

JOHN A. MUNDELL, P.E., L.P.G.

President and Senior Environmental Consultant
MUNDELL & ASSOCIATES, INC.

EDUCATION:

Doctoral Studies (abd), Civil Engineering, University of Notre Dame
specialization - groundwater/environmental engineering
M.S., Civil Engineering, Purdue University, 1980
specialization - geotechnical engineering
B.S., Civil Engineering, Purdue University, 1979

PROFESSIONAL AFFILIATIONS:

American Society of Civil Engineers
Association of Ground Water Scientists and Engineers
International Society of Soil Mechanics and Foundation Engineers
American Society for Testing and Materials
American Geophysical Union
Hazardous Materials Control Research Institute
Indiana Water Resources Association
Indiana Geologists
Professional Geologists of Indiana, Inc.
Tau Beta Pi, Chi Epsilon, Phi Eta Sigma Honoraries
Water Environment Federation
American Chemical Society

REGISTRATION:

Professional Engineer: Indiana
Licensed Professional Geologist: Indiana

EXPERIENCE:

President and Senior Environmental Consultant, MUNDELL & ASSOCIATES, INC., 1995 - Present
Vice President, Corporate Director, Technical Services, ATEC Associates, Inc., 1991- 1995
Assistant Vice President, Corporate Director, Technical Services, ATEC Associates, Inc., 1989-1991
Corporate Director, Environmental Services, ATEC Associates, Inc., 1988-1989
Research Associate, University of Notre Dame, 1984-1988
Environmental Consultant, 1984-1988
Project Engineer, ATEC Associates, Inc., 1983-1984
Staff Engineer, ATEC Associates, Inc., 1981-1983
Graduate Teaching Assistant, Purdue University, 1979-1980
Assistant Programmer, AMAX Coal Company, 1979
Soils Engineering Assistant, Indiana State Highway Commission, 1978

PROFESSIONAL CAPABILITIES:

Mr. Mundell has been an environmental/geotechnical engineering consultant and researcher for over 23 years specializing in contamination assessment, waste containment, and remediation. He has served as project engineer, project manager, project director, senior technical consultant and expert witness for numerous projects throughout the United States, Canada, Mexico, Puerto Rico, Europe and Asia covering the full range of environmental services including: remedial investigation/feasibility studies (RI/FS); RCRA facility investigation (RFI), remedial design/remedial action (RD/RA) studies; RCRA corrective measures studies (CMS), geologic and hydrogeologic assessments; solid and hazardous waste facility siting, design and closure investigations; underground storage tank assessments; groundwater contamination, restoration, and treatment studies; and geophysical and geotechnical engineering studies.

Expertise includes groundwater and contaminant modeling; geochemical evaluations; risk assessments; design and installation of monitoring well systems; groundwater sampling techniques; field and laboratory permeability testing of soils and rock; water and waste analytical chemical testing interpretation; regulatory compliance; delineation, recovery, and containment of hydrocarbon and hazardous constituents in the subsurface; and evaluation and design of innovative technologies for hazardous waste site clean up.

In addition, Mr. Mundell has been responsible for the development and implementation of environmental standard operating procedures and quality assurance/quality control programs, regulatory status evaluation, technical specialty group management, and in-house training and research for one of the largest environmental consulting firms in the United States.

SELECTED PROJECT EXPERIENCE:

Selected project experience includes:

Brownfields Redevelopment

- Historical review, Phase II soil and groundwater investigation and geophysical survey for the CSX Railyard (formerly known as Moorefield Yard) in Indianapolis, Indiana. Soil analytical testing revealed residual levels of polynuclear aromatic hydrocarbons (PAHs) most likely the result of existing coal fragments and dust, cinders and residual hydrocarbons. Levels of PAHs and volatiles in the soil and groundwater were well below Indiana Department of Environmental Management Voluntary Remediation Program Tier II Nonresidential Cleanup Goals.
- Phase II assessment and constructing monitoring for the development of the Indianapolis Indian's Victory Field baseball stadium in Indianapolis, Indiana.
- Phase II assessment, waste evaluation and construction monitoring for the development of the Indiana Pacer's Fieldhouse in Indianapolis, Indiana.
- Phase I/II, risk assessment and Indiana Department of Environmental Management Voluntary Remediation Program for the former Continental Lumber Company site in Indianapolis, Indiana. Evaluation included groundwater flow modeling of the potential for offsite movement of a volatile organic chemical plume.
- Investigation oversight, community relations, and wellfield evaluation for commercial/industrial sites along 16th and Martin Luther King Drive corridor in Indianapolis, Indiana.

Remediation

- Project director and engineering task manager for the remedial design of a groundwater pump and treat system for a gasoline plume adjacent to Eagle Creek Reservoir, Indianapolis, Indiana. Design considerations included both an aquifer pumping and injection test, plume capture and time-to-cleanup modeling, pumping well system design, evaluations of discharge alternatives (POTW, NPDES permit, or direct infiltration), and determining the impact of high chloride concentrations on air stripping efficiency.
- Project director and engineering task manager for the remedial design of a groundwater pump and treat system for a volatile organic chemical plume near the White River, Indianapolis, Indiana. Full scale aquifer pump testing was performed. System design considerations required establishment of hydraulic control of the site through capture zone analysis, high discharge rates (>200 gpm), POTW and NPDES discharge alternative evaluations, and life-cycle cost analysis.
- Project director and engineering task manager for an air sparging/vapor venting groundwater treatment system for a gasoline/diesel fuel plume from maintenance facility near a tributary to the White River in Indianapolis, Indiana. Cleanup alternatives evaluated standard pump and treat technology as well as air sparging well point and trench options. The final design consisted of a two-trench sparging barrier with vapor venting system, approved by the Indiana Department of Environmental Management (IDEM), the first such system designed, constructed, and in operation in Indiana.
- Project director and engineering design task manager for a groundwater pump and treat system at a metal fabrication facility in northern Indiana. The work activities included a full scale aquifer pump test, capture zone modeling analysis, pumping well system configuration and capacity evaluation, and design of groundwater treatment by air stripping and final discharge into a below-ground infiltration gallery.
- Senior technical consultant for the remediation design review of the Main Street Well Field Superfund Site in Elkhart, Indiana. The review, performed for a PRP, included hydrogeologic and historical contamination review, design alternative performance evaluation, and plume contribution analysis for the chlorinated solvent plumes observed in the area.
- Corrective action plan for a petroleum hydrocarbon release from the West Street Indianapolis Department of Transportation maintenance facility along the White River in Indianapolis, Indiana. Investigations included removal of 12 underground storage tanks, geophysical surveys, off-site delineation, indoor gas vapor evaluation, remedial alternative assessment, groundwater/contaminant and hydrological modeling, and the development of a natural attenuation approach for site closure.
- Technical review of the remedial engineering design of a 200 gpm groundwater pump, treat, and infiltration system for a metal parts manufacturer in Elkhart, Indiana. The review included evaluation of the historical release of chlorinated solvents, the adequacy of the capture zone and hydraulic control exercised at the site, and the analysis of economic evaluation of the remedial alternatives. In addition, the design and performance of the infiltration gallery for treated water discharge was reviewed.
- Project manager for a 7000 gallon TCE spill evaluation and groundwater clean-up assessment for a chemical company in Indianapolis, Indiana.
- Design study of a passive soil biopile system for Turnpike Exxon Station, Delaware Turnpike, Delaware. Design included a contamination assessment, an air emission study to estimate the magnitude of vapor release, and microbial analysis to document levels of indigenous microorganisms. Emissions from the biopile were estimated using the RTI model included in the U.S. EPA CHEMDAT7 program, taking into consideration the area, thickness, TPH and BTEX soil concentrations, the mean wind velocity, and the mean temperature.

- A laboratory treatability study on a lead and cadmium contaminated soil/aggregate mixture taken from the Southwire Corporation in Carrolton, Georgia. Two stabilization reagents (lime and cement) were evaluated at varying mix ratios and curing times to determine final mix design specifications. A lime addition of at least 20 percent by weight resulted in a treated mixture that would not exceed TCLP regulatory levels.

Remedial Investigations

- Preliminary hydrogeologic environmental assessment for the Rock Island Refinery in Indianapolis, Indiana. The study included a review of local and regional geologic and hydrogeologic data, drilling of soil borings and placement of monitoring wells, and analytical testing of soil and groundwater.
- Project manager for a hydrogeologic investigation of an electrical components manufacturer in Franklin, Indiana. The study, a part of the RCRA facility closure, included review of published regional geologic and hydrogeologic literature and water well logs, field exploration including the drilling of soil borings, monitoring well installation, field permeability testing, analytical testing of soil and groundwater to determine the presence of organic and inorganic chemicals, and a determination of the extent and severity of existing contamination.
- Project manager for the contamination assessment of a property adjacent to a wood-treatment facility in Indianapolis, Indiana.
- Senior technical consultant for the review of the remedial investigation/feasibility studies for two wood-preserving facility Superfund sites in Illinois and Wisconsin.
- Senior technical consultant for the review of the remedial investigation/feasibility studies for the Allied-Signal Goldcamp Disposal Area and the Ironton Coke and Tar Plant Superfund site in southeast Ohio.
- Senior technical consultant and expert witness for the evaluation of the remedial investigation/feasibility studies and remedial design/remedial actions for twenty Superfund sites located in twelve states previously used as wood-preserving plants, coke and tar plants, chemical manufacturing plants and landfills owned, operated or used by the Kopper Company. The assessment included the evaluation of the sources of soil and groundwater contamination resulting from the discharge of creosote, tar, and various organic chemical mixtures, analysis of the groundwater flow and chemical transport characteristics at the sites, and a review of the alternatives and cost estimates for implementation of proposed remediation alternatives. One site, the Koppers Florence, South Carolina wood-preserving plant, was selected for detailed three-dimensional visualization and volumetric analysis to determine the relative contribution of site operational features to the quantity of subsurface soil and groundwater contamination for the purposes of remediation cost allocation.
- Senior technical consultant for the review of the remedial investigation/feasibility studies and hydrogeologic analysis of the Lowry Hazardous Waste Landfill Superfund site near Denver, Colorado.
- Project manager for a remedial investigation of a hazardous waste landfill in southern Indiana. Field studies included intensive subsurface characterization using soil and rock borings, monitoring wells, lysimeters, and downhole geophysical logging (gamma ray, caliper).
- Senior consultant for a remedial investigation at the former A.Y. McDonald Foundry Superfund site in Dubuque, Iowa. Geophysical electromagnetic conductivity and resistivity surveys were performed across the site prior to the bulk of the sampling effort to gain preliminary information on areas of high conductivity indicative of buried foundry wastes. Subsequent investigations included the drilling of 32 exploratory borings, installation of 12 monitoring wells, and multiple test pit excavations and surface material sampling guided by the geophysical survey results.

- Remedial investigation/feasibility study, design, and construction management of a dual groundwater recovery/treatment/soil venting system for industrial volatile organic contamination at a plant site in Texas. The study included pilot vapor extraction testing, air discharge monitoring, and pump testing to determine hydraulic parameters.
- RI/FS study, remedial design, and evaluation of a groundwater recovery and treatment system at a major fuel pipeline rupture in Texas.
- Manager of RCRA monitoring well network designs, installations, monitoring programs, and evaluations at numerous industrial and public land disposal and storage facilities.
- Hydrogeologic investigations of underground hydrocarbon leaks at multiple major oil companies (Chevron, Shell, Amoco, BP, Marathon, Exxon) facilities throughout the U.S. Work included literature reviews of the geology and hydrogeology of the area; defining the general subsurface and ground water conditions by drilling exploratory soil borings and installing monitoring wells, determination of the extent and thickness of free and bound product within the area and the probable direction of movement; evaluation of existing and potential impacts to structures and utilities in the area of the suspected leak; development of recommendations for product recovery and groundwater recovery, and remedial alternative design and construction.
- Managed projects throughout the United States for the delineation, hydraulic containment, and recovery of petroleum product spills at underground storage tank locations.
- Petroleum hydrocarbon vapor evaluation from a product release at a Shell station in Evanston, Illinois. The study resulted in the design and installation of a soil vapor extraction (SVE) system along with a groundwater pump and treat system.
- Project director for a hydrogeologic assessment of selected areas at the facilities of McDonnell Aircraft Company (MAC) in St. Louis, Missouri. Work included characterizing subsurface soil and groundwater conditions, delineating contaminated areas, and developing cleanup and decontamination strategies best suited for each location.
- Project manager for a hydrogeologic study at the Eli Lilly Clinton, Indiana Laboratories facility to determine the existing subsurface soil and groundwater conditions in the vicinity of Building C-63 and develop recommendation to control seepage into valve pits and an underground tank farm.
- Petroleum hydrocarbon vapor evaluation in an office building in Corydon, Indiana.
- Petroleum hydrocarbon vapor evaluation and subsurface soil and groundwater remediation beneath a residential dwelling and restaurant in Richmond, Indiana.
- Methane gas migration from a landfill in Texas.
- Field and laboratory characterization study of an abandoned limestone quarry for evaluation as a potential sanitary and hazardous waste disposal site for Penn Dixie Steel in Kokomo, Indiana.
- Development of first national standard for the performance of Phase I environmental site assessments for nationwide delivery of reports.
- Senior reviewer of agricultural, commercial and industrial Phase I environmental site assessments nationwide.
- Evaluation of the historical development of the state-of-practice for Phase I environmental site assessments.

Geophysical Surveys

- Performance of and data reduction/evaluation of field resistivity, magnetics, and seismic surveys over three Indian burial mounds in Battleground, Indiana. The results were used to guide selected accelerated archaeological excavations of the mounds to recover key artifacts. (National Science Foundation sponsored research)
- Project manager for a riverbank stability project along the Ohio River. Downhole geophysical logging (gamma ray, caliper) was used to accurately interpret subsurface stratigraphic variations and, together with monitored slope inclinometer measurements, determine the depth and orientation of the failure plane.
- Geophysical survey of an urban Indianapolis brownfield site to determine a sampling strategy approach and the cost of site development. Survey included deep metal detection with a Geonics EM61, an apparent conductivity survey with a Geonics EM-31, and 2-D resistivity profiling with a Sting/Swift 2-D resistivity imaging system. Eighteen (18) test pits were used to confirm and characterize anomalous areas, allowing the quantification of expected redevelopment costs. The results of the verification test pit excavations together with the geophysical survey indicated approximately 16,000 to 19,300 cubic yards of materials would require removal and disposal to prepare for site development, at an estimate cost of \$525,000 to \$970,000.
- Data collection and interpretation of seismic surveys to determine depth to bedrock for a rippability study for construction development of an industrial facility.
- Geophysical survey for a large building addition located within a former chemical manufacturing plant area. EM61, EM31 and 2-D resistivity imaging were used to characterize site materials, clearly mapping both horizontal and vertical variations in site fill materials (including former utilities, tanks and metal debris) as well as chemically-impacted soil fill. The geophysical survey allowed the quantification of special waste disposal costs (\$550,000); final construction costs from the project were within 5 percent of this estimate. This pre-development survey allowed for adequate health and safety plan development and air monitoring considerations to be planned and in place via an approved health and safety plan, allowing for the completion of the basement excavation without delays or significant incident.
- Geophysical survey for a new waste handling facility within a large manufacturing complex in Indiana. The survey consisted of a multi-faceted approach consisting of EM61 deep metal detection, EM31 terrain conductivity measurements, and 2-D resistivity profiling to map out past waste and fill materials in the area. Test pit confirmation of anomalous areas revealed the presence of metallic debris and concrete foundations associated with a former, large aboveground oil tank located in the area and the disposal of pure organic chemical containers mixed within the upper 10 ft of soils. The results allowed for the selected removal of environmentally-impacted materials and the development of building foundation alternatives avoiding unnecessary remedial costs.
- Geophysical survey at the 110-acre prehistoric Mitchell Springs Ruins archaeological complex located near Cortez, Colorado. The purpose of the survey was to test the efficacy of geophysical methods for pre-evaluating Anasazi ruins within selected areas of the site prior to archaeological excavation. Magnetic, ground-penetrating radar, and 2-D resistivity profiling results were used to develop an archaeological exploration strategy. Field verification of various geophysical anomalies completed during the summer of 2000 field program identified a pueblo with connecting rooms, several deep storage pits, and three burials.

Groundwater, Surface Water, Porous Media Modeling/Contaminant Transport Studies

- Groundwater quality review, hydrogeologic assessment, and groundwater modeling study for a petroleum bulk terminal near Seymour, Indiana.
- Task manager for the site stratigraphic analysis and groundwater flow modeling of the United Airlines MOC II facility at the Indianapolis International Airport. The study included assessing the geology and hydrogeology of the

site and the development of a site and area groundwater flow model for evaluating the site conditions that will control contaminant movement resulting from future spill events at the facility.

- Extensive hydrogeologic analysis of excessive seepage loss rates for the 173-acre Westwood Lake (Structure 13) reservoir contained behind a 55-ft embankment dam that had experienced severe problems soon after the initial filling. The study included both regional and site geologic evaluations including the drilling of soil borings, excavation of test pits, groundwater level monitoring, field hydraulic conductivity testing of underlying sandy soils, and laboratory testing. In addition, detailed hydraulic modeling analyses were performed to quantify the cause of the uncontrolled seepage. Water balance calculations involving considerations for surface runoff, evaporation and soil seepage rates, reservoir pool level versus filling time were performed. Pre- and post-construction conditions were evaluated. Remedial design activities included considerations of a slurry trench cutoff and blanketing of significant portions of the reservoir bottom. Design drawings and construction specifications were developed and the blanketing recommendations implemented.
- A surface water/groundwater interaction study for the Wild Dunes Condominium complex in Pensacola, Florida. The detailed modeling analysis evaluated the effects of sustained fluid discharge into a proposed 100 ft by 100 ft sewage lagoon on the water levels of an underlying fine to medium sand aquifer. The study included the drilling of soil borings, installation of monitoring wells for water level evaluation, and in-situ hydraulic conductivity testing to determine the flow characteristics of the sandy aquifer. The effects of varying discharge rates into the lagoon on the magnitude and rate of groundwater mounding were analyzed using both one- and two-dimensional analytical techniques assuming steady-state and transient conditions (McWhorter and Sunada, 1977; Bear, 1979; Boulton, 1965; Glover, 1964; Bianchi and Mockel, 1970; Hantush, 1967). The results of the study guided the final configuration and location of the storage reservoir and the allowable discharge rates to the facility.
- Seepage analysis of flow contributions from both a soil and bedrock aquifer system to the Markham Harvey Reservoir and Calumet-Union Drainage Ditch, a 28-acre, below-grade storm water retention basin in Markham, Illinois. Calculations guided the design and installation of a vibrated-beam slurry wall to control groundwater infiltration into the reservoir and protect the surrounding groundwater system.
- Projects involving groundwater dewatering of construction sites, seepage analysis for dams and surface impoundments, and hydraulic control for water supply endangerment mitigation.
- Groundwater modeling and contaminant transport studies for the Broderick Superfund Site in Denver, Colorado. Wood preserving operations at the site since the late 1940s had discharged wastewaters containing pentachlorophenol, naphthalene, and other organic chemicals into multiple unlined impoundments. Advanced one and two-dimensional analytical and numerical (finite difference and finite element) modeling was performed to assess the impact that the operations had on groundwater quality in the area. As part of the contaminant source evaluations, three-dimensional computer visualization analysis was performed to determine the full extent and relative distribution of the light nonaqueous phase liquids (LNAPLs) and dense nonaqueous phase liquids (DNAPLs) released from both the plant treatment area and the impoundments. The modeling calculations were used to provide a basis for pollution liability claims made against the Hartford Insurance Company.
- Development of multicomponent contaminant transport numerical computer codes for research sponsored by the Department of Energy. The finite element codes involved inorganic chemical reactions including aqueous complexation, adsorption, ion exchange, precipitation, and dissolution. The research was published in both national and international publications.
- One and two dimensional analytical and numerical groundwater and organic contaminant transport modeling of multiple volatile organic plumes at an industrial site in Greenville, Texas. The analyses accounted for site specific retardation due to sorption mechanisms and concentration decay due to biological degradation of the contaminants, migration pathways to the nearest receptors, and toxicity evaluations. The study supported the contention that the

chemicals posed minimal long-term risks to human and aquatic health and was used by the Texas Water Commission as the technical basis for the first risk-based site closure approved in the state of Texas.

- Groundwater and contaminant transport modeling of multiple volatile organic plumes at the Goshen Avenue and Shirk Road site in Visalia, California. Study included two-dimensional finite difference and finite element numerical modeling to determine the historical release of organic chemicals at the site and the relative contribution of distinct source areas.
- Probabilistic groundwater contaminant transport evaluation at a hazardous waste landfill in Mount Vernon, Indiana.
- Performed geochemical groundwater evaluation for the design of the in-place immobilization of 8000 tons of EP-toxic foundry wastes and site closure at the former A.Y. McDonald foundry Superfund site in Dubuque, Iowa, approved by U.S. EPA, Region VII. A theoretical equilibrium-based chemical model was calibrated to actual site geochemical condition to determine the controlling in-place conditions. Extensive laboratory testing included EP toxicity, total lead, acid neutralizing capacity, pH, modified batch leaching tests, and dynamic column leaching tests. The study was instrumental in providing the U.S. EPA the technical data to allow the first use of on-site immobilization techniques at a Superfund site.
- A geochemical groundwater analysis of the potential impact of municipal incinerator ash from the Chicago Northwest Waste to Energy Facility. The detailed study indicated the ash would not leach the hazardous constituents lead and cadmium into the groundwater system below the Forest Lawn Landfill in Three Oaks, Michigan.
- Ground water and geological study for land application and tank farm areas for Texaco, USA in Lawrenceville, Illinois. Additional work included the development of a Ground Water Quality Assessment Plan (GQAP) pursuant to the requirements of Illinois Regulations, Section 725-193(d)(3) to determine whether hazardous water or hazardous waste constituents have entered the ground water, their rate and extent to migration, and their concentration in the ground water.
- Solute transport modeling studies to evaluate the effectiveness of the existing groundwater monitoring system at the Waste Management, Inc. - CID Recycling and Disposal Facility in Calumet City, Illinois. The studies included the postulation of two worst case scenarios (point and area contaminant sources), hydraulic parameter estimation, definition of the effective monitoring well spacings (EMWSs) relative to groundwater flow direction, and a two-dimensional plane dispersion analytical analysis of contaminant transport from the source areas to the compliance monitoring boundary. The study determined the EMWSs required to detect varying release concentrations within the 30-year post closure monitoring period.
- Geochemical evaluation of the Waste Management, Inc. Wheeler Recycling and Disposal Facility in Wheeler, Indiana. The study included a review of both regional and site geology, development of a stratigraphic and hydrostratigraphic site model, geochemical analysis of site soils and groundwater including selected organic and inorganic testing and mineralogical analyses, groundwater flow analysis, and recommendations for a proposed detection monitoring system. The results of the study demonstrated that natural variations in site geochemistry due to varying depositional environments were the cause of the statistically significant changes in groundwater quality downgradient of the facility, rather than releases from the facility itself.
- Evaluation of geochemical properties of glacial till soils in central Indiana and assessment of attenuation mechanisms for leachates generated from landfills.
- Developer of over ten computer programs to perform both analytical and numerical (finite elements, finite differences) analyses of groundwater flow and multicomponent contaminant transport problems. Results of simulations have been published in both national and international scientific and engineering journals.

- Vapor transport modeling of volatile organic chemicals remaining in the soil and groundwater beneath the U.S. Can facility in Burns Harbor, Indiana. The U.S. EPA Box Model was used to simulate the movement and impact of chemicals in the groundwater on the outdoor air quality near the facility. The Johnson and Ettinger (JE), 1991, analytical model was used to predict emission rates into enclosed basements and subsurface structures. A sensitivity analysis was also performed to determine the impact of assumed and measured physical parameters (diffusion coefficients, enclosed-space air exchange rates, crack intensity of basement floor) on the simulated air concentrations.
- Methane gas generation analysis for a closed landfill near Mt. Vernon, Indiana.
- Analysis of vapor diffusion transport models to evaluate indoor air quality from residual soil and groundwater contamination for the development of the Indiana risk based regulatory standards.
- Natural gas migration analysis through soils adjacent to a pipeline release in west-central Indiana.
- Indoor air quality study at a apartment complex for vapors from a chlorinated solvent groundwater plume.

Water Resources

- Wellhead Protection Officer for Marion County, Indiana. This position evaluates special exemption requests to the Marion County Wellhead Protection Ordinance.
- Served as the Technically Qualified Person (TQP) for Marion County, Indiana. This position evaluated the site and development plans under the Marion County Wellhead Protection Ordinance.
- Wellhead delineation studies for Ladoga, Linden, Van Buren and Camden, Indiana.
- Wellhead delineation/impact study for Lowell, Indiana. The study evaluated the effects of septic systems for a planned residential development on the nearby wellfield.
- Wellhead delineation/impact study for the Jennings Water Company in Bartholomew County, Indiana. The study evaluation the potential impact of releases from the proposed Bartholomew County Landfill on the wellfield. The study involved a hydrogeologic assessment, groundwater and contaminant transport modeling, and litigation support.
- Wellhead study in Greendale, Indiana to evaluate the impact of a proposed casino on the future water quality. The study included an assessment of the potential stormwater runoff quality from proposed parking lots, an evaluation of existing and future capture zones of the Greendale Wellfield, and a quantitative determination of the dilution expected from discharge of the surface water to intake into the pumping wells.
- A research study supporting the work of the Center for Urban Policy and the Environment, School of Public and Environmental Affairs at Indiana University Purdue University in Indianapolis to evaluate the risks posed by potential contaminants in wellfield protection areas. The research included the modeling of the behavior of a wide range of contaminants in the subsurface, the development of a relative risk index for chemicals based on their toxicity, mobility and persistence in the environment, and an assessment of the impact of small releases within wellhead capture zones using a capture zone dilution model. The research study supported the policy decisions for the formulation of a new wellhead protection ordinance by Marion County, Indiana.
- Groundwater assessment of the Mainstreet Well Field Superfund Site in Elkhart, Indiana. Study included an assessment of the capture zone analysis for the wellfield and surrounding industrial areas.

- A regional-scale groundwater hydrology assessment of the White River Drainage Basin in downtown Indianapolis funded by the U.S. Army Corps of Engineers. This comprehensive study evaluated the existing groundwater, surface water and nearby Indianapolis Water Company wellfield interactions near the White River, and simulated the effects of raising the river level by constructing a new low-flow dam. The transient impacts of a flood superimposed on the proposed water level were also evaluated in relation to nearby subsurface basements, sewers and other below-grade structures.

Risk Assessment

- Human health risk assessment for the closure of an interim status RCRA Drum Storage Unit for the U.S. Can Company in Burns Harbor, Indiana. Historical investigations had revealed the presence of spent non-halogenated solvents (F003/F005) generated from the application of solvent based varnishes, inks and other organic coatings from tinplate. The site and area geologic and hydrogeologic conceptual model was input into the analytic element code GFLOW to generate a regional groundwater flow model for determining contaminant migratory pathways. A quantitative assessment of the potential groundwater discharge into nearby surface water bodies was completed to evaluate expected chemical concentrations at points of exposure. JE and Box air inhalation models were developed to predicted the exposure from volatilization of organics of concern into the site's main structure and on-site air. The results of this risk assessment established alternative cleanup goals for naphthalene, 4-methylphenol and 2,4-dimethylphenol that had been satisfied by five years of active site soil and groundwater remediation by a soil venting and groundwater sparging system.
- Human health and ecological risk assessment for the establishment of alternative Tier III nonresidential cleanup goals for a commercial site located in Elkhart, Indiana which had been entered into the Indiana Department of Environmental Management's Voluntary Remediation Program. Previous studies had indicated impacted groundwater beneath the site as a result of the release of paints and paint-related wastes contained in buried metal drums which were encountered during the construction of a new shopping plaza. The work included the development of a regional and site-specific groundwater flow model for determining the ultimate pathway of groundwater movement downgradient of the site. Risk characterization of the direct ingestion of site and downgradient groundwater indicated the existing contamination should not impact human health above a regulatorily-acceptable target risk level.
- Human health and ecological risk assessment for the establishment of alternative Tier III nonresidential cleanup goals for an industrial site located in Elkhart, Indiana, which had been entered into the Indiana Department of Environmental Management's Voluntary Remediation Program. Chlorinated volatile organic chemicals (including trichloroethylene and its degradation products) had been disclosed beneath the site in 1984 as a result of the discovery of impacted groundwater downgradient of the property. After more than 13 years of active remediation with a soil vapor extraction and groundwater pump and treat system, chemical concentrations have been significantly reduced. The exposure assessment portion of the risk evaluation involved the development of a regional and site-specific groundwater flow model and chemical transport modeling to demonstrate potential downgradient impacts.
- Human health risk assessment for the establishment of alternative Tier III nonresidential cleanup goals for a large auto dealership site located in Elkhart, Indiana.
- Senior technical consultant reviewer for the performance of a risk assessment and modeling for a petroleum spill potentially impacting the Dayton, Ohio, municipal well field.
- Human health risk assessment review of an industrial facility in Fremont, Ohio to determine the potential human health risks associated with volatile organic chemicals remaining in soil near an underground storage tank and a degreaser. The risk assessment included evaluating exposures to both indoor and outdoor workers using soil-vapor emission modeling and air dispersion modeling with exposure via inhalation of volatile organic vapors. The review found the risk assessment to be deficient in several areas: lack of full characterization of the extent of soil and groundwater contamination; omission of other exposure scenarios such as ingestion, dermal contact, and inhalation

of airborne dust, ingestion of contaminated groundwater; no sensitivity analysis of estimated input parameters; and limited justification of the use of the vapor emission model selected.

- Risk exposure evaluation for a service station gasoline release in Sturgis, Michigan as part of a Corrective Action Plan (CAP). Potential contaminant migration exposure pathways to groundwater and to direct contact through inhalation and ingestion were evaluated with respect to site specific conditions and compared to Michigan Type B closure criteria rules. Calculation of the saturation vapor concentration of benzene and the maximum potential emission flux rate of benzene was completed in order to model "worst case" vapor air concentrations using the mass-balance "Box" model. The results indicated that the potential "worst case" benzene air concentrations are well below the existing OSHA Permissible Exposure Limit (PEL) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and are at the very low end of published ambient air ranges for benzene, even for rural and remote areas.
- Modified groundwater risk assessment for an industrial site in Washington, D.C. to assess impacts to human health and the environment from residual groundwater contamination that may still exist after the excavation and off-site disposal of contaminated soil. The study included a receptor survey, exposure assessment, toxicity assessment, and risk characterization for exposure of construction and maintenance workers by dermal and inhalation of soil contaminated with benzene, toluene, ethylbenzene, and xylene. Two-dimensional analytical contaminant fate and transport modeling was performed to determine the potential long-term impact of the soil source removal on the unremediated groundwater plume, and the travel times for plume contaminants to move beyond site boundaries. Future plume contaminant concentrations accounting for both retardation and potential biodegradation affects were predicted. The modeling simulations indicated that a reduction in the contaminant source concentration due to the proposed soil remediation should significantly reduce off-site environmental impacts.
- Data evaluation and qualitative risk review for an industrial facility in Logansport, Indiana. The study included a review of the historical uses of the site, the results of soil and groundwater sampling and testing, a preliminary migration pathway evaluation, an estimate of groundwater discharge quantities to the adjacent river, estimated dilution factors based on river flow and contaminant discharge rates, and a preliminary exposure evaluation. Although three volatile organic chemicals (trichloroethene, vinyl chloride, and cis-1,2-dichloroethane) exceeded the U.S. EPA Maximum Contaminant Levels (MCLs), the likelihood of direct ingestion of contaminated groundwater was found to be remote since city water supplies used upstream surface waters, and the soils encountered beneath the site are of limited thickness and not considered capable of future development as a water supply. Dilution calculations indicated that contaminant levels discharged to the adjacent river would be diluted by more than a factor of 4500, which would reduce concentrations to well below the MCLs.
- Human health risk assessment for a gasoline station release in Macon, Georgia. In the area of the release, Maximum Contaminant Levels (MCLs) specified by the U.S. EPA for benzene, toluene, and ethylbenzene were exceeded. The study involved exposure assessment calculations supported by two-dimensional analytical contaminant fate and transport modeling. Over 20 release scenarios were modeled to account for variations in contaminant source strength variation in the vicinity of the release, contaminant retardation, and biodegradation of contaminants. The downgradient point of concern was a stream located about 700 ft from the site. The Georgia In-Stream Water Quality Standards (GISWQS) dictated the level of groundwater contamination that could ultimately be released to the stream. The results of the study indicated that the conservative estimations of retardation and source strength removal would not, by themselves, prevent benzene in the groundwater from discharging to the stream at levels above the GISWQS. However, when even the most conservative estimates of natural biological degradation were included in the modeling, it appeared that benzene concentrations discharging to the stream would not approach the GISWQS.
- Geochemical groundwater evaluation for the final closure assessment of a former waste storage area at the General Motors Willow-Springs Facility, Willow Springs, Illinois. Study involved modified laboratory leaching studies and a detailed theoretical solubility model to assess the possible limiting controls on lead aqueous releases to the subsurface. The study resulted in approval of the closure plan by the Illinois EPA.

- Senior consultant for the evaluation of a risk assessment to determine the potential health effects of low concentrations (13 ppb) of Freon-11 (trichlorofluoromethane) disclosed in groundwater on the potential receptors in a proposed mall in Haverhill, Massachusetts. The study was designed to conform with the general standards of the Massachusetts Department of Environmental Quality Engineering (now the Department of Environmental Protection (DEP)) in support of the Massachusetts Contingency Plan. It consisted of the following tasks: hazard identification, including extent of release and toxicity profile; dose-response assessment; exposure assessment; identification of applicable or suitably analogous public health standards; risk characterization; and uncertainty analysis. The primary exposure route evaluated was transport of Freon-11 from the groundwater to the air through evaporation, followed by inhalation of contaminated air. Based on the results of the study confirmed with periodic on-site air sampling and analysis, maximum air concentrations of Freon-11 were found to be well below any proposed health guidelines, indicating the effects of the Freon-11 contamination on public safety were negligible.
- Project director for a contamination and human health risk assessment of a site in Alexandria, Virginia contaminated with volatile and semivolatile organic chemicals and heavy metals. The scope of work included an exposure assessment to identify potential exposure pathways, characterization of the potentially exposed population, and determination of the extent of exposure. Both ingestion of and dermal contact with soil were evaluated during the exposure scenarios. A toxicity assessment and risk characterization was completed to determine toxic effects and incremental carcinogenic risks and noncarcinogenic hazards in order to determine appropriate cleanup levels at the site.
- Human health risk assessment for volatile organic-contaminated soil piles in Indianapolis, Indiana. The risk assessment followed the U.S. EPA's Guidance for Superfund-level studies. The risk was quantified using both Reasonable Average Exposure (RAE) and Reasonable Maximum Exposure (RME) scenarios for ingestion and dermal contact routes of exposure for future on-site residents, current and future trespassers, off-site residents, future construction workers, and on-site workers. It was determined that based on the low cumulative risk ($< 10^{-6}$) considering seven organic chemicals, the piles did not pose any significant risk to human health and should not be considered hazardous.
- Human health risk assessment for a dry cleaner's site contaminated with trichloroethylene, perchloroethylene, and chloroform in Fairfax, Virginia. The study included a soil and groundwater contamination assessment, data validation, determination of site mean exposure concentrations, potential pathway and receptor evaluation, toxicity assessment, and risk characterization.
- Surface water modeling/risk assessment for site and remediation discharges to Eagle Creek Reservoir in Indianapolis, Indiana for the Department of Public Works, City of Indianapolis. This study was prompted by the need to install a groundwater remediation system to remove volatile organic chemicals that had been released at the site by an underground storage tank. The pump and treat system was designed to remove the organic constituents prior to discharge to the reservoir. However, the existence of high concentrations of chloride due to salt release from an existing on-site storage area was a human health and aquatic environment concern since the reservoir is used as a principal source of the City of Indianapolis' drinking supply and a major natural habitat for fish and wildlife. To estimate chloride concentrations migrating to Eagle Creek, both surface water and groundwater modeling and field measurements of chloride concentrations and specific conductance were utilized to determine the expected level of impact near the site bank and discharge areas. The results of the study indicated that the chloride concentrations released near the bank adjacent the Trader's Point facility would be only slightly elevated above current background levels and that existing plant and animal species living in Eagle Creek would not be impacted.
- Human health risk assessment for a proposed elderly housing facility in Herndon, Virginia. The assessment was conducted in accordance with the U.S. EPA guidelines and the ASTM Risk-Based Corrective Action Standard for petroleum releases. Exposure calculations indicated that the inhalation of benzene vapors was the controlling exposure pathway. The chemical doses associated with indoor air inhalation were predicted over a wide range of parameter assumptions to test the sensitivity of the inhalation model and resulting human-health risks. Exposure calculations indicated that the presence of a well-maintained, uncracked foundation slab properly sealed with

appropriate vapor and moisture barriers used with a passive ventilation system should reduce potential health risks to below acceptable levels. Ongoing vapor barrier maintenance and air monitoring programs were recommended.

- Human health risk assessment for a dry cleaner's in Alexandria, Virginia contaminated with perchloroethylene, trichloroethylene, 1,1-dichloroethylene, and vinyl chloride. The study included a subsurface investigation and contamination assessment, exposure pathway and receptor evaluation, toxicity assessment, and risk characterization. The study was reviewed by the Virginia State Water Control Board (SWCB).

Solid and Hazardous Waste Facilities

- Development of the design bid documents and construction quality assurance manuals for the Phase I, Cell A construction of the Elkhart County Landfill Expansion, Elkhart, Indiana. The design called for the construction of a composite liner system composed of a recompacted clay with a flexible membrane liner (FML). The FML selected was a non-textured 60 mil thick High Density Polyethylene (HDPE) for the floor or base of the cell and a 60 mil thick textured HDPE for the sideslopes. Bid documents included considerations for site preparation, clay placement, flexible membrane liner installation, screening procedures, liner defects and repair procedures, and liner documentation. The construction also included leachate and storm water collection systems.
- Design evaluation of a flexible liner system for use as a permanent vapor barrier system for the Men's Maximum Security Prison Division IX, Chicago, Illinois. Because of unique construction and time constraints, final remedial design called for a spray liner applied to a uniform thickness of 40 mils over a 67,000 sq ft area.
- Leachate attenuation evaluations for the closed Old Maumee (Fort Wayne reduction site) and Parrott Road Landfill Superfund sites in Fort Wayne, Indiana. The analyses included considerations for hydrogeology and soil geochemistry, leachate quality, and production.
- Operating permit renewal application for the Tolley-Hunt Sanitary Landfill. Study included subsurface investigation including the completion of soil borings, laboratory classification and hydraulic conductivity testing, area water well records review, and compilation of data from previous investigations and published sources. The information was used to revise the design plans to document the extended life of the facility. Amended final contour and operational plans were also submitted to document the proposed development of the remaining permitted acreage.
- Project engineer for the site evaluation of a landfill area used for expansion of the Memphis International Airport. The study included a determination of the thickness and character of the existing waste area through soil borings, the installation, sampling, and testing of gas monitoring wells to evaluate methane gas production within the waste, and the performance of field load tests on the waste to evaluate its compressibility characteristics.
- Geologic and hydrogeologic investigation of a proposed 400 acre landfill near Marseilles, Illinois. The study included extensive subsurface investigation (over 50 soil borings and 40 monitoring wells), facility design, and preparation of the design plans and specifications. The design called for a composite liner system (ten feet of compacted clay and a flexible membrane liner), with design considerations for nearby mining operations. A detailed evaluation of the effects of organic chemicals and elevated leachate temperatures on compacted clay and geomembrane hydraulic integrity was performed. In addition, the structural capacity of the compacted clay to withstand excavation stress relief and waste loading was reviewed.
- Senior technical consultant for the development of a groundwater assessment and corrective action plan for the Four County Landfill, a closed RCRA hazardous waste storage facility in Fulton County, Indiana. The work included extensive RCRA facility investigation (RFI) activities including the installation of more than 100 monitoring wells and groundwater sampling.
- Pilot treatability studies for the National Steel Corporation (Midwest Division) Greenbelt F006 sludge hazardous waste landfill Part B permit application in northern Indiana to determine the solidification/stabilization admixture

quantities to limit leaching of heavy metals. Testing also included strength testing, special batch and column leaching tests, and permeability testing. Study generated the technical data to design, permit, and construct the largest (600,000 cubic yards of sludge on 14 acres) approved stabilized sludge landfill in the United States.

- Hydrogeologic and feasibility study, engineering design and construction quality control of the closure of a hazardous waste landfill in southern Indiana. Project characteristics include the assessment and design of the final cover liner alternative, site grading, surface water hydrology, risk analysis of the ground water flow characteristics, methane generation evaluation, as well as the quality control testing and inspection during construction. Borrow area evaluation for use as a source of compacted clay for final cover included preliminary office assessment and geologic study, field mapping and soil sampling and control of excavation operations.
- Sanitary landfill development study for a site in Marion County, Indiana for Browning-Ferris Industries, Inc. Study included complete site characterization (surface and subsurface geology and hydrogeology) and design of landfill including the site development and operation plans. The report included the necessary data to satisfy the requirements to obtain a construction/operating permit from the Environmental Management Board of the State of Indiana.
- An extensive hydrogeologic exploration study for a 105-acre site in Hamilton County, Indiana for Waste Management, Inc. to determine the suitability of the site for sanitary landfill development. The results of the study were used as part of a development permit application.
- Senior consultant for an environmental assessment and review of the Midway Sanitary Landfill in El Paso County, Colorado. The purpose of the study was to assess the landfill facility to evaluate the landfill design, proposed operations for compliance, and potential environmental impacts. The scope of work included a cursory review of the site, a review of available information from the Design and Operations Plan, a review of regulatory agency files, and discussions with selected personnel having knowledge of the facility.
- Geological investigation for Warren County Landfill relocation, Indiana permit application.
- Senior consultant for the amended permit application review of the Central Weld Sanitary Landfill in Weld County, Colorado. The review, performed for the Colorado Department of Health Solid Waste Section, Hazardous Materials and Waste Management Division (CDH), included an evaluation of the Site Development Plan, Hydrogeologic and Geotechnical Characterization Report, Groundwater Monitoring Plan, Landfill Gas Monitoring Plan, Access Control Plan, Interim Groundwater Measures Plan, and the Design, Operations, and Closure Plan submitted by Golder Associates, Inc. on behalf of Waste Services Corporation, an affiliate of Waste Management of Colorado, Inc. Deficiencies in the amended Permit Application were determined based on a comparison of the submittals with the CDH supplied Landfill Application Checklist and the existing Regulations Pertaining to Solid Waste Disposal Sites & Facilities, as revised in November, 1991.
- Senior consultant for geotechnical and hydrogeological investigation for the siting of a sanitary landfill in Dickson County, Tennessee.

Confined Animal Feeding Operations

- TOPSOW permit application review for proposed facility near Flora, Indiana.
- Newcomer permit application review for proposed facility in Elkhart County, Indiana.
- Gettelfinger permit application review for proposed facility in Washington County, Indiana. Karst hydrogeologic concerns were evaluated for the site..
- Reiboldt permit application review and hearing testimony for proposed facility in Union County, Indiana.

- McGrady permit application review for proposed facility in Montgomery County, Indiana.
- Bellar permit application review for proposed facility in Miami County, Indiana.
- Permit application review for proposed facility in Jefferson County, Indiana.

Compliance Audits

- Project director for a series of compliance audits for several industrial plant facilities throughout the United States. The audits concentrated on both EPA and OSHA regulations including SARA Title III, RCRA, USTs, PCBs, CERCLA, and state and local concerns.
- Project director for a RCRA generator-only status audit for a petroleum refinery in Indianapolis, Indiana. Audit included review of waste type streams and quantities generated, hazardous waste notification documentation, waste transportation documentation, manifesting procedures, container management evaluation, waste storage inspection, personnel training review, and recommendations for modifications to existing programs.
- Project director for compliance audit of a metal fabricating facility in northern Indiana involving OSHA, RCRA, and Title III review.
- Risk management of contaminated properties for major lending institutions throughout the United States.
- Development and management of ATEC's Phase I Environmental Site Assessment National Account Program for providing property assessments for the financial industry worldwide.

Air

- Air discharge permit exemption preparation and submittal to the Texas Air Control Board (TACB) for the discharge of volatile organic chemicals from a soil venting system operated to remediate contaminated soils. Study included derivation of theoretical discharge rates, sampling and testing of discharge lines during a field pilot study, and measurement of discharge velocities to estimate atmospheric loading rates.

Geotechnical/Mining Studies

- Geotechnical engineering studies for three abandoned mine land sites in Kentucky (Kenvir Burning Refuse Piles - Harlan County; Lawson Landslide - Whitley County; Corn Creek Landslide - Whitley County) which included subsurface explorations and laboratory analyses. Design and construction considerations included computer-aided slope stability analyses, embankment drainage, evaluation of potential borrow material for the cover, extinguishment of burning refuse, pre-fill surface preparation and the minimization of future combustibility potential. Studies were performed for the Kentucky Department of Natural Resources, Division of Abandoned Lands.
- Assessment of coal refuse pile strength parameters for stability analyses of a coal refuse pile for Westmoreland Coal Company.
- Development of a dragline simulation program for Amax Coal Company
- Field inspection, stability analyses and borrow area evaluation for Phase II study of the Tom Wallace Dam near Louisville, Kentucky.
- Phase II study including stability analyses for Mount Washington Dam in Bullitt County, Kentucky

- Slope stability and seepage analyses of earthen embankments, dams and residual and colluvial soil slopes over bedrock.
- Extensive shoreline protection investigation along 2.5 miles of shoreline in Albemarle Sound, North Carolina for the Department of Defense. The study included (1) an office study to collect, review and evaluate all pertinent published information including geology, hydrology, climatology and coastal characteristics of the area, (2) a geotechnical investigation and site survey which included soil sampling and mapping of shoreline characteristics, (3) frequency analysis of wind and tide data, hydraulic wave analysis including rip-rap design, (4) evaluation of available shoreline protection alternatives (bulkheads, rip-rap revetments, gabions, and groins) including recommendations for selected designs, cost estimates and environmental evaluations, and (5) determination of the availability of rip-rap sources including the size, quality and quantity of rip-rap needed, haul distance and shipping parameters, site access problems and anticipated costs.
- River bank erosion study on the White River, Indianapolis, Indiana for a gas pipeline crossing.
- Geotechnical studies for transmission lines and substations which required supervision of field geophysical surveys and drilled pier recommendations for laterally-loaded pole and tower structures.
- Geotechnical investigations for state highway and county road bridges including foundation and construction recommendations for retaining and drainage structures and pile type recommendations.
- Forensic failure analysis of foundations, pavements, and tennis courts.

LITIGATION SUPPORT/EXPERT WITNESS:

Mr. Mundell has provided litigation support services and expert witness testimony in over 30 cases in the areas of hydrogeology, groundwater evaluations and modeling, remediation design, National Contingency Plan compliance, cleanup cost allocation, underground storage tank releases and landfill/waste containment. Selected cases have included:

- Groundwater and contaminant transport modeling and hydrogeologic analysis testimony in civil action pollution liability insurance cases involving the Broderick Wood Preserving Superfund Site in Denver, Colorado.
- Geochemical assessment of the potential of municipal incinerator ash from the Chicago Northwest Waste to Energy Facility to leach hazardous constituents from the Forest Lawn Landfill in Three Oaks, Michigan (Environmental Defense Fund, Inc. and Citizens for a Better Environment vs. the City of Chicago).
- Volatile organic chemical groundwater and soil contamination assessment and remediation testimony (a private settlement case) for the Goshen Avenue and Shirk Road Site in Visalia, California.
- Groundwater and hydrogeologic analysis in a civil action pollution liability insurance case involving the Lowry Hazardous Waste Landfill Superfund site near Denver, Colorado.
- Groundwater contamination and remediation design review for the Main Street Well Field Superfund site in Elkhart, Indiana.
- Waste characterization, source identification and quantification, contaminant migration and remediation review, and allocation analysis for the Goldcamp Disposal Area Superfund site in Ironton, Ohio.
- Hydrogeology and groundwater monitoring testimony in state and federal courts involving both RCRA interim status and Part B Permit Application denial for the Four County Hazardous Waste Landfill near Rochester, Indiana.

- Hydrogeology and landfill design testimony in the matter of the issuance of the Construction and Operating Permit for the proposed Browning-Ferris Industries (BFI), Greenhill Sanitary Landfill, in Lawrence, Indiana.
- Conceptual remedial alternative design evaluation testimony in a civil action suit involving volatile organic groundwater contamination at an impacted site in Denver, Colorado.
- Testimony involving the review of investigation and remedial activities undertaken at the Elkhart Products Facility Site in Elkhart, Indiana since disclosure of volatile organic soil and groundwater contamination to determine consistency with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).
- Remedial design evaluation and cost estimates for civil action suit involving multiple hydrocarbon-contaminated sites in Indiana and Kentucky.
- Remedial design evaluation for a civil action suit involving a hydrocarbon-contaminated site in Georgia.
- Natural gas migration analysis from a pipeline release in west-central Indiana.

RESEARCH EXPERIENCE:

Mr. Mundell has been involved in several funded (Department of Energy, National Science Foundation, American Society of Civil Engineers) and non-funded research projects focusing on environmental/geotechnical issues related to groundwater contamination and waste containment. Research topics have included:

- Numerical simulation of multicomponent solute transport with chemical reaction
- Permeability characteristics of compacted clay for design of waste containment
- Chemical reaction effects on hydraulic conductivity of porous media
- In-place precipitation immobilization at uncontrolled hazardous waste sites
- Acid reactions with soils
- Leachate mass estimates from degrading municipal refuse
- Finite element modeling of moving boundary problems
- Stochastic prediction of soil characteristics from geophysical data
- Non-circular slope stability analysis (G.A. Leonards, 1979 Terzaghi Lecture)
- Applications of geophysics to archaeological investigations.

HONORS AND AWARDS:

Best Paper, American Association of Petroleum Geologists 28th Annual Meeting, 1999; Who's Who in America; Who's Who in Science and Engineering; American Society of Civil Engineers Research Fellowship, national recipient, 1986-1987; The Arthur J. Schmitt Foundation Dissertation Fellowship, Notre Dame, 1986-1987; University of Notre Dame Groundwater Physics Research Fellowship, 1984-1985; Purdue University Graduate Fellowship, 1979-1980; Tau Beta Pi, Chi Epsilon, and Phi Eta Sigma Honoraries; Purdue University 500 (top 500 undergraduate students); BSCE with highest distinction (5th out of 124 in C.E. class); Elks National Foundation and United Transportation Union scholarships, 1975-1976.

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- Wittman, J. and Mundell, J.A., 1997, *Evaluation of Risks of Potential Contaminants in Well Field Protection Areas*, Center for Urban Policy and the Environmental, Indiana University Purdue University, Indianapolis, Indiana, 60 p.
- Mundell, J.A., 1997, "Total Petroleum Hydrocarbons by U.S. EPA Method 418.1 IR: Limitations of the Test Method for Environmental Consulting," Seminar on Identifying the Nature and Extent of Petroleum Hydrocarbon Contamination, City of Indianapolis Department of Public Works, Indianapolis, Indiana, June, 4 p.
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- Mundell, J.A., "Indiana Wellhead Protection and Industry," Indiana Environmental Briefs, Environmental Quality Control, Inc. , December 1996, pp. 3-4.
- Mundell, J.A., "Groundwater/Surface Water Interactions for Proposed Pool Changes Along the White River in Indianapolis, Indiana," 41st Annual Midwest Groundwater Conference, Lexington, Kentucky, September 29 - October 1, 1996, pp. 11-12.
- Mundell, J.A. and Wightman, A., "Cost Recovery Through National Contingency Plan Compliance," Proceedings of Superfund XV, Washington, D.C., November 29 - December 1, 1994, pp. 1121 - 1126.
- Mundell, J.A., "Developing an Effective Groundwater Monitoring System for Detecting Releases from Waste Disposal Facilities," 13th Annual Indiana Water Resources Symposium, Turkey Run, Indiana, June 1992, pp. 29-41.
- Mundell, J.A., "Developing an Effective Quality Assurance Program for Performing Environmental Site Assessments," NWWA Environmental Site Assessments Conference, Orlando, Florida, August 5-7, 1992, pp. 105-115.
- Mundell, J.A., Nichols T., and Hicks, M., "Addressing Off-Site Concerns in Environmental Site Assessments," NWWA Environmental Site Assessments Conference, Orlando, Florida, August 5-7, 1992, pp. 495-503.

Mundell, J.A. and Laflin S., "Environmental Site Assessments: Disclosing a Potentially Costly Liability," Indianapolis Business Journal, Vol. 12, No. 13, July 8-14, 1991.

Mundell, J.A., "Technical Environmental Education: Toward Responsible Stewardship," Indiana Industrial Technical Education Association's Annual Convention, Fort Wayne, Indiana, April 18, 1991.

Keene, D.G. and Mundell, J.A., "Practical Considerations for UST Closures," Indianapolis Business Journal, Vol. 11, No. 52, April 1-7, 1991.

Mundell, J.A., "Underground Storage Tank Compliance: Where Are We Headed?," Sixteenth Semi-Annual Convention of the National Advisory Group, Convenience Stores/Petroleum Marketers Association, Las Vegas, Nevada, March 17-20, 1991.

Mundell, J.A. and Boos, T.A., "Interpretation of Field Permeability Test Results on Full Scale Liner Systems," Proceedings of the 21st Annual Ohio River Valley Soils Seminar (ORVSS XXI), Cincinnati, Ohio, October 26, 1990, pp. 57-62.

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Keene, D.G. and Mundell, J.A., "UST Closures - Some Practical Considerations for Owner Planning," Tank Talk, Steel Tank Institute, June 1989.

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PRESENTATIONS:

Mundell, J. A., and Byer, G. B., "The Use of Geophysics in Support of Environmental Judgmental Sampling Strategies," Midwestern States Risk Assessment Symposium, Indianapolis, Indiana, July 26, 2002.

Berndt, J. A., Mundell, J. A., and Arnold, J., "The First Indiana RISC Closure Using Monitored Natural Attenuation," Poster Session at the Midwestern States Risk Assessment Symposium, Indianapolis, Indiana, July 24, 2002.

Mundell, J. A., "Evaluating Naturally-occurring Petroleum Hydrocarbon Residuals in Soil," Midwestern States Risk Assessment Symposium, Indianapolis, Indiana, July 24, 2002.

Mundell, J. A. and Berndt, J. A., "Examination of Petroleum Hydrocarbon Attenuation as a Remedial Alternative," Indiana Department of Environmental Management Seminar, February 27, 2002.

Mundell, J. A., "The Use of Geophysics in Archaeology," Martin University Department of Anthropology, Indianapolis, Indiana, February 20, 2002.

Mundell, J.A., and Byer, G. B., "Geophysical Characterization of Brownfield Sites for Better Development Evaluation and Construction Planning," SAGEEP 2002, Environmental and Engineering Geophysical Society, February, Las Vegas, Nevada, February 13, 2002.

Mundell, J.A., Byer, G. B., Henson, H., Gutowski, V. and Dove, D. E., "The Use of Geophysical Surveys for Archaeological Excavation Planning at the Mitchell Springs Ruins in Cortez, Colorado," SAGEEP 2002, Environmental and Engineering Geophysical Society, February, Las Vegas, Nevada, February 11, 2002.

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Byer, G. B. and Mundell, J. A., "Environmental Geophysics: The Effective Use of Geophysics in Environmental Site Characterization and Site Remediation," invited speakers, Indiana Department of Environmental Management, Indianapolis, Indiana, May 23, 2001.

Mundell, J.A., "Effective Management of Wellhead Protection Areas," 21st Annual Water Resources Symposium, Indiana Water Resources Association, Springmill State Park, June 15, 2000.

Byer, G. B. and Mundell, J. A., "The Application of Geophysics to Geotechnical Engineering Problems," Indianapolis Geotechnical Engineering Group, American Society of Civil Engineers, Indianapolis, Indiana, May 31, 2000.

Berndt, J.A. and Mundell, J.A., "Developing Groundwater/Surface Water and Contaminant Modeling Strategies for Risk Assessment," Indiana Geology Expo 2000, Indianapolis, Indiana, April 5, 2000.

Byer, G.B., and Mundell, J.A., "Characterization of Bedrock Hydrogeologic Features with Geophysical Methods," Indiana Geology Expo 2000, Indianapolis, Indiana, April 5, 2000.

Mundell, J.A., Berndt, J.A., and Arnold, J., "Natural Attenuation of Petroleum Hydrocarbons in a Prolific Outwash Sand and Gravel Aquifer," 28th Annual Eastern Section Meeting, American Association of Petroleum Geologists, September 20, 1999.

Mundell, J.A., Gremos, A., and Arnold, J., "Naturally-Occurring Petroleum Hydrocarbons in Indiana Glacial Till," 28th Annual Eastern Section Meeting, American Association of Petroleum Geologists, September 20, 1999.

Mundell, J.A. and Deveau, F., "Litigation-Related Topics for the Civil Engineer," Indianapolis Section of the American Society of Civil Engineers, Indianapolis, Indiana, October 13, 1998.

Mundell, J.A., "Environmental Risks and Cleanup Strategies," Brownfields An Important New Conference, CLE International, Indianapolis, Indiana, August 28, 1998.

Mundell, J.A., "Wellhead Protection for Small Communities," Indiana Society of Professional Land Surveyors 46th Annual Convention, West Lafayette, Indiana, January 15, 1997.

Mundell, J.A., "Human Health Risk Assessments: Merging Long-Term and Short-Term Exposure Conditions for Remediation Goal Setting," 11th Annual Hoosier Safety Council Convention & Safety Seminar, Indianapolis, Indiana, February 25, 1997.

Hansell, R.N. and Mundell, J.A., "Implementing Wellfield Protection in Marion County," Surface Water and Ground Water Resources in the White River Watershed, White River Watershed Workshop, Hoosier Environmental Council, January 14, 1997, Anderson, Indiana.

Mundell, J.A. and Hansell, R.N., "Experiences with Implementing the Marion County Wellhead Protection Ordinance," Indiana Water Resources Association Fall Meeting, December, 1996, Lafayette, Indiana.

Mundell, J.A., "Geologic Influences on the Groundwater/Surface Water Dynamics Along the White River in Downtown Indianapolis," Indiana Geologists, November 13, 1996, Indianapolis, Indiana.

Mundell, J.A., Berndt, J., and Wittman, J., "Groundwater/Surface Water Interactions for Proposed Pool Changes Along the White River in Indianapolis, Indiana," 41st Annual Midwest Groundwater Conference, September 29-October 1, 1996, Lexington, Kentucky.

Mundell, J.A. and Peters, D., "Risk-Based Corrective Action: Point of Compliance," Environmental Quality Control, Inc. Workshop, September 11, 1996, Indianapolis, Indiana.

Mundell, J.A., "Indiana's Risk-Based Corrective Action Program Update," Indianapolis Certified Hazardous Materials Managers Meeting, July 18, 1996, Indianapolis, Indiana.

Mundell, J.A., "Brownfields Cleanup Alternatives for Reduced Health Exposures," Environmental Justice & Brownfields Redevelopment New Humanity Forum, Indiana Black Expo, July 11-12, 1996, Indianapolis, Indiana.

Mundell, J.A., "Overview of Groundwater Exposure Pathways: Conceptual Models and Modeling Strategies," Indiana Department of Environmental Management Risk-Based Corrective Action Modeling Technical Group Meeting, June 21, 1996., Indianapolis, Indiana.

Mundell, J.A., "Environmental Risk Assessment Policy Development for the Groundwater Exposure Pathway," 17th Annual Indiana Water Resources Association Conference, June 19-21, 1996, Madison, Indiana.

Berndt, J., Mundell, J.A., and Wittman, J., "Groundwater Hydrology Assessment for Proposed Pool Changes Along the White River," 17th Annual Indiana Water Resources Association Conference, June 19-21, 1996, Madison, Indiana.

Mundell, J.A., "The Evolving Use of IH Professionals in the Risk Assessment of Contaminated Properties," Fifteenth Annual American Industrial Hygiene Association Conference, "IH & Environmental Crossover and Integration", Carmel, Indiana, February 27, 1996.

Mundell, J.A., "Technical Evaluation of the Allocation of Remedial Costs to PRP's under CERCLA," Superfund XVI, 16th Annual National Conference and Exhibition Washington, D.C., November 8, 1995.

Mundell, J.A. and Firestone, D., "State-of-Practice in Environmental Assessments," Finova Capital Corporation First Annual Risk Management Environmental Assessments Seminar, Phoenix, Arizona, July 21, 1995.

Mundell, J.A., "Groundwater and Contaminant Modeling for Exposure Assessment," International Congress on Hazardous Waste, U.S. Department of Health & Human Services, Agency for Toxic Substances and Disease Control, Atlanta, Georgia, June 5, 1995.

Mundell, J.A., "Managing Environmental Programs," Department of the Army Engineering Support Group North Joint Conference, Indianapolis, Indiana, June 3, 1995.

Mundell, J.A. and Wightman, A., "Cost Recovery Through National Contingency Plan Compliance," Superfund XV, 15th Annual National Conference and Exhibition, Washington, D.C., November 30, 1994.

Mundell, J.A., "The Evolving Civil Engineer in Environmental Consulting: From Stone Age to Present," Indianapolis Section of the American Society of Civil Engineers, Indianapolis, Indiana, November 9, 1994.

Mundell, J.A., "Subsurface Pathway Identification and Contaminant Transport Modeling for Risk Assessments," Indiana University Purdue University Department of Geology Colloquium, October 13, 1994.

Mundell, J.A., "Groundwater/Contaminant Plume Modeling," Environmental Information Association Fall Conference, Indianapolis, Indiana, September 9, 1994.

Mundell, J.A., "The Use of Groundwater and Contaminant Transport Models in Risk Assessments," Indiana University Purdue University School of Public and Environmental Affairs, Indianapolis, Indiana, April 20, 1994.

Mundell, J.A., "Educating the Next Generation of Responsible Environmental Citizens: Balancing Human Health and Environmental Risk with Sustainable Development," Technology Educators of Indiana 62nd Annual Conference, April 15, 1994.

Mundell, J.A., "Remediation of Soil and Groundwater", Seminar to Graduate Students in Advanced Geoenvironmental Engineering, Purdue University, April 7, 1994.

Mundell, J.A., "Reacting to Environmental Surprises During Construction Projects," Eight Annual Civil Engineering Professional Development Seminar, Purdue University, W. Lafayette, Indiana, November 4, 1993.

Mundell, J.A. and Vance, D.B., "Remediation Techniques for the Treatment of Contaminated Soil and Groundwater," Eighth Annual Civil Engineering Professional Development Seminar, Purdue University, W. Lafayette, Indiana, November 4, 1993.

Mundell, J.A., "Applied Environmental Soil Science and Geochemistry in Contamination Assessments and Remediation," Indiana University, Bloomington, Indiana, March 25, 30, and April 1, 1993.

Mundell, J.A., "The Toxic Substances Control Act (TSCA)," Executive Enterprises, Inc., Environmental Regulation Course, Louisville, Kentucky, October 14-16, 1992.

Mundell, J.A., "Environmental/Geotechnical Aspects of Landfills," American Society of Civil Engineers Metropolitan Indianapolis Branch, September 8, 1992.

Mundell, J.A., "Environmental Soils," Indiana University School of Public and Environmental Affairs," Bloomington, Indiana, April 13, 15, 20, and 22, 1992.

Mundell, J.A., "Ground Water Modeling Applications in Environmental Consulting," Sixth Annual Civil Engineering Professional Development Seminar, Purdue University, West Lafayette, Indiana, October 31, 1991.

Mundell, J.A., "Groundwater Models: Capabilities, Limitations, and Applicability in Environmental Law," Seminar Presented to Cromer Eaglesfield & Maher, Indianapolis, Indiana, May 2, 1991.

Mundell, J.A., "Technical Environmental Education: Toward Responsible Stewardship," Indiana Industrial Technical Education Association's Annual Convention, Fort Wayne, Indiana, April 18, 1991.

Mundell, J.A., "Underground Storage Tank Compliance: Where Are We Headed?," National Advisory Group, Convenience Stores/Petroleum Marketers Association, 16th Semi-Annual Convention, Las Vegas, Nevada, March 19, 1991.

Mundell, J.A. and Amlin G., "Landfill Design Considerations," Fifth Annual Civil Engineering Professional Development Seminar, Purdue University, West Lafayette, Indiana, November 14, 1990.

Mundell, J.A., "Interpretation of Field Permeability Test Results on Full Scale Liner Systems," Proceedings of the 21st Annual Ohio River Valley Soils Seminar (ORVSS XXI), Cincinnati, Ohio, October 26, 1990, pp. 57-62.

Mundell, J.A., "Groundwater Issues in Environmental Real Estate Assessments," Commercial/Industrial Marketing Division, Metropolitan Board of Realtors, Indianapolis, Indiana, August 1, 1990.

Mundell, J.A., "The Nature of Groundwater," Chemical Waste Management Seminar to the Citizens of Fort Wayne, Fort Wayne, Indiana, March 7, 1990.

Mundell, J.A., "Solid Wastes and Landfill Design," U.S. Department of Defense Environmental Protection Training, Columbia, Maryland, December 4-15, 1989.

Mundell, J.A., "Underground Storage Tank Challenges: Releases, Containment, and Closure," Gen Sem '89, 7th Annual Waste Generators' Seminar, Dearborn, Michigan, September 13-15, 1989.

Mundell, J.A., "Design of Solidified/Stabilized Sludge Landfills," ASCE 1989 National Conference on Environmental Engineering, Austin, Texas, July 10-12, 1989.

Mundell, J.A., "The Impact of Advanced Geochemical Modeling on Future Strategies for Hazardous Waste Site Remediation," Hazwaste EXPO Atlanta 89, First Annual Southeastern Hazardous Waste Generators National Conference, Atlanta, GA, May 1-4, 1989.

Kawalek, M., Mundell, J.A., and Burris, C.B., "Site Remediation -Greenville Operation," Occupational Health, Safety and Environmental National Meeting, The Gillette Company, Baltimore, MD, May 1-3, 1989.

Mundell, J.A., "Release Response and Corrective Action for UST Systems Containing Petroleum or Hazardous Substances," Interpreting EPA's Final Underground Storage Tank Regulations in Cooperation with the U.S. EPA, State UST programs, Steel Tank Institute, Fiberglass, Petroleum Tank and Pipe Institute, and the Association for Composite Tanks, Atlanta, GA, Feb. 16, Dallas, TX, Feb. 22, Sterling, VA, Feb. 28, Boston, MA, March 1, Chicago, IL, March 15, and Long Beach, CA, March 28, 1989.

Fidler, D.L., Mundell, J.A., and Price C.W., "Drilling Safety in Hazardous Materials Sites," Georgia Department of Transportation Drilling Seminar, February 15, 1989.

Mundell, J.A., "The Impact of Advanced Geochemical Modeling on Future Groundwater and Waste Management Practices," Indiana Geologists 1989 Winter Seminar, Groundwater: Pollution, Protection, and Policy, Indianapolis, Indiana, February 18, 1989.

Mundell, J.A., "Geochemical Considerations for Evaluating Contaminant Leaching Patterns from Restricted Waste Disposal Sites," Environmental Seminar, Office of Solid and Hazardous Waste Management, Indiana Department of Environmental Management, Indianapolis, Indiana, October 6, 1988.

Mundell, J.A., "Multicomponent Contaminant Transport with Precipitation/Dissolution Moving Boundaries," Department of Civil Engineering Seminar, Cleveland State University, Cleveland, Ohio, April 1988.

Mundell, J.A., "Future Trends in Environmental Geotechnology," Department of Civil Engineering Seminar, University of Toledo, Toledo, Ohio, June 1987.

Mundell, J.A., "Clay Liners-Design and Construction," Civil Engineering Seminar Series, University of Notre Dame, Notre Dame, Indiana, February 26, 1985.

VIDEOS:

"Inspection of Sites, Soils, Concrete Forms, and Steel Reinforcement in Conventional, Light-frame Construction," International Conference of Building Officials, 1989.

"Interpreting EPA's Underground Storage Tank Regulations," U.S. EPA, Steel Tank Institute, Fiberglass, Petroleum Tank and Pipe Institute, and Association for Composite Tanks, 1989.

COMMUNITY INVOLVEMENT

Indiana University Purdue University, Instructor, Applied Mathematics in Environmental Engineering, 2002.

Martin University, Instructor, Environmental Science, 2002-2003.

Center for the Earth and Environmental Sciences, Indiana University Purdue University, Advisory Board, 2001 - 2003.

American Association of Petroleum Geologists Eastern Section Meeting Committee, 1998 - 1999.

Indiana University Purdue University School of Science Dean's Advisory Council, 1998 - 2001.

Indianapolis Urban League Environmental Coalition, Coordinating Member, 1997 - 2003.

Indiana University Purdue University Department of Geology External Review Team, 1997

Indianapolis Brownfields Redevelopment Advisory Group, 1997 - 1999.

Marion County, Indiana Wellhead Protection Officer, 1995 - 1997.

Indiana Department of Environmental Management Risk-Based Corrective Action Workgroup, 1995 - 1997.

Marion County Wellhead Protection Technical Task Group, 1995 - 1996.

American Society of Civil Engineers, Media Contact, Environmental, 1995 - 1998.

Indianapolis, Indiana Ground Water and Soil Contamination Policy Task Force, 1993.

Indiana University Purdue University Department of Geology Advisory Committee, 1993-1996.