, emulsified vegetable oil (EVO) was injected into the aquifer to further ERD. Based on the results of post-injection groundwater monitoring, a closure request was prepared and closure with the site placed on the soil and groundwater GIS registries was obtained in 2010.

Senior Project Manager, Site Remediation and Monitoring, Confidential Client, South-Central Wisconsin. GZA reviewed almost 15 years of data gathered by another environmental consultant at a site in which an estimated 500,000 pounds of solvent had been released to the surface. The site had undergone about 10 years of active soil and groundwater remediation under Wisconsin's voluntary action program. GZA documented previous site activities and lack of cleanup progress and successfully convinced the Wisconsin Department of Natural Resources (WDNR) that continued operation of the expensive and aging remediation system was not warranted. GZA also identified an improperly constructed well that indicated the false identification of contamination in the regional aquifer and resulted in an incorrect interpretation of the contaminants' migration potential



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through the low permeability till into the regional aquifer. Given the technical impracticability of source remediation with the current state of remedial technologies, a low technology remedial approach consisting of groundwater monitoring and ERD in the sandstone aquifer was proposed and accepted by the WDNR. Continued evaluation of source remediation is being performed on a five-year basis. The change in remedial strategy resulted in substantial savings to the RP of about \$1M over 10 years. Implementation of ERD through organic carbon injections began during Summer/Fall 2004, with positive response. A follow-up organic carbon injection and groundwater monitoring were performed in Fall/Winter 2008/2009. Recent sampling results (2017) indicated sustained TCE degradation in the source area of the site.

Senior Project Manager, Pre-Acquisition Due Diligence, Site Characterization, Remediation and Post-Remediation Groundwater Monitoring, Confidential Client, Central Wisconsin. GZA performed complete turn-key services for the buying party of a manufacturing facility in central Wisconsin that performed plating operations. Due to the detection of chlorinated solvent in the soil and groundwater of the Site during a Phase II Environmental Site Assessment (ESA) and the presence of a municipal water supply well within 500 feet of the site, GZA provided a pre-acquisition remedial estimate to closure of \$1.3M. As part of the sale, an escrow account was established for the estimated cost of investigation and remediation. GZA performed site investigation and remediation activities between 1995 and Fall 2002, and post-remedial groundwater monitoring through 2007. GZA also assisted client with contaminated soil management and underground storage tank (UST) issues discovered during several post-acquisition building phases. Total environmental cost from pre-acquisition of closure, including environmental activities related to building phases, was less than \$550,000 resulting in savings of about \$750,000 from the initial pre-acquisition remedial estimate. WDNR issued a closure letter for the site in 2007.

Senior Project Manager, Groundwater Assessment for Tritium at a Nuclear Power Plant, Southern United States. In 2006 and 2007, GZA performed a review of various plant systems for the potential for an unmonitored release of impacted or potentially impacted liquid-containing radionuclides in support of the facility's Groundwater Protection Initiative. The potential for unmonitored releases was combined with the site's hydrogeological conditions and potential receptors to make recommendations for upgrading the site's groundwater monitoring system. Recommendations were also made for collecting additional information to close data gaps identified during the evaluation of site information.

Senior Project Manager, Commercial Brownfield Site Development, Altman, Kritzer & Levick, S.C., Madison, Wisconsin. In 1996, GZA performed pre-acquisition due diligence activities on two adjacent commercial and industrial properties with documented soil and groundwater contamination. The environmental work was performed under Wisconsin's Voluntary Party Liability Exemption (VPLE) program for redevelopment of a Brownfield property. GZA identified several environmental conditions on the combined properties, the most significant consisting of a release of PCE from a former dry cleaner requiring source remediation. GZA assisted the site developer with the preparation of a Wisconsin Department of Commerce (Commerce) Brownfield Development Grant, which resulted in the award of a \$750,000 grant that could be used for development of the site. GZA performed a "not-to-exceed" lump sum remedial action of the PCE source area during construction at the site and performed two years of groundwater monitoring to establish downward contaminant trends in the groundwater system after source remediation. The site received a conditional Certificate of Completion under the VPLE program in 2001, and final closure after placement of the Site on Wisconsin's groundwater GIS registry in 2004.

Senior Project Manager, Site Characterization and Remediation, Sunnyside Mobil, Neviaser Investments, Janesville, Wisconsin. GZA managed the characterization and remediation of a leaking UST (LUST) site with free-product present in dolomite and sandstone bedrock several hundred feet upgradient and up to 400 feet downgradient of the former USTs. Free-product thicknesses were measured at over 2 feet at depths of more than 50 feet. Twelve of the 32 monitoring wells (nine screened in the dolomite and 23 in the sandstone) installed during the investigation were found to have had measurable free-product. Factors complicating the site investigation and remedial action included very large-scale fluctuations in the depth to water in the sandstone (up to 14 feet), upgradient migration of contamination (petroleum product migration above the water table in the dolomite), two aquifers impacted, two adjacent closed LUST sites with commingled contamination, fracture flow in the dolomite, separate and isolated groundwater flow systems between the sandstone and the dolomite, and a separate dissolved-phase PCE plume comingling with the petroleum contamination. WDNR complimented GZA for its efficient performance of the site investigation and the conclusions made given the complicating geological factors at the site. Due to the technical impracticability of free-



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product removal in the sandstone and dolomite and the lack of known receptors to the contamination, GZA successfully argued for a low-tech approach to site remediation consisting of passive product collectors and MNA monitoring. The Site received closure in 2006, following free-product collection and groundwater monitoring to support the MNA remedial option.

Senior Project Manager, Site Investigation, Closure, New Waico Development Co., LLP, Milwaukee, Wisconsin. GZA evaluated soil and groundwater conditions in this two-block, multi-family housing development in 2002. As part of the pre-acquisition environmental activities, GZA evaluated Phase II ESA results performed by another environmental consultant and provided "likely" and "worst-case" environmental liability estimates for the buyer, its lending institutions, and Commerce's WHEDA program. The "worst-case" environmental liability estimate was required by the WHEDA program as a condition of providing financing for the acquisition. Based on the very limited Phase II ESA data, GZA's "likely" and "worst-case" total investigation and remediation estimates were \$90,000 and \$720,000, respectively. After completing further environmental investigation activities and evaluating site risk, GZA requested site closure from WDNR. GZA obtained a No Further Action (NFA) letter for the owner of the site in Summer 2003. In Fall 2003, the site was placed on Wisconsin's soil GIS Registry and a Deed Restriction was placed on the property specifying site maintenance conditions requirements, as detailed in a cap maintenance plan prepared by GZA. GZA was able to complete the environmental investigation through closure for a cost of less than \$40,000 resulting in savings of about \$50,000 and \$680,000 from the "likely" and "worst-case" environmental cost estimate, respectively.

Senior Project Manager, Site Characterization and Remediation of a Federal RCRA Site, Confidential Client, Eastern Tennessee. Managed site investigation, remedial action and risk assessment activities associated with a ¼-mile long chlorinated solvent and plating metals groundwater plume beneath industrial and residential properties originating from a plating operation. Geological conditions consist of sand and gravel over karst limestone and significant dense, non-aqueous phase liquid (DNAPL) was detected beneath former process areas of the plant. A \$750,000 groundwater recovery system was installed at several locations on the site and 1,000 feet off the site to remove contaminated groundwater, achieve hydraulic control and restore the condition of the groundwater at off-site locations. Site work was performed under Tennessee Department of Environmental Conservation, Resource Conservation and Recovery Act (RCRA) Section, and USEPA.

Senior Project Manager, Milwaukee World Festival Grounds Redevelopment, Milwaukee, Wisconsin. GZA evaluated site-wide environmental and geotechnical conditions prior to two phases of a major reconstruction of the existing Summerfest festival grounds completed between 2001 and 2004. Contamination concerns were focused on the presence of methane, cyanide, polynuclear aromatic hydrocarbon (PAH) and petroleum VOC (pVOC) contamination and the presence of a variety of manufactured gas plant (MGP) and industrial waste/fill that was used to create the land mass several decades ago. GZA obtained a fast-tracked Exemption to Construct on a Landfill through WDNR and prepared a Materials Management Plan (MMP) to minimize off-site transport and disposal of contaminated residues. GZA performed materials management oversight activities to ensure implementation of the MMP during both phases of construction.

Senior Project Manager, Environmental Evaluation for Lakefront Development, Freedom Education Center Wing Addition to the War Memorial Art Museum, Milwaukee, Wisconsin. GZA conducted an environmental evaluation of subsurface conditions during a geotechnical evaluation of the site for the development of this lakeshore facility, including a multi-story parking garage and education wing to the War Memorial. Contamination concerns were focused on the presence of methane at two times the lower explosive limit (LEL) in soil beneath the site and pVOC contamination in the groundwater system. Future development on the site will require minimizing off-site disposal of soil generated during construction activities, obtaining an Exemption to Construct on a Landfill from WDNR, engineering controls for the presence of methane below the planned building and proper management of materials (soil and groundwater) generated during site development.

Senior Project Manager, Site Characterization and Remediation, More than 25 Sites, Various Clients, Southeastern Wisconsin and Illinois. GZA managed the characterization and remediation of numerous LUST sites in southeastern Wisconsin between 1989 and 2011. Site complexities range from minor petroleum releases in clay environments to free-product present in multiple bedrock aquifers at distances of several hundred feet from the UST release area. Remedial technologies implemented have included soil vapor extraction, groundwater and free-product extraction, sparging, excavation and off-site disposal and MNA. The UST sites are



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administered under Wisconsin's PECFA program. PECFA program reimbursements have typically been in excess of 99% after the RP has satisfied the deductible.

Project Manager and Hydrogeologist, Northern States Power Company and James River Corporation Landfills, Ashland, Wisconsin. GZA performed hydrogeological characterization activities in accordance with NR 500 requirements for preparation of Initial Site Reports and Feasibility Reports requiring approval from WDNR. The investigations included soil boring and monitoring well installation, in-situ aquifer testing by measuring groundwater recovery, which required more than six months of monitoring, 2-D groundwater flow modeling and leachate generation calculations. Submission of documentation and subsequent review by WDNR project managers resulted in only minimal follow-up on GZA's part to address WDNR concerns and questions.

HYDROGEOLOGICAL AND GROUNDWATER USE ASSESSMENTS

Senior Project Manager, Confidential Client, Central Wisconsin. In 2014 and 2015, GZA aided a sand mine operator with the assessment of hydrogeological conditions and potential for detrimental impacts to area water wells and wetlands from the proposed operation of a 1,500-acre sand mine in central Wisconsin. Hydrogeological conditions were assessed through soil borings and production wells and multiple large-scale pumping tests and 3-dimensional (3D) MODFLOW groundwater modeling. The 3D groundwater model was used to evaluate various mine plan scenarios to minimize groundwater impact to water supply wells and surrounding wetlands and evaluate wetland mitigation options.

Senior Project Manager, Confidential Client, Livingston County, Kentucky. In 2013 and 2014, GZA aided a limestone mine operator in Livingston County, Kentucky with an assessment of hydrogeological conditions as they relate to groundwater inflows to the mine and stability of the mine floor due to uplift pressure from deeper aquifers. Plans were made to conduct a very high capacity, long-term pumping test to obtain the parameters to allow a safe and economic development of the mine to greater depths in the limestone formation.

Senior Project Manager, Confidential Client, Manitowoc County, Wisconsin. From 2013 through 2017, GZA has been aiding a limestone mine operator in Manitowoc County, Wisconsin with an assessment of hydrogeological conditions as they relate to potential groundwater impact of a horizontal mine expansion. Predictions of groundwater drawdowns were made based on the impact to groundwater of the existing mine. Upon obtaining a conditional use permit to expand the mine, a well protection plan was developed and offered to area property owners and a groundwater monitoring network established to assess groundwater-level changes as the horizontal expansion proceeded.

Senior Project Manager, Confidential Client, Sevier County, Tennessee. In 2010 and 2011, GZA conducted a hydrogeological assessment of an existing limestone mine in a karstic region of Sevier County, Tennessee. Very high groundwater inflows were occurring in the mine, which was affecting the depth to which mine development could feasibly occur. Modifications were made to the development plans based on GZA's assessment of area hydrogeological conditions.

Senior Project Manager, Linnerud Development, Stoughton, Wisconsin. In 2007 and 2008, GZA performed a hydrogeologic assessment of the groundwater/storm water basin for the area of the proposed Linnerud Development in order to evaluate the potential impact of the development's storm water plan on the nearby Virgin Lake basin. The pre-developed conditions of a primarily internally-drained site needed to be maintained after development. GZA aided the engineer in the design of site infiltration in accordance with WDNR's Conservation Practice Standard 1002 *Site Evaluation for Stormwater Infiltration*. GZA performed drilling services and reviewed geotechnical boring logs (more than 150 borings were drilled to support the analysis) and performed grain-size analyses and conducted double-ring infiltrometer testing in the various proposed infiltration basins.

Senior Project Manager, Phantom Lake Management District, Town of Mukwonago, Wisconsin. In 2005, GZA performed a hydrogeologic assessment of the Upper Phantom Lake groundwater/surface water basin for the Phantom Lakes Management District (PLMD) Board in order to evaluate the potential impact of pumping from a proposed Village of Mukwonago municipal water supply well located within 1,000 feet of the southern border of Upper Phantom Lake. GZA also provided recommendations to the PLMD and the Village of Mukwonago for pumping test protocols on a test well in 2007, to better assess potential impacts to the lake and an opinion on the potential to impact the lake based on pumping test results. GZA also provided recommendations to the PLMD in 2012, for conditions for the operating permit by the Village of Mukwonago.



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Senior Project Manager, Pabst Farms, Town of Summit, Wisconsin. In 2005, GZA performed an evaluation of the potential effect of stormwater management on the groundwater system and numerous flow-through lakes at the Aurora Hospital proposed for the Pabst Farm property. GZA performed its evaluations using information from United States Geological Survey (USGS) topographic maps, area domestic well construction reports, Wisconsin Geological Survey and Southeastern Wisconsin Regional Planning Commission (SEWRPC) hydrogeologic reports, and large-scale pumping tests. GZA's assessment of potential impact to groundwater and surface water was performed with the aid of a ModFlow model constructed for a 16 square-mile area surrounding the site. The evaluation was successful in showing the negligible impact of the proposed site development on the groundwater system and surrounding lakes through the proper management of storm water.

Senior Project Manager, Numerous Residential Developments, Town of Richfield, Wisconsin. During 2006 through 2010, GZA performed evaluations of the likely effect water usage from several proposed residential and commercial developments had on the local groundwater system and surrounding surface water bodies. GZA performed its evaluations using information from USGS topographic maps, Wisconsin Geological Survey and SEWRPC hydrogeologic reports, area domestic well construction reports and incorporated applicable requirements and provisions of the Town of Richfield groundwater protection ordinance, Chapter 59 of the Richfield Municipal Code. GZA's assessments of potential impact to groundwater and surface water were performed by comparing pre-construction to post-construction site infiltration characteristics and water demands and sanitary water return (on-site septic systems) to the area aquifer.

Senior Project Manager, Non-Metallic Mining Industry, More than 15 Sites in Southeastern Wisconsin and Northern Illinois. GZA evaluated the feasibility of carbonate bedrock quarry and sand and gravel pit dewatering, predicted impact of dewatering activities to local wetlands, aquifers and water levels in area domestic wells for numerous sites in southeastern Wisconsin between 1993 and 2010. Site activities have included test well installations, monitoring well and soil boring installations, test pumping and groundwater modeling. GZA has provided professional opinions and answered questions from members of zoning and planning boards and the public in public forums as part of the property re-zoning process or issuing of Conditional Use Permits.

GEOPHYSICAL INVESTIGATIONS

Senior Geophysicist, Numerous Wisconsin and Illinois Municipalities. Performed seismic refraction and resistivity sounding surveys to evaluate sand and gravel aquifer development potential and to optimize test well drilling locations.

Senior Geophysicist, Numerous Wisconsin and Illinois Municipalities. Performed seismic refraction, azimuthal resistivity, electromagnetic profiling and geothermal surveys, and aerial photography interpretation to evaluate the potential for fractured bedrock aquifer development.

Senior Geophysicist, Numerous Sites, Iowa, Illinois, Michigan and Wisconsin. Performed magnetic, magnetic gradiometer, electromagnetic, ground penetrating radar, time-domain electromagnetic, and seismic refraction surveys at environmental sites to detect buried metallic objects, groundwater contamination plumes, geologic characteristics and subsurface disturbed zones.

Project Geophysicist, Southeastern Pennsylvania. Performed seismic refraction depth to bedrock surveys at sites considered for commercial development in southeastern Pennsylvania. Surveys were performed to allow adjustments to site layout plans to minimize the requirements for bedrock excavation to achieve site grades and to estimate the costs to construction related to requirements to excavate bedrock.

GROUNDWATER-SUPPLY INVESTIGATIONS

Project Manager, Sand and Gravel Aquifer Exploration for Wisconsin, Illinois and Iowa Municipalities. Performed evaluations for sand and gravel aquifer development by conducting surface geophysical surveys, test drilling and well installation, test well pumping and water sampling. The assessments were performed for municipalities including the Village of Tigerton (**resulted in the highest capacity production well in the Village by 50% and best water quality in the Village**), Town of Bristol, City of Mosinee, Town of Weston and City of Kiel, Wisconsin; City of West Des Moines and Newton, Iowa; St. Charles and Oswego, Illinois; Sioux Falls, South Dakota; and Omaha, Nebraska.



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Project Manager Fractured Bedrock Aquifer Exploration for Wisconsin, Illinois and Iowa Municipalities. Performed aerial photography interpretation and surface geophysical surveys, test drilling and well installation, and test well pumping to evaluate the potential for fractured bedrock aquifer development. The assessments were performed for municipalities including the City of Kiel, Wisconsin (**resulted in the highest capacity production well in the City by more than 200%**), Town of Bristol, Town of Pewaukee and City of Plymouth, Wisconsin; Village of Roland, Iowa; and Town of Bolingbrook, Illinois.

Senior Project Manager, Fractured Bedrock and Sand and Gravel Aquifer Exploration for Irrigation Wells in Wisconsin, Illinois and Iowa. Performed exploration services, as described above, for irrigation water supply for private entities consisting of golf courses and greenhouses.

Senior Project Manager, Groundwater Use Assessment, Industrial and Housing Developments in Southeastern Wisconsin. Assessed the impact of groundwater pumping from the Niagaran dolomite aquifer of proposed developments on existing domestic wells adjacent to the proposed development. Services included review of existing hydraulic information, digital modeling of the proposed groundwater use, and presentation of results at public meetings.

GROUNDWATER FLOW MODELING

Senior Project Manager, Confidential Client, Central Wisconsin. In 2014 and 2015, GZA conducted a 3D MODFLOW groundwater modeling for development of a 1,500-acre sand mine in central Wisconsin. The 3D groundwater model was used to evaluate various mine plan scenarios to minimize groundwater impact to water supply wells and surrounding wetlands and evaluate wetland mitigation options.

Senior Project Manager, Proposed Quarry, Northern Illinois. Managed the performance of a 3D MODFLOW groundwater flow model in 2006, to assess the effect of quarry dewatering on the local groundwater system and area domestic wells.

Senior Project Manager, Institutional Development, Waukesha County, Wisconsin. Managed the performance of a 3D MODFLOW groundwater flow model in 2005, to assess the effect of various storm water management options to the local groundwater system and nearby lakes.

Senior Project Manager, CERCLA Site, Confidential Industrial Client, North-Central Iowa. Managed the performance of a 3D groundwater flow model in 1993, consisting of MODFLOW to assess risk of contaminant migration from a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site to receptors (consisting of a municipal water supply well and surface water body) and to optimize groundwater extraction and hydraulic containment remedial scenarios.

Senior Project Manager, Manufacturing Facility, Amana Appliances, Middle Amana, Iowa. Performed 3D contaminant groundwater flow model in 2000, consisting of MODFLOW and MT3D to assess risk of contaminant migration from an industrial site containing chlorinated solvents and petroleum product to a municipal water supply well and potential groundwater recovery scenarios.

Senior Project Manager, Natural Gas Compressor Stations, Several Michigan Sites. Managed 3D contaminant groundwater flow model in 2003, consisting of MODFLOW and MT3D to assess risk of contaminant migration to receptors and potential for off-site migration of contaminants.

Senior Hydrogeologist, Payne and Dolan and Various Developments, Southeastern Wisconsin. Managed 2-dimensional (2D) and 3D groundwater flow modeling from 1989 to 2000, to predict the impact of proposed quarry dewatering at numerous sites in southeastern Wisconsin using MODFLOW to simulate the regional dolomite aquifer.



Jesse D. Graham, P.E.

Geotechnical Engineer/Project Manager

Education

B.S., 2004, Geology and Geophysics,
University of Wisconsin-Madison

B.S., 2005, Geological Engineering,
University of Wisconsin-Madison

M.S., 2010, Civil Engineering, Arizona
State University-Tempe

Licenses & Registrations

Professional Engineer,
Wisconsin, No. 41826-006
Illinois, No. 062.065431
Arizona, No. 51568
Washington, No. 47865
Oklahoma, No. 27644
Minnesota, No. 52217
Texas, No. 127131

Areas of Specialization

- Subsurface Characterization
- Shallow and Deep Foundation Analysis
- Retaining Wall Analysis & Design
- Geotechnical Instrumentation
- Geophysical Testing
- Pavement Design

Summary of Experience

Mr. Graham has been involved in geotechnical engineering and engineering geology projects for over 15 years and has conducted many investigations for deep and shallow excavations, building foundations, retaining walls, highways, bridge structures, tunnels, storm water detention and infiltration structures, and other civil works projects. His experience includes subsurface improvement and characterization for geotechnical and environmental projects using both invasive and non-destructive testing methods in both soil and rock conditions.

Relevant Project Experience

SUBSURFACE IMPROVEMENT

Earthen Embankment Grouting, Confidential Client/Site, Northwestern Ohio. Mr. Graham designed a grouting program for an existing earthen embankment for a tailings pond at an operating mine in northwestern Ohio. The grouting program was designed to retard movement of groundwater through an existing open-graded toe-drain. Mr. Graham developed the grouting program and wrote project specifications for the program. Mr. Graham later aided in the onsite quality control/quality assurance program, including documentation of grouting volumes and pressures and material testing.

Slurry Cut-off Wall, City of Surprise Department of Public Works, Surprise, Arizona.

Mr. Graham aided in the design of a soil mixing/downhole grouting program for the construction of a slurry cut-off wall at an existing wastewater treatment facility in Surprise, Arizona. Mr. Graham aided in the subsurface investigation, laboratory testing and design specifications for a bentonite/cement slurry injection to isolate various cells of the treatment facility. Mr. Graham aided in the development of bentonite/cement/water ratios for use in the field program. Mr. Graham provided review services as an owner's representative for contractor submittals and third-party quality control/quality assurance submittals.

Earthen Embankment Grouting, Confidential Client/Site, Southcentral Oklahoma.

Mr. Graham designed a grouting program for a new earthen embankment for a tailings pond at an operating mine in southcentral Oklahoma. Grouting was related to both the embankment footprint and tie-in locations and was designed to inhibit flow of water through and around the footprint and edges of the embankment. Mr. Graham developed the grouting program and wrote project specifications for the program. Mr. Graham later aided in the onsite quality control/quality assurance program, including documentation of grouting volumes and pressures and material testing and review of third-party quality control/quality assurance submittals.

SUBSURFACE CHARACTERIZATION

Soil and Bedrock Evaluation, Des Plaines River Combined Sewer Overflow Tunnel Project, City of Joliet, Illinois. Work at this site included sampling and geotechnical classification of unconsolidated terrestrial and marine soil deposits and underlying dolomitic bedrock. Seven borings were completed along the alignment of a proposed tunnel for geotechnical considerations for construction of a combined sewer pipe under the Des Plaines River. Five borings were drilled from a barge platform in the river and



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the remaining two borings at the east and west banks of the river. Detailed observation and classification were utilized to determine the depth of overburden and the soundness of the underlying bedrock for potential tunneling use. Mr. Graham collected samples and conducted additional laboratory testing to determine the engineering characteristics of the native soils and bedrock.

Fill and Native Soils Evaluations, Century City Development, Milwaukee, Wisconsin. Mr. Graham worked with the Redevelopment Authority of the City of Milwaukee (RACM) to help characterize soils at the Century City site in north-central Milwaukee for development of several commercial buildings. The site had a long history of previous development that resulted in several areas of undocumented fill and remnant subsurface construction. Mr. Graham worked with the City and the developer to evaluate the fill and subsurface conditions to expediate grading and construction at the site.

Aggregate Source Evaluation, Desert Claim Wind Project, enXco, Ellensburg, Washington. Work at this site included sampling and classification of sand, gravel, and cobble deposits at the eastern base of the Cascade Mountains in central Washington for possible development of and a gravel source for concrete and general aggregate use as part of the Desert Claim Wind Project development. Detailed observation and classification were utilized to determine the depth of overburden and the usefulness of the underlying sand, gravel, and cobble deposits for potential use. Mr. Graham collected samples and conducted additional laboratory testing to determine the engineering characteristics of the native soils.

Confidential Frozen Subsurface Conditions Evaluation, Milwaukee, Wisconsin. Mr. Graham worked with a public utility to determine the extent and condition of subsurface soils in an area that had been subjected to ground-freezing prior to Mr. Graham's involvement in the project. Mr. Graham oversaw the drilling of several soil borings in the frozen zone and developed site-specific soil sampling techniques to aid in understanding of the frozen soils. Furthermore, Mr. Graham aided in plan development and installation of several types of geotechnical instrumentation to provide long term monitoring of the subsurface conditions.

GEOTECHNICAL FOUNDATION AND RETAINING WALL ANALYSIS

833 East Development, Milwaukee, Wisconsin. Mr. Graham was the lead field engineer and aided in the analysis and report writing of a proposed new multi-story skyscraper to be located in downtown Milwaukee. Field work included multiple deep borings (approximately 100 feet below ground surface [bgs]) and associated pressuremeter testing to determine the maximum allowable bearing capacity for the proposed structure. Pressuremeter analysis performed by Mr. Graham allowed for significantly increased bearing capacities and negated the need for deep foundations. Analysis indicated that the proposed structure could safely be supported on a combination of shallow spread-type footings and a large mat-type foundation.

The North End Phase III, IV and IV, Milwaukee, Wisconsin. Mr. Graham was the lead field engineer and aided in the analysis and report writing of a proposed new, multi-story, residential and commercial development to be located in Milwaukee. Field work included multiple borings and review of previous field work conducted at the site by GZA and other firms. Mr. Graham aided in development of recommendations for the driven-pile deep foundation system, earth retention and dewatering of the excavation at the site. Ongoing field work during construction included analysis and recommendations for urban fill removal and repair of damaged subgrade soils. New sheet-pile retaining walls were included in the development along the Milwaukee river as part of the new Riverwalk.

Palouse Wind Farm, Whitman County, Washington. Mr. Graham was the geotechnical engineer of record for a 56 wind turbine generator (WTG) and associated substructures project in eastern Washington. As lead field and project engineer/manager, Mr. Graham coordinated the field work activities and drilling directions. Mr. Graham or peoples under his direct supervision were responsible for drilling over 100 borings utilizing both soil and rock coring techniques in a 12 square-mile area. Mr. Graham analyzed the field and laboratory data to provide recommendations for the development, including WTG foundation design parameters, paved and aggregate (gravel) roadway design, foundation design for transmission line towers, electrical soil resistivity analysis for electrical grounding, seismic design characterization and recommendations regarding ancillary buildings and earthwork throughout the project. Mr. Graham's design was submitted to a third party, Garrad Hassin (GH) Review and was determined to be free of errors and returned with zero comments. Analyses included bearing capacity, settlement (both soil and fractured bedrock),



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soil reaction to cyclical loading, moduli calculations and electrical resistivity computations. Mr. Graham also provided in situ testing criteria related to geotechnical criteria during the construction process.

Sheet Pile Retaining Wall, Near Hager City, Wisconsin. Mr. Graham was the lead field engineer and field manager for the design and construction oversight for a new ~1,600-foot sheet pile retaining wall along an existing railroad track. Mr. Graham's responsibilities included scheduling and organization of field work activities and staffing during construction oversight. Mr. Graham directed drilling operations along the retaining wall alignment and researched additional published work to minimize change order potential during the construction.

West Valley High School MSE-type Retaining Wall, Yakima, Washington. Mr. Graham completed the field work and provided multiple designs for a design-build MSE-type retaining wall as part of an overall campus improvement. The retaining wall was on the order of 175 feet long and up to 19 feet high (exposed height). Perched groundwater required dewatering operations during construction and on-call engineering recommendations at the request of the contractor. Being part of a design-build team, Mr. Graham worked directly with the general contractor to aid in the development of an economical and stable retaining wall, while adapting to a constantly changing financial and aesthetic environment.

Butter Creek Wind Farm Expansion, Umatilla and Morrow Counties, Oregon. Mr. Graham was the lead field manager and provided a majority of the analysis for the expansion of 20 new WTGs at the existing Butter Creek Wind Project located in north-central Oregon. Mr. Graham's responsibilities included scheduling and organization of field work activities. Foundation systems for the WTGs utilized the proprietary Patrick & Henderson (P&H) semi-deep, tensionless foundation system, requiring specific parameters for stable foundation design. In addition to the foundation design parameters, Mr. Graham was also responsible for field work and recommendations regarding development of the roadways, electrical substation and other ancillary construction. Mr. Graham served as the primary author of the final geotechnical report and provided a majority of the design calculations.

Eisenhower High School Replacement, Yakima, Washington. Mr. Graham managed the field investigation and served as a lead author and engineering point-of-contact for the largest publicly-funded project in Yakima in over 20 years. Mr. Graham's responsibilities involved scheduling and conducting a multi-faceted subsurface investigation while school was in session. Mr. Graham worked in team environment to provide a full geotechnical analysis of the site, including foundation design and bearing zone improvement recommendations, providing criteria for disqualification of unsuitable native soils, and recommendations for storm water retention and disposal. Further analysis and recommendations were provided for on-site retaining walls (both cast-in-place concrete walls and MSE-type retaining walls). Mr. Graham served as primary field engineer during the construction process.

White Wings Solar Energy Facility, La Paz County, Arizona. Mr. Graham completed the field work for a proposed (but never completed) experimental solar energy facility located in rural La Paz County, Arizona. Field work activities consisted of over 50 soil borings to depths of up to 100 feet. Settlement tolerances for the primary central tower structure (approximately 60 feet high and with a required allowable bearing capacity of 5 ksf) was limited to less than 1 inch. Geotechnical design provided analysis and recommendations for both settlement analysis for the large central tower structure and uplift resistance for over 100 focusing mirrors. Although the structure was not built (on account of funding issues), significant team-based and value engineering was exercised between the geotechnical, civil, and structural engineering groups. As a staff engineer, Mr. Graham was responsible for subsurface exploration, site characterization and providing geotechnical recommendations.

Arizona State University Dormitories, Tempe, Arizona. Arizona State University (ASU) expanded the student housing facilities in 2003. Mr. Graham toured the existing structures and conducted a thorough subsurface exploration for the proposed new multi-story structures. The proposed dormitories were on the order of 15 stories with basements. Groundwater in the area was on the order of 12 feet bgs, requiring additional dewatering and waterproofing recommendations for the structure. Additionally, the presence of high plasticity (fat) clays required the use of lime-stabilization methods to ensure that floor slabs would not be subject to uncompensated swelling pressures. Mr. Graham performed the complete field investigation and aided in the identification of swelling soils. Mr. Graham aided in the development of settlement analysis and was the primary author on the final geotechnical report.



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GEOPHYSICAL TESTING

48-inch High Pressure Water Main, US Hwy 89, Northern Arizona. A planned 48-inch diameter high pressure water main required exploration of the subsurface along various portions of its transect. Throughout the planned approximately 37-mile transect, several portions were not accessible using standard geotechnical exploration equipment (i.e., drill rigs, back hoes). As a result, a combination of seismic (reflection and refraction), electrical resistivity and ground penetrating radar (GPR) was utilized to explore the soil and rock conditions. Mr. Graham took part in the field investigation, as well as performed the necessary calculations to determine the properties of the rock and soil along the alignment.

Rock Joint Mapping, Private Residence, Phoenix, Arizona. A proposed home was planned for a seismically active mountainside located in Phoenix, Arizona. Several rock outcroppings showing distinct joint orientation were noted in the area, causing the City to initiate rock and joint pattern mapping of the area for any planned development or cuts into the rock face. Seismic refraction and reflection testing were utilized to aid in delineation of inherently weak and/or fractured zones within the subsurface rock. Multi-channel testing with multiple shot locations was utilized by Mr. Graham and his team during the investigation. Information collected from the seismic investigation was analyzed to determine locations of weakness and areas of secondary exploration utilizing rock coring techniques.

Existing Pavement Evaluation, Desert Claim Wind Project, Kittitas County, Washington. Mr. Graham aided in the field work and interpretation of data collected using GPR during evaluation of existing roads for potential haul routes for development of a wind farm in central Washington. Mr. Graham collected data along approximately 23 miles of existing pavement using a pull-behind GPR system. GPR data collected was analyzed and used to determine average thicknesses of asphalt pavements and aggregate base course materials, as well as locations of very shallow groundwater and bedrock.

PAVEMENT DESIGN AND EVALUATION

1005th and State Highway 35 Turn Lane, Pierce County, Wisconsin. Mr. Graham conducted the subsurface investigation and geotechnical analysis for a proposed new turn lane to be frequented by dump trucks and other heavy traffic loads at the intersection of a State Highway and a local rural road in northwestern Wisconsin. Subsurface exploration in the area consisted of several shallow test borings and geotechnical testing of the recovered materials. Geotechnical analysis using Wisconsin Department of Transportation (DOT)-approved methods allowed for a reduction of approximately ½-inch of asphalt concrete pavement.

Miller Ranch Wind Project Haul Road Design, Klickitat County, Washington. Mr. Graham conducted a thorough investigation of existing paved and unpaved roadways and subsurface conditions to determine the life of existing pavements and provide recommendations for new pavements in anticipation of the heavily loaded trucks required for the wind farm development. Mr. Graham determined the existing pavement conditions using a combination of pavement coring and falling-weight deflectometer data. Those areas without existing pavement were subject to subsurface investigation utilizing soil borings (both hand auger and drill rig borings). Mr. Graham utilized the expected loading and trailer geometries to determine the expected equivalent single axle loads (ESALs) for the entire wind farm project and determine what repairs or new designs would be required to provide economical and comfortable travel lanes. Mr. Graham's design was approved without protest by both the County and the wind farm developer and provided suitable driving conditions through the construction process and maintained its integrity following completion of the project.

FedEx Distribution Hub, Hermiston, Oregon. Mr. Graham performed analysis to determine the thicknesses for economical and stable pavements. The facility saw well over 300 trucks during peak periods and was subject to several stopping and turning loads. Mr. Graham analyzed the results of a subsurface exploration to determine appropriate thicknesses for flexible and rigid pavements and base course. As part of rigid pavement design, Mr. Graham also determined reinforcing steel locations and layouts, as well as provided recommendations for construction joint placement.

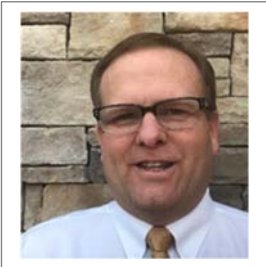
Maricopa County Post Offices, Maricopa County, Arizona. Mr. Graham aided in the evaluation and recommendations for repair and/or replacement to several post offices located within Maricopa County. Mr. Graham observed the paved areas to delineate



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areas of high traffic loading (braking areas, turning areas, loading docks, etc.) and completed several hand auger borings and pavement cores to determine the existing pavement conditions. Mr. Graham, where possible, provided recommendations for repair of worn pavements and replacement of pavements when repair was no longer economically feasible. Mr. Graham's provided cost savings to the client such that he provided continuing on-call services for other post offices in the surrounding areas.



Kevin M. Hedinger

Senior Project Manager

Summary of Experience

Mr. Hedinger has formal training as a hydrogeologist and has 28 years of experience in environmental site investigation, remediation, and project management. He has managed projects ranging from Phase I Environmental Site Assessments (ESAs) to complex remediation projects, including data management and review in support of due diligence for multiple properties, litigation matters, and risk transfer projects. His technical experience primarily includes performing and managing soil and groundwater investigations of organic compounds, management and review of technical information, evaluation of technical information to develop remedial strategies, design and implementation of remedial strategies, data reduction and preparation of technical reports, negotiation with regulatory agencies, interaction and development of client relationships, and overall project management. Mr. Hedinger has been involved in a wide variety of sites including petroleum and chemical storage facilities, railroad properties, Resource Conservation and Recovery Act (RCRA) facilities, and commercial and industrial properties. His work has been focused in Wisconsin for the last 21 years, but prior to 1995, his project experience was focused in the southwestern United States.

Education

B.S., Geology, Ball State University,
Muncie, Indiana, 1989

Post-Graduate Studies, Hydrogeology,
Southern Illinois University, Carbondale,
Illinois, 1989-1991

Areas of Specialization

- Site Investigation Scope and Implementation
- PFAS Investigation and Remediation
- Remedial Design and Implementation
- Chlorinated and Petroleum Hydrocarbon Subsurface Fate and Transport
- Soil and Groundwater Treatment and Disposal
- Due Diligence
- State Leaking Underground Storage Tank Fund Reimbursement

Relevant Project Experience

Overall job responsibilities include managing site investigation and remediation projects for private and municipal clients. In this role, Mr. Hedinger is responsible for managing the project scope, developing the schedule and budget, managing health and safety aspects, communicating with the client, ensuring the work is completed in accordance with the scope of work, interaction with property owners and tenants to complete the work, preparation and review of documents for submittal to regulatory agencies, interaction with the client to address issues on the projects, and overall project management from inception to completion.

Confidential Client, Michigan. Provided environmental oversight and management for the investigation and remediation of PFAS impacts from a former tannery operation and waste disposal sites.

- Reviewed historical information to determine the potential location of potential historic waste disposal sites.
- Field reconnaissance of potential waste disposal areas for evidence of disposal activities. This included performing exploratory field sampling, magnetometer surveys, and installation of temporary monitoring wells in and around the potential areas.
- Provided oversight of the remediation activities to remove waste materials that were historically placed as fill material in ravines. This included coordinating activities with State regulatory agencies, town officials, and landowners for removal of the materials, developing remediation and excavation plans to efficiently remove the material, management of subcontractors performing the excavation and off-site transportation of the material, documenting the work activities, determining the extent of excavation, and oversight of the restoration of the site.



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- Field lead for the USEPA-led investigation of PFAS impacts to soil, groundwater, and sediment from the former tannery operations. This included coordination and implementation of the scope of work, development and implementation of standard operating procedures for sample collection, coordination and training of personnel performing the work, management of the scope of work and sample collection, interaction with the laboratory for sample analysis, data review and report preparation. The investigation was performed on the former tannery property and along the adjacent river. The scope of work consisted of advancing approximately 100 soil boring, collecting 100 sediment samples from 10 transects, and sampling of approximately 60 monitoring wells of varying depths.
- Field lead for oversight of USEPA-led remedial activities at the former tannery site to address the areas of immediate health risk. This included oversight of soil excavation activities in select areas of the property, in areas adjacent to the property and within the river. This included regular interaction with the USEPA on the schedule of activities and progress on remedial activities, coordination and interaction with the contractors performing the excavation activities, oversight of field confirmation sampling, management of groundwater in the excavations, documentation of the field activities and compliance of the remedial action levels, restoration of the excavation areas including the river bank, and data review and report preparation.

Trent Tube, East Troy, Wisconsin. Development and implementation of a remedial strategy, under a guaranteed fixed price arrangement, for a 20-acre industrial property that manufactured stainless steel tube products. Soil and groundwater data collected during the site investigation identified areas affected by metals, chlorinated hydrocarbon, and polychlorinated biphenyls that required remediation. A groundwater extraction system was installed at the site in 1999, to control the off-site migration of the chlorinated hydrocarbons into an adjacent creek. The chlorinated hydrocarbon groundwater plume persisted in the environment from 1999 to 2018. The site was evaluated to determine if a different remedial strategy could be implemented to address the groundwater impacts. In addition, a remedial strategy was developed to evaluate other portions of the site that previously contained wastewater treatment ponds and lagoons. The remedial strategy was developed as a comprehensive solution that considers the site conditions and the proposed development plan. Responsibilities for this project included overall project management, supervision of the groundwater extraction operation and maintenance, management of documents and technical data, coordination of remedial activities with site development contractors, evaluation of fate and transport of chlorinated hydrocarbons in the subsurface, preparation of technical documents for submittal to the WDNR.

Green Tech Station, Milwaukee, Wisconsin. This site was used as a bulk petroleum storage facility in the mid-1900s, and had railroad spurs that crossed the site. The site had a former stream area that was filled. The planned use for the site was an educational park to demonstrate storm water technologies and green infrastructure. This included bioswales, an on-site cistern to store storm water, and areas of trees and prairie plantings. A site investigation was completed at the site and identified petroleum products in groundwater and polycyclic aromatic hydrocarbons (PAHs) in soils. The soil and groundwater data were evaluated with a focus on developing a remedial closure strategy that incorporated the planned site use and institutional controls to satisfy the requirements of NR 700. A soil management plan was submitted to and approved by the Wisconsin Department of Natural Resources (WDNR) to manage excavated soils during construction. The responsibilities on this project included evaluating soil and groundwater data to meet the planned site use, regulatory interaction for the approval of the soil management plan, and oversight of excavation contractors during construction activities.

Various Properties, Milwaukee, Wisconsin. Performed Phase I ESA activities for the Housing Authority of the City of Milwaukee to identify recognized environmental conditions (RECs) and impairment to the properties. This included reviewing historic records and documents and evaluating the site for evidence of environmental impairment.

Former Westinghouse Facility, Milwaukee, Wisconsin. Implemented a soil and groundwater remedial strategy at a former transformer repair facility. The soil and groundwater at the site were affected by various constituents including mixed wastes of petroleum, chlorinated solvents, and polychlorinated biphenyls (PCBs). The technical information collected at the site by three previous consultants was reviewed and used to develop a comprehensive remedial strategy. The remedial strategy was presented to the regulatory agency and approval was granted. The responsibilities on this project included the implementation of the



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remedial strategies and regulatory negotiation, waste disposal characterization and coordination, data and document management, preparation of bid specifications, preparation and evaluation of contractor bids, daily coordination of remediation and laboratory service providers, management of waste disposal documentation, and preparation of technical documentation reports.

Confidential Project, Appleton, Wisconsin. Provided support of a litigation case involving the release of hexavalent chromium in the manufacturing of drilling fluid additives. The manufacturing operations were conducted by multiple parties over the course of approximately 40 years. The litigation matter was initiated by the current operator to recover costs for remedial activities that had been performed from our client, a previous operator of the site. The client requested an evaluation of the appropriateness and necessity of the remedial activities and the development of a cost separation methodology. Responsibilities on this project included management of documents provided by the defendant, a thorough review of the site history and soil and groundwater data collected by other environmental consultants, evaluation of chromium fate and transport in soil and groundwater, development of a reasonable remedial strategy to estimate an appropriate remedial cost for the site, development of several allocation methodologies, and review of other expert depositions for evidence to support the cost allocation methodology. This case was settled with the client making payment for a percentage of the past and future remedial costs in return for indemnification from the current operator for environmental liabilities.

Confidential Project, Wichita, Kansas. Provided assistance in support of a litigation case involving the release of chlorinated hydrocarbons from operations associated with the manufacturing of printed circuit boards. The purpose of the litigation was for the client to recover remedial costs incurred from previous owners and operators of the property. The chlorinated hydrocarbons were released from multiple operations that were relocated as the facility expanded. The client was not responsible for the operation of each of the potential source locations. Responsibilities on this project included managing technical and non-technical documents pertaining to the investigation and remediation of the site, performing a thorough review of the project documentation, identifying potential sources of chlorinated hydrocarbon release, evaluating the distribution of the chlorinated hydrocarbon mass as it related to each of the potential source areas, evaluating the hydrogeological properties of the site as it related to the fate and transport of the chlorinated hydrocarbons in the subsurface environment, assisting with the preparation of a technical opinion report and a subsequent rebuttal report, and assisting in the development of a cost allocation methodology. This litigation matter was favorably settled for the client and significant costs were recovered from the previous owners based on the allocation methodology.

Strip Shopping Center, Elmhurst & Northlake, Illinois. Provided environmental services for properties that previously contained a dry-cleaning operation in Chicago metro area under the Site Remediation Program using the focused site investigation process. Responsibilities on this site were to coordinate activities to complete the site investigation to delineate soil and groundwater impacts, develop a remedial strategy for addressing the soil and groundwater exposure pathways, complete the Tier 2 modeling to document compliance with the remediation objectives, notification to the municipalities regarding residual soil and groundwater impacts, prepare and submit the required regulatory reports to obtain a NFR letter from the regulatory agency, and management of the overall scope and budget.

Maxus Exploration, Spearman, Texas. Performed a subsurface investigation relating to an alleged release of inorganic contaminants from a former salt water injection well near Spearman, Texas. A homeowner adjacent to the former injection well alleged that prior salt water injection activities had adversely impacted the groundwater quality in their potable well. In response, a monitoring well was advanced to approximately 300 feet below ground surface into the Ogallala formation and groundwater samples were collected at six intervals. The results of the well sampling eliminated the former injection well as a source of the impacts on the potable well. Responsibilities on this project included coordinating drilling services at a remote location, supervising the installation of the 300-foot groundwater monitoring, development of the monitoring well, collection and documentation of field data, collection of soil and groundwater samples, management and review of field documentation, and technical data for accuracy and consistency.



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Walgreens Property, Mishawaka, Indiana. Provided environmental services for site investigation in Indiana at a property that was previously operated as a gas station but was currently a Walgreens pharmacy. Responsibilities included developing a scope and budget to complete the site investigation, developing a remedial options report to identify the appropriate remedial actions for remediating the soil and groundwater, providing input on the design of a soil vapor extraction and air sparge system (SVE/AS), coordinating with Walgreens for access to implement the installation and operation of the remediation system, coordinating scheduling, and implementing the SVE/AS system at an operating Walgreens pharmacy, coordinating the operation and maintenance of the SVE/AS system, collecting of air and groundwater samples to monitoring the effectiveness of the system, preparing system performance reports for the client, preparing required regulatory reports, and managing the overall scope and budget.

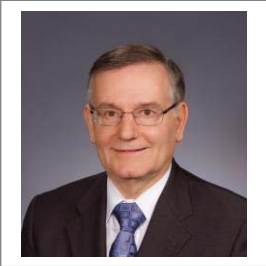
7-Eleven, Cleveland Metro Area, Ohio. Provided remediation services for a site with an existing tenant of the current property owner in the Cleveland metro area at which free product persisted and was hindering regulatory closure of the project. Responsibilities included reviewing the soil and groundwater data that was collected at the site, coordinating the periodic removal of free product from the on-site wells until a remedial plan could be developed and implemented, designing a pilot test to evaluate enhanced fluid recovery as a viable option for remediation of the site, coordinating and implementing an enhanced fluid recovery test, obtaining regulatory approvals for completing the test, reviewing the data and subsequent monitoring to determine the effectiveness of the enhance fluid recovery pilot test, coordinating field and office staff from the Cleveland office to complete the field work and report preparation, negotiation of environmental covenants for the property and one off-site property, and management of the overall scope and budget.

Publications and Presentations

Esling, S.P., McDonald, T., Hedinger, K., Brammer, J., Caudle, R.D., Malinconico, L.L., Jr. *Development of a Methodology for Field Determination, of Hydrologic System Components on Abandoned and Reclaimed Coal Refuse Sites, National Mine Land Reclamation Center, Midwest Region, Final Report, Coal Research Center, Southern Illinois University, Carbondale, Illinois, May 26, 1995.*

Certifications/Training

- 40-Hour OSHA Health and Safety Training
- 8-Hour OSHA Hazwoper Supervisor Training
- 8-Hour OSHA Refresher



James E. Huff, P.E.

Senior Consultant

Summary of Experience

From 1980 through 2016, Mr. Huff was an officer of Huff & Huff, Inc., responsible for projects pertaining to water quality studies including watershed-based plans, 319 grants, stream surveys, wet weather studies, antidegradation assessments, sustainable wastewater treatment designs, and regulatory rule changes. From October 2016, Mr. Huff has served as a Senior Consultant to Huff & Huff, until his retirement in October 2019. A significant part of Mr. Huff's practice area has been assisting both municipal and industrial clients with implementation of Best Management Practices (BMPs) for de-icing practices to protect water quality.

Education

B.S., 1970, Chemical Engineering, Purdue University
 M.S.E., 1971, Environmental Engineering, Purdue University
 Graduate School of Business, 1976, University of Chicago

Licenses & Registrations

Professional Engineer – 1975, Illinois, #062-032933
 Class 2 and Class K Sewage Treatment Works Operator, Illinois

Areas of Specialization

- Water Quality Standards
- Sustainable Wastewater Treatment & Green Infrastructure Wet Weather Design
- Stream Surveys/Antidegradation Analysis
- Soil and Groundwater Remedial Design
- Hazardous Waste Management

Relevant Project Experience

Water Quality: In the area of water quality, Mr. Huff is active in the Chicago Area Waterways, the DuPage River/Salt Creek Workgroup and the Hickory Creek Watershed Planning Group. For the DuPage River/Salt Creek Workgroup, Mr. Huff worked on low dissolved oxygen problems including measuring sediment oxygen demand for the QUAL2k model to evaluating alternative in-stream aeration technologies. He was responsible for the final report on the watershed plans for both the East Branch of the DuPage River and Salt Creek and was responsible for reviewing the QAUL2k modeling work. This work led to the first project by the Workgroup to improve dissolved oxygen, with the design of the Churchill Woods Dam removal, which Mr. Huff was part of the design/permitting team. This work resulted in an *Honor Award for Engineering Excellence* from ACEC-IL and was featured in *Watershed Science Bulletin*. Mr. Huff led a consortium evaluating cold temperature toxicity of chlorides, in anticipation of supporting a new seasonal chloride water quality standard and has prepared a number of BMP plans for de-icing practices, including training of the applicators. Mr. Huff chaired the de-icing committee for industrial users as part of the CAWS Time Limited Water Quality variance effort.

Mr. Huff was the lead reviewer for NIPC/CMAP on water quality impacts of proposed expansions/new discharges in northeastern Illinois from 2004 to 2008. On behalf of the Village of New Lenox, Mr. Huff assisted in the formation of the Hickory Creek Watershed Planning Group, and this work continues assisting with development green storm water projects within the watershed and the implementation of BMPs for de-icing practices and chloride monitoring.

On the Fox River, Mr. Huff was project manager for a group of municipal dischargers on a project to collect and analyze weekly water quality samples along the river, its tributaries, and outfalls at over 30 locations to establish a better database on un-ionized ammonia levels. Mr. Huff has directed fish, mussel, and benthic surveys for industrial, storm water, and municipal wastewater discharges located on the following waterways: Cedar Creek, Deep Run, Flint Creek, Mississippi River, Thorn Creek, North Kent Creek, Tyler Creek, Kishwaukee River, Hickory Creek, Jackson Branch of Jackson Creek, the Chicago Sanitary & Ship Canal, Kaskaskia River, and Casey Fork Creek, and has completed antidegradation studies as part of many of these studies. Thermal studies, mixing zone studies, thermal studies, and diffuser designs have been



James E. Huff, P.E.

Senior Consultant

completed for a variety of clients on large rivers (Mississippi River, Ohio River, Illinois River, and the Des Plaines River) as well as small waterways, using Cormix.

Wastewater Design: Mr. Huff has directed 15 municipal wastewater treatment design projects. In addition, he has designed a number of pumping systems, including the lift stations, controls, and force main designs. These designs included a wide range of features from converting existing facilities to cutting edge P removal systems.

Wet Weather Design: Mr. Huff has also conducted several CSO studies including Long-term Control Plans, Nine Minimum Controls, O&M Plans, and Water Quality Impact Studies. He has completed three CMOM evaluations and two Long-term Control Plans (LTCP) and assisted on a number of other wet weather plans as a sub consultant. Mr. Huff assisted the Galesburg Sanitary District and currently its LTCP is nearing the end of its planned upgrades and was one of the first communities in Illinois to achieve the USEPA presumptive remedy of less than 4 overflow events annually, through the implementation of a number of sustainable projects, including an aggressive foundation drain disconnection program. Mr. Huff also assisted the Village of Hinsdale. A 20-year program was successfully negotiated as part of its LTCP, which includes one 1-million-gallon wet weather tank and extensive sewer separation until the presumptive remedy is achieved. For the Village of Barrington, a value engineering project completed recommended there were more cost-effective ways to eliminate excess flow besides a large holding tank. Extensive modeling work has been followed by extensive smoke testing, installation of overhead sewers with foundation drain disconnections and replacement of a number of key interceptor sections.

Sustainable Solutions: Mr. Huff is a leader in sustainable wastewater issues, with an emphasis on decentralized wastewater treatment approaches or cluster wastewater treatment systems with subsurface discharge for nine residential developers/country clubs, and three temples. These systems are typically 10,000 to 20,000 gpd, utilizing two SBRs, computer controlled, followed by a large leach field allowing for groundwater recharge and more open space within developments. Recently Membrane Bioreactors (MBRs) have been used, with water reuse. The first medical marijuana grower in Illinois was permitted with an MBR followed by using the treated effluent for irrigation in the green house, after ozonation.

Mr. Huff was part of the design team for evaluating three alternative porous pavements for the MWRDGC in 2009, which included the ability to measure water quality from runoff and infiltration, as well as flow rates from the three porous pavements plus a control. Rain gardens have been installed at two facilities and for the Tollway. Mr. Huff assisted with the sustainable stormwater practices for the I-90 exit at Route 47. This project was an ACEC-IL *Honor Award* recipient in 2015. Mr. Huff completed a Facilities Plan Report for a wastewater expansion that included the PACT process to address concerns over endocrine disrupter chemicals, a wetted prairie, a bioswale, and solar, wind, and a novel geo-thermal element associated with wastewater expansions to reduce the carbon footprint. In 2010, a floating island was installed on Cedar Creek and a novel matting material for stream bank stabilization installed to evaluate both from a water quality perspective. Wastewater expansions on two streams with endangered mussels have been successfully permitted by Mr. Huff, requiring extraordinary efforts to assure the preservation of the protected species.

Two novel in-stream aeration systems, using high-purity oxygen on Cedar Creek were designed by the firm, and have operated successfully for over 30 years, as an alternative to advanced wastewater treatment, based on a stream model developed for Cedar Creek.

Experience Prior to GZA

Mr. Huff served on the Illinois Nutrient Technical Advisory Committee, representing the American Council of Engineering Companies – Illinois (ACEC-IL) from 2001 to 2015 and was a member of the Illinois Site Remediation Advisory Committee from 2012 to 2019. From 1987 through 1990, Mr. Huff was a part-time faculty member, teaching the senior level environmental courses in the Civil Engineering Department at IIT-West in Wheaton, Illinois. From 1976 to 1980, Mr. Huff was Manager of Environmental Affairs for Akzo Nobel Chemicals, a diversified industrial chemical manufacturer. At Akzo, Mr. Huff was responsible for all environmental activities at eight plants located throughout the U.S. Technical work included NPDES permitting, extensive treatability studies as well as designing new facilities.

Previously, Mr. Huff was an Associate Environmental Engineer in the Chemical Engineering Section at IIT Research Institute (IITRI). Much of this work involved advanced wastewater treatment development, including applying a combination of ozone/UV



James E. Huff, P.E.

Senior Consultant

treatment of cyanide, PCB's, RDX, HMX, and TNT and the use of catalytic oxidation of cyanide using powdered activated carbon impregnated with cupric chloride in petroleum refinery activated sludge units. At Mobil Oil's Joliet Refinery Mr. Huff was employed as an Advanced Environmental Engineer during the construction and start-up of the largest grassroots refinery ever constructed, responsible for wastewater permitting, training, start-up, and technical support as well as for wastewater treatment system as well as water supply, solid waste, and noise abatement issues at the refinery from 1971 to 1973.

Honors:

- 2012 Purdue University Civil Engineering Alumni Achievement Award
- Omega Chi Epsilon (Chem. Engr. Honorary)
- President's Academic Award
- Graduated with Distinction
- Fellowship from the Federal Water Quality Admin.

Thesis: "Destabilizing Soluble Oil Emulsions Using Polymers with Activated Carbon," Major Professor, Dr. James E. Etzel

Publications and Presentations

"Ozone-U.V. Treatment of TNT Wastewater," E.G. Fochtman and J.E. Huff, International Ozone Institute Conference, Montreal, May 1975.

"Alternative Cyanide Standards in Illinois, a Cost-Benefit Analysis," L.L. Huff and J.E. Huff, 31st Annual Purdue Industrial Waste Conference, Lafayette, IN, May 1976.

"Cyanide Removal from Refinery Wastewaters Using Powdered Activated Carbon," J.E. Huff, J.M. Bigger, and E.G. Fochtman, American Chemical Society Annual Conference, New Orleans, LA, March 1977. Published in Carbon Adsorption Handbook, P.N. Cheremisinoff and F. Ellerbusch, Eds., Ann Arbor Science Publishers, Inc., 1978.

"Industrial Discharge and/or Pretreatment of Fats, Oils and Grease," J.E. Huff and E.F. Harp, Eighth Engineering Foundation Conference on Environmental Engineering, Pacific Grove, CA, February 1978.

"A Review of Cyanide of Refinery Wastewaters," R.G. Kunz, J.E. Huff, and J.P. Casey, Third Annual Conference of Treatment and Disposal of Industrial Wastewater and Residues, Houston, TX, April 1978. Published as: "Refinery Cyanides: A Regulatory Dilemma," Hydrocarbon Processing, pp 98-102, January 1978.

"Disinfection of Wastewater Effluents in Illinois-A Cost-Benefit Analysis," L.L. Huff and J.E. Huff, Illinois Water Pollution Control Association 2nd Annual Conference, Kankakee, IL, May 20, 1981.

"Treatment of High Strength Fatty Amines Wastewater - A Case History," J.E. Huff and C.M. Muchmore, 52nd Conference - Water Pollution Control Federation, Houston, TX, October 1979. Published JWPCF, Vol. 54, No. 1, pp 94-102, January 1982.

"Measurement of Water Pollution Benefits - Do We Have the Option?" L.L. Huff, J.E. Huff, and N.B. Herlevson, IL Water Pollution Control Assn 3rd Annual Conference, Naperville, IL, May 1983.

"Evaluation of Alternative Methods of Supplementing Oxygen in a Shallow Illinois Stream," J.E. Huff and J.P. Browning, IL Water Pollution Control Assn 6th Annual Meeting, Naperville, IL, May 7, 1985.

"Engineering Aspects of Individual Wastewater System Design," J.E. Huff, 22nd Annual Northern Illinois Onsite Wastewater Contractors Workshop, St. Charles, IL, February 27, 1995.

"Total Maximum Daily Loadings (TMDL) and Ammonia Conditions in the Fox River Waterway," J. E. Huff and S. D. LaDieu, Illinois Water '98 Conference, Urbana, IL, Nov. 16, 1998.

"The Illinois Ammonia Water Quality Standards: Effluent Implications & Strategies for Compliance," L.R. Cunningham & J. E. Huff, Illinois Water '98 Conference, Urbana, IL, Nov. 16, 1998.

"Phase II Storm Water Regulations – Compliance Strategies for the Gas Transmission/Distribution Industry," J.E. Huff, American Gas Association 2003 Operations Conference, Orlando, Florida, April 28, 2003.

"Endocrine Disruptors or Better Living Through Chemistry," J. E. Huff, Illinois Association of Wastewater Agencies Fall Meeting, Bloomington, IL, November 14, 2003.



James E. Huff, P.E.

Senior Consultant

"Permitting Wastewater Treatment Plant Expansions in Northeast Illinois in the 21st Century", J.E. Huff, 28th Annual Illinois Water Environment Association Conference, Bloomington, IL, March 6, 2007.

"Lessons Learned from the New Lenox Decision," R. Harsch, R. Sly, and J.E. Huff, Illinois Association of Wastewater Agencies, Annual Meeting, Springfield, IL, March 12, 2009.

"Implementation of Antidegradation in Illinois," J.E. Huff, Indiana ACEC Environmental Business Conference, Indianapolis, IN, September 16, 2009.

"Removal of Low Head Dams to Improve Water Quality and other DuPage River/Salt Creek Workgroup Watershed Management Efforts", J.E. Huff and D. Bounds, IAFSM, Annual Meeting, March 10, 2010.

"Stream Dissolved Oxygen Improvement Study-Salt Creek and East Branch DuPage River," S. McCracken and J.E. Huff, Watershed Science Bulletin, Vol 3, Issue 1, pgs. 17-23, February 2012.

"The Science Behind the Chloride Water Quality Standard", J E Huff, Chicago Area Waterway Chloride Workshop, Oct 29, 2015.

"Municipal Separate Storm Sewer System (MS4) Permit Requirements", J E Huff, APWA Chicago Metro Chapter Expo, May 18, 2016.

Affiliations/Memberships

- ACEC-Illinois (past Environmental Committee Member and Past Chairman)
- ACEC-Illinois (past Board of Directors, Vice President, and Secretary/Treasurer)
- Water Environment Federation Member
- Illinois Water Environment Association
- National Water Well Association



Alycia A. Klueenberg

Senior Scientist

Summary of Experience

Alycia Klueenberg is a senior scientist with experience in wetlands, natural resources, and green technologies. She has over 20 years of experience delineating wetlands in the Chicago region. She has obtained Section 404 permits (nationwide, regional, and individual) for a variety of projects, including transportation, utility, industrial, and commercial or residential development. She is currently the Section 404 permit reviewer at IDOT District 1. Best Management Practices are now a required aspect of wetland permitting; as a result, Ms. Klueenberg has worked with engineers to design BMPs for their site, including infiltration basins, bioswales, and native plantings. Ms. Klueenberg also has extensive experience in invasive species control, habitat restoration and mitigation plan development. In addition, she has completed numerous endangered species surveys and coordinated permits for endangered species impacts when needed.

Relevant Project Experience

NATURAL RESOURCES

- Project Manager for Chicago to St. Louis High Speed Rail Projects. Completed surveys for several species and habitats, including Indiana and Northern long-eared bats, several mussels, prairies, plants, birds, and insects along the proposed Chicago to St. Louis High Speed Rail. Conducted surveys for rusty-patched bumblebee, Hines Emerald Dragonfly, eastern prairie fringed orchid, leafy prairie clover and additional state listed species. Provided endangered species coordination for the corridor. Completed Biological Assessments for the Kankakee River Bridge and the Elwood to Braidwood sections of the project. Coordinated bird surveys along the rail line for two species identified by the IDNR. Included surveys along and within Midewin National Tallgrass Prairie. Developed Conservation Plans for the Eryngium stem borer moth (*Papaipema eryngii*), and several mussels (2012-present).
- Completed the natural resources sections of the Kankakee River Bridge Environmental Assessment and the Elwood to Braidwood sections of the Joliet to St. Louis High Speed Rail (2015-2018).
- Completed a Biological Assessment for the Kankakee River Bridge and the Elwood to Braidwood sections of the Joliet to St. Louis High Speed Rail (2015-2018).
- Project Manager for the Tollway's Environmental Studies Upon Request contract. In charge of managing multiple task orders, budgets, monitoring project status, coordination with the Tollway, and coordination with sub-consultants. To date, over forty task orders have been assigned to several different companies with various environmental topics such as wetlands, water quality, noise, erosion control inspection, vegetation management, and green technology (2007-present).

Education

M.S., 2000, Environmental Science,
University of Maryland

B.A., 1996, Biology and Environmental
Studies with Honors, Hamline University

Licenses & Registrations

Lake County Certified Wetland Specialist,
C-055

McHenry County Certified Wetland
Specialist

Illinois Pesticide Applicator License

Areas of Specialization

- Wetland Delineation/Mitigation Permitting
- Threatened and Endangered Species Studies
- Habitat Restoration
- Constructed Wetland Design

Alycia A. Klunenberg

Senior Scientist

- Completed a habitat assessment and lizard survey for Dunes Sagebrush Lizard for a sand mining project in Kermit, Texas (2018).
- Prepared a Candidate Conservation Agreement with Assurances for the Dunes Sagebrush Lizard (2018).
- Project Manager for Tri-state Tollway Roadway Study Design. Managed and coordinated wetland delineations, tree surveys, special waste BMP design, and environmental permitting. Wrote, coordinated, and compiled environmental sections of the EED and the Master Plan. Wrote, compiled, and coordinated submittal of the Individual Section 404 permit. (2015-2019).
- Project manager for the Tollway's Vegetation Management task order. Managed, coordinated, and implemented restoration tasks at Keepataw, Black Partridge, and Waterfall Glen Forest Preserves as part of the Hine's Emerald Dragonfly habitat restoration for the Illinois Tollway related to the I-355 extension. Tasks included planting created rivulets with 15,000 plugs, numerous herbicide applications within sensitive habitats, and hand pulling/weed whacking of invasive species. Coordinated work with various agencies including the U.S. Fish & Wildlife Service, U.S. Army Corps of Engineers, and the Forest Preserve Districts of Cook, DuPage, and Will Counties. Target species included buckthorn honeysuckle, reed canary grass, common reed, bull and field thistles, garlic mustard, white and yellow sweet clover, and purple loosestrife (2008-2015).
- Project Manager for Natural Gas Pipeline Company of America (Natural) projects. Provide environmental services including wetland/resource screening for maintenance digs and assist Natural in determining whether there are ways to avoid impacts. Prepare wetland permits to the U.S. Army Corps of Engineers and various county agencies (Lake, DuPage, Will, McHenry) for impacts. Provide endangered species habitat reviews. Provide soil, erosion, and sediment control inspections. Provide training to the contractors on identification and avoidance of sensitive species or resources (2008-2015).
- Performed inspections and coordinated with regulatory agencies during construction of a wetland mitigation bank in Lake County, Illinois. Following construction, monitoring, inspections, and restoration recommendations were provided yearly (2004-2012).
- Big Marsh Remediation & Restoration Project, vegetative surveys, outlined recommended preliminary vegetation management and monitoring strategy for Big Marsh in conjunction with the Calumet Open Space Reserve Plan set forth by the City of Chicago, Department of Planning and Development (2010-2012).
- Project manager for a streambank stabilization project in Zion, Lake County, Illinois. The project included wetland delineation, endangered species habitat assessment, and plan development. Obtained permits from Lake County SMC and the COE. Wrote the bid document and construction specifications. Coordinated between the property owner and contractor prior to and during construction (2008-2011).
- Completed field monitoring of Hine's emerald dragonfly (*Somatochlora hineana*; HED) in areas of expected HED activity over or adjacent to rail lines for the Illinois High Speed Rail Project. Identified HED, determined dragonfly density and frequency, including primary (morning) and secondary (evening) activity periods (2010).

WETLAND DELINEATION AND PERMITTING

- In-house wetland permitting coordinator at IDOT District 1. Review wetland permits, plans, and wetland impact evaluations. Facilitate meetings between IDOT and the U.S. Army Corps of Engineers. Coordinated and received over 100 permits since 2016, including several Individual Permits and 401 Water Quality Certifications. Track permits and mitigation (2014-present).
- Wrote, compiled, and coordinated submittal of the Individual Section 404 permit for the Central Tri-State Tollway (2017-2019).



Alycia A. Klunenberg

Senior Scientist

- Prepared Section 404 and Section 401 Permit Applications for six complex crossings on the Chicago to St. Louis High Speed Rail (2015-2016).
- Project manager for the Tollway's I-90 task order. Managed, coordinated, and participated in field delineations and tree surveys of over 40 miles of roadway improvements (2011-2012).

SUSTAINABILITY

- Assisted with BMP and specification development and plan review for I-90 west (2012-2013).
- Assisted with development of the Tollway's "green interchange" at I-90 and IL 47. Presented the Tollway with options for design and provided life-cycle costs for several items including solar, green roofs, reflective roofs, infiltration ponds, and porous pavement. Designed green walls adjacent to buildings. Reviewed infiltration design and native planting plans. Wrote specifications and special provisions (2011-2012).

Experience Prior to GZA

Hey & Associates – Environmental Scientist (2001 – 2003)

STS Consultants, Ltd – Assistant Project Scientist (1999-2001)

Horn Point Laboratory, University of Maryland Center for Environmental Studies – Graduate Research Assistant (1997-1999)

University of Minnesota Plant Biology Department – Laboratory Technician (1995-1997)

Publications and Presentations

- Preparation of 404 USACOE & 401 IEPA Permit Application, IDOT Region One, District One Phase II Design Workshop, September 7, 2017.
- Don't Let Endangered Species Act Requirements Threaten Your Project, AGG1 Online Webinar, November 19, 2015.
- Wetland and Threatened & Endangered Species Training, Various brown bag seminars.

Certifications/Training

- ACEC-Illinois/IDOT Phase I Training. Glen Ellyn, IL. April 2016.
- FERC Environmental Review and Compliance for Natural Gas Facilities Seminar. San Diego, CA. March 2016.
- Advanced Wetland Delineation. UW La Crosse. August 2015.
- Green Roof Plants and Growing Media 401, Green Roofs for Healthy Cities, Washington D.C. (April 2011)
- Wetland Plant Identification, Robert Mohlenbrock course, DuPage County, IL (April 2005, April 2006, May 2010, and May 2013)
- Joliet Junior College Erosion Control 007, Erosion Management Consultants, Inc., 8 hours, Joliet, IL (2009)
- Midwest Interim Regional Supplement for Wetland Delineation workshop via Illinois Soil Classifiers Association (2009)
- Wetland Delineation Manual Supplement/Mitigation Rule, 8 hours, Coralville, IA (February 2009)
- Winter Tree Identification, Morton Arboretum, 18 hours, Lisle, IL (February-March 2004)
- Wetland Delineation Training, 40-hour, Environmental Concern, Inc., St. Michaels, MD (April 1999)



Alycia A. Klunenberg

Senior Scientist

Volunteer Activities

Site Steward at Montrose Point. Organize volunteers, coordinate invasive species removal, and plan workdays (2015-2019).

Illinois Butterfly Monitoring Network, Butterfly Monitor

Affiliations/Memberships

Society of Wetland Scientists

ACEC Tollway Committee

Chicago Park District Montrose Point Volunteer Steward



James C. Novak, PWS

Associate Principal, Senior Scientist

Summary of Experience

Mr. Novak has 31 years of environmental analysis experience associated with a variety of wetlands and natural resources with the last 28 years focusing on these issues for transportation project. Mr. Novak has authored natural resource sections of numerous transportation Environmental Impact Statements (EIS), Environmental Assessments (EA), and other environmental documents. These projects varied in complexity from minor roadway improvements, to lane additions or new road and highway construction. He is pre-qualified as an Environmental Lead for EIS projects with IDOT. He is also pre-qualified in Ecology, Noise, Public Involvement and Technical Writing with IDOT. He has also achieved certification as a Professional Wetland Scientist (PWS) as well as a Designated Erosion Control Inspector.

Education

B.A., 1981, Geography and Environmental Studies, Northeastern Illinois University
 Post Graduate Studies, 1985, Earth Science and Environmental Studies, Northeastern Illinois University

Licenses & Registrations

- Professional Wetland Scientist
- Kane County QWRS - Qualified Wetland Review Specialist November 2004 to present
- McHenry County Certified Wetland Specialist- 2008 to present
- Illinois Licensed Pesticide Applicator – 2005 to present
- Wetland Training Institute, Inc., 40 hours (1991)
- Designated Erosion Control Inspector – 2012 to present

Areas of Specialization

- Section 106 Reports, Section 4(f)
- Wetland Delineation / Mitigation / Permitting
- Constructed Wetland and Habitat Restoration
- Threatened and Endangered Species Studies
- NEPA Documentation/EIS, EA, CE

Awards



Kane County Department of Transportation's Consultant of the Year for 2020 (GZA's Oak Brook office)

Relevant Project Experience

WETLAND PERMITTING/NATURAL RESOURCES

- In-House project manager for Natural Resource studies and permitting for the construction of Longmeadow Parkway in Kane County by the Kane County Division of Transportation. Longmeadow Parkway was one of the five new Fox River bridge crossings studied for the Fox River Bridges Environmental Impact Statement (EIS - 2001). Activities conducted for the Phase 2 portion of the project included Individual Section 404 and Section 401 Clean Water Act permitting, noise studies, and assisting in the development of the NEPA update document. Additional activities included preliminary mussel surveys in the Fox River, surveys with the Illinois Natural History Survey for the newly federally listed endangered Rusty Patch Bumblebee (*Bombis affinis*), and surveys for bald eagles (*Haliaeetus leucocephalus*) and nesting locations. Also assisted with regulatory agency coordination and Section 4(f) issues. (2013 to present)
- In-House Lead for Wetlands and Natural Resource studies conducted for the proposed improvement for an 8-mile segment of IL Rte 62 in Barrington and unincorporated Cook County. Tasks included wetland delineations, surveys for eastern prairie fringed orchid (*Platanthera leucophaea*), historic structure documentation, and environmental expert for Citizens Advisory Group meetings and NEPA/Section 404 Merger meetings. Project will be processed as a NEPA Environmental Assessment (EA). (2018 to present)
- In-House Lead for Natural Resource and noise studies conducted for the proposed roadway improvements for the Tri County Access project in Lake County, Illinois. Tasks included assessment of noise receptors and natural resource issues for the development of feasible alternatives for the project. Presented preliminary findings on natural resources to the Citizens Advisory Group. Will prepare relevant sections of the Draft and Final EIS as the project moves forward. (2018 to present)



James C. Novak, PWS

Associate Principal

- In-House project manager for Phase 3 construction inspection and post construction monitoring for the replacement of two bridges over Mill Creek on LaFox Road in Kane County for the Kane County DOT. Provided contractor training for sensitive natural resources adjacent to the project along with the potential presence of the state endangered Blandings turtle (*Emydoidea blandingii*). Conducted post construction trapping for turtles in 2017 and safely captured and released a Blandings turtle from the project site. Other activities included vegetation management for the right-of-way plantings. (2013 to 2017)
- In-House Lead for Wetlands and Natural Resource studies conducted for the proposed improvements to a one-mile segment of Quentin Road in Palatine, Illinois for the Cook County Dept. of Transportation and Highways. Activities included public involvement with stakeholder groups and the Forest Preserves of Cook County. Technical studies and field activities included the establishment of wells to determine groundwater flow, wetland delineations, tree surveys, and water quality studies. Issues involving the proposed improvement include impacts to forest preserve land, water quality issues related to a nearby wetland bank and state Nature Preserve and potential impacts to wildlife and habitat from the road improvements. Project will be processed as an EA. (2005 to present)
- Designated Environmental Lead for 11-mile proposed improvements to IL Rte 83 in Grayslake and Lake Villa, Lake County Illinois. Proposed improvements studied for IDOT include widening and realignment of the existing two-lane facility. Preparing the EA document and providing peer review and QA/QC for environmental studies conducted by others. Participated in meetings with resource agencies and NEPA 404 Merger meetings. Tracked project schedules and budgets. (2015 to present)
- Designated Environmental Lead for 9-mile proposed improvements to IL Rte 31 in Crystal Lake, Prairie Grove, and McHenry, McHenry County Illinois. Proposed improvements studied for IDOT include widening and realignment of the existing two-lane facility. Prepared the EA document (FONSI completed 2018) Participated in meetings with Citizen Advisory Groups, resource agencies and NEPA 404 Merger meetings. Tracked project schedules and budgets. (1997 to 2017)
- In-House Lead for Wetlands and Natural Resource studies conducted for the Tier 1 Illiana Expressway Draft EIS. Coordinated the development of EIS text for both Illinois and Indiana to combine into pertinent sections of the EIS. Tier 1 Final EIS and Record of Decision (ROD) approved in 2013. Participated in meetings with resource agencies and NEPA 404 Merger meetings. Tracked project schedules and budgets through the Tier 1 process. (2010 to 2013)
- In-House Lead for Wetlands and Natural Resource studies conducted for the Tier 2 Illiana Expressway Draft and Final EIS. Coordinated the development of EIS text for both Illinois and Indiana. Provided QA/QC of technical memoranda for avian resources, riparian corridors, and wildlife corridors. Co-authored Biological Assessment for federally endangered species, submitted to USFWS in February 2014. Also assisted in the development of Indirect and Cumulative Impacts section, Permitting, and Constructive Use issues related to Section 4(f) for the Tier 2 Draft EIS. Continued coordination with resource agency and NEPA 404 Merger meetings. Tracked project schedules and budgets through the Tier 2 process. ROD completed in December 2014.
- Project manager for District 1, Illinois Department of Transportation Various Environmental Services Blanket Contract. Coordinating and scheduling staff for various work orders for wetland delineations for proposed transportation improvement projects. Assisting junior staff in complex delineations for this contract. Providing QA/QC of all reports and results and coordinating with the Department on schedules, budgets, and project priorities. Three contracts have been awarded dating back to 2006.
- Oversaw the development of the wetlands and natural resource sections of the DEIS and FEIS for the 70-mile proposed improvements of US Route 51 from Centralia to Pana in IDOT District 7. Conducted map reviews of wetlands to assist in alternatives development prior to the receipt of the INHS wetland delineations and Biological Resource Review. The use of this review was to provide information for the numerous alternatives for the community bypass locations. Conducted field reconnaissance of wetland locations including seep areas along an ancient glacial moraine.

James C. Novak, PWS

Associate Principal

- Project manager for Metra Wetland Blanket Contract from 2002 through 2014. Tasks include numerous wetland delineations and NEPA document preparation for proposed Metra Commuter Rail expansion and improvements.
- Provided environmental inspection for the 65-acre State Line Wetland Mitigation Bank for Metra. Coordinated agency reviews and approvals for the mitigation bank. Oversaw construction of the wetland bank and provided regular reporting to Metra on progress. Worked with the contractors to resolve issues during construction. Upon completion, regular inspections of the bank were performed to determine if goals were met. Reviewed annual reports prepared by contractor.
- Conducted maintenance activities and delineations of new wetlands at Metra's Antioch Wetland Bank. Continued to monitor this site through 2014 which received full closure from the Corps of Engineers. Maintenance included removal of invasive species with manual removal or chemical herbicide control.
- Developed a wetland prairie/savanna restoration plan for Metra at St. Charles Park District's Campton Hills Park site to meet the requirements of a Corps of Engineers permit. Investigated suitable sites for the eventual translocation of approximately one acre of native prairie from Metra right-of-way to the Campton Hills site. Continue monitoring of the site to determine future maintenance needs.
- Was responsible for technical review of the IDOT Elgin O'Hare DEIS and FEIS. Provided review of the entire DEIS in the first rounds of reviews and then focused on natural resource and wetland sections of the later drafts and FEIS. Involved in mitigation coordination for wetlands due to FAA restrictions on locations of creating natural areas near O'Hare Airport runway fly patterns.
- Conducted permitting task for Stearns Road Extension Project for the Kane County Division of Transportation including the crossing of the Fox River (Fox River Bridge EIS). Submitted permitting documents and coordinated efforts between USACE, IEPA, and Kane County. Obtained Individual Section 404 permit in 2006.
- Project manager for Environmental Inspections for the construction of Stearns Road in Kane County. This includes contractor awareness training for sensitive natural resources in the project corridor including the South Elgin Fen, McLean Blvd. Fen, James Pate Philip State Park, DeSantos Brewster Creek INAI site, and endangered species within the corridor including fishes, mussels, and various plant species. Participated in the mussel surveys and relocation for sections of Brewster Creek and its tributaries. (2007 to 2011)
- Environmental Lead for a CEII environmental review for the proposed reconstruction of the Barrington Road Bridge and roadway approaches over Interstate 90 (Jane Addams Tollway). Major issues related to coordinating special waste review between local agency, IDOT and the Illinois Tollway. Coordination required for the completion of wetland impact section as a result of wetland delineations completed for two separate projects. Resolved potential Section 4(f) issue.
- Provided final QA/QC and technical guidance in preparation of Wetland Technical Report for DEIS for Fox River Bridge Crossings project, Kane County, Illinois, 1997. Prepared response to comments from agencies and public (2001). Co-authored biological sections for DEIS. Conducted Supplemental Wetland delineations for one corridor of the DEIS, including threatened and endangered species survey and locating proximity to proposed roadway, as well as delineation of a hillside/slope fen wetland. Provided Floristic Quality Index compilation for delineated wetlands.
- Project manager for Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) assessment of Upper Salt Creek Watershed. Trained staff to perform wetland and habitat investigations in the field screenings. Staff investigated over 200 areas and reported on existing conditions. Developed a project specific prioritizing system to identify highest priority sites based on a suite of field conditions keying on restoration potential. Goals were to identify areas of highest flood control/water quality benefits in the basin to the MWRDGC. (2008)
- Provided technical guidance and QA/QC oversight for the MWRDGC assessment of the North Branch Chicago River Watershed. Worked with staff to implement the field assessment and rating system developed for the Upper Salt Creek Watershed study for this watershed assessment. In addition to restoration priorities near existing streams, also assessed the ravine communities along Lake Michigan for existing conditions and restoration and enhancement potential. QA/QC of final report. (2009)

James C. Novak, PWS

Associate Principal

- I-294 Tri-State Tollway North – Bioswale Concept development for the Illinois Tollway relative to impacts to Forest Preserves of Cook County (FPCC) land. Developed plans and design of bioswales for water quality treatment of I-294 stormwater runoff. Presented updated bioswale plan to the Tollway and FPCC. Development of conceptual preliminary design of bioswales. Prepared revisions and responses to public and FPCC comments. (2007). Concept plan received Highest Honors Award from ACEC in 2008.
- Provided technical oversight and review during the contract plan/design phase for the Illinois Tollway Bioswale project. Provided comments on plan details and compliance reviews to original plan agreements between FPCC and Tollway. (2009)
- Illinois Tollway – Developed system wide Threatened and Endangered Species Conservation Management Plan for addressing issues related to seaside crowfoot (*Ranunculus cymbalaria*), alkali bulrush (*Scirpus paludosus*), and bog arrow grass (*Triglochin maritima*). For compliance with the Conservation Plan, monitored and maintained the translocated plants and provided annual reports to the IDNR. (2006 - 2010)
- I-294 North – Inventoried individuals of bog arrow grass along I-294 at Illinois Route 22 and Toll Plaza 21. Developed a conservation plan for the translocation of these plants from Tollway right-of-way. Coordinated translocation efforts with Tollway, IDNR, and Chicago Park District and received approval for relocation to selected suitable sites in Chicago Park District sites. Led the field efforts to remove and transplant the individuals to their destination sites.
- Environmental Inspector and Coordinator for preliminary construction activities for the Interstate 355 South Extension. Coordinated field investigations for Indiana bat (*Myotis sodalis*), working with contractors, the Illinois Tollway, and federal regulatory agencies. Coordinated regular agency meetings and provided QA oversight for Section 404 submittals for haul road construction. Identified suitable habitat for Indiana bat along the corridor and assisted in overnight bat mist surveys and conducted overall tree preservation activities for mainline construction. (2004/2005)
- As part of the permitting activities for Interstate 355 South Extension, was part of the coordination team that developed final protocols for construction activities relative to the federally endangered Hine's Emerald Dragonfly (*Somatochlora hineana* - HED). Organized monthly HED coordination meetings with all pertinent agencies and experts. These meetings were initiated in 2005 and continued to 2015. Assisting Huff & Huff staff with issues related to habitat restoration for the HED.
- Coordinated native plantings to provide suitable habitat for the state and federally endangered Hine's Emerald Dragonfly at Keepataw Forest Preserve for the Interstate 355 South Extension. Monitored the progress of the plantings. Provided hands-on assistance in plant installation and also was herbicide applicator for management activities at Black Partridge Forest Preserve adjacent to Keepataw. (2008-2009)
- Prepared Conceptual Mitigation plan for the re-construction of wetland mitigation site owned and constructed by the Illinois Department of Transportation at Route 83 and Gilmer Road, found to be in non-compliance by the Corps of Engineers. Assisted engineers in preparation of grading plans. Designed mitigation site including plant communities and location of water control structures. Formally presented the plan to regulatory agencies at IDOT's annual wetland coordination meeting. Served as liaison between IDOT, Corps of Engineers and the Fish and Wildlife Service. (1997)
- Conducted natural resources inventory and study for proposed improvements to Interstate 80/94 near the Indiana State line including the Illinois Route 394 interchange. (2001)
- Prepared Endangered Species Translocation Plan for two plant species impacted by the Algonquin Bypass (IL Route 31). Surveyed plant locations and assisted in minimization plan. Identified suitable receiving site and assisted INHS and Illinois DNR in actual translocation activities. Coordinated effort with IDOT, INHS, IDNR, McHenry County Highway Dept. and McHenry County Conservation District. (2004)



James C. Novak, PWS

Associate Principal

Publications and Presentations

Lorman Education Services – Wetlands and Wetland Permitting Training Seminars – 2007 to present.

Bioswales for Stormwater/Water Quality Benefit – I-294 – Illinois Water Environment Association (March 2008) Illinois State Floodplain Managers Conference (Feb 2009)



John C. Osborne, P.G.

Senior Principal

Education

B.S., 1985, Geological Sciences,
University of Wisconsin-Milwaukee

M.S., 1991, Geological Sciences,
University of Wisconsin-Milwaukee

Licenses & Registrations

Professional Geologist, Wisconsin, #676

Areas of Specialization

- Subsurface Investigations and Remedial Actions Involving Petroleum and Chlorinated Hydrocarbons
- Hydrogeologic Site Characterization
- Vapor Intrusion Assessment and Mitigation
- Regional Groundwater Flow Evaluation
- Superfund and RCRA Corrective Action
- Commercial and Industrial Site Redevelopment
- Groundwater Resource Assessment

Summary of Experience

Mr. Osborne has performed as Principal-in-Charge or Senior Hydrogeologist/Project Manager for over 25 years in the fields of environmental and groundwater consulting. As the Principal-in-Charge and Senior Hydrogeologist, he has developed technical strategies on a large diversity of hydrogeologic, contaminant transport, and groundwater resource projects. Responsibilities have included the geological and hydrogeological site characterizations and development of defensible conceptual site models (CSMs) in a variety of geological terrains including fractured crystalline and carbonate bedrock systems. He has managed major soil and groundwater contamination investigations associated with chlorinated solvent sites, industrial landfills, hazardous waste releases and bulk petroleum storage facilities; and multi-faceted environmental due diligence support related to the acquisition of commercial/industrial operations and redevelopment of urban properties. Expert testimony in support of litigation has been provided in the areas involving Resource Conservation and Recovery Act (RCRA) Corrective Action and evaluating environmental liabilities related to de-valued contaminated properties, State regulatory violations and professional standard-of-care issues and in evaluation of Vapor Intrusion (VI) systems, VI mitigation effectiveness and VI system monitoring and maintenance. Mr. Osborne also offers a unique blend of technical expertise in hydrogeology and contaminant transport with regulatory negotiating experience that enables the development of sound strategies for site characterization, remediation and closure that effectively manages risk on behalf of the client while establishing a beneficial working relationship with regulators.

Project management tasks have also included remedial investigation/feasibility studies, preliminary and final remedial system design and remedial construction as the prime contractor on National Priority List (NPL) sites. Mr. Osborne has taken active roles in representing clients and presenting technical issues to the United States Environmental Protection Agency (USEPA) and Department of Justice (DoJ), the Wisconsin Department of Natural Resources (WDNR) and many other state regulatory agencies. He offers technical expertise in bridging complex site development issues such as civil engineering, geotechnical, environmental and regulatory concerns that typically characterize Brownfield properties. He has specialized experience in the areas of groundwater flow interpretations and contaminant transport involving the characterization of subsurface impacts from dense non-aqueous phase liquids (DNAPLs) in porous media and fractured bedrock environments. Additional expertise is offered in the design of groundwater isolation and dewatering systems, the integration of surface geophysical methods during site characterization activities and the evaluation of regional groundwater resource and drinking water quality issues. His professional experience is described below.

Relevant Project Experience

Senior Principal, GZA GeoEnvironmental, Inc., Waukesha/Milwaukee, Wisconsin Operations. At GZA, Mr. Osborne manages technical staff and operates as principal-in-charge and project manager for a broad spectrum of environmental and hydrogeological consulting projects. Project sizes vary from NPL and Superfund sites to environmental site assessments (ESAs) and RCRA closure projects. The Milwaukee



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operation, through technical quality and ongoing consideration of the client's perspective, has developed a strong reputation in the consulting field.

RCRA CORRECTIVE ACTION AND NPL/SUPERFUND SITE EXPERIENCE

Principal in Charge - RCRA Corrective Action – Closure of Hoover and Universal Die Casting, Saline, Michigan. Was asked on behalf of a global manufacturer to take over the project management of the closure of the former Hoover manufacturing facility under a Record of Decision from another consultant and provide a stronger negotiation strategy with the USEPA Region V project team. Provided independent data analysis, conducted several additional rounds of data collection to close data gaps, provided RCRA Corrective Action Proposals and are presently in final stages of a revised approach to receive RCRA closure in 2014. Included river sediment evaluations, groundwater analyses, soil data collection and analysis and landfill characterization, remedial strategy development and co-negotiations with USEPA RCRA Department and the Michigan Department of Environmental Quality (DEQ).

Principal in Charge - RCRA Corrective Action – Litigation Support and Expert Witness – Former Hoover and Universal Die Casting, Saline, Michigan. Litigation support in defense of client in Federal Court in an attempt to drive USEPA enforcement action and in support of a RCRA counterclaim. Provided both fact and expert witness depositions and testimony on behalf of client, including three days of Federal Court testimony. Both cases were won resulting favorable settlements on behalf of the client.

Project Manager - RCRA Closure Assessment - The Marley Company, Davenport, Iowa. Performed RCRA Closure activities for a hazardous waste storage area, including geologic and hydrogeologic characterization, infield soil sampling and gas chromatography and monitoring system installation and sampling, preparing the RCRA closure report and conducting meetings and negotiations with USEPA project team.

Principal-in-Charge - NPL Site, Preliminary Investigation and RI/FS Related to Landfilling of Industrial By-Products; Confidential Industrial Client. Managed and oversaw the investigation of groundwater contamination migrating from multiple industrial waste disposal areas in a fractured carbonate aquifer. Investigation techniques included seismic refraction and electromagnetic induction geophysical methods, installation of monitoring wells and physical and geochemical characterization of the groundwater flow system. Reporting to the USEPA Region VII included preparation of a Remedial Investigation (RI) Work Plan, Health and Safety Plan, Quality Assurance/Quality Control (QA/QC) Project Plans and RI/Feasibility Study (FS) Report.

Principal-in-Charge - NPL Site, Remedial Design and Construction to Address Closure of Industrial By-Products Landfilling Areas; Confidential Industrial Client. Managed and oversaw the remedial design plan for the closure of multiple areas where landfilling of industrial by-products had occurred. The design included the preparation of re-grading plans involving the consolidation and capping of disposal areas with natural materials. In addition, the remedy included the design of a pH water neutralization plant capable of treating impacted water at a rate of 300 gallons per minute (gpm).

Project Manager - West Quarry Superfund Site RI/FS and Remedial Design, Mason City, Iowa; Holcim (US), Inc./formerly Holnam, Inc. Performed RI/FS study, remedial design, pilot testing, as well as plans and specifications for the capping and closure of a 119-acre cement kiln dust landfill. Hydrogeologic characterization and determination of the extent of groundwater impacts in a fractured carbonate aquifer. Conducted geophysical surveys, aquifer pumping tests, collected groundwater samples and performed stream gauging as part of data collection activities. Other work tasks conducted included preparing work plans, directing field staff, interpreting chemical and physical data, conducting groundwater flow modeling and performing a risk assessment to evaluate exposure potential to private and municipal wells. Also conducted the FS, and through careful integration of client's interests and regulatory concerns, recommended a remedial strategy that was selected by USEPA and incorporated into the Site Record of Decision. The preliminary and final remedial design phases included the oversight of a technical design for a Programmable-Logic-Controlled hydraulic isolation system, Consent Decree negotiations with the USEPA/DoJ and solicitation and selection of construction bids.

Project Manager - Remedial Construction, West Quarry Superfund Site, Mason City, Iowa; Holcim (US), Inc./formerly Holnam, Inc. Managed the remedial construction as the prime contractor for a \$2.7 million project. Actual construction included the installation of over 220,000 cubic yards (yd³) of clay cap, a bedrock extraction well network with over 7,000 feet of distribution



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pipng and a water treatment facility capable of receiving flows of over 500 gpm with remote monitoring capabilities. Following successful operation of the remediation system, the site was de-listed from the NPL by the USEPA.

INDUSTRIAL SITE/BROWNFIELD REDEVELOPMENT

Principal Hydrogeologist, Chlorinated Solvent Site Re-Characterization and Remedial Planning at a Former Industrial Site, Confidential Client, Northern Indiana. In 2008, GZA was asked by a Fortune 100 manufacturing company to review remedial progress of a large-scale hydraulic remediation system that was pumping over 1 million gallons per day (gpd) in an effort to control a chlorinated solvent plume from migrating beneath residential areas. Our analysis began with reviewing over 20 years of soil and groundwater data gathered by other environmental consultants related to multiple trichloroethene (TCE) releases. GZA was asked to evaluate the effectiveness of the remedial system and evaluate remedial alternatives to bring the site to closure. GZA conducted a series of vertical and horizontal sampling profiles to analyze mass loading of volatile organic compounds (VOCs) to the aquifer under the former industrial plant. As part of this evaluation, GZA discovered that the existing groundwater remediation system was not controlling shallow TCE migration in an area of residential neighborhoods resulting in a potential vapor inhalation risk and liability exposure to the client. GZA managed and lead a communication effort with local health departments, the Indiana Department of Environmental Management (IDEM) and the client to allay possible concerns and provide useful information to property owners. GZA worked with residences to obtain authorization to conduct vapor intrusion assessments. In 2011, sub-slab soil gas and/or indoor air quality were evaluated in 24 buildings overlying the shallow groundwater plume and 15 ventilation systems were installed in homes with indoor air TCE concentrations exceeding IDEM's 30-year residential indoor air action level. Currently, remedial alternatives are being evaluated for implementation in 2012 to replace the groundwater remediation system which has outlived its useful life and allow redevelopment of the property.

Principal Hydrogeologist, Site Investigation, Remediation Planning and Monitoring of Dry Cleaning, Solvent Release, Confidential Client, Grafton, Wisconsin. GZA was engaged by legal counsel to evaluate the source and extent of chlorinated solvent contamination (tetrachloroethylene [PCE]) at an industrial property surrounded by residential properties and an abutting high-capacity municipal water supply well. Following substantial historical review and interviews of former employees, GZA discovered that a historical owner of the property manufactured and tested dry cleaning machines on the property. This evidence was presented by legal counsel to the WDNR and resulted in the naming of an additional responsible party to cost share in mitigation of the problem. GZA's investigation revealed a shallow clay zone containing over 95% of the total solvent mass released. However, underlying the clay zone was a permeable sand and gravel layer through which dissolved-phase VOCs were migrating off-site and under residential neighborhoods. Following delineation of the off-site plume, it became apparent that vapor intrusion assessments on 15 residential properties were necessary. GZA coordinated and executed a communication plan with residents, performed sub-slab sampling and conducted mitigation where state levels were exceeded. At the source area, GZA has presented a thermal remediation plan to address the high levels of solvent resident in clays. Implementation elements of the remedial plan are presently under consideration.

Project Manager/Principal-in-Charge - Industrial Site Redevelopment for Northeast Milwaukee; Altman, Kritzer and Levick, S.C. Conducted pre-acquisition due diligence activities on an approximately 16-acre industrial property formerly used for extensive railroad operations and maintenance, lumber yard and bulk petroleum storage activities to be developed for a large retail facility. Activities managed included Phase I ESAs, Phase II investigation of subsurface impacts and quantification of environmental liabilities including asbestos-containing materials (ACMs) related to site purchase and development. A Grant of Exemption to Construct on an Abandoned Landfill was requested and obtained from WDNR pursuant to Chapter NR 500 in order to develop and manage foundry residues on the Site. A Materials Management Plan (MMP) was prepared for the site construction activities and implemented with the cooperation of the site contractors resulting in the proper handling and displacement of the regulated material. Significant cost saving were realized through on-site management of the foundry material instead of off-site disposal. The site was also received into the Voluntary Party Liability Exemption (VPLE) Program administered by WDNR.

Project Manager/Principal-in-Charge - Demolition and Redevelopment of Nakoma Plaza, Madison, Wisconsin; Altman, Kritzer and Levick, S.C. Conducted pre-acquisition due diligence activities on two adjacent commercial and industrial properties



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with documented soil and groundwater contamination. Assisted in negotiating environmental agreements with sellers, conducted comprehensive asbestos inspections and hazardous materials inventories of buildings slated for demolition. Proceeded with large-scale, pre-demolition asbestos-containing building material (ACBM) abatement and hazardous materials management. Also conducted combined environmental and geotechnical investigations to define the extent of impact from multiple source areas that had migrated within an intermittent perched saturated zone and regional sand and gravel aquifer. Entered site into the State of Wisconsin VPLE Program and managed program requirements during the fast-tracked demolition and reconstruction process. Also assisted with the preparation of a Wisconsin Department of Commerce (Commerce) Brownfield Development Grant that resulted in the award of \$750,000. Remediation was conducted of primary source areas coupled with an MMP approved by WDNR that enabled off-site disposal of impacted soil to be minimized. Supplementing this work was a geotechnical evaluation of low-strength soil and providing foundation criteria for a 120,000 square-foot building design. This combined scope of work culminated in the issuance of a Certificate of Completion for the client under the VPLE program.

Principal-in-Charge - Comprehensive Environmental Due Diligence, Multiple Site Investigations and Brownfield Redevelopment of the Bayshore Town Center, Glendale, Wisconsin. GZA assisted a team of investors, developers and their legal counsel to evaluate and navigate the environmental risks and potential liabilities related to the redevelopment of Bayshore Mall into the Bayshore Town Center, a 47-acre combined retail, commercial and residential development situated on a variety of previously impacted properties. The project involved multiple Phase I and Phase II ESAs, developing remedial and environmental costs estimates, working with WDNR and assisting with stakeholder decision making and providing an environmental management strategy that satisfied the interests of the developers and their regulatory obligations. The project also involved obtaining exemptions to construct on abandoned landfills, the development and implementation of MMPs, construction observation, the installation of several hundred thousand square feet of sub-slab venting systems and post-construction documentation. Regulatory closure was obtained on all open cases and the site is proposed for issuance of a VPLE Certificate of Completion.

Principal-in-Charge - Milwaukee World Festival Grounds Redevelopment, Milwaukee, Wisconsin. The project consisted of evaluating the site-wide environmental and geotechnical conditions in consideration of a major reconstruction of the existing Summerfest festival grounds on the shore of Lake Michigan. Contamination concerns were focused on cyanide contamination and the presence of a variety of waste/fill that was used to create the landmass several decades ago. A fast-tracked Exemption to Construct was obtained through WDNR and an MMP was created to minimize off-site transport and disposal of contaminated residues. Six new structures were proposed within close proximity to existing buildings overlying the fill materials. Driven pile foundations were used for support of the major structures. To address the concern for vibration-induced settlements of the existing buildings due to vibration from the pile driving, GZA evaluated the subsurface conditions and established vibration guidelines to protect the existing buildings. Vibrations were monitored by GZA during pile driving to confirm that vibrations were within the established guidelines.

Principal-in-Charge - Combined Geotechnical and Environmental Evaluation for Lakefront Development; Freedom Education Center Wing Addition to the War Memorial Art Museum, Milwaukee, Wisconsin. Conducted simultaneous investigation of subsurface geotechnical and environmental conditions that could affect the lakeshore development of this facility, including a multi-story parking garage and education wing. Evaluated methane presence, environmental contaminants in groundwater and construction-related difficulties, such as dewatering feasibility. GZA was able to show key geotechnical and environmental design considerations that resulted in significant cost savings to the project. Methane evaluation and design considerations continue.

Project Manager/Principal-in-Charge - Contaminated Site Development, Delafield, Wisconsin; Altman, Kritzer and Levick, S.C. Conducted pre-acquisition due diligence activities on a former industrial property adjacent to a closed major solid waste disposal facility. In combination with a geotechnical investigation, managed the Phase I ESA, Phase II investigation of subsurface impacts and quantification of environmental liabilities related to site purchase and development. During Phase II activities, methane concentrations were found to exceed 50%, by volume, beneath the property slated for development. Completed an assessment of methane venting designs and selected an optimal design that would minimize methane gas migration to the sub-building area. An active methane venting system was designed, the construction phases inspected in the field and operation and maintenance of the system is on-going.



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CHLORINATED VOC INVESTIGATIONS, VAPOR INTRUSION AND REMEDIAL ACTIONS

Principal-in-Charge – Revised Remedial Action for a Chlorinated Solvent Impacts in a Shallow Sand and Gravel Aquifer System; Confidential Manufacturing Client. A large manufacturing client requested the detailed evaluation of the effectiveness of an existing remedial system and recommendations for revising the entire site remedial strategy. A CVOC mass loading analysis was performed to understand the distribution of cVOCs in the aquifer. A shallow cVOC plume was identified to extend off site resulting in a coordinated effort to reach out to off-Site property owners and conduct an area-wide vapor intrusion assessment. VI mitigation systems were installed and found to closely reflect the distribution of cVOCs in the aquifer. Fifteen operating VI mitigation systems continue to operate while Site-wide remedial actions are carried out.

Project Manager - RI/FS, Appleton, Wisconsin; Confidential International Paper Manufacturer. Conducted multi-phased RI/FS of chlorinated solvent contamination and evaluation of DNAPL extent in glacial deposits and a fractured dolomite aquifer in central Wisconsin. Through the investigation effort, the solvent source was identified beneath the primary manufacturing facility. Migration of VOCs from the source area extended through a complex sequence of glacial tills and impacted the upper portion of a regional carbonate and sandstone aquifer. Lead an evaluation of remedial technologies, including soil vapor extraction (SVE), in situ oxidation, hydraulic isolation and air sparging.

Principal-in-Charge - Remedial Technology Peer Review for a Chlorinated Solvent Recovery and Remediation System; Confidential Manufacturing Client. A large manufacturing client requested the detailed evaluation of the effectiveness of an existing remedial system and recommendations for revising the entire site remedial strategy. The site involved the release of hundreds of drums of chlorinated solvents in several areas, the presence of DNAPL in a glacial till and bedrock system and significant dissolved-phase contamination attempting to be addressed through an SVE system supplemented with groundwater pumping. The evaluation revealed significant ineffectiveness of the current system in regards to mass recovery and environmental repair. As a result of the evaluation, GZA was awarded the site to implement a bio-stimulation strategy, which was fully accepted by the regulating agency.

Principal-in-Charge - Regional Aquifer Investigation of Chlorinated Solvent Impacts; Confidential International Industrial Client. On behalf of a confidential client, an investigation of a historical manufacturing site revealed chlorinated solvent impacts emanating into a regional fractured sandstone aquifer. Other regional investigations determined that a continuous plume of chlorinated solvent impacts in groundwater extend over a 2-mile radius and impacted potentially over 250 private residential wells. A comprehensive investigation of the site was conducted and a detailed 3-dimensional CSM was developed to demonstrate local vs. regional impacts. This project involved vertical plume tracking and hydrogeological characterization to depths of up to 400 feet and an ability to unravel and communicate complex hydrogeological conditions while negotiating with state regulators, setting technical strategy and providing technical support during the defense of multiple legal claims.

Principal-in-Charge - Paper Pulp Landfill Siting and Permitting Study, Ashland, Wisconsin; James River Corporation. Performed oversight of landfill siting and hydrogeologic characterization activities to prepare a Chapter NR 500 Initial Site Report and Feasibility Report for approval from WDNR. The investigations included soil boring and monitoring well installation, in-situ aquifer testing by measuring groundwater recovery which required more than six months of monitoring, 2-dimensional groundwater flow modeling and leachate generation calculations.

Principal-in-Charge - RI/FS for the French Island Chlorinated Solvent Burn Pits, La Crosse, Wisconsin. Provided on-going technical supervision during RI and FS phases of the project. Continually provided practical, low cost, technology-appropriate solutions for the municipality.

Project Manager/Senior Hydrogeologist - Ashland, Wisconsin; Northern States Power Company. Conducted a siting study, Initial Site Report and FS for a new fly ash disposal facility in the Ashland/Bayfield County area. Performed regional and on-site studies of glacial and bedrock geology and hydrogeologic characteristics.



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Project Manager/Hydrogeologist - Rhinelander, Wisconsin; Rhinelander Paper Company. Conducted an evaluation of the transport and fate of multi-phase contaminants in the groundwater system from the Rhinelander Paper Company Landfill near Rhinelander, Wisconsin. Involved an examination of sulfite liquor migration in glacial outwash overlying bedrock, co-mingling of pulp landfill leachate and downgradient geochemical evolution of groundwater.

ENVIRONMENTAL DUE DILIGENCE

Principal-in-Charge/Project Manager - Multi-Site Phase I ESA at Retail Operations throughout the United States. Coordinated a team of environmental staff to conduct fast turnaround Phase I ESAs and asbestos surveys at sites in Arizona, California, Michigan, Illinois, North Carolina, Mississippi and Wisconsin.

Principal-in-Charge/Project Manager - Phase I and II ESAs and ECAs at Manufacturing Operations in Illinois. Conducted pre-acquisition Phase I and Phase II ESAs and environmental compliance assessments (ECAs) at a major manufacturing operation, painting facility and administrative offices. Despite claims of strong environmental performance by the operation and no reported historical use of industrial solvents, was able to identify a significant chlorinated solvent plume emanating from beneath the facility. The plume included vinyl chloride concentrations exceeding inhalation standards for workers at the site and an off-site TCE plume migrating toward residential areas with groundwater users. Assisted in quantifying the liabilities related to the contamination and non-compliance issues while working with a team of attorneys and financial experts.

Principal-in-Charge/Project Manager - Multi-Site ESAs at Closed Retail Operations throughout the East Coast; Kohl's. Assisted Kohl's with the acquisition of the Caldor's chain of retail operations by performing a fast-tracked risk ranking of 34 operations throughout the East Coast of the United States. Coordinated a team of environmental staff in multiple GZA offices to perform site visits, review existing files and to complete a risk ranking of potential environmental concerns related to each facility. The assessments lead to managing and conducting asbestos inspections and abatement at most operations and geotechnical investigations in support of building renovations and expansions.

Principal-in-Charge/Project Manager - Multi-Site ESAs at Closing Retail Operations throughout the New England and Atlantic States; Kohl's. Assisted Kohl's with the acquisition of the Bradlees's chain of retail operations by performing a fast-tracked risk ranking of 17 operations throughout the upper East Coast, including New York, New Jersey, Massachusetts, New Hampshire and Connecticut. Coordinated a team of environmental staff in multiple GZA offices to perform site visits, review existing files and to complete a risk ranking of potential environmental concerns related each facility.

Principal-in-Charge/Project Manager - Multi-Site ESAs at 42 Locations throughout the Midwestern United States. Assisted in the pre-acquisition due diligence of 42 properties scattered throughout the Midwest over a period of 45 days. Coordinated a team of staff from several GZA offices to conduct the work and then provided recommendations on follow-up activities while quantifying environmental liabilities to assist in proper valuation of the real estate deal.

Experience Prior to GZA

Senior Hydrogeologist/Division Manager, Layne GeoSciences, Inc. A Subsidiary of Layne, Inc., Pewaukee, Wisconsin. At Layne GeoSciences, Inc., Mr. Osborne had extensive experience in the project management of soil and groundwater contamination studies, as well as in the characterization of physical flow systems for the purpose of groundwater dewatering control and for geotechnical problems. Incorporated into the range of projects are tasks such as finite difference flow modeling, bedrock fracture studies and regional aquifer contamination studies.

Project Hydrogeologist, ASHCO, Inc., New Berlin, Wisconsin. Responsibilities included conducting hydrogeologic studies, groundwater investigations and monitoring designs for solid waste disposal facilities in the pulp and paper and power generation industries. Also included are landfill capping and liner design, permitting negotiations with the WDNR, clay source determination and characterization for use in landfill construction and construction management.



John C. Osborne, P.G.

Senior Principal

Publications and Presentations

Osborne, J.C., 1991, "An Investigation of Coliform Bacteria Contamination in the Silurian Dolomite Aquifer in the Lisbon Township," Waukesha County, Wisconsin.

Osborne, John, C., 2019, PFAS: Life Cycle, Regulations and Solutions - An Overview of Per and Polyfluoroalkyl Substances in the Environment, AIPG Spring Conference.

Osborne, John, C., 2019, Fate and Transport of PFAS in the Environment, Wisconsin Public Utilities Institute, Madison, WI,

Osborne, John, C., 2019, Investigating and Remediating PFAS in the Environment, Municipal Lawyers Institute, Delavan, WI

Affiliations/Memberships

- Association of Groundwater Scientists and Engineers
- National Water Well Association
- American Institute of Professional Geologists



Lailah R. Reich, PWS, ISA Certified Arborist

Senior Technical Specialist/Project Manager

Summary of Experience

Lailah Reich is a wetland scientist and ecologist with over 16 years' experience conducting wetland delineations, Section 404 and 401 permitting, local and regional stormwater permitting, tree surveys, soil and erosion control plan review and inspections, and water quality and best management practices concepts related to transportation, utility, commercial, and industrial developments as well as mitigation and restoration projects. She has been involved in rare and threatened and endangered flora studies and surveys for over 20 years. Ms. Reich has conducted hundreds of wetland delineations within the Illinois, Wisconsin, Michigan, and Indiana. She is competent in 404/401 permitting process (individual, nationwide, and regional), NPDES permitting, Chicago area stormwater permitting, Incidental Take Authorizations, and threatened and endangered species consultations. She has also designed a mitigation bank in southern Wisconsin and has assisted within restoration/mitigation design for riparian mitigation, wetland mitigation, as well as restoration of sensitive habitats for listed species.

Lailah has completed analysis for threatened and endangered species, natural resources, wetlands, and agriculture sections of NEPA documents for various transportation projects. In addition, she has completed fauna surveys for various species including shrews, Franklin ground squirrel, rusty-patched bumble bee, snakes, macro-invertebrates, and listed bird species, and various listed bat species.

Ms. Reich is a Society for Wetland Scientists certified Professional Wetland Scientist (#2835) and an International Society of Arboriculture, Certified Arborist (IL-9047A).

Relevant Project Experience

NEPA DOCUMENTATION AND ANALYSES

Illinois Intercity High-Speed Rail, Will, Grundy, and Livingston Counties, Illinois. Completed multiple prairie characterization studies, point count surveys for the state listed avian fauna, field surveys for the rusty patched bumble bee and various species of listed flora, as well as the rattlesnake master borer moth. Field monitoring of Hine's emerald dragonfly (HED) in areas of expected HED activity over or adjacent to rail lines. Determined dragonfly density and frequency, including primary (morning) and secondary (evening) activity periods. Summarized findings in the Environmental Impact Statement (EIS) and various Natural Resources technical memoranda (2011-2020).

Illinois 83/137 Study, Lake County, Illinois. Completed field surveys to assess forest resources, completed Environmental Assessment (EA) document for Wetlands, Forest Resources, and Threatened and Endangered Species (2018-2020).

Tri-County Access, Cook, Lake, and McHenry Counties, Illinois. Prepared draft methodology for the assessment of Natural Resources and Threatened and Endangered Species (2018).

Illiana Expressway, Illinois and Indiana. Completed surveys for listed fauna as well as habitat surveys for the federally threatened northern long-eared bat prepared the EIS

Education

M.A., 2008, Candidacy in Geography and Environmental Studies, Northeastern Illinois University

B.S., 2002, Biological Sciences, Illinois State University, Normal, Illinois

Licenses & Registrations

SWS Professional Wetland Scientist

ISA Certified Arborist (IL-9047A)

Lake County Certified Wetland Specialist

McHenry County Certified Wetland Specialist

Kane County Qualified Wetland Review Specialist

Lake County Designated Erosion Control Inspector

Illinois and Indiana Certified Pesticide Applicator

Areas of Specialization

- Wetland Delineation/Permitting
- Ecological Issues
- Threatened and Endangered Species Studies/Coordination
- Restoration/Mitigation Design
- Stormwater and NPDES Permitting
- Tree Surveys
- Tree Preservation Plans
- Soil and Erosion and Sediment Control
- Construction Oversight



Lailah R. Reich

Senior Technical Specialist/Project Manager

for Natural Resources and Threatened and Endangered Species. Assisted with drafting the Biological Assessment and conducted intensive coordination with the FWS for potential impacts to federal threatened and endangered species (2013-2014).

U.S. Route 51 EIS, South Central Illinois. Prepared Natural Resources and Agricultural technical memorandum (2011-2012).

Prairie Parkway, Kane and Will Counties, Illinois. Prepared Agricultural Technical Memorandum and EIS for agricultural impacts (2010).

Churchill Woods Dam Removal, DuPage County, Illinois. DuPage County Forest Preserve District, Churchill Woods Forest Preserve. Completed delineations and permitting for proposed project and prepared EA for wetlands (2010).

Interstate 55 at Lorenzo Road and IL 129, Will County, Illinois. Prepared EA for agricultural impacts (2009).

WETLAND DELINEATIONS AND PERMITTING

RFD II, LLC. Mitigation Bank Design, Burlington, Racine County, Wisconsin. Development of Compensation Site Plan and Mitigation Bank Instrument, management, and monitoring of a wetland mitigation bank on a 33-acre parcel (2018-present).

Village of Oak Lawn Regional Water System Improvement, Cook County, Illinois. Environmental Lead, coordination, and scheduling staff for various contracts for wetland delineations for proposed Bid Packages associated with water main improvements. Conducted and assisted junior staff with complex delineations for contracts. Provided QA/QC of reports and results and coordinating with Oak Lawn as well as the USACE and local agencies to obtain permits and clearances on schedules, budgets, and project priorities (2015-present).

Plum Creek Greenway Trail at Plum Creek Forest Preserve and Goodenow Grove Nature Preserve, Unincorporated Will County, Illinois. Environmental Lead for the proposed extension of Plum Creek Greenway Trail. Project components include wetland delineations, Section 404 and SWCD permitting, PESA, and ESR submittal (2020-present).

Hidden Lake Forest Preserve Bridge Replacement, Downers Grove, Illinois. Environmental Lead for the Forest Preserve District of DuPage County proposed bridge improvements. Project components include wetland delineations, DuPage County, Section 404, and SWCD permitting, obtaining threatened and endangered species clearances, coordination with the IDNR, bat habitat assessments, and development of mitigation strategies (2020-present).

Des Plaines River Trail South Extension, Cook County, Illinois. Environmental Lead for the Forest Preserves of Cook County proposed extension of the Des Plaines River Trail through various forest preserves. Project components include wetland delineations, PESA, and tree surveys (2020-present).

Illinois Route 83 (IL 83) Pedestrian Bridge Overpass, DuPage County, Illinois. Environmental Lead for the Forest Preserve District of DuPage County Phase I study for the proposed pedestrian overpass at Cricket Creek Forest Preserve. Project included delineations and tree surveys (2020).

IDOT District 1 Blanket Contract, Chicago Area, Illinois. Lead field delineator and lead arborist for IDOT District 1 within Cook, DuPage, Kane, Lake, McHenry, and Will Counties for various roadway improvement projects. Wetland and waterway delineations and associated reporting, tree surveys and tree impacts assessments, as well as eastern prairie fringed orchid surveys completed as part of these contracts on an on-call basis. Many delineations included work within sensitive properties such as forest preserves, Illinois Natural Areas Inventory (INAI) sites, and nature preserves (2008-present).

Bell Road Improvement Project, Homer Glen, Illinois. Environmental Lead for Will County DOT proposed improvements to Bell Road. Project components include wetland delineations, ESR submittal, PESA/PSI/CCDD, Section 404 and SWCD permitting (2019-present).

North Central DuPage River Trail Extension, DuPage County, Illinois. Environmental Lead for the Forest Preserve District of DuPage County proposed extension of the North Central DuPage River Trail system located in Pratts Wayne Woods INAI Site.



Lailah R. Reich

Senior Technical Specialist/Project Manager

Project components include wetland delineations, tree surveys, DuPage County, Section 404, and SWCD permitting, PESA, PSI/CCDD (2016-present).

Arlington Drive Bridge Replacement, Hanover Park, Illinois. Environmental Lead for improvements to the Arlington Drive bridge over the West Branch DuPage River. Project components include wetland delineations, PESA, DuPage County, Section 404, and SWCD permitting (2020-present).

Natalie Creek Trail, Southwestern Cook County, Illinois. Environmental Lead for the Forest Preserves of Cook County proposed 13-mile Natalie Creek Trail project. Project components include wetland delineations, ESR submittal, tree surveys, PESA (2019-present).

Pfeiffer Road Extension, Frankfort, Illinois. Environmental Lead for the proposed extension of Pfeiffer Road from U.S. 30 to Colorado Avenue. Project components include wetland delineations and jurisdictional determination (2020-present).

Burnham Trail Extension, Burnham, Illinois. Multiple wetland delineations for the Village of Burnham for the extension of Burnham Trail at Burnham Prairie Nature Preserve (2018-2020).

Cromwell Trail Extension, Wheaton and Unincorporated, DuPage County, Illinois. Wetland delineations for the Forest Preserve District of DuPage County for proposed Cromwell Trail extension at Danada Forest Preserve (2020).

Washington Street Bridge Improvements, Naperville, Illinois. Wetland delineations for improvements to Washington Street bridge over West Branch DuPage River (2020).

Mid-Michigan Materials, Jeddo, Michigan. Wetland delineations on an approximately 160-acre mine site (2020).

Butterfield Creek Flood Alleviation Project, Richton Park, Illinois. Wetland delineations within a 44-acre area for a flood alleviation and streambank restoration project (2019).

Fischer Woods Forest Preserve Trail Extension, DuPage County, Illinois. Wetland delineations for the Forest Preserve District of DuPage County for the extension of a multi-use trail within Fischer Woods Forest Preserve, an INAI Site (2019).

St. James Farm Forest Preserve Trail Extension, DuPage County, Illinois. Wetland delineations for the Forest Preserve District of DuPage County for the extension of a multi-use trail along the south side of Mack Road within the St. James Farm Forest Preserve (2019).

North Aurora Road Widening Project, Naperville, Illinois. Wetland delineations and permitting for City of Naperville proposed reconstruction and widening of North Aurora Road between Frontenac Road and Fairway Drive (2011-2019).

Chippewa Sands Company, Bloomer, Chippewa County, Wisconsin. Wetland delineations for an industrial mining project on an 1,100-acre parcel (2018).

Lannon Stone Products, Lannon and Menomonee Falls, Wisconsin. Wetland delineations for a river crossing project on an approximately 31-acre parcel (2018).

Des Plaines River Trail Extension over the Union Pacific Railroad, Des Plaines, Illinois. Wetland delineations, tree surveys, and flora surveys for the Forest Preserves of Cook County proposed crossing of the Des Plaines River Trail over the Union Pacific Railroad within Kloempken Prairie Forest Preserve and Carle Woods, INAI Site (2018).

Illinois Tollway Interstate 88 Improvements, Central Illinois. Wetland delineations and Section 404 permitting (Chicago and Rock Island Districts) for improvements to a 40-mile segment of Interstate 88 (2017).

Carol Stream Southeast Bike Path Project, Carol Stream, Illinois. Wetland delineation for the Village of Carol Stream proposed construction and reconstruction of a multi-use bike path as part of the Carol Stream Southeast Bike Path project (2017).



Lailah R. Reich

Senior Technical Specialist/Project Manager

Illinois Tollway Interstate 294 Improvements, Cook County, Illinois. Wetland delineations for improvements to a 12-mile segment of Interstate 294 (2017).

Quentin Road Widening Project, Cook County, Illinois. Assistant Environmental Lead for proposed widening project through sensitive forest preserves. Wetland delineations and tree surveys for the reconstruction and widening of Quentin Road between Dundee Road and Lake Cook Road. Tree surveys conducted within Cook County Forest Preserve District, Camp Reinberg and Deer Grove Forest Preserve. Attended stakeholder meetings and coordinated groundwater surveys (2015-present).

Wilson Road and Nippersink Road Intersection Improvements, Lake County, Illinois. Environmental Lead for improvement project. Conducted multiple wetland delineations, jurisdictional determination, eastern prairie fringed orchid surveys, and USACE Section 404 permitting for Lake County Division of Transportation (2010-2016).

Moraine Hills State Park, Grand Illinois Trail, McHenry County, Illinois. Wetland delineations, Section 404 permitting, and creation of a wetland mitigation plan for the Grand Illinois Trail - Moraine Hills McHenry/Lake Segment Moraine Hills State Park Entrance at River Road to Griswold Lake Hills Subdivision McHenry County for the Illinois Department of Natural Resources (2013 – 2015).

Churchill Wood Forest Preserve Dam Removal, DuPage County, Illinois. Completed wetland delineations for over 200 acres within Churchill Wood Forest Preserve for the DuPage County Stormwater Management Division and the Forest Preserve District of DuPage County for removal of the Churchill Woods Dam (2009).

ECOLOGICAL ISSUES

Beaubien Woods Forest Preserve Habitat Assessment, Chicago, Illinois. Habitat assessment completed on a 32-acre property located south of 134th Street, east of South Maryland Avenue, and west of Beaubien Woods Forest Preserve (2019).

West Branch DuPage River Trail Project, Naperville, Illinois. Management of post-construction seeding of wetlands and upland buffers associated with Segment 4 of the West Branch DuPage River Trail project and Jefferson Avenue over West Branch DuPage River for the City of Naperville. Annual reporting for performance standards associated with the permits obtained for this project (2014-2018).

Illinois Tollway, Statewide Roadside Vegetation Maintenance Manual, Illinois. Drafted statewide Roadside Vegetation Maintenance Manual for the Illinois Tollway to provide basic technical support for sustainable roadside programs and guidance for the maintenance and management of vegetation within the Tollway's right-of-way. This manual is intended to promote environmentally sound policies, enhance habitats on Tollway property where feasible, and support native plant and pollinator species statewide (2016).

Krisdala Baka Rest Area, Henry County, Illinois. Conducted a wind turbine feasibility study for the Krisdala Baka Rest Area located off Interstate 74 for IDOT (2014).

Big Marsh Habitat Assessments, Chicago, Illinois. Conducted vegetative surveys for the proposed remediation and restoration at Big Marsh located between the 11000 and 11600 blocks of South Stony Island Avenue in the South Deering community of Chicago. Outlined the recommended preliminary vegetation management and monitoring strategy for Big Marsh in conjunction with the *Calumet Open Space Reserve Plan* set forth by the City of Chicago (2010 & 2011).

Hampshire Waste-Water Treatment Plant, Hampshire, Illinois. Stream survey along 2.5 miles of Hampshire Creek. Identification of aquatic biota, assessment of biotic communities and habitat, and water quality analysis (2009).

Mobil Oil, Restoration Oversight, Will County, Illinois. Oversight of restoration work on a 40-acre parcel containing four federally threatened and endangered species adjacent to Midewin National Tallgrass Prairie for Mobil Oil (2006 & 2007).

Baseline Mammal Study, Kane County, Illinois. Baseline population study conducted for small mammal species for the Forest Preserve District of Kane County. Research methods included Sherman live traps and pitfall traps (2009).



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Senior Technical Specialist/Project Manager

THREATENED AND ENDANGERED SPECIES

Illinois Route 62 Improvements, Cook County, Illinois. Surveys for the federally threatened eastern prairie fringed orchid completed for IDOT (2018).

Bat Research, Forest Preserve District of Will County. Assisted the Forest Preserve District of Will County with mist netting for bats at various county forested preserves for research purposes (2015-2016).

Casey Road Improvement Project, Lake County, Illinois. Conducted surveys for the eastern prairie fringed orchid for the Lake County DOT (2016).

Illinois Tollway Interstate 294 Improvements, Lake County, Illinois. Transplanted state threatened species marsh bog arrow grass along I-294 to suitable protected habitat (2006 & 2007).

Center Point Properties, Crete Intermodal Facility, Crete, Illinois. Survey of state threatened Kirtland's snake and state endangered eastern massasauga in a 100-acre corridor along Plum Creek Tributary Illinois (2007).

Natural Gas Pipeline Improvements, Nicor Gas, Lake County, Illinois. Survey over a 10-acre wetland for the state threatened Blanding's turtle for pipeline maintenance work (2005 & 2006).

TREE SURVEYS

Village of Oak Lawn Regional Water System Improvement Project, Cook County, Illinois. Tree surveys for water main improvements and multi-use trail construction, coordination with Forest Preserves of Cook County for impacts to forest resources on various forest preserve properties as well as coordination with the Illinois Department of Natural Resources (IDNR) for potential impact to northern long-eared bat habitat (2017-2020).

Illinois 137 over Bull Creek, Beach Park, Illinois. Tree survey and tree survey memorandum for IDOT (2017).

Interstate 290 Improvements, Bellwood, Broadview, Forest Park, Hillside, Maywood, Oak Brook, Westchester, and the Chicago, Illinois. Conducted tree surveys for improvements to a 13-mile segment of Interstate 290 (I-290) from the Interstate 88 and I-290 interchange at the western terminus to Racine Avenue at the eastern terminus. Reported the results of the tree survey in the Environmental Assessment document (2016).

Quentin Road Widening Project, Cook County, Illinois. Conducted tree surveys within a sensitive oak and hickory Forest. Over 4,000 trees identified (2015-2016).

Illinois Tollway Emerald Ash Borer Survey, northern Illinois. Conducted a system-wide emerald ash borer survey for all ash trees located on Illinois Tollway property to determine impacts and replacement opportunities (2012).

Fleming Road Improvements, Bull Valley, Illinois. Coordinated tree survey and preservation plan for improvements to Fleming Road for McHenry County Division of Transportation. Over 1,700 trees identified (2010).

Illinois Route 53 at Illinois Route 56 Improvements, DuPage County, Illinois. Coordinated tree survey and preservation plan, inclusive of surveys on Morton Arboretum and DuPage County Forest Preserve District property. Over 9,000 trees identified via traditional and transect methodologies (2009).

Interstate 294 at Interstate 57 Improvements, Cook County, Illinois. Coordinated tree survey for Interstate interchange project for IDOT and the Illinois Tollway. Over 10,000 trees identified (2008).

SECTION 4(F) – SECTION 106 AND SECTION 6(F) LAND AND WATER CONSERVATION FUND ACT

St. Charles Bridge Crossing over the Fox River, City of St. Charles, Illinois. Individual Section (4) Evaluation for the new bridge crossing for preparation of the associated EA (2010).



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Fleming Road Improvements, Bull Valley, Illinois. Completed the structure photographs for determination of potential historic quality improvement project (2010).

Experience Prior to GZA

Regional Floristics, Chicago Botanic Garden – Intern, Glenview, Illinois. Conducted conservation research for state and federally threatened and endangered plant species in the Chicago region through the Plants of Concern Program. Performed monitoring workshops, collection of baseline and demographic data, digital mapping of study species through ArcView, data analysis and presentation in grant reports and program constituents, and finalized the 2004 Plants of Concern Report. Also, assisted with herbarium management, construction of V-Plants Virtual Herbarium and federally endangered species surveys at Midewin National Tallgrass Prairie (2003-2004).

Hawaii Volcanoes National Park, Interdisciplinary Research Technician, Volcano, Hawaii. Conducted research on macro-invertebrate and gastropod composition in rodenticide (Ramik Green) treated/non-treated areas. Collected seedling depredation data to determine disparity of damage by rats, birds, and slugs in wet/mesic forests as well as seedling predation data to determine differences in rodenticide treated/non-treated sites. Documented wet/mesic forest composition (2002-2003).

REU Research Assistantship, Baylor University, Waco, Texas. Research of Texas Plant Species for Baylor University. Baseline research conducted through Baylor University's REU program on the rare species, Reverchon's prairie clover, to determine condition and number of the few remaining populations. Completed an aquatic plant taxonomy teaching assistantship through Baylor University at Guadalajara University in Jalisco, Mexico (2001).

Research Assistantship, LaSelva Biological Research Station, Costa Rica. Costa Rican Rainforest Ecological Research for LaSelva Biological Research Station. Undergraduate research conducted through the Organization of Tropical Studies, comparing herbivory and toxicity of understory vegetation in primary rainforest versus secondary. General application of taxonomic identification of flora and fauna. Operation of field equipment and application of statistical data (2000).

Keeper, Willowbrook Wildlife Rehabilitation Center, Forest Preserve District of DuPage County, Illinois. Caretaking and overseeing rehabilitation of indigenous wildlife of Northern Illinois. Daily feeding, cleaning, and minor therapeutic engagement with species such as raccoon, opossum, owls, and birds (1999).

Certifications/Training

- Wetland Delineation Training (USACE 2004) IWEER
- Advanced Wetland Delineation Training, University of La Crosse, Wisconsin (2014-2019)
- Conservation Research Institute, 2018 Field Seminar Wetlands of the Chicago Region with Gerould Wilhelm
- Wetland Plant Identification coursework via Dr. Mohlenbrock (2006, 2007, 2009, 2010, 2014)
- First Aid/CPR Certified

Affiliations/Memberships

- Society of Wetland Scientists
- Illinois Native Plant Society
- Conservation Foundation
- Chicago Wilderness
- International Society of Arboriculture



David P. Ruetz

Senior Assistant General Counsel/Senior Environmental Scientist

Education

A.A.S., Environmental Health Technology, Milwaukee Area Technical College, 1981

B.A., Biology, University of Wisconsin-Milwaukee, 1982

Juris Doctor, University of Montana School of Law, 1990

M.S., Environmental Studies, University of Montana, 1992

Areas of Specialization

- Environmental Due Diligence/Site Assessment
- Regulatory Compliance Auditing
- Surface Water Quality Assessment
- Stream and Fishery Habitat Assessment and Rehabilitation
- FIFRA Compliance
- Stormwater/Wastewater Monitoring and Permitting
- Medical Waste Compliance
- Superfund Litigation Support
- Asbestos Litigation Support

Summary of Experience

Mr. Ruetz has over 30 years of environmental experience in a variety of fields, including work as an environmental attorney, the President of an environmental consulting-engineering firm, an Administrative Director of a Governor-appointed Advisory Council, an environmental scientist, and an aquatic biologist.

During his employment with GZA, Mr. Ruetz has performed numerous Phase I Environmental Site Assessments (ESAs), environmental and United States Department of Labor, Occupational Safety and Health Administration (OSHA) regulatory compliance audits, remedial investigations of petroleum and chlorinated solvent-contaminated sites, wetland delineations, and water permitting projects. Mr. Ruetz has also been a member of GZA's Litigation Support Team, which specializes in providing expert witness support and report preparation in asbestos toxicology cases and has assisted in the preparation of over 300 asbestos litigation expert reports.

Relevant Project Experience

Environmental Regulatory Compliance Surveys, Multiple Properties in Wisconsin, Michigan, Illinois, and Ohio. Managed a project team to conduct environmental regulatory compliance project for 16 boat marina properties throughout the Upper Midwest. The marina sites included 100 or more boat slips and also included boat warehousing, and boat sales and maintenance facilities. Regulatory compliance areas covered in the audit included Clean Water Act (CWA) stormwater and wastewater permitting, Resource, Conservation and Recovery Act (RCRA) hazardous and universal waste compliance, aboveground and underground storage tank (AST and UST, respectively) compliance and Emergency Planning Community Right-to Know Act (EPCRA) compliance.

Phase I ESA/Environmental Regulatory Compliance Audit, Lake Delton, Wisconsin. Managed a project team to conduct Phase I ESA and environmental regulatory compliance project for a commercial client of the largest water park in the United States. The site encompassed 100+ acres and also included employee housing and maintenance facilities in addition to the waterpark grounds. Regulatory compliance areas covered in the audit included Clean Air Act (CAA) permitting, CWA stormwater and wastewater permitting, Toxic Substance Control Act (TSCA) compliance, and RCRA hazardous and universal waste compliance.

Phase I ESA, Restaurant Properties in Wisconsin, Illinois, and Indiana. Managed a project team to conduct environmental due diligence for commercial client at 25 properties in Wisconsin, Illinois, and Indiana that contained national-based franchise chain restaurant sites as part of a large real estate acquisition.

Environmental Regulatory Compliance Audit, Borax Mine, Death Valley, California. Managed a project team to conduct environmental regulatory compliance audit for a mining client for one of the largest open pit mines in North America. Regulatory compliance areas covered in the audit included CAA permitting, CWA stormwater and wastewater permitting, TSCA compliance, and RCRA hazardous and universal waste compliance, including an assessment of Bevill Amendment hazardous waste exemptions applicable to the waste streams of the mine operation.



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Environmental Regulatory Compliance Audit, Mining Facilities in Wisconsin, Michigan, Illinois, and Indiana. Managed a project team to conduct environmental regulatory compliance audits for a mining company client as part of an acquisition of 20+ sand mining facilities in the Upper Midwest. Regulatory compliance areas covered in the audit included CAA permitting, CWA stormwater and wastewater permitting and RCRA hazardous and universal waste compliance.

Phase I ESA, 2,000+ Acre Property, Wisconsin. Performed a Phase I ESA of a 2,000+ acre, undeveloped parcel in north-central Wisconsin for a lending client as part of the formation of a legal trust. The Phase I ESA was conducted pursuant to the American Society for Testing and Materials' (ASTM) Phase I Standard Practice for ESAs of Forest and Rural Land (E2247-08).

Wetland Delineation, 1,000+ Acre Property, Juneau County, Wisconsin. Managed a project team of six wetland delineators and also conducted wetland delineation of a 1,000+ acre property in north-central Wisconsin to be developed as a sand mine. The property included 200+ acres of wetlands. Also prepared wetland delineation and compensatory mitigation reports associated with the site and U. S. Army Corps of Engineers (USACE) and Wisconsin Department of Natural Resources' (WDNR) CWA Section 404 joint permit application.

Toxicology Litigation Support Reports for Asbestos Lawsuits. Prepared 300+ toxicological litigation reports for attorneys in asbestos-related lawsuits that involve a review of litigation documents regarding the life history of a plaintiff and the preparation of an asbestos dose reconstruction that provides a maximal hypothetical worst-case dose of asbestos associated with a variety of asbestos-containing products (joint compounds, brakes, roofing materials, etc.).

Phase I ESA/Environmental Regulatory Compliance Audit/Chemical Inventory, Baraboo, Wisconsin. Managed a project team to perform a Phase I ESA, environmental regulatory compliance audit, and a chemical inventory of a rocket propulsion testing facility in central Wisconsin. Regulatory compliance areas covered in the audit include CAA permitting, CWA stormwater and wastewater permitting, and RCRA hazardous and universal waste compliance.

Wetland Delineation, Assisted Living Center, Appleton, Wisconsin. Managed a project team of wetland delineators and also conducted wetland delineation of a 30+ acre property in east-central Wisconsin to be developed as an assisted living center facility. The property included over 5+ acres of wetlands. Met with the WDNR on behalf of the client and negotiated the design of the assisted living facility site features to avoid impacts to the wetlands and eliminated the need for a Section 404 permit.

Wetland Delineation/Endangered Species Act Review, Mining Client, Ottawa, Illinois. Managed a project team of wetland delineators and also conducted wetland delineation of a 70+ acre property in north-central Illinois to be developed as a sand mine. The site included potential habitat for the Indiana Bat, a threatened species under the Endangered Species Act, so he conducted a review of the site for the presence of this species.

Water Permitting of Aggregate Quarry Wash Ponds, Mining Client, Wisconsin. Prepared a detailed state/federal water permit application on behalf of a mining client for wash ponds for aggregate product for a site in Wisconsin. The permit application included a review of wetlands in the vicinity of the ponds, presence of endangered species and cultural resources, and applicable setback distances from protected resources.

Experience Prior to GZA

As an attorney, Mr. Ruetz has represented corporate, commercial, and industrial clients regarding environmental due diligence and risk assessment in mergers, acquisitions, and real estate transactions. He has also represented commercial, industrial, health care, and banking clients in matters involving Superfund (CERCLA), the CWA, the CAA, RCRA hazardous waste including the Bevill Amendment, medical waste, wetlands, and water law. He has extensive experience in all aspects of Superfund litigation, negotiation, and regulatory review. Mr. Ruetz has also represented industrial, commercial, and banking clients in environmental matters involving the TSCA and the OSHA Act. He has also been involved in litigation and has presented oral arguments in cases held in both State and U.S. Federal District courts.

While employed at a previous environmental firm, he served as its President. Mr. Ruetz was responsible for the administrative, financial, and technical affairs for a 40+ employee environmental engineering firm with offices in southeastern and northern Wisconsin that specialized in environmental assessment and remediation of contaminated sites.



David P. Ruetz

Senior Assistant General Counsel/Senior Environmental Scientist

During his employment with a state Department of Natural Resources, he was an Administrative Director of the Rock Creek Advisory Council, a Governor-appointed Advisory Council that consisted of the Secretaries of several State agencies. Mr. Ruetz produced the Annual Report for the Advisory Council and also managed the administrative affairs. He also implemented a resource inventory program for the Advisory Council to prioritize critical wildlife habitat as part its conservation easement program.

As an environmental scientist, Mr. Ruetz has experience in managing field staff and the technical services of an environmental consulting firm/laboratory. He also conducted groundwater and hazardous waste monitoring of landfill sites and industrial wastewater discharges for industrial clients.

As an aquatic biologist, Mr. Ruetz has conducted numerous fishery and macroinvertebrate surveys, stream and lake fishery population surveys, and habitat rehabilitation projects, in addition to many surface and groundwater quality assessments. He has also conducted stream channel morphology and stream surface water hydrologic studies, including sediment impact assessments associated with developed areas, particularly due to mining and logging.

He also implemented a fishery/hydrology evaluation program ("substrate embeddedness") used as a prototype by the U.S. Forest Service (USFS), as well as monitored the impact of a large BPA powerline corridor construction project on National Forest watersheds and fisheries. Further, Mr. Ruetz has also conducted wetland delineation and habitat assessment surveys for commercial and industrial properties.

Seminars

Mr. Ruetz has presented numerous seminars and presentations for the legal community and industrial trade associations, and for various training sessions and workshops. He is particularly sought out as a speaker regarding environmental due diligence, water and wetland regulations, and environmental compliance.

February 2019. "An Update Regarding the Waters of the US Rule," National Stone, Sand and Gravel Association (NSSGA) Annual Meeting, Indianapolis, IN.

February 2019. "EH&S Compliance Assessments," Caterpillar Corporate EH&S Dept., Peoria, IL

April 2018. "EPA Compliance Update," American Society of Safety Engineers (ASSE), Milwaukee, WI.

April 2018. "An Update Regarding the Waters of the US Rule and Recent Developments in Wisconsin Water Law," Milwaukee Bar Association (MBA), Milwaukee, WI.

October 2017. "Environmental Regulations for Real Estate Attorneys," Milwaukee Bar Association (MBA), Milwaukee, WI.

September 2017. "Environmental Regulations for In-House Corporate Counsel," Association of Corporate Counsel (ACE), Milwaukee, WI.

March 2017. "EPA Compliance Update," American Society of Safety Engineers (ASSE), Milwaukee, WI.

November 2016. "A Primer for Attorneys on Issues Associated with Wetland Regulations and Assessment, and the WDNR's Guidance Regarding *Review of Wetlands on Dormant Development Sites*," Milwaukee Bar Association, Milwaukee, WI.

October 2016. "EPA Compliance Update," American Society of Safety Engineers (ASSE), Milwaukee, WI.

October 2016. "Environmental Liabilities in Real Estate Transactions: After the Deal is Done," Association of Corporate Counsel (ACC) Annual Meeting, San Francisco, CA.

June 2016. "A Brownfields Primer: Federal and Wisconsin Law Update," State Bar of Wisconsin Annual Meeting, Green Bay, WI.

September 2016. "ASTM's Standard Practice for Phase I ESAs," State Bar of Wisconsin Annual Environmental Law Update, Madison, WI.

December 2014. "Environmental Liabilities in Real Estate Transactions," National Business Institute Training, Milwaukee, WI.

October 2014. "EPA Compliance Update," American Society of Safety Engineers (ASSE), Milwaukee, WI.

July 2014. "Conducting Phase I ESAs," Certified Hazardous Materials Training, Federation of Environmental Technologists, Racine, WI.

May 2014. "USEPA's and USACE's Proposed Rule on Identifying Waters Protected by the Clean Water Act," Milwaukee Bar Association, Milwaukee, WI.

April 2014. "Overview of Wisconsin Water Law Issues," Lorman Training Workshop, Madison, WI.



David P. Ruetz

Senior Assistant General Counsel/Senior Environmental Scientist

October 2013. "EPA Compliance Update," American Society of Safety Engineers (ASSE) Milwaukee, WI.

September 2013. "Environmental Regulations for Architects, Engineers and Contractors," (National Business Institute Training, Pewaukee, WI.

July 2013. "Phase I ESAs," Certified Hazardous Materials Training, Federation of Environmental Technologists, Pewaukee, WI.

May 2013. "Proposed Changes to the ASTM "Standard Practice for Phase I Environmental Site Assessments" (E1527-13)," Milwaukee Bar Association, Milwaukee, WI.

March 2013. "The Endangered Species Act: An Overview," National Stone, Sand and Gravel Association (NSSGA) Annual Meeting, San Antonio, TX.

March 2013. "The Bevill Amendment Exclusion to RCRA," Industrial Minerals Association (IMA) Technology Workshop, Ft. Lauderdale, FL.

February 2013. "Environmental Permitting and Impacts on Construction," Association of General Contractors (AGC), Milwaukee, WI.

October 2012. "Conducting Phase I ESAs and Compliance Audits," American Society of Safety Engineers (ASSE) Milwaukee, WI.

October 2012. "EPA Compliance Update," American Society of Safety Engineers (ASSE), Milwaukee, WI.

September 2012. "Conducting Phase I ESAs and Compliance Audits," Certified Hazardous Materials Training, Federation of Environmental Technologists, Milwaukee, WI.

March 2012. "Understanding Wetland Issues: A Primer on Issues Associated with Wetland Regulation, Assessment and Agency Enforcement," U.S. Silica Environmental Manager Training, Orlando, FL.

January 2012. "Practical Tips for Handling Environmental Issues When Working with Consultants and Expert Witnesses," Milwaukee Bar Association.

October 2011. "EPA Compliance Update," American Society of Safety Engineers (ASSE), Milwaukee, WI.

June 2011. "The USEPA's and USACE's Draft Guidance on Identifying Waters Protected by the Clean Water Act," Milwaukee Bar Association, Milwaukee, WI.

May 2011. "Stormwater and Runoff Regulations: Practical Tips for Stormwater Compliance," National Business Institute Teleconference, Milwaukee, WI.

March 2011. "Do's and Don'ts for In-House and Outside Counsel in Commissioning Phase I and Phase II ESAs and Compliance Audits on Behalf of Aggregate-Based Clients," National Stone, Sand and Gravel Association (NSSGA) Legal Symposium, Las Vegas, NV.

September 2010. "ASTM's Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions" (E2600-10), Milwaukee Bar Association, Milwaukee, WI.

March 2010. "EPA's Stormwater Enforcement Initiative/Practical Tips for Stormwater Compliance," Industrial Minerals Association (IMA) Annual Meeting, Ft. Lauderdale, FL.

February 2010. "Understanding Wetland Issues: A Primer for Attorneys on Issues Associated with Wetland Regulation, Assessment and Agency Enforcement," Milwaukee Bar Association, Milwaukee, WI.

February 2010. "Understanding Wetland Issues: A Primer for Attorneys on Issues Associated with Wetland Regulation, Assessment and Agency Enforcement," National Stone, Sand and Gravel Association (NSSGA) Legal Symposium, Cincinnati, OH.

February 2010. "Do's and Don'ts for Conducting Phase I ESAs and Compliance Audits at Aggregate Facilities," National Stone, Sand and Gravel Association (NSSGA) Legal Symposium, Las Vegas, NV.

March 2009. "Wetlands and Waters of the U.S.," National Stone, Sand and Gravel Association (NSSGA) Annual Meeting, Orlando, FL.

March 2009. "What Attorneys Need to Know When Working with Environmental Consultants: How to Make Your Clients' Environmental Projects More Effective and Efficient," National Stone, Sand and Gravel Association (NSSGA) Legal Symposium, Orlando, FL.

September 2008. "ASTM's Standard Practice for Assessment of Vapor Intrusion into Structure on Property Involved in real Estate Transactions (E2600-08)," Milwaukee Bar Association, Milwaukee, WI.

August 2008. "What Attorneys Need to Know When Working with Environmental Consultants: How to Make Your Client's Environmental Projects More Effective and Efficient," Godfrey and Liebsle, S.C., Elkhorn, WI.

October 2007. "Wisconsin Environmental Law Primer for Real Estate Professionals," Milwaukee, WI.



David P. Ruetz

Senior Assistant General Counsel/Senior Environmental Scientist

Affiliations/Memberships

- Member, Federal District Court of Eastern District of Wisconsin Bar Association, Federal District Court of Western District of Michigan Bar Association and State of Wisconsin, Washington State and Milwaukee Bar Associations
- Chairman, Milwaukee Bar Association Environmental Law Section, 2003 to present
- Board Member and current Board Secretary of the State Bar of Wisconsin Environmental Law Section, 2015 to present
- Member, Wisconsin Department of Natural Resources Lender Liability Technical Advisory Committee, 2015 to 2018
- Member, Wisconsin Department of Natural Resources Water Body Use Designation Technical Advisory Board
- Member, Federation of Environmental Technologists



Heidi Woelfel, P.G.

Project Manager

Education

B.S., Geology and Geophysics, University of Wisconsin - Madison, 1997

Registrations

Professional Geologist – Texas, #4650

Areas of Specialization

- Site Investigation
- Due Diligence
- Environmental Compliance
- Groundwater Assessments
- Remedial Assessments
- Regulatory Communications
- Project Management

Summary of Experience

Ms. Woelfel has extensive experience overseeing and conducting Phase I Environmental Site Assessments (ESAs), site investigations, vapor investigations, data reductions and statistical evaluations, remedial activities, sediment evaluations, and project management for various redevelopment and remedial projects for industrial, commercial, institutional, transportation, and private clients. She has provided geological review of subsurface investigations across the country utilizing various boring and drilling technologies. Ms. Woelfel is able to provide an in-depth review of vapor, soil, and groundwater data in support of regulatory reporting and communications. She also has project management experience and training to manage a variety of environmental and remedial projects from inception to completion. She has also provided support to litigation matters and risk transfer projects. She has provided input to regulatory agencies for ongoing projects and interacted and developed client relationships. Ms. Woelfel has conducted oversight of per- and polyfluoroalkyl substances (PFAS) sampling and evaluation for current and former industrial and commercial facilities. Ms. Woelfel has also worked in the southeastern United States providing environmental oversight to the chemical, oil, and gas industries.

Relevant Project Experience

Project Manager, PFAS Assessments, Various Sites. Ms. Woelfel has worked with clients to meet regulatory requests for PFAS sampling based on site history and not regulator perceived activities. She was worked with developers and site owners to evaluate groundwater and soil conditions for various sites for PFAS; conducting the sampling to reduce any cross-contamination or false positives.

Project Geologist, Phase I Assessments, Various Sites, Wisconsin. Ms. Woelfel has conducted Phase I ESAs at industrial, commercial, and residential sites in Wisconsin in support of real estate transfers and refinancing. She has also conducted Phase I ESAs for numerous City of Milwaukee sites identified for redevelopment. The Sites assessed include chemical facilities, manufacturing facilities, historic and active dry cleaner facilities, multi-tenant residential buildings, and commercial buildings, as well as linear project area assessments. Ms. Woelfel also reviewed environmental compliance reports for a number of the sites to determine if environmental compliance reporting was required. Ms. Woelfel has also provided historical research for various Phase I ESAs, including reviewing Sanborn Maps, city directories, aerial photographs, and municipal building records.

Project Manager/Geologist, Vapor Assessments, Various Sites, Wisconsin. Ms. Woelfel has conducted various vapor assessments for a variety of project investigations for petroleum, chlorinated, methane, historic landfills, and coal tar facilities. The assessments include the investigation of soil gas, off-gassing from groundwater, sub-slab vapor sampling, and public sewer vapor assessments. Ms. Woelfel has reviewed the vapor data and has worked with GZA staff to identify source areas and appropriate remedial options to break the vapor migration pathway into overlying structures.



Heidi Woelfel, P.G.

Project Manager

Project Manager/Geologist, Chlorinated Solvent Site Assessment, Various Sites, Wisconsin. Ms. Woelfel has managed site investigations, data reductions, vapor assessments, and statistical evaluations of sites impacted with chlorinated solvents for industrial, real estate, dry cleaners, and historical due diligence projects. Ms. Woelfel has also provided expertise on the remedial remedy approaches for each individual site, considering stakeholder concerns and site-specific conditions. She has also worked with the Wisconsin Department of Natural Resources (WDNR) on site-specific needs to ensure regulatory closure. Remedies have included reductive dechlorination, soil excavation, and in-situ chemical oxidation.

Project Manager/Geologist, Petroleum Site Assessment, Various Sites, Wisconsin. Ms. Woelfel has conducted geological oversight in the drilling and sampling activities at numerous sites around Milwaukee to assess historic uses and spills in support of redevelopment. Ms. Woelfel has conducted site investigation at 3500 West Burleigh Street in Milwaukee with drilling and groundwater studies and most recently with regulatory closure documentation. Ms. Woelfel has also conducted work at various City of Milwaukee sites located along Fond du Lac Avenue, which have included ground penetrating radar (GPR) to locate underground storage tanks (USTs).

Project/Manager Geologist, Fill Material Assessment and Historic Landfill Evaluations, Various Sites, Wisconsin. Ms. Woelfel has managed and provided oversight for numerous projects with historic fill material or unlicensed landfills throughout the City of Milwaukee and the State of Wisconsin. She has conducted drilling and soil sampling activities to determine the extent and degree of impaired fill material. Ms. Woelfel has also worked with the WDNR to obtain exemptions for building on historic fill and for low hazard waste exemptions. Ms. Woelfel has worked on City of Milwaukee historic fill material sites on South 6th Street, Fond du Lac Avenue, and North Avenue properties.

Project Manager, Brownfield Redevelopment, Appleton, Wisconsin. Ms. Woelfel has worked to assist a major Brownfield redevelopment of a former paper mill and drilling fluid additives facility in Appleton, Wisconsin. She has assisted the developer and stakeholder navigate WDNR's Voluntary Party Liability Exemption (VPLE) program in order to obtain a Certificate of Completion. Ms. Woelfel conducted data reviews of soil lithologies, groundwater conditions, and analytical reports to determine the degree and extent of contamination at the site to assist with how the final development could be used as part of the remediation and barrier. Ms. Woelfel has worked closely with the developer to assist in the financial lender requirements for each phase of the redevelopment.

Experience Prior to GZA

Phase I Assessor. Ms. Woelfel has conducted Phase I ESAs, as well as desktop reviews of Phase Is for both individual sites and project portfolios. She has conducted historic research for the sites and has communicated with regulatory and municipal authorities in order to gather additional site data pertinent to the assessments. Her review of Phase I portfolios were utilized by clients in the real estate transactions for multi-state investments and divestitures.

Project Manager, Petroleum Storage Facility Litigation, Green Bay, Wisconsin. Ms. Woelfel provided oversight for site investigation of a petroleum litigation project for soil and groundwater delineation. Data was also collected on the location, thickness, and make-up of free phase petroleum. Ms. Woelfel worked with petroleum experts to determine the mobility and viscosity of the free phase with respect to on- and off-site migration. Ms. Woelfel also conducted vapor monitoring in support of the litigation, as well as provided expert witness deposition. Site delineation and vapor monitoring were used to provide evidence of on-site migration from a neighboring petroleum storage facility.

Project Manager, Various Sites, Class I and Shortline Railroads, Wisconsin, Illinois, and Michigan. Ms. Woelfel has worked with Class I and Shortline rail clients to assess environmental issues with former leased facilities and existing operational yards. Ms. Woelfel has also provided environmental assessment and management to rail equipment repair and maintenance yards. She has conducted drilling and sampling oversight in support of regulatory investigations and closure requests for sites impacted with various degrees of volatile organic compounds (VOCs), metals, and polycyclic aromatic hydrocarbons (PAHs) that have migrated off-site.



Heidi Woelfel, P.G.

Project Manager

Environmental Compliance, Kohl's Corporation, Various U.S. Locations. Ms. Woelfel worked as an in-house consultant at Kohl's Corporation's (Kohl's) corporate office to provide waste management for its stores and distribution centers throughout the United States. She worked with responsible units and counties for the quarterly reporting of recycled wastes for the stores. She also provided Kohl's with recommendations of the reporting and permitting requirements for new and existing stores. Ms. Woelfel assisted in the preparation of informational posters presenting guidelines on the disposal of various universal, hazardous, and solid waste streams, which were sent to each facility.

Project Manager, Koch Industries, Wisconsin, Kansas, and Illinois. Ms. Woelfel provided project management and geological expertise for the divestiture of former Koch coal sites in the upper Midwest. Ms. Woelfel performed reviews of existing and potential environmental impacts, both on- and off-site, of the facilities and identified ongoing obligations and liabilities for the sites.

Project Manager, Subsurface Investigations, Various Clients. Ms. Woelfel has conducted soil, groundwater, and vapor investigations for rail clients, institutional clients, telecommunication clients, industrial client, oil and gas clients, and real estate clients. She has overseen and managed investigations of petroleum impacts, chlorinated solvent impacts, and metals, PAH, and semi-VOC (SVOC) impacts. Ms. Woelfel has worked with clients with portfolios of projects across the country and has worked with numerous regulators in support of site investigations and remediations.

Project Manager, Brownfield Redevelopments, Wisconsin. Ms. Woelfel has worked with developers on Brownfield sites to redevelop the sites for mixed-used end design. She has provided oversight for subsurface investigations for metals, petroleum, and PAH impacts under WDNR's VPLE program. Ms. Woelfel has also provided data reduction and reporting in support of a site-specific remedial plan and capping, which incorporated the final site use. Following the VPLE closure, Ms. Woelfel worked with the developer and construction crews to ensure the soil management for each phase of the development was followed, as well as providing construction documentation. Ms. Woelfel has also provided geological and hydrogeological support for the closure and redevelopment of a former coal barge offloading facility in Chicago.

Project Manager, Creosote Facility, Texas. Ms. Woelfel provided geological review of site data, including fault lines traversing the project facility for support of site investigation and remedial objectives. The facility was heavily impacted with creosote in soil and groundwater with dissolved plume migrating off-site into a residential area. Ms. Woelfel worked with stakeholders on the site issues and concerns, as well as the requirements and budgets for achieving site regulatory closure.

Presentations

Woelfel, Heidi and James Drought (April 2011). *RiverHeath Brownfield Redevelopment*. Wisconsin Ground Water Association (WGWA) Annual Seminar. Brookfield, Wisconsin.

Additional Training

- 40-Hour OSHA Health and Safety Training
- 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Certification
- 8-Hour OSHA Hazwoper Supervisor Training
- 8-Hour OSHA Refresher

Affiliations

- Wisconsin Council on Recycling, Secretary
- Parks Commission Member, Richfield, Wisconsin



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Summary of Experience

Mr. Womack's design philosophy is rooted in a lifelong affinity for the ecosystems of the Midwest and in the belief that people need to be connected to the environment, a philosophy closely aligned with Aldo Leopold's Land Ethic. By listening to the land and hearing its story, Jay balances the unique and ever-changing relationship between nature and the built environment. His design strategies incorporate ecology, rain, and ecosystem functions into everyday life.

Relevant Project Experience

Nells Woodland Ecological Master Plan, Ottawa, Illinois. Worked closely with Serena Sturm Architects and a local landscape contractor to develop a restoration and management plan for the 70-acre oak woodland in Ottawa. While on site, trail alignments and ravine overlooks were identified with future walking paths and connections to the outdoor building spaces and gardens (2019 -).

Nells Woodland Site Development, Ottawa, Illinois. Working closely with Serena Sturm Architects and building upon the Ecological Master Plan, GZA is developing plans for the gardens, outdoor spaces, and native landscapes at the Ecology Center, Wellness Center and Amphitheatre; for sustainable site infrastructure and stormwater management; for trails and overlooks; and shared spaces for a series of Studios/Artist Retreats (2019 -).

Choices Mental Health Facility, Ottawa, Illinois. Working closely with Serena Sturm Architects, the existing landscape is being reworked to bring back native landscapes and garden spaces that become part of the healing process at this mental health facility (2019).

Northside Learning Center, Chicago, Illinois. Worked closely with BLDD Architects and their Civil Engineer to provide design sketches, permeable paver specifications, and hand-drawn details that resolved serious stormwater issues associated with isolated flooding around a greenhouse, at entry doors, on walkways, and within landscaped areas on the north side of the school (2020).

Prairie Crossing Charter School, Grayslake, Illinois. Looking to create new entries into the Kennicott Building and the Byron Colby Barn Main entrance, the Executive Director also saw an opportunity to address overgrown landscapes, stormwater issues, and safer pedestrian walkways to lead students and visitors into the new entrances. Working together with their design/build team, GZA developed plans and details to address all the goals envisioned for the school (2020).

Rogue River Canoe Launch, Rockford, Michigan. As part of a larger riverbank stabilization project, the existing 'passive' canoe launch was identified as an opportunity for improvement that would provide ADA accessibility, create a point of interest adjacent to existing retail stores, and introduce a 'plaza' space that allowed bicyclists, pedestrians, and kayak users to co-mingle and pass safely from one space to another. The addition of a kiosk with solar panels provides a place for merchants to

Education

B.S. 1988, Landscape Architecture,
University of Illinois- Champaign/Urbana
1998, Ecological Restoration classes,
University of Wisconsin-Madison

Licenses & Registrations

Landscape Architecture - Illinois
#157-000270
LEED AP, 2006
IDOT Documentation of Contract
Quantities Certificate Number: 20-16323

Areas of Specialization

- Landscape Architecture
- Ecological Design and Restoration
- Sustainability
- Green Infrastructure
- Grant Writing

Affiliations

- American Society of Landscape Architects
- The Natural Resources Committee of Geneva
- The Conservation Foundation – Kane County Advisory Committee
- Geneva Park District Foundation

Publications and Presentations

- Resilient Cities | What Would an Entirely Flood-Proof City Look Like? The Guardian, 2017
- Reconnecting People to Nature; USGBC / CNU, 2016
- Sustainable Pavement Systems; ASLA Convention, 2012
- The Greenest Street in Chicago; Public Works, 2010
- Hidden Meaning – Best Practices in Stormwater Management; Parks and Rec Business, 2010
- Go Green, Think Blue; College Planning and Management, 2009

*project completed at a previous firm.



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post advertisements and local kayak groups to post flyers regarding upcoming trips (2020).

Canoe Launch Feasibility Study, Evanston, Illinois. To help understand if a new canoe launch would be feasible along the North Shore Channel, GZA worked closely with the City of Evanston GZA to review three sites - the existing canoe launch site, the Ladd Arboretum site, and within Twiggs Park. Beginning with a series of Site Analysis and Observations as well as multiple Concept Plans for each of the three sites, the City selected two concepts for further exploration. During early discussions with the City, it became clear that the biggest challenges will be negotiating an almost twenty-two (22) foot change in elevation and avoiding significant underground utilities and a sixty-inch water main that serves numerous Cities along the North Shore Channel. (2020).

Illinois State Toll Highway Authority Landscape Services Upon Request, Systemwide, Illinois. Working with a diverse team of landscape architects, led by 2IM, GZA is helping design, oversee installation, and provide maintenance oversight that meets the Tollways goal to plant 58,000 trees throughout the Tollway System. GZA is the design lead for two segments of tollway on I-294 that equals nearly 25 miles of roadway (2019 -).

Laraway School, Joliet, Illinois. Worked closely with the architect and civil engineer to envision sustainable stormwater strategies for the school and site, which will also be used in school curriculum and as learning landscapes. All sustainable strategies were vetted against Joliet Stormwater Ordinances (2018).

Coffee Creek Watershed Conservancy Stewardship Plans, Chesterton, Indiana. Over time the ornamental plants within many of the Preserves amenities are in much need of an overhaul and will be replaced with a simple matrix of native plants. At The Water Plaza, The Amphitheatre, The Weir bridge, and Pathway Islands, existing landscapes have been overrun by cool season grasses and aggressive ornamental plants that will be replaced with native plants (2018).

Clarke at Garden Avenue, Roselle, Illinois. Worked closely with Serena Sturm Architects to create a landscape that embodies the major ecosystems of the Midwest – Prairie, Savanna, and Wetland. The ecosystems will also function as rainwater management tools and educational opportunities for staff and visitors. Permeable pavers in the parking lot and a solar carport greet visitors that come to the site (2015-2018).

East Branch of Marley Creek Streambank Stabilization, Mokena, Illinois. Working closely with the City and HR Green, GZA created a series of cross sections that identified various levels of stabilization to match the existing conditions of the East Branch of Marley Creek Streambank Stabilization Project Area. The sketches took into consideration high levels of erosion, stream velocity, and visibility from adjacent walkways. Once a typical cross section was selected, construction documents were created for restoration of 130 linear feet of highly eroded streambank. Improvements included clearing, regrading, and replanting of native plants along this stretch Marley Creek (2018).

Floating Islands, Village of Orland Park, Illinois. The Village of Orland Park implemented floating islands in two stormwater ponds within the Hickory Creek Watershed to improve overall water quality within the ponds. Working with the Village, the floating islands were designed, built, and installed by H&H and Village staff. On-going maintenance and water quality sampling is being conducted (2018 - 2019).

Flagg Creek Stabilization Permitting, Hinsdale, Illinois. During a site visit to review water conditions within Flagg Creek, it was discovered that a 48" intercept pipe had been exposed from prolonged scouring of the embankment, the condition was so critical that work was ordered to stop the erosion. Working closely with the Village, H&H prepared After the Fact Permits through the U.S. Army Corps of Engineers, Chicago District, for the work that had been completed (2018).

DuPage County Government Center Landscape Improvements, Wheaton, Illinois. Teamed with RATIO and working closely with DuPage County Facilities Management staff, GZA is helping develop native landscapes and gardens for the DuPage County Government campus on County Farm Road that unify and create identity features at key locations on the campus (2018 -).

Pilcher Park Natural Areas and Soil Erosion Assessment, Joliet, Illinois. After securing a grant for the 900-acre Pilcher Park Nature Center, worked closely with the Nature Center's program manager to conduct a natural areas assessment, trail and bridge assessment, and invasive plant impacts within the park's site. The final report helped formulate restoration efforts to be completed



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by volunteers within the woodlands, identified trails that needed repair work, and listed additional grants that the park's program manager could pursue (2018 - 2019).

Village of Brookfield Comprehensive Plan, Brookfield, Illinois. Identified and portrayed various green infrastructure, open space, and natural resources that exist within Village limits. This information will be used to formulate future opportunities to spur sustainably minded development, attract visitors to downtown Brookfield, protect and enhance current resources such as Salt Creek, and identify potential funding sources for green infrastructure (2016 - 2018).

Fondy Food Market, Milwaukee, Wisconsin. Worked with the City of Milwaukee and several stakeholders to envision a vacant green space next to the food market that will now become a community open space asset. The new park will infiltrate water from market roof tops, incorporate native landscapes, host music on a new stage, educate the public about sustainable initiatives, and monitor runoff in order to quantify the effectiveness of green infrastructure (2017).

Eco-Arts Learning Center, Milwaukee, Wisconsin. Arts@Large is leading the way, with support of multiple partners, to artistically transform the .52-acre city-owned park known as Paliapito Park into an Eco-Arts Learning Center. The park will feature an amphitheater and seating for social events, a below-ground 1,700-gallon cistern that will collect on-site generated run-off for vegetable irrigation, and educational signs about the new amenities (2017).

Innovation Park, Milwaukee, Wisconsin. Currently, the property is considered a Brownfield Site and contains contamination in soil and groundwater. Due to limited potential uses of the property, the City of Milwaukee is looking to transform the site into a demonstration park that will display innovations in sustainable stormwater management, advanced soil and water remediation, renewable energy techniques, innovative materials, and urban ecology (2017).

Happy Turtle Farm, Galien, Michigan. Working closely with the Owner and State Forester, H&H created a site analysis and feasibility study to look at sustainable tree farming practices for an agriculture farm in rural Michigan. The plan identified opportunities to infiltrate water coming off adjacent properties, improve existing wetland and woodland habitat, incorporate boardwalks and trails for nature exploration, and install a matrix of native sedges and grasses in the cornfields where the tree farm will be planted. The grass matrix will establish a permanent native groundcover that will eliminate erosion and protect soils for long-term health of the farm (2016).

Lytle Park OSLAD Grant Administration, Mattoon, Illinois. Led a multi-disciplinary team to design and implement items supported by the Open Space Land Acquisition and Development (OSLAD) Grant, which included the Nature-based Playground, NewAGE Gardens, and the Amphitheatre with new restrooms (2015 – 2018).

Heritage Park, Mattoon, Illinois * Led a multi-disciplinary design team, The Lumpkin Family Foundation, City of Mattoon, and multiple stakeholders through an interactive process that has turned a parking lot into a park that showcases numerous Regenerative Design Principles such as rainwater harvesting, permeable pavers parking, a solar carport and charging station, ecosystem development, energy conservation, and a history wall, all within downtown Mattoon (2014 – 2016).

Cook County Forest Preserve District-wide Gateway Master Plan, Cook County, Illinois * Working with a diverse team of professionals, helped develop the Gateway Master Plan and Design Guidelines that will inform how gateway sites throughout the entire Cook County Forest Preserve District can be designed with better wayfinding capabilities, entry and monument signage, directional signage, and safety placards. The plan also identifies ecology restoration strategies for Phase 1 work (2014-2015).

The American Institute of Architects Sustainable Design Assessment Team (SDAT), Oxford, Mississippi* As part of a two-day design workshop, Jay joined a team of architects, urban planners, engineers, and local city staff and stakeholders to review existing conditions and develop scenarios for sustainability of Oxford's ecological resources, economic values, and cultural enhancements. After a focused City investigation, the design team provided initial findings at a community open house with a subsequent final report outlining and describing in-depth analysis and recommendations for Oxford's sustainable growth (2014).

Village of Mettawa Open Lands Management Plan, Mettawa, Illinois * Developed an "Open Lands Management Plan" to guide future planning and stewardship of all Village owned properties, their bike trail system, and right-of-way landscapes. During the



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process, created awareness for the need to protect various properties with permanent conservation easements, Open Space Zoning, and/or Illinois Nature Preserve status (2014 – 2015).

Route 53-120 Corridor Plan, Lake County, Illinois *. Created Existing Condition Assessments for the 17-square mile corridor with detailed analysis of environmental assets. Identified 'Cool Spots' - areas where environmental protection and enhancement should be focused so that development would not create a negative impact. Created "Open Space and Natural Resources Best Practices" to help strengthen municipal and county ordinances. (2013-2015).

Lytle Park Master Plan - A Vision for the Next 100 Years, Mattoon, Illinois *. Worked closely with the park Superintendent and Board to identify and articulate a series of sustainable initiatives – Natural Cleansing, Nature-based Play, New Active Green Environment, Sustainable Operations, and Access and Circulation, that will set the stage for the next 100 years of development (2011 – 2013).

North Shore Water Reclamation District (NSWRD) Conservation and Stormwater Study, Lake County, Illinois *. Identified and mapped areas for natural landscape improvements including green roofs, naturalized open spaces, bioinfiltration zones and permeable pavements to reduce stormwater runoff and its negative impacts to local waterways. Recommended methods to improve environmental assets and receive financial benefits at the three NSWRD locations reviewed. Prepared cost estimates and return on investments (ROI) for the suggested sustainable improvements to help guide capital budget allocations (2014).

Kickapoo Woods Forest Preserve Forest and Gully Restoration, Cook County, Illinois *. In conjunction with Friends of the Chicago River, used GIS in combination with field reconnaissance at the 280+ acre study area within Kickapoo Woods to understand existing conditions such as native and non-native vegetation zones, stormwater infrastructure, trails, boat launches, and at-risk topography within the ravines. Prepared restoration and revegetation that prioritized strategies specifically geared for Friend's volunteers to help stabilize onsite gullies and riparian corridors and work that required local contractors to enact due to the severity of erosion (2014).

Permeable Paver Plaza at Peck Farm Park, Geneva, Illinois *. Designed and oversaw the removal of the existing brick plaza at Peck Farm Park, which was rebuilt with permeable pavers. Included in the design were a number of rain gardens that collected runoff from barn roofs and incorporated the excess water into infiltration trenches out into the adjacent prairie landscape (2014-2015).

Hidden Oaks Nature Center, Bolingbrook, Illinois *. Worked closely with the Owner, Design Team, and stakeholders to develop a LEED Platinum nature center in Bolingbrook. Because the center was located within an oak/hickory woodland, the roads and trails were laid out in the field, following natural topography, and fitting into the site. A green roof, rain gardens, 100% permeable roadway, and infiltration trenches were used for detention in lieu of conventional detention (2010-2011).

CANEC – Child Advocacy and Neutral Exchange Center, Wheaton, Illinois *. Worked closely with the Owner, Design Team, and stakeholders to develop a Master Plan that was used to garner a grant from the DuPage County Water Quality Improvement Program. Once the grant was secured, helped develop full construction documents to implement permeable pavers in parking lots and sidewalks, and install rain gardens and infiltration trenches at every downspout and roof edge (2011-2013).

Anne Reid Early Learning Center, Naperville, Illinois *. Worked closely with the design team and Naperville School District to envision a Sustainable Schoolyard Plan for the new school, which helped win a significant grant from the IL EPA. The school grounds included parking lot bioswales, rain gardens, infiltration trenches, native landscapes, and permeable pavers in the bus drop off area that were topped with smog eating concrete, or photocatalytic cement (2010).

The American Institute of Architects Regional/Urban Design Assistance Teams (R/UDAT), Petersburg, Virginia*. This highly flexible program works for communities of all sizes, from small towns to districts in major metropolitan regions. Teamed with architects, urban planners, engineers, and local city staff and students, the design team matches solutions for the communities needs and struggles such as affordable housing, vacant storefronts, unfocused growth, and neighborhood decline. Through a series



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of community activities and evaluation, the design team creates and presents an action plan with phased, implementable recommendations for the future (2012).

Naper Settlement, Naperville, Illinois *. Worked closely with the Owner, Design Team, and stakeholders to develop a Master Plan that was used to garner a significant grant from the IL EPA for Non-Point Source Pollution. Once the grant was secured, helped develop full construction documents to transition asphalt trails and parking lot to permeable pavers, install rain gardens and infiltration trenches at every downspout and roof edge, and create a rainwater harvesting and recycling system for education and irrigation purposes. The project helped reinforce the need for BMP's in stormwater ordinances (2010-2012).

Edgewood Elementary, Woodridge, Illinois *. Worked closely with school district personnel to implement new permeable pavements for parking lots, sidewalks, school entries, and even play surfaces that did not hold playground equipment (2013).

Siple Elementary, Woodridge, Illinois *. Worked closely with school district to implement new permeable pavements for parking lots, sidewalks, school entries, and play surfaces that did not hold playground equipment (2012).

Willow Creek Elementary, Woodridge, Illinois *. Worked closely with school district to implement new permeable pavements for parking lots, sidewalks, school entries, and play surfaces that did not hold playground equipment (2011).

Seager Park, Naperville, Illinois *. Worked with Naperville Park District and a multi-disciplinary team to create the nature-inspired learning center that incorporated permeable pavers into the entire driveway and drop off zone for the nature center (2008-2010).

Cermak Road Sustainable Streetscape, Chicago, Illinois *. Building on their Green Alleys Program, the multi-disciplinary team and CDOT created a 2-mile-long streetscape that met LEED Platinum criteria, which led to the project being dubbed the 'Greenest Street in America'. Permeable pavers were used in sidewalks, plazas, and on-street parking to significantly reduce run-off from entering MWRD's stormwater system. It was also the first-time photocatalytic cement, or smog-eating concrete, was applied to permeable pavers in Chicago. The technology increased light reflection, which allowed streetlights to be reduced and spaced farther apart along the roadway (2008-2011).

Irving Park Road, Phase 2 Streetscape, Chicago, Illinois *. Worked closely with CDOT to develop a streetscape design that incorporated numerous green infrastructure techniques (2010-2011).

Federal Street Improvements, 31st to 33rd Street on the Illinois Institute of Technology Campus, Chicago, Illinois *. Created a series of sketches to show street improvements, pedestrian circulation, parking alignments, and sustainable techniques applicable to roadway design (2008-2009).

Green Campus Initiatives for Woodridge Community SD 68, Woodridge, Illinois *. Working closely with school district personnel, helped create plans for three of their seven schools to transition every impermeable surface possible to permeable pavements, this included all parking lots, sidewalks, school entries, and even play surfaces that did not hold playground equipment. Rain gardens and infiltration techniques were used at every downspout or roof edge where rain sheets off from the top. Reading gardens were implemented at the entrance to each school to facilitate nature-based school curriculum opportunities (2010-2015).

ICPI (Interlocking Concrete Paving Institute) Seminars*. Participated in a series of yearly seminars that educated participants on technical aspects and trends in permeable interlocking concrete pavement systems (2014 – 2017).

Hammerschmidt Elementary Learn+Play Gardens, Lombard, Illinois *. Working closely with school staff, helped develop a nature-based playground and green schoolyard vision that encourages active and passive play, community gatherings, and appreciation of the arts such as outdoor music, sculpture, and interpretive signage. Designed sustainable stormwater features including porous concrete sidewalks, native plantings, rain gardens, and infiltration pits tied to the root zone of poplar trees (2014 – 2016).

Chicago Teachers Union Headquarters, Chicago, Illinois *. Worked closely with multi-disciplinary team to identify strategies to offset stormwater runoff on a site that had no room for conventional stormwater attenuation per the City of Chicago Code.



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Strategies included 100% permeable pavers in parking lot areas, green roofs, and cisterns to collect and recycle excess runoff from the green roof (2015).

City of Chicago Department of Housing and Economic Development's (DHED) Learning Landscapes, Chicago, Illinois *. At three schools in Englewood Community, designed vacant land that was seen as problematic around the schools and turned them into community garden spaces where students and residents can gather (2008-2011).

Carmel Catholic High School Courtyard, Mundelein, Illinois *. An antiquated courtyard inside the school was converted into two separate but united spaces through commonalities of texture, color, and water. A water harvesting system collects roof runoff for a series of water features that move water through the terrace, providing an interaction between students and rain while a bench that utilizes reclaimed white oak tells the story of our State tree (2010 – 2012).

West Hall at Elmhurst College*, Elmhurst, Illinois. Working closely with the design team and university personnel, helped create a project that incorporated sustainable stormwater management into almost every facet of the project – bioswales, rain gardens, permeable pavers, rainwater harvesting for irrigation, and native landscapes (2008-2010).

University of Chicago Cultural Landscape and Sculpture Assessment, Chicago, Illinois *. Collected, reviewed, and documented existing landscape conditions and historic data on fifty-five (55) garden sites throughout the campus as well as twenty-six (26) sculptures throughout the campus. This led to the development of individual Resource Data Sheets for all sites documented (2011-2012).

Columbarium at Elmhurst College, Elmhurst, Illinois *. Working directly with the University, developed a series of sketches for a columbarium on University-owned property that holds burials of past Presidents and University personnel (2010).

Ball Horticultural Company's Sustainable Streetscape & Premier Lab, West Chicago, Illinois *. Created a multi-phased master plan with sustainable features including bioswales, rain gardens, native landscape establishment, and infiltration zones associated with their existing parking lots. The new landscape identity for the headquarters reflects Ball's evolving brand to showcase the naturalistic side of natives and perennials combined with annuals (2010-2012).

Clarke Corporate Headquarters, St. Charles, Illinois *. Created a Campus Master Plan that outlined sustainable initiatives for stormwater run-off reductions, increased landscape biodiversity, opportunities for staff to interact with edible garden spaces, and education of adjacent property owners about sustainable land management (2013-2014).

The Chautauqua Institute, Chautauqua, New York*. Developed a series of sustainable initiatives that include native landscapes to engage local residents and city officials in conversations about their positive attributes; reduced direct discharge of stormwater runoff into Lake Chautauqua where algal blooms are becoming a serious summer nuisance; green infrastructure such as rain gardens, permeable pavers, and bioswales on a residential scale not seen before in this area of New York (2012 – 2014).

Helen Plum Library Shade Study, Lombard, Illinois *. Worked closely with Engberg Anderson Architects, the Helen Plum Library, the Lombard Park District, and key stakeholders to identify and document impacts from shade and construction on Lilacia Park, their lilac's, and other vegetation within twenty feet of the building envelope (2016).

Park 580 (Read-Dunning), Chicago, Illinois *. Created revisions to the overall site plan and layout for the recreational fields, parking, walkways, concession building and plaza, restrooms, and landscape around the property (2015 – 2016).

Redevelopment Plan and Code-based Ordinances, Highland, Indiana. Working closely with City Staff and Officials, a Redevelopment Plan and Code-based Ordinances detailed how the community would incorporate new development patterns into existing infrastructure, architecture, and transportation systems, and how it could build toward a sustainable future. The document contains diagrams, maps, aerial photos, reports, and data that support Highland's vision (2014).

McKinkley Woods Forest Preserve, Joliet, Illinois *. Led a team of design professionals to improve handicap accessibility to a Civilian Conservation Corps camp and the Frederick's Grove Shelter. Work also included a new handicap accessible canoe launch onto the I&M Canal, updated restrooms, trails, and restoration initiatives (2010).



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Chicago Stormwater Ordinance Manual, Chicago, Illinois. Worked with the City's Dept. of Environment to discuss and understand a set of best management practices (BMPs) to control stormwater-related impacts for development and redevelopment in the City. During the development of updates to their current stormwater ordinance, participated as an expert witness to discuss the benefits of stormwater BMPs and green building technologies with City of Chicago Council Members (2010).

The Morton Arboretum Permeable Paver Parking Lot, Lisle, Illinois * Worked closely with the Arboretum, Civil Engineer, and Grant Writer to develop plans for the 500-car permeable paver parking lot and submit an application to the Illinois EPA Clean Lakes grant program, who awarded approximately \$1.2 million for the design and construction of the parking lot (2002).

City of Waukegan Master Plan, Waukegan, Illinois. A multi-disciplinary team, working with the City of Waukegan, envisioned a new future for Waukegan's Downtown Central Business District, the Harbor District, and railyards area to establish a long-term vision for development and growth on properties identified as brownfield sites (2002 - 2003).

The Queens Botanical Garden Master Plan, Queens, New York * Worked closely with the Owner, Architect, Stakeholders, and public to develop a Master Plan that honored the legacy of the botanical garden while identifying Regenerative Design Principles that could be implemented within various garden spaces. The Master Plan also had to speak to the 122 language dialects of Queens. Water was identified as the one unifying element to all the dialects (2002).