Matthew J. Barvenik, L.S.P.
Senior Vice President

RESUME

Education

B.S., 1974, Civil Engineering, Northeastern University

M.S., 1976, Civil Engineering (Geotechnical Engineering), Massachusetts Institute of Technology

Professional Registration

1993, Licensed Site Professional, Massachusetts, 1631

Areas of Specialization

Groundwater Radionuclide Protection for Nuclear Power Plants

Weapons Radionuclide Fate and Transport

Residential/Commercial Development of Contaminated Sites

Hydrodynamic Contaminant/Groundwater Treatment

DNAPL Contaminated Bedrock

Remediation Involving Multiphase Fluid Flow

Feasibility/Treatability Studies

Slurry Cut-off Walls and Caps

Soil Vapor Extraction, Bioventing, Air Sparging

Technology Development

Geotechnical Instrumentation & Civil Engineering

Summary of Experience

With over 35 years of experience, Mr. Barvenik has managed numerous small- and large-scale geohydrological, geotechnical, and instrumentation engineering efforts including full-scale field test sections and final design/construction of remedial actions. Many of these efforts have required development of new equipment and innovative methodologies for source area characterization and remediation. He has over 30 years of multi-disciplinary hazardous waste engineering experience specific to NPL sites including: formulating and negotiating technical scopes of work for both the U.S. EPA (initially) and PRP groups (currently); source area investigation and plume delineation, design, construction and three-dimensional numerical modeling-based performance monitoring of remedial actions encompassing groundwater hydrodynamic isolation/ recirculation/treatment systems; slurry trench cutoff wall/cap containment; soil and sludge solidification/fixation; soil vapor extraction, etc. He was also in the first group to be registered as Licensed Site Professionals (LSPs) in Massachusetts and has extensive non-NPL and Massachusetts Contingency Plan-related experience including: radionuclide groundwater investigations/remediations, landfill containment; active/passive barrier systems for residential and commercial projects constructed on contaminated soils; oil recovery operations; contaminant transport/groundwater remediation in fractured bedrock aquifers containing chlorinated DNAPLs and/or radionuclides; soil vapor extraction; bioventing; air sparging and litigative work for private industry and state/federal agencies.

Mr. Barvenik is currently a Senior Technical Consultant, GZA's highest technical position. He provides technical input and quality control for the firm's district offices regarding hazardous waste and radionuclide investigation and remediation. In this capacity, he has had major involvement in the investigation and/or remediation of 13 Superfund sites. He is also founder and president of BARCAD Systems, Inc., the first firm to manufacturer multi-level groundwater sampling instrumentation for hazardous waste source characterization, plume delineation and verification of remedial action effectiveness. He has authored numerous professional papers, has taught a multitude of hazardous waste investigation and remediation short courses as well as training sessions under contract to state and federal regulatory agencies, and has provided technical presentations at public meetings, mediations, arbitrations and jury litigations (depositions and expert witness testimony).

Mr. Barvenik's experience with nuclear waste and nuclear energy issues began in 1975 during graduate studies at MIT, including research on high level waste disposal issues sponsored by Oak Ridge National Laboratory. Subsequent work at GZA included geotechnical analyses and instrumentation design for the Office of Nuclear Waste Isolation (ONWI) Waste Isolation Pilot Projects (WIPP) as well as forensic geotechnical analyses of turbine building settlement for Consumer Power's Midland Nuclear Power Plant. More recently he has led

groundwater investigations pursuant to the fate and transport of subsurface radionuclide releases from military weapons plant fabrication of depleted uranium penetrators. This work required the development of new methodologies and equipment for Site-specific uranium partitioning coefficient determination. Mr. Barvenik is a member of the Nuclear Energy Institute (NEI) and is actively participating with the American Nuclear Society (ANS) on its Working Group which has recently completed a groundwater investigation guidance (ANSI/ANS-2.17-2010 for Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants), as well as two newly formed Working Groups for ANSI/ANS 2.32 and ANSI/ANS 2.9 . He has also consulted with American Nuclear Insurers (ANI) during preparation of their guidance documents. Mr. Barvenik's most current efforts over the last five years have been focused on Indian Point Energy Center as Entergy's lead investigator for groundwater contaminant fate and transport investigations, dose calculations, remediation and long term monitoring associated with subsurface releases of Tritium, Strontium and other radionuclides from multiple fuel pools at this site which includes two operating PWR reactors and a third in SAFSTOR. He has also participated in the initial and currently ongoing phases of Groundwater Protection Initiative investigations on eight of their other nuclear facilities. He has also worked on projects for other plant owners, including citing analyses for new plants and ISFSI .installations. Both his hazardous waste and nuclear related work have required a high level of interface with numerous project stakeholders including regulators, the lay-public, and activist groups. He has also been an invited speaker at a number of NRC, ANS and NEI /EPRI "lessons learned" conferences.

Notable radiological project experience includes:

Senior Principal and Consultant Reviewer, Entergy Nuclear Northeast, Vermont Yankee, Hydrogeological Investigations, Vernon, Vermont. Responsible for quality control and quality assurance of GZA's technical approach, recommendations and deliverables on this project. In January 2010, GZA was retained to conduct additional hydrogeological investigations at the Vermont Yankee Nuclear Power Station. Services were provided on a rapid response basis due to tritium being detected in groundwater monitoring wells at levels requiring reporting to state regulators under the nuclear industry's Groundwater Protection Initiative. GZA managed the additional installation of 17 shallow groundwater monitoring wells and three deep overburden wells. Environmental monitoring data from all wells were reviewed along with surface water samples to identify the possible source of the tritium release. The source was identified through excavation activities as the auxiliary off-gas pipe tunnel. The leak locations were confirmed by the investigations team and this tunnel was repaired, which effectively stopped the leak to the subsurface in February 2010. GZA prepared groundwater flow and contour maps and updated the site conceptual model based on the new data. The area of contaminated soils proximate to the source of the leak was excavated for disposal. Approximately 300,000 gallons of groundwater containing tritium was pumped and stored on site for re-use in the plant and off- site disposal. GZA was requested to review the groundwater monitoring programs being conducted by others at all other Entergy Nuclear Northeast plant locations as part of a fleet wide initiative by Entergy to become an industry leader in preventing inadvertent releases of tritium to groundwater and to assist Entergy in benchmarking best practices in the industry and in implementing improvement plans for preventing reoccurrence of inadvertent releases.

Senior Principal, Groundwater Assessment, UniStar Nuclear Nine Mile Point 3, Lycoming, NY for AREVA NP Environmental Review Combined Operating License Application (COLA) Project. Mr. Barvenik was a expert technical specialist on a COLA consulting team. He was responsible for evaluating geohydrological analyses with other technical experts from GZA and AREVA NP in support of UniStar's COLA for the new nuclear power plant. GZA was charged with developing geology and groundwater studies to address completion of Section 2.5.3 of the Final Safety Analysis Report (FSAR).

Principal/Hydrogeo Program Manager, Nuclear Power Support Company, Multiple Sites in New York, Vermont, Massachusetts, Louisiana and Mississippi. Managed the preparation of initial hydrogeologic assessments for six active nuclear power facilities in support of the end-client's Groundwater Protection Initiative (GPI) program . The objectives of this project focused on (1) characterizing site hydrogeology based on available information pre and post plant construction and (2) assessing which plant systems have the potential to impact site groundwater based on their contents and the presence of potential pathways to ground. For each facility, the project included a site field reconnaissance, engineering systems review (performed by others); review of as-built plant drawings, and review and analysis of regional and local hydrogeological information. Based on our

assessment, options for future hydrogeologic characterization and groundwater monitoring were provided. Work was executed under an aggressive schedule to meet end-Client's GPI goals.

Tritium and Radionuclide Release and Groundwater Monitoring- Stakeholder Engagement Services - Indian Point Energy Center (Nuclear Power Plant), Buchanan, New York. GZA designed 2D and 3D exhibits which were interactive, multi-media, and organized in educational layers that addressed the varied levels of public sophistication relative to understanding of the actual site subsurface conditions. GZA arranged the layout of the exhibits to facilitate one-on-one and small group discussions. The event created trust and accountability for Entergy through visual demonstrations of what is known and what is still being determined, a repeating short film kiosk narrated by videographer in language and units of measure that GZA's technical, marketing and communications staff developed, simplified and tested internally for simplicity so the public could understand that human health and the environment were not threatened by the release, and small group discussions to help clear up misunderstandings and rumors based on the public's fear of the unseen (radiation and underground contamination) and the politically charged environment surrounding the ongoing operation and relicensing of Indian Point. GZA coordinated investigations and public outreach with the client, under the review of the U.S. Nuclear Regulatory Commission (NRC) and New York State Department of Environmental Conservation. The New York Department of Health Laboratory, Energy Research and Development Authority, State of New York Emergency Management Office and New York's Public Service Commission also reviewed or participated in the project meetings and stakeholder decisions.

Radionuclide Release Investigation, Indian Point Energy Center (IPEC), Buchanan, New York. As a part of the Independent Spent Fuel Storage Installation (ISFSI) Dry Cask Storage Project at IPEC, certain modifications were required within the Indian Point Unit 2 Fuel Storage Building (IP2-FSB). Among these was the installation of a new crane to assist with the transfer of spent fuel into the dry casks. The installation of this crane required the construction of new foundations for the crane supports and a sub-surface counterweight. It was therefore necessary to excavate to bedrock through the floor of the IP2-FSB adjacent to the IP2-Fuel Storage Pool (FSP) to construct the crane foundations and counterweight. During this excavation process, a shrinkage crack in the concrete fuel pool wall was found to be leaking. GZA was therefore engaged to help investigate the impact of this release of radionuclides to the subsurface. Following review of all available information concerning the Systems, Structures and Components (SSCs) at the facility, as well as the hydrogeology of the Site, GZA prepared a Site Conceptual Model (SCM). The initial SCM consisted of groundwater flow in bedrock governed by natural anisotropies and anthropogenic features such as additional blasting-induced fracturing in the foundation bedrock, and a number of actively flowing foundation drains, as well as the overall impact of changes to the natural flow system as a result of mass excavation into the natural bedrock bank of the Hudson River. To assess the leak from the IP2-FSB and validate our Site Conceptual Model, GZA installed 41 monitoring installations, in addition to the 18 existing monitoring wells at the Site. Prior to boring installation, GZA conducted a review of existing utility plans, performed surface geophysical surveys, and employed vacuum excavation techniques to provide a very high level of certainty pursuant to avoiding potentially miss-located underground utilities or SSCs. GZA conducted downhole borehole geophysics, including ATV/OTV, on 22 bedrock borings to evaluate fracture orientations and their degree of interconnectivity. In addition, the geophysics data was correlated to actual subsurface conditions through inspections of rock cores by GZA geologists. We conducted a pumping test as well as 229 hydraulic conductivity tests using pneumatic slug testing and straddle zone packer testing instrumentation. Twelve deep bedrock monitoring installations were completed with Solinst Waterloo Multilevel Sampling instruments and 18 well installations were completed as nested piezometers. Pressure transducers were installed in the existing wells and newly installed wells to evaluate groundwater flow, tidal effects, effects of precipitation on groundwater flow, and interconnectivity of fractures. Subsequent to the investigation program, Mr. Barvenik was responsible as Principal-in-Charge for developing and directing a quarterly monitoring program to track radionuclide groundwater concentrations and to identify potential future releases to the environment from facility structures, systems, and components. Mr. Barvenik's responsibilities included communications with Entergy personnel, reviewing and approving budgets and invoicing, approving data reduction and interpretation of results with the Project Manager, and reviewing and approving quarterly groundwater monitoring reports.

Depleted Uranium Lagoon Closure – Feasibility Study and Partitioning Coefficient Determination, Concord, Massachusetts. Nuclear Metals produced uranium-based "tank killing penetrators" for use by the army and air force under a contract with the DOD. The penetrator manufacturing process involved coating depeated uranium rod stock with copper to act as a lubricant during high pressure extrusion. The copper coating was then stripped off of the penetrator with nitric acid, which also removed some of the uranium (The copper is responsilble for the distinctive green color of the lagoon sludge). The "liquid" waste from this operation was neutralized and stored in an unlined lagoon on the property. As part of its work for this client, GZA first performed a feasibility study (Phase III under the MCP). During this work we evaluated a number of potential remedial technologies in addition to excavation, with on-site and off-site treatment and disposal. These included institutional controls, Passive Containment Methods, Active Containment, and solidification/fixation methods. The feasibility study clearly showed that the most feasible alternative (satisfying both technical and cost feasibility requirements) was impermeable capping with institutional controls. To determine realistic cleanup levels, GZA first developed a conceptual site model. In this model, rainwater infiltrating impacted site soils in the unsaturated zone desorbed uranium and carried it to groundwater. The primary objective of GZA's study was to determine the maximum concentration of residual uranium that could be left in the soil and still be protective of human health. To accomplish this goal GZA conceived, designed and fabricated innovative equipment, and conducted multiple field and laboratory studies in parallel, to measure site-specific partitioning coefficients for uranium. GZA used these partitoning coefficients, combined with site specific modeling and a thorough knowledge of the Site, to develop appropriate RALs, nearly fifty times higher than the regulatory default value. To demonstrate to the regulators the validity of the higher RALs, GZA produced a highly technical, structured argument to demonstrate that further soil excavation at the site was not necessary from a risk-based perspective.

Notable additional non-radiological project experience includes:

The nation's first cooperatively funded Superfund hazardous waste site hydrodynamic isolation/cutoff wall remediation. Responsibilities included: investigation, design, construction quality control and post-construction monitoring of a 200,000-square-foot, 110-foot-deep cutoff wall/20-acre polymeric cap containment including a three-dimensional numerical model designed and performance optimized, 1/2-million gpd, groundwater hydrodynamic isolation/recirculation/treatment system. Developed and was the first to implement the concept of a slurry wall as a "clean water exclusion barrier" rather than just for contaminant containment so as to allow guarantee of no off-site contaminant migration. The cutoff wall was constructed in 1982 followed by the hydrodynamic isolation system. The hydrodynamic pump and treat recirculation system was shut down in January 1996, leaving the cutoff wall as the remaining containment system. In recognition of the innovative engineering on this NPL project, was awarded the 1982 N.H. ASCE Outstanding Engineering Achievement Award, the ACEC New England Grand Conceptor Award and the National ACEC Grand Award for Engineering Excellence as well as a $250,000 sole-source R&D full-scale test section contract by the U.S. EPA. The R&D contract encompassed: (1) development of new quality control testing procedures, (2) assessment of the effectiveness of electronic piezocone equipment for detection of "windows" in cutoff walls, and (3) hydraulic stress testing of over 1,000 feet of cutoff wall to evaluate bulk hydraulic conductivity. This work culminated in the preparation of the U.S. EPA Guidance Document on cutoff wall design, construction, and performance monitoring, an invitation to present the state-of-the-art paper on cutoff design at the 1987 National ASCE-GT Specialty Conference, and the Boston Society of Civil Engineers Best Technical Paper Award. **Developed Barcad multi-level groundwater sampling system (patent pending)**. Recognizing that clustered monitoring wells were an unreasonably expensive method to obtain multilevel contaminant data, conceptualized and then developed this instrumentation system in 1977 on behalf of the Massachusetts Bay Transportation Authority as part of a three-dimensional contaminant delineation prior to subway tunnel construction through a chemical plant site. This early work resulted in ongoing nationwide consulting with respect to state-of-the-art sampling of contaminated soils and groundwater. Projects include groundwater monitoring at depths in excess of 1,600 feet for in situ retorting of oil shale; permanent sampling installations located over 500 feet offshore allowing groundwater samples from below the Ohio River bed to be routinely and efficiently obtained from remote shoreline locations; below liner monitoring of a 250-acre hazardous waste landfill with instruments located over 1,000 feet from a common sample retrieval point allowing uninterrupted landfill operation and avoiding penetration of the liner systems; the **EPRI**-funded Tennessee Valley Authority Three-Dimensional

Tracer Study for Volatile Aromatic Compound Migration in Hydrologically Complex Formations; and pumping test and O&M monitoring of the first cooperative funded Superfund cutoff wall/hydrodynamic isolation system.

Hazardous Waste Landfill, Texas. Three-dimensional computer simulations of a proposed cutoff wall/landfill containment to demonstrate the efficacy of a slurry trench cutoff wall as compared to the natural 5-foot clay barrier required by state regulation. The Texas Water Commission (TWC) had previously issued a letter to the landfill owner (prior to GZA involvement) which precluded the use of a slurry wall for containment. GZA was engaged, based on our reputation with containment walls, to demonstrate the equivalency of the slurry wall. After meeting with the TWC, it became clear that much of the regulators' aversion to cutoff walls was due to a lack of understanding of methods for the proper installation and QA/QC field control. Therefore, developed a short course for the regulators to increase their comfort level through understanding of the technology. This work, as well as other cutoff wall simulation projects, required development of numerical techniques to allow modeling of the severe and abrupt changes in hydraulic conductivity associated with high permeability aquifers truncated by thin, low permeability barriers. Elimination of the natural clay barrier requirement by the Texas Water Commission allowed increased landfill design capacity worth $80 million.

Development of Hydrophysical Technique for More Cost-Efficient Determination of Bedrock Hydraulic Conductivity. This new and innovative investigative technology allows cost-efficient determination of bedrock fracture location and quantification of hydraulic conductivity and contaminant distribution versus depth for fractured bedrock. The technique involves replacing the standing column of formation water in a borehole with a uniformly deionized fluid, and then real-time profiling of the induced changes in Fluid Electrical conductivity and temperature (FECAT) of this emplaced water using proprietary hydrophysical logging tools developed by GZA. These changes occur when the contrasting formation water is drawn back into the borehole through the conductive bedrock fractures during pump testing. The resulting hydrochromographic signature is analyzed via numerical algorithms, developed under the **DOE**-sponsored Technology Transfer Program in cooperation with the Lawrence Berkeley Laboratory to determine the hydraulic conductivity and contaminant versus depth profile.

MBTA Red Line, Cambridge, Massachusetts. Project required concrete diaphragm slurry wall construction which had never before been attempted in highly sensitive quick clays. To demonstrate the feasibility of the method, the Federal Highway Administration granted GZA a $250,000 R&D contract to execute a full-scale, instrumented test section (Barvenik & Goldberg, 1980). The soil/structure interaction data obtained allowed successful design and construction of the nation's first cast-in-place concrete diaphragm slurry wall for permanent tunnel support. The 6,000-foot-long cut-and-cover tunnel required over 3/4 million square feet of slurry wall constructed through highly ionic, low pH chemical sludges, ash and cinder fills, clays, sands and bedrock. The tunnel alignment also transected property owned by a chemical manufacturer. Investigations uncovered high levels of organic and inorganic hazardous wastes above and below the water table. Implemented a hydrologic study which was one of the first three-dimensional groundwater analyses and was the first in the country to employ multilevel sampling instruments. Invented these instruments in 1977 to decrease the high drilling costs associated with standard clustered monitoring wells. Identified buried chemical sludges which were the source of the groundwater contamination. These sludges, totaling over 14,000 cubic yards, were excavated to allow tunnel construction and chemically fixed and solidified on site to remove their Hazardous Waste designation and thus allow final disposal in a municipal landfill. Designed the tunnel structure to be a barrier to the residual contaminated soils and groundwater which remained in place. Subsequently work with the MBTA when transit workers complained of health effects "due to the hazardous waste around the tunnel." Environmental investigations indicated that the problem was related to atomized hydraulic fluid from a high-pressure elevator leak and not from the compounds in the soil and groundwater outside the tunnel.

Grace Chemical – Town of Acton, Massachusetts. This NPL project was directed toward evaluation of closure options for chemical sludge lagoons and industrial landfill located upgradient of a major municipal water supply aquifer. This project, involving Grace Chemical and the Town of Acton, was the second U.S. EPA enforcement action in the nation (1979) resulting in a remedial action consent decree. Initially performed RI/FS work on this project including source area (lagoon sludge) characterization, contaminant plume definition, numerical modeling, and physical/chemical treatability testing to evaluate the feasibility and effects

of lagoon closure on the 300-acre, 180-foot-deep municipal supply aquifer. The work required development of new methodologies and equipment to model cap compression and clean water flushing for 20 years to assess groundwater impact on the municipal water supply. Subsequently worked with the Town during technical negotiations with the U.S. EPA pursuant to the ROD. Served as a member of the technical group responsible for establishing/negotiating the scope of work for the ongoing RD/RA phase of this project. Remedial action technologies include groundwater extraction/treatment, solidification/fixation of lagoon sludges/soils including vapor extraction and industrial landfill closure incorporating the solidified sludges and a polymeric cap. GZA then completed the Remedial Action on this project.

Neville Island Superfund Site, Pittsburgh, Pennsylvania, one of the first applications of soil gas monitoring techniques (1981). Designed, fabricated, and employed an in situ probe to allow samples of VOC-contaminated vadose zone liquids and soil pore gas to be repeatedly extracted as the probe was advanced with a drill rig to depths of 50 feet. Subsequent data analysis in 1981 aided in determination of areal and vertical extent of dioxin-contaminated sludges in the unsaturated zone and the selection of an appropriate remedial alternative.

Professional Development

Member, Nuclear Energy Institute
American Nuclear Society - Groundwater Investigation Guidance (ANSI/ANS-2.17), and ANSI/ANS 2.32 and ANSI/ANS 2.9 Working Groups
Licensed Site Professional Association

Publications

American Nuclear Society ANS-2.17 Working Group, Bollinger (cochair), Rasmussen (cochair), Barvenik, et al, "Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants", ANSI/ANS-2.17-2010, American Nuclear Society, La Grange Park, Ill., December 2010.

Paquin, J.R., J.M. Wieck, M.M. Shaw, M.A. Powers, and M.J. Barvenik, *Impacts of Subsurface Building Components on Groundwater Flow – A Case for Sentinel Wells*, Proceedings of the 2009 EPRI Groundwater Protection Workshop (in collaboration with NEI), Electric Power Research Institute, September 15-16, 2009.

Barvenik, M.J, "*Indian Point Energy Center NEI Groundwater Protection Initiative – Lessons Learned"*, 2008 NRC Regulatory Information Conference; Bethesda, Maryland, March 2008

Barvenik, M.J., "*The Observational Method for Conceptual Site Model Development and Verification – Indian Point Energy Center"*, 2007 ANS / ENS International Meeting, Washington, D.C., Nov. 2007

Winslow, D.M., M.B. Barvenik, et al, "*Integration of Investigative Methods to Assess a porous Media vs Fracture Flow Approach in Fractured Bedrock Systems"*, 2007 U.S. EPA/NGWA Fractured Rock Conference, Portland ME, September 2007

Ponti, M.J. Barvenik, et. al., "*Integration of Investigative Methods to Assess a Porous Media vs. Discrete Fracture Flow Approach in Fractured Bedrock Systems"*; EPRI / NEI Groundwater Workshop, Sept., 2007.

Winslow D.M., M.J. Barvenik, et al, "*Characterization of Tritium and Strontium Releases and Hydrogeology at the Indian Point Nuclear Power Plant, Buchanan", New York*, Northeast Geological Society of America, March 2007.

Barvenik M.J., Powers, et. al., *Use of the Observational Method in the Investigation and Monitoring of a Spent Fuel Pool Release*, EPRI / NEI Groundwater Workshop, Sept. 2006.

Barvenik, M.J., "*Environmental Expert Witnesses Clean Things Up in R.E. Courtroom*", Banker & Tradesman Commercial Real Estate, August 30, 2004

Barvenik, M.J., "Air Sparging - Panacea to Panic", lectures presented to Massachusetts Institute of Technology, Environmental & Geotechnical Engineering, April 2, 1999/January 31, 1996 and Tufts University Hazardous Materials Management Forum, March 8, 1996.

Currier, P.M., Koenen, B.A., Barvenik, M.J., T.P., & Iskanoar, I.K., "Small Diameter Wells for Site Characterization, Remediation & Monitoring", The 1st Tri-Service Environmental Technology Workshop, Sponsored by the U.S. Army Environmental Control (USAEC), Hershey, Pennsylvania, May 20, 21 & 22, 1996.

Barvenik, M.J., "Dense Non-Aqueous Phase Liquids (DNAPL) - Migration Theory and Remedial Strategy Case Studies." The New Hampshire Environmental Symposium sponsored by the New England Water Environment Association and the New Hampshire Department of Environmental Services, June 22, 1994.

Carr, D.B., and M.J. Barvenik, "Feasibility of Biosparging in Stratified Geology," Second Annual Maine Conference of Lessons Learned in Remediation of Petroleum Contaminated Sites, Maine Department of Environmental Protection, Augusta, Maine, April 28, 1994.

Barvenik, M.J., "Design Options Using Vertical Barriers," American Society of Civil Engineers (ASCE) International Convention & Exposition, New York, New York, September 17, 1992.

Barvenik, M.J. and Benson, S.D., "Chlorinated Solvent Contamination at 300 Feet - Proactive Remediation Results in Cost Savings," The Second Forum and Industrial Exhibition on Environmental Protection sponsored by the Instituto Para la Proteccion Ambiental De Nuevo Leon, A.C., Monterrey, H.L. Mexico, May 25, 1992.

Dean, A.R. and M.J. Barvenik, "Use of the Observational Method in the Remedial Investigation and Cleanup of Contaminated Land," The Seventh Geotechnique Symposium - Geotechnical Aspects of Contaminated Land, sponsored by the Institution of Civil Engineers, London, Volume XLII, Number 1, March 1992.

Barvenik, M.J., "Evaluation of Depth Specific Hydraulic Conductivity for Well Head Protection of Bedrock Aquifers," Lecture and Notes presented at the Short Course entitled: Methods for Delineating Well Head Protection Areas in Fractured Aquifer Settings, sponsored by the American Institute of Hydrology and the U.S. EPA, Boston, MA, June 1991.

Barvenik, M.J., "Corrective Action," Session Chairman, HMC-Northeast '91, sponsored by the Hazardous Materials Control Research Institute, Boston, MA, July 1991.

Pedler, W.H., M.J. Barvenik, C.F. Tsang, and F.V. Hale," Determination of Depth Specific Bedrock Hydraulic Conductivity and Hydrochemistry Using Wellbore Fluid Logging," Forth National Outdoor Action Conference on Aquifer Restoration, Groundwater Monitoring and Geophysical Methods, Las Vegas Nevada, May 1990.

Barvenik, M.J., W.E. Hadge, and J.E. Ayres, "Converting An Above Ground Storage Terminal to Luxury Waterfront Condominiums," Contamination and the Constructed Project, ASCE/BSCE, November 2, 1989.

Barvenik, M.J., "Soil Remediation - The $64 Million Question," Chairman of Session on Soil Remediation Technologies for the New England Environmental Exposition, Boston, MA, May 1989.

Pedler, W.H., M.J. Barvenik, G.W. Gardner, and D.W. Urish, "Detection and Characterization of Hydraulically Conductive Fractures in Bedrock by Geophysical Logging After Fluid Emplacement," 2nd Annual Hazmat Central 89 Conference, Rosemont, Il, March 1989.

Foglio, J.C., C.L. Eidam, and M.J. Barvenik, "Vapor Extraction Enables Cost Effective Shopping Mall Development," First Annual Real Estate Site Assessment Conference, Sturbridge, Massachusetts, December 1988.

Foglio, J.C., C.L. Eidam, and M.J. Barvenik, "Innovative Application of Soil Vapor Extraction Eliminates Off-Site Disposal Requirement," 6th Annual Hazmat 88 Conference, Atlantic City, New Jersey, June 1988, and First Annual Real Estate Site Assessment Conference, Sturbridge, Massachusetts, June 14, 1988.

Barvenik, M.J. and J.E. Ayres, "Construction Quality Control and Post-Construction Performance Verification for the Gilson Road Hazardous Waste Site Cutoff Wall." U.S. EPA Report No. EPA/600/2-87/065, Hazardous Waste Engineering Research Laboratory, Cincinnati, OH. August, 1987.

Barvenik, M.J., "Design of In-Situ Passive Containment Barriers," Lecture and Notes presented at the ASCE-GT Specialty Conference Entitled: Geotechnical Practice for Waste Disposal, Ann Arbor, MI. June, 1987.

Barvenik, M.J., Lecture and notes presented as training session entitled: Remedial Technology. Presented under contract with EPA Region V, Chicago, IL. February 1987 and January 1988.

Barvenik, M.J., Lecture and notes presented as part of a short course entitled: Groundwater Pollution Remedial Actions. Sponsored by the College of Engineering, University of Wisconsin, Madison, WI. January 1987, January 1988, and April 1989.

Barvenik, M.J., Lecture and notes presented as part of short course entitled: Cutoff Technology for Containment of Hazardous Wastes. Presented to the Texas Water Commission, Austin, TX. December 1986.

Barvenik, M.J., "Methods for Passive Physical Containment of Groundwater Contamination," and "Field Applications of Active and Passive Physical Containment of Contaminated Groundwater," lectures and notes presented as part of the Short Course entitled: Corrective Action for Containing and Controlling Groundwater Contamination, sponsored by the National Water Well Association; San Diego, Orlando, Boston, Columbus, Denver, Tempe, Berkeley, Tampa, in 1985 and Columbus, Salt Lake City, San Diego, Boston, Orlando, and Tempe in 1986.

Barvenik, M.J., D. Brown, and T. Kern, "Evaluation of Cutoff Wall Containment Efficiency Using Aquifer Stress Tests: Gilson Road Hazardous Waste Site, Nashua, New Hampshire," 12th Annual EPA Research Symposium, Cincinnati, Ohio, April, 1986.

Barvenik, M.J., "Passive Physical Containment: An Overview" and "A Case Study: Groundwater Restoration In Unconsolidated Deposits," lectures and notes presented for short course entitled: Contamination Control for Managers, sponsored by R.E.I.; Worcester, Massachusetts, April, 1986. Also presented as training session under contract to Massachusetts DEP, Westborough, MA; May 1986.

Barvenik, M.J. and T.J. Kern, "Combination Active and Passive Barrier Systems Enable Habitation of Contaminated Sites," Proceedings of the Third Annual Hazardous Materials Management Conference, Philadelphia, PA, June 4-6, 1985.

Barvenik, M.J., W.E. Hadge, D.T. Goldberg, "Quality Control Procedures for Determination of Hydraulic Conductivity and Bentonite Content During Construction of Soil/Bentonite Cutoff Walls," Eleventh Annual EPA Research Symposium, Cincinnati, Ohio, April 1985.

Barvenik, M.J., "Disposal Site Engineering," lecture and notes presented as part of the Short Course entitled: Controlling Hazardous Wastes, sponsored by the Boston Society of Civil Engineers/ASCE in cooperation with the Massachusetts Institute of Technology, Cambridge, Massachusetts, February 1985.

Barvenik, M.J., et al "Seminar on Landfill Cover/Liner Borrow Selection Process". Presented to the Massachusetts Department of Environmental Quality Engineering (DEQE), Boston, MA, February 1985.

Barvenik, M.J., "Dedicated Gas-Drive Groundwater Sampling Instruments," Lectures and Notes presented as part of the Design, Installation, and Sampling of Groundwater Monitoring Wells Short Course sponsored by the National Water Well Association; Orlando, Florida, April 1984 and Boston, Massachusetts, July 1984. Also presented as training session under contract to Massachusetts DEQE, Boston, MA; July 1984.

Schulze, D., M.J. Barvenik, and J.E. Ayres, "Design of the Soil/Bentonite Backfill Mix for the First EPA Superfund Cutoff Wall," Proceedings of the 4th National Symposium and Exposition on Aquifer Restoration and Groundwater Monitoring, sponsored by NWWA, Columbus, Ohio, May 1984.

Cadwgan, R.M., M.J. Barvenik et al., "Improving Monitoring Efficiency of Deep Wells," Groundwater Monitoring Review, Vol. 3, No. 1, Winter 1983.

Lindberg, C.A., J.E. Ayres, D. Schulze, and M.J. Barvenik, "Measurements of Contaminant Distribution, Migration, and Attenuation Within the Vadose Zone Below Disposal Lagoons," Proceedings of the 1st National Symposium on the Characterization and Monitoring of the Vadose Zone, sponsored by NWWA, Las Vegas, Nevada, December 1983.

Barvenik, M.J. and R.M. Cadwgan, "Multilevel Gas-Drive Sampling of Deep Fractured Rock Aquifers in Virginia," Groundwater Monitoring Review, Vol. 3, No. 4, Fall 1983.

Ayres, J.E., M.J. Barvenik, and D.C. Lager, "The First EPA Superfund Cutoff Wall; Design and Specifications," Proceedings of the 3rd National Symposium and Exposition on Aquifer Restoration and Groundwater Monitoring, sponsored by NWWA, Columbus, Ohio, May 1983.

Barvenik, M.J. "The Design of Soil/Bentonite Cutoff Wall Backfill Materials for Hazardous Waste Containment," lecture presented to the Boston Society of Civil Engineers/ASCE, Boston, Massachusetts, February, 1983.

Barvenik, M.J. and D.T. Goldberg, "Performance of Two Instrumented 60' Deep Slurry Wall Test Panels in Quick Clay," Proceedings of ASCE National Convention, Session 52, New York, New York, May 1981.

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