

DUANE R. HAMPTON

HYDROGEOLOGIST AND CIVIL ENGINEER

Associate Professor

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ACADEMIC BACKGROUND

Ph.D. (Civil Engineering) Colorado State University, 1989

Dissertation title: Coupled heat and fluid flow in saturated-unsaturated compressible porous media.

M.S. (Civil Engineering) Auburn University, 1978

B.S. (Geology) Michigan State University, 1976

PROFESSIONAL HISTORY

Geosciences Department, Western Michigan University, Dec 1986 to present

ERT (now ENSR), Fort Collins, CO, 1985 to 1986

Hale, Smith & Williams, Fort Collins, CO, 1984 to 1985

Civil Engineering Dept., Auburn University, Alabama, 1982 to 1984

Conservation Foundation, Washington, D.C., summer 1977

U.S. Geological Survey, Conservation Division, summer 1976

National Wildlife Federation, Washington, D.C., summer 1975

TECHNICAL SPECIALTIES AND RESEARCH INTERESTS

Hydrogeology and Hydrology

Monitoring and Recovering Free Product (LNAPLs and DNAPLs)

Flow of Water and Other Fluids in the Unsaturated Zone

Remediation of Contaminated Sediments in Streams and Lakes

Characterization of Flow Systems and Contaminant Migration Pathways

Modeling Groundwater Flow and Contaminant Transport using Finite Elements

Heat Transport and Storage in the Subsurface

Interactions between Surface Water and Groundwater

Well Design, Construction, and Hydraulic Testing

PUBLICATIONS

(refereed publications are in italics)

Cassidy D., A. Northup, and D. Hampton (2009). "The Effect of three chemical oxidants on subsequent biodegradation of 2,4-dinitrotoluene (DNT) in batch slurry reactors." *Journal Chemical Technology Biotechnology*, 84 (6), 820-826.

Hampton, D. and T. DeFrain, 2008. Laboratory tests of Schumasoil® well screens for free product recovery, in Proc. of 2008 Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection, and Remediation Conference and Exposition, Nov. 3-4, 2008, Houston, TX, National Ground Water Association, available through Ground Water On Line.

D.P. Cassidy, A. Northup, and D. Hampton, 2008. The Effect of AOPs on the Chemical Destruction of 2,4-Dinitrotoluene and on its Subsequent Biodegradability by Native Soil Microorganisms, 4th European Bioremediation Conference, Chania, Greece, September 3-6.

Northup A., D. Hampton, and D. Cassidy, 2007. The Effect of AOPs on the Chemical Destruction of 2,4-Dinitrotoluene and on its Subsequent Biodegradability by Native Microorganisms. *The 9th International Battelle Symposium on In Situ and On-Site Bioremediation*. May 7-10, Baltimore, MD, USA.

Northup A., D. Hampton, and D. Cassidy, 2006. Treatment of a Dinitrotoluene-Contaminated Soil Using Five Different Oxidants. The 12th International Conference on Advanced Oxidation Technologies for Treatment of Water, Air, and Soil. September 25-28, Pittsburgh, PA, USA.

Northup A., D. Hampton, and D. Cassidy, 2006. The Effect of Fenton Reagent Dose on Co-Existing Chemical and Microbial Oxidation in Soil. The Third European Conference on Oxidation and Reduction Technologies for Ex-Situ Treatment of Water, Air & In-Situ Treatment of Soil & Groundwater, September 11-13, Göttingen, Germany.

Hampton, D.R., D.R. Beck, S.L. Kohler, and D.P. Cassidy, 2005. Geotextile sediment cover blocks biointrusion in tests, In: Proc. 3rd Int. Conf. on Remediation of Contaminated Sediments, Jan. 24-27, 2005, New Orleans, LA, USA, Battelle Press.

Hampton, D.R., 2003. Improving Bail-Down Testing of Free Product Wells, in Proc. of 2003 Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection, and Remediation Conference and Exposition, Aug. 19-22, 2003, Costa Mesa, CA, CD format, National Ground Water Association, 16-30.

Hampton, D.R., D.P. Cassidy, D.R. Beck and S.L. Kohler, 2002. In-Situ Remediation of Contaminated Sediments in Groundwater-Fed Streams and Lakes, in Abstract Book, AGWSE 2002 Annual Mtg. and Conf.: Linking Surface and Subsurface Hydrology—From Science to Technology, 40-41, Las Vegas, NV, 8-11 Dec., 2002, National Ground Water Assoc.

Cassidy, D.P., D. Hampton, S. Kohler, and H.E. Nuttall, 2002. "Ozonation and biodegradation of persistent bioaccumulative toxins in sediments." In: *Remediation and Beneficial Reuse of Contaminated Sediments* (Hinchee, R. E., Porta, A. Pelli, M., Eds.), Battelle Press, 71-78.

Cassidy, D. P., D. Hampton, S. Kohler, H.E. Nuttall, and W.L. Lundy, 2002. "Comparative Study of Chemical Oxidation and Biodegradation of PCBs in Sediments" In CD format:

Remediation of Chlorinated Compounds (Gavaskar, A. R., and Chen, A. S. C., Editors), Proceedings of the Third International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, May 20-23, 2002, Battelle Press, 2C-27.

Cassidy, D., D. Hampton and S. Kohler, 2002. Combined chemical (ozone) and biological treatment of polychlorinated biphenyls (PCBs) adsorbed to sediments, J. Chemical Technology and Biotechnology, 77(6): 663-670.

Cassidy, D., D. Hampton and S. Kohler, 2001. Ozonation and biodegradation of persistent, bioaccumulative toxins in sediments, in Proc. International Conf. on Remediation of Contaminated Sediments, Venice, Italy, 10-12 Oct., 2001, Battelle.

Hampton, D.R. 2000. Hydrophobic gravel packs improve free product monitoring and recovery, in Proc. of Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection, and Remediation Conference and Exposition, Nov 14-17, 2000, Anaheim, CA, National Ground Water Association, 169-183.

Peng, W.S., D.R. Hampton, L.F. Konikow, K.K.R. Kambham and J.J. Benegar, 2000. Can Contaminant Transport Models Predict Breakthrough? Ground Water Monitoring and Remediation, Vol. XX, No. 4, Fall 2000, 104-113.

Peng, W.S., D.R. Hampton, J.J. Benegar, K.K.R. Kambham and L.F. Konikow, 1998. Can MODFLOW-Based Contaminant Transport Models Predict Breakthrough?, in MODFLOW '98, Proc. Vol. 1, Colorado School of Mines, Golden, CO, 363-370.

Kirby, M.J. and D.R. Hampton, 1997. The Hydrology and Hydrogeology of the Dowagiac River Watershed--Southwest Michigan. Dept. of Geology/Institute for Water Sciences, WMU, Kalamazoo, MI, 46 pp.

Peng, W.S., D.R. Hampton and K.M. Grindstaff, 1996. Can Groundwater Contaminant Transport Models Predict Breakthrough?, in MODEL CARE 96, Poster papers, Int. Ground Water Modeling Center, Golden, CO, 195-204.

McCarville, M. E., J. K. Bergin and D. R. Hampton, 1995. Tracers for immiscible hydrocarbons in groundwater: laboratory experiments, in Tracer Technologies for Hydrological Systems (Proc. of a Boulder Symposium, July 1995) IAHS Publ. no. 229, 125-131.

Hampton, D. R., T. R. Barrett, H. S. Nayyar and T. P. O'Connell, 1995. Geosynthetic Sand Pack for Free Product Wells, in Y. B. Acar & D. E. Daniel, Eds., Geoenvironment 2000, Vol. 1, 167-181.

Hampton, D. R., T. R. Barrett, H. S. Nayyar and T. P. O'Connell, 1993. Hydrophobic Gravel Packs for Product Monitoring and Recovery Wells, in Proc. 7th Nat. Outdoor Action Conf., May 25-27, 1993, Las Vegas, NV, 581-595.

Hampton, D. R., 1993. Improving Monitoring and Recovery of Immiscible Fluids, in Y.

Eckstein and A. Zaporozec, Eds., Environmental Impact of Industrial Activities, Proc. of the Second US/CIS Joint Conference on Environmental Hydrology and Hydrogeology, May 15-21, 1993, Washington, DC, 111-125.

Adams, T. V. and D. R. Hampton, 1992. Effects of capillarity on DNAPL thickness in wells and in adjacent sands, in K. U. Weyer, ed., Subsurface Contamination by Immiscible Fluids, Proc. of Int. Assoc. Hydrogeologists Conf., April 18-20, 1990, Calgary, Alberta, Canada, p. 131-138.

Hampton, D. R., R. Wagner and J. Howell, 1991. Method and apparatus for subterranean liquid level measurement, U.S. Patent No. 5,048,334, issued Sept. 17, 1991.

Hampton, D. R., M. M. Smith and S. J. Shank, 1991. Further laboratory studies of gravel pack design for hydrocarbon recovery wells, in Proc. of Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection and Restoration, Nov. 20-22, 1991, Houston, TX, 615-629.

Hampton, D. R. and H. G. Heuvelhorst, 1990. Designing gravel packs to improve separate-phase hydrocarbon recovery: laboratory experiments, in Proc. of Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection and Restoration, Oct. 31 - Nov. 2, 1990, Houston, TX, 195-209.

Hampton, D. R., R. B. Wagner and H. G. Heuvelhorst, 1990. A new tool to measure petroleum thickness in shallow aquifers, in Proc. 4th Nat. Outdoor Action Conf., May 14-17, 1990, Las Vegas, NV, 127-141.

Hampton, D. R., 1990a. A method to fit the soil hydraulic curves in models of flow in unsaturated soils, in Computational Methods in Subsurface Hydrology, the Proc. of the VIII Int. Conf. on Computational Methods in Water Resources, June 11-15, Venice, Italy, Computational Mechanics Publications, Boston, 175-180.

Hampton, D. R., 1990b. Monitoring of free product in wells--purposes and pitfalls, in Proc. of Conf. on Prevention and Treatment of Soil and Groundwater Contamination in the Petroleum Refining and Distribution Industry, Oct. 16-17, 1990, Montreal, Quebec, Canada, 9.1-9.20.

Wagner, R. B., D. R. Hampton and J. A. Howell, 1989. A new tool to determine the actual thickness of free product in a shallow aquifer, in Proc. of the Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection and Restoration, November 15-17, 1989, Houston, TX, 45-59.

Hampton, D. R., 1989. Laboratory investigation of the relationship between actual and apparent product thickness in sands, in Environmental Concerns in the Petroleum Industry, S. M. Testa, ed., May 1989, Pacific Section, Amer. Assoc. Petroleum Geologists, 31-55.

Hampton, D. R. and P. D. G. Miller, 1988. Laboratory investigation of the relationship between actual and apparent product thickness in sands, in Proc. of NWWA/API Conf. on Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection and Restoration,

November 9-11, 1988, Houston, TX, Vol. I, 157-181.

RESEARCH GRANTS AND CONTRACTS

Successful Funding (Research Grants and Contracts)

1. Amoco Corporation grant, Dec. 1988, period open, **\$10,000**. "Field methods for determining free product thickness in soils". Principal Investigator (PI): Duane Hampton.
2. U.S. Environmental Protection Agency--Environmental Monitoring Systems Laboratory--Las Vegas (USEPA-EMSL-LV) contract, 2/89-9/89, **\$17,000**. "Field methods for determining free product thickness in soils". PI: Duane Hampton.
3. The Upjohn Company grant, May 1989, period open, **\$2,200**. "Physical model studies of the behavior of dense chlorinated solvents in porous media". PI: Duane Hampton.
4. USEPA-EMSL-LV contract, 11/89-2/90, **\$6,500**. "Write a summary of laboratory, field and theoretical work pertaining to product thickness". PI: Duane Hampton.
5. WMU Faculty Research Travel Grants: 1990—1999.
6. USEPA-EMSL-LV Co-operative Agreement # CR 817594, 9/10/90-9/9/91, \$75,000 federal, **\$85,992** total, WMU indirect costs \$15,840. "Improving free product monitoring and recovery--year 1". PI: Duane Hampton, with Michael McCarville, Marian Smith and James Howell.
7. USEPA-EMSL-LV Co-operative Agreement # CR 817594, 9/10/91-9/9/92, \$93,000 federal, **\$106,638** total, WMU indirect costs \$11,553. "Improving free product monitoring and recovery--year 2". PI: Duane Hampton, with Michael McCarville, Marian Smith and James Howell.
8. USEPA Office of Research and Development, Edison, NJ, 1/9/92-1/8/97, \$25,000,000 federal total level of effort. "Research for the prevention, detection, and cleanup of contamination from leaking tanks, waste sites, and spills of hazardous materials". IT is prime contractor, with subcontractors (Midwest Research Inst.), small businesses (Geotrans), and 4 consultants: Duane Hampton; Rick Johnson, Oregon Grad Inst; Gary Robbins, U. Conn.; & Ryan Dupont, Utah State.
9. USEPA-EMSL-LV Co-operative Agreement # CR 817594, 9/10/92-9/9/93, \$98,000 federal, **\$112,163** total, WMU indirect costs \$19,383. "Improving free product monitoring and recovery--year 3". PI: Duane Hampton, with Michael McCarville and William Sauck.
10. The Upjohn Company, June 1994--Jan. 1995, Upjohn Thermal Modeling Study, **\$18,329**. PI's: Duane Hampton and W. Thomas Straw.
11. USEPA 604b Planning Grant through MDEQ and Cass Conservation District, Jan. 1997--Feb. 1998: Dowgiac River Watershed, **\$29,000**. Co-PI with C. He and Lauren Hughes.
12. USDOA through Michigan State U., Jun. 1997--Dec. 1997, Lysimeter Nests 97, **\$7000**. PI: Al Kehew, Co-PI with W. Sauck.

13. USEPA Kalamazoo River Initiative, Task 6: Alternatives for Remediation, Co-PI with Daniel Cassidy, Nov. 1999-June 2001, \$21,700 direct, **\$113,851** total.
14. Michigan Dept. of Environmental Quality—Michigan Great Lakes Protection Fund, Sept. 20, 2000, Development of Innovative Remedial Methods for PCB-Contaminated Sediments in the Great Lakes Drainage Basin, Year 1 total **\$134,858**, MGLPF share \$88,672. Daniel Cassidy, PI, Duane Hampton, Co-PI.
15. U.S. Department of State, Bureau of Educational and Cultural Affairs, 2002-2005. “Establishment of an Environmental Hydrogeology Coalition including Western Michigan University, Suez Canal University and South Valley University”, \$221,772. Alan Kehew, PI, Duane Hampton and William Sauck, co-PI’s.
16. Kalamazoo Community Foundation via Asylum Lake Policy and Management Council, March 2005. “Plan for removing visual impacts from wells at Asylum Lake Preserve”, \$11,539.79. PI: Paul MacNellis and Duane Hampton
17. Michigan Dept. of Transportation, Div. of Construction and Technology, Apr. 29, 2005. “Review of TCE spill cleanup using surfactants at MDOT Lansing facility”, \$3500. PI: Duane Hampton
18. Pall Corporation, June 28, 2007. “Schumasoil well screen lab experiments”, \$8,310, including \$2695 overhead, completed and paid May 8, 2008. PI: Duane Hampton
19. NTH Consultants: Implementation of STOMP CWS; Numerical CO2 Injection Simulation Modeling, through June 2009; David Barnes, PI; Duane Hampton, \$44,057.
20. USDOE earmark to MGRRE for MICHCARB—A Resource Center for Geological Carbon Sequestration Research, Education and Outreach in Michigan; 2009—2010; PI—David Barnes; Co-PIs, Duane Hampton, Mike Grammer, Bill Harrison, \$601,158.
21. USDOE proposal: 2009—2012; Simulation Framework for Regional Geologic CO2 Storage Infrastructure along Arches Province of Midwest United States, PIs: Neeraj Gupta and Joel Sminchak, Battelle Memorial Institute, WMU subcontract, Dave Barnes, PI; Duane Hampton and Bill Harrison, participants, \$160,308.
22. USDOE NETL DE-FOA-0000033: 2010—2012; Regional Assessment of the Knox-Prairie du chien/St. Peter Sandstone, Illinois State Geological Survey, PI, WMU, Co-PI; \$305,639.75, DOE cost.

Pending Grant Proposals

Unsuccessful Grant Proposals

1. USEPA-EMSL-LV, submitted 9/89, period 1 year, \$50,000. "Free product recovery effectiveness". Revised and resubmitted (See II A #5-#6 above).
2. U.S. Geological Survey, ultimate funding to come from U.S. Air Force, Omaha, NB, submitted

3/90; submitted 4/90 to U.S. Air Force, Tyndale AFB, Florida; 14 months, \$52,942. "Laboratory study of gravel pack used in petroleum product recovery wells; and rapid field determination of jet fuel spill thickness". Revised and resubmitted to EPA with success: see above A. #5, #6 and #9.

3. USEPA-EMSL-LV Co-operative Agreement # CR 817594 amendment, submitted 12/90, period <1 year, \$21,958 federal, \$30,455 total. "Use of a buried current electrode in conjunction with the 'Aquifer Dipstick' to map the lateral extent of hydrocarbon product plumes". William Sauck and Duane Hampton, Co-PI's.

4. NIEHS, 3 years, \$50,500 per year portion of >\$1 million per year. "Modeling the KL landfill", part of interdisciplinary study on risks to human health and the environment from this Superfund site, submitted June 12, 1991, but collective proposal was not finished.

5. U.S. Air Force Center for Environmental Excellence (AFCEE), 2 years, \$925,129 total, \$863,723 federal. "Accelerated LNAPL Removal from Medium Permeability Aquifers", submitted May 3, 1993. PI: Duane Hampton. with William Sauck, Michael McCarville, Andrew Blystra. This was redesigned and submitted at a much lower cost to Rice Univ.

6. National Research Council, Collaborative Research in Sectoral Policy Program, 3/10/95, \$2200. "Developing Policies to Remediate Fuel Spills in Latvia Through Cost-Effective Technology."

7. USDOE-Energy Research/Environmental Management FY 96 Collaborative Research Program, Topic 1: Fractured Rock Systems at DOE's Hanford, INEL and ORNL sites: Site Characteristics Related to Site Remediation. Part B. Geochemistry of Basalt/Contaminant Interactions. 3 years, \$288K/year, submitted 9/95. Preproposal with PI: David J. Wronkiewicz, Argonne National Laboratory-East, Co-PI: Duane Hampton. Revised and resubmitted to Program 96-10 on 2/28/96.

8. USDOE Energy Research/Environmental Management Science Program Notice 96-10, submitted 5/8/96, period 3 years, \$573,136. "Field Experiment to Investigate the Validity of Multi-phase Flow Models." PI: Duane Hampton. Co-PI: Avery Demond, U. Michigan. Also involved: Michael McCarville, Chemistry, and Amir Salehzadeh, U. Michigan.

9. USDOE Water Institutes for 13-state region, submitted 5/96, period 3 years, \$26,000/year + WMU match. "Nitrate transport and accumulation in deep vadose zone as affected by agricultural practices." Michael Kirby, Duane Hampton, Alan Kehew and William A. Sauck.

10. Michigan Dept. of Environmental Quality—Environmental Response Division, Wyoming District, Phased Research Plan for Crytal Refinery site, Carson City, Michigan, \$345,254. Co-PI with Estella Atekwana, William Sauck, and Mr. Franklyn Legall, preproposal, summer 1998, my portion \$105,900.

11. Michigan Dept. of Environmental Quality--Environmental Response Division, 12/98, roughly \$400K. "Determination of the impacts of hydrocarbon-contaminated groundwater on surface water." Co-PI with Daniel Cassidy.

12. NIH, NIEHS Division, submitted 5/99 by the WMU Environmental Institute, \$11,089,082 proposal, period 5 years, year 1 beginning 4/00, Project 8--\$162,978, 5 year total \$808,947. Remedial methods for sediments in the Kalamazoo River." Co-project leader with Dan Cassidy.

13. USEPA-GLNPO, Feb. 18, 2000, 2 years, Isolating and Bioremediating PCBs in Sediments, \$132,156. Daniel Cassidy, PI, Duane Hampton, Co-PI.
14. USEPA-GLNPO, Feb. 18, 2000, 0.5 years, Evaluation of Technologies for PCB-contaminated Sediments, \$114,010. Duane Hampton, PI.
15. USDOD-ESTCP, Demonstration of Anchored Geotextile Biointrusion Barrier for In Situ Remediation of PBT-Contaminated Sediments, Mar 2004-Dec 2005, \$153,000, Hampton, PI, Cassidy and Kohler, Co-PI's, Dellapenna, Koretsky, and Price.
16. Environmental Institute Research Fund, Evaluation of Slug Test Methods at Asylum Lake Facility, Duane R. Hampton and Hailachin Mengistu, Summer-Fall 2003, \$4125.
17. Great Lakes Environmental and Molecular Sciences (GLEaMS) Center, Proposal for White Paper on Innovative Remediation of Contaminated Sediments, by Duane R. Hampton and Steven L. Kohler, Summer-Fall 2003, \$5000.
18. U.S. EPA STAR program, 3/23/04. In-Situ Management and Remediation of PBT-Contaminated Sediments, \$319,932 federal. Duane Hampton, PI.
19. U.S. EPA—Great Lakes National Program Office, 3/28/04. Managing PCB-Contaminated Sediments Using Geotextile Caps, \$237,170 federal. Duane Hampton, PI.
20. SERDP (Strategic Environmental Research and Development Program), preproposal submitted Jan. 6, 2005, 3-year period, \$299,181. “Anchored Geotextile Biointrusion Barrier Containing Modified Fenton’s Reagent for In Situ Remediation of Contaminated Sediments”, Duane Hampton, PI, Dan Cassidy and Steve Kohler, co-PI’s.
21. USDOD—ESTCP preproposal: 2010—2012; Application of Chemical Oxidants for the *In Situ* Destruction of Contaminants in Sediments, Daniel Cassidy, PI; Duane Hampton and five other Co-PIs; \$1.5 million.
22. USDOE NETL DE-FOA-0000033: 2010—2012; Site Characterization of Promising Geologic Formations for CO₂ Storage; Consumers Energy, PI; Western Michigan Univ., Co-PI (Dave Barnes, PI; Duane Hampton, Bill Harrison, G. Michael Grammer, participants), and NTH Consultants; \$759,471.51, WMU budget share.

Professional talks, colloquia, papers

Presentations With Published Abstracts

Hampton, D. R., 1985. The storage term in the equation for transient groundwater flow through saturated/unsaturated porous media, Fall Meeting, AGU, San Francisco, CA, December, 1985.

Hampton, D. R. and P. M. Haff, 1988. Validation of a model of coupled heat and water transport in saturated/unsaturated media, Int. Conf. and Workshop on the Validation of Flow and

Transport Models for the Unsaturated Zone, Ruidoso, NM, May 22-25, 1988.

Hampton, D. R., 1988. Laboratory and field comparisons between actual and apparent product thickness in sands, Fall Meeting, AGU, San Francisco, CA, December 5-9, 1988.

Hampton, D. R., 1989. Physical processes controlling the distribution of light hydrocarbons in unconfined sandy aquifers, Int. Symp. on Processes Governing the Movement and Fate of Contaminants in the Subsurface Environment, Stanford, CA, July 24-26, 1989.

Adams, T. V. and D. R. Hampton, 1989. Laboratory study of DNAPL behavior in wells and adjacent porous media, 34th Midwest Ground Water Conf., Kalamazoo, MI, October 18-20, 1989.

Hampton, D. R., H. G. Heuvelhorst, T. V. Adams, S. J. Greer and B. E. Hartenberger, 1990. What can wells tell us about the location of immiscible fluids in aquifers?, Spring Meeting, AGU, Baltimore, MD, May 29, 1990.

Hampton, D. R., 1991. Interactions of immiscible fluids and wells at equilibrium in glass sand tanks, Invited Paper, Spring Meeting, AGU, Baltimore, MD, May 30, 1991.

Hampton, D. R., 1991. Fitting the soil hydraulic curves to model flow in unsaturated soils, Annual Meeting, Soil Science Soc. Amer., Denver, CO, Oct. 30, 1991.

Hampton, D. R., M. E. McCarville, J. K. Bergin and R. D. Golding, 1996. Two families of chemicals successfully tracked hydrocarbon flow in soil columns, Annual Meeting, Soil Science Soc. Amer., Indianapolis, IN, Nov. 3-8, 1996.

Laton, W.R, A.P. Hascall, E.A. Atekwana and D.R. Hampton, 1996. Seepage meter spatial and temporal variability in the study of groundwater interaction with surface water features, Fall 1996 Mtg. Amer. Geophysical Union, San Francisco, CA, Dec. 1996.

Hampton, D.R., and M.J. Dalman, 1998. Hydrogeology field course as a capstone learning experience, Annual Meeting, Geol. Soc. of Amer., Toronto, Ont., Can., Oct. 26-29, 1998.

Kirby, M.J, and D.R. Hampton, 1999. Monitoring macropore flow and agrichemical transport using multiple techniques, Annual Meeting, Soil Science Soc. Amer., Salt Lake City, UT, Nov. 2, 1999.

Other presentations

Presented seminar at Brigham Young University, Department of Geology, May 1989

"Field methods for measuring product thickness in shallow aquifers", USEPA Office of Underground Storage Tanks 2nd Continuous Improvement Conf., Tucson, AZ, Nov. 6-9, 1989.

"What wells can tell us about the location and extent of immiscible liquids in aquifers", invited

expenses-paid seminar, Dept. of Earth Sciences, U. of Waterloo, Ontario, Canada, June 18, 1990.

"Monitoring of free product in wells: purposes and pitfalls", talk to Michigan Well Drillers' Assoc., Ground Water Technology Div., Oct. 23, 1990, Grand Rapids.

"Monitoring oil spills and modeling of unsaturated flow", seminar to Environmental and Water Resources Engineering, U. of Michigan, Ann Arbor, MI, Jan. 23, 1991.

"Overview of underground storage tank research - past, present and future", report at Innovative Monitoring Technologies -- 91, USEPA-Environmental Monitoring Systems Laboratory-Las Vegas, NV, review of Aquatic and Subsurface Monitoring Branch, Feb. 26, 1991.

Hampton, D. R., R. B. Wagner and J. A. Howell, 1991. The Aquifer Dipstick for detecting free product leaked from underground storage tanks, Technology Transfer Conf. on Environmental Cleanup, Rocky Mountain Region, Soc. Amer. Military Engineers, Denver, CO, Nov. 14, 1991.

Hampton, D. R., M. M. Smith and S. J. Shank, 1991. Laboratory and field studies of gravel pack design for hydrocarbon recovery wells, Technology Transfer Conf. on Environmental Cleanup, Rocky Mountain Region, Soc. Amer. Military Engineers, Denver, CO, Nov. 14, 1991.

"EMSL/LV Methods to Improve Detection, Monitoring and Recovery of Free-Product", presentation to USEPA Science Advisory Board, Environmental Engineering Committee, Underground Storage Tank Research Subcommittee, Arlington, VA, June 29, 1992.

Hampton, D. R., T. R. Barrett, H. S. Nayyar and T. P. O'Connell, 1993. Plastic Gravel Packs for Free Product Wells, Michigan Well Drillers Assoc. Annual Conv., Lansing, MI.

Hewitt, K. M. and D. R. Hampton, 1993. Comparison of USGS 2D and 3d Transport Models of the Mobile Tracer Test, 1993 Ground Water Modeling Conference, June 9-12, 1993, Golden, CO.

"Hydrophobic Gravel Packs for Free Product Monitoring and Recovery Wells", seminar at New Mexico Institute of Mining and Technology, Socorro, NM, Aug 2, 1993.

Hampton, D. R., and R. Buechler, 1995. "High Production Wells vs Aquifer Depletion", presentation at Michigan Environmental Health Association Ground Water Conference, Cadillac, MI, Sept. 19, 1995.

Hampton, D.R. and W.S. Peng, 1998. Can contaminant transport models predict breakthrough?, seminar at Michigan State University Geology Dept., Feb. 5, 1998.

"Remediation of PCB-Contaminated Sediments," By Daniel Cassidy, Duane Hampton, Steven Kohler, Western Michigan University Geosciences Seminar, Feb. 18, 2002.

"Remediation of PCB-Contaminated Sediments," By Daniel Cassidy, Duane Hampton, Steven Kohler, Hope College Science Seminar, Mar. 8, 2002.

Water Management Issues in Michigan, Kalamazoo College seminar, Duane Hampton, Jan. 17, 2006

Northup A, Hampton D., Cassidy D. (2006). Treatment of a Dinitrotoluene-Contaminated Soil Using Five Different Oxidants. The 12th International Conference on Advanced Oxidation Technologies for Treatment of Water, Air, and Soil. September 25-28, Pittsburgh, PA, USA.

Northup A, Hampton D., Cassidy D. (2006). The Effect of Fenton Reagent Dose on Co-Existing Chemical and Microbial Oxidation in Soil. The Third European Conference on Oxidation and Reduction Technologies for Ex-Situ Treatment of Water, Air & In-Situ Treatment of Soil & Groundwater, September 11-13, Göttingen, Germany.

Farsheed Rock, Tony E. Clark, David A. Barnes, and Duane R. Hampton, Spatial Variability of Injectivity and Storage Capacity in a Geologically Complex Sequestration Target: The Devonian Sylvania Sandstone, Michigan Basin USA, poster at 9th Annual Conference on Carbon Capture & Sequestration, May 10—13, 2010, in Pittsburgh, Pennsylvania.

Extension

1989 Organized and conducted 1-day seminar at WMU on Underground Storage Tanks, March, attendance over 90 people.

Talked about oil spills to 75 freshmen at Kalamazoo Area Math and Science Center (KAMSC), October.

Presented lecture to Groundwater Education in Michigan Teachers Workshop, November

1990 Guided science fair projects of two high school juniors from KAMSC, Winter.

Summer Institute for the Arts and Sciences - 2 week course on Groundwater Flow and Contamination.

1991 "Aquifer Analysis", lecture to Michigan Dept. of Public Health On-Site Water Supply Systems Course, W. K. Kellogg Biological Station, Jan. 28, 1991.

"Groundwater Hydrology", lecture to sophomore class at KAMSC, April 1991.

Mentored a senior from KAMSC, Britt Hartenberger, for Winter 1991.

"Monitoring petroleum and petroleum products in the subsurface environment", lecture to Michigan Dept. of Natural Resources Inservice Training Course at Higgins Lake, MI, 9/12/91.

1993 Mentored a senior from KAMSC, Ian Kozak, for Winter 1993.

1997 Sanitarian Field Training, July 10, 1997, in conjunction with Mich. Dept. Env. Quality and the Michigan Ground Water Association. about 50 participants.

1998 Groundwater Geology for Science Teachers: Concepts and Activities, GEOL 502, 18 students (teachers), July 13-17, 1998.

1999 "Locating and Remediating Free Product", lecture to Michigan Dept. of Envir. Quality Inservice Training Course at WMU, 5/13/99.

Groundwater Geology for Science Teachers: Concepts and Activities, GEOL 502, 10 students (teachers), July 12-16, 1999.

2000 Organized Glowing Embers Council Girl Scout Geology Badge Day at WMU Geosciences Dept., March 18, 2000. Hosted 63 girl scouts for the morning. Got extensive help from other Geoscience faculty and students.

2002 Helped plan and teach course in Battle Creek (Binder Park Zoo) on groundwater concepts for K-12 teachers from that area, June 17-21, 2002.

Interviewed for WMUK about remediating PCB-contaminated river sediments

2003 June 18—Presentation to Michigan Dept. of Environmental Quality, Lansing, annual training meeting.

Helped plan and teach course in Battle Creek (Binder Park Zoo) on groundwater concepts for K-12 teachers from that area, June 16-20, 200.

2003 Oct. 15, "Cleaning Up Gas Spills", Michigan Environmental Health Assoc., 10th Annual Ground Water Conference, Bellaire, MI

2005 Mentored Hydrogeology seniors Kevin Smith and Benjamin Offrink, as they carried out funded grant at Asylum Lake Preserve, removing some wells, flush-mounting other wells. Mentored Ben's research project, turning sand-filled culvert at Asylum Lake into vertical constant-head permeameter. Supervised Tracey Lund's research project on effects of global warming on groundwater.

Helped plan and teach course in Battle Creek (@BC Math and Science Center) on groundwater concepts for K-12 teachers from that area, June 13-17, 2005.

2006 Mentored Melissa Kovich, M.S. student in Geography, Jtanner Wiens, Hydrogeology major in a research project, and Nick Shorkey, Hydrogeology major, on his research project with the WMU Engineering and Business Technology & Research Park.

Helped plan and teach course in Battle Creek (@BC Math and Science Center) on groundwater concepts for 13 K-12 teachers, June 12-16, 2006.

2007 Presented "The Kalamazoo River and PCB's: Background on PCB pollution of the Kalamazoo River, Superfund, & the cleanup to date", in a public meeting in the west ballroom in the Bernhard Center organized by Sarah Hill, WMU, April 12, 2007, standing room only crowd.

2009 Presented "PCB-contaminated sediments in the Kalamazoo River--what's the story?" at Kalamazoo College, Jan. 21, in the Dalton Center, and February 9, at the Geosciences seminar in 1118 Rood Hall, WMU.

Editing, refereeing, reviewing activities

- 1982 (2 papers) Transactions American Society of Agricultural Engineers
1984 (1 paper) Soil Science Society of America Journal
1989 (4 papers) Journal of Ground Water
(1 paper) Soil Science Society of America Journal
1990 (2 papers) Journal of Contaminant Hydrology
(2 papers) Journal of Ground Water
2 Preproposals to USEPA-EMSL Las Vegas
1991 (3 papers) Journal of Ground Water
(1 paper) Ground Water Monitoring Review
1992 (2 papers) Journal of Ground Water
1993 Preproposal to Alabama Agricultural Experiment Station
1995 (1 paper) Ground Water Monitoring & Remediation
(1 paper) J. Contaminant Hydrology
review of manual for USEPA-OUST
1997 (1 paper) J. Hydrology
(1 paper) J. Hydrologic Engineering
1998 Proposal to USDA/CREES/NRICGP
(1 paper) J. Amer. Water Resources Assoc.
(1 paper) J. Contaminant Hydrology
1999 (1 paper) J. Amer. Water Resources Assoc.
2000 (1 paper) J. Amer. Water Resources Assoc.
Proposal to USDA/CREES/NRICGP
Proposal to NSF
(3 papers) ASCE J. of Hydraulic Engineering
Manuscript for textbook: Ground Water Science, by Charlie Fitts
2001 (1 paper) J. Amer. Water Resources Assoc.
2002 (1 paper) ASCE J. of Hydraulic Engineering
2003 State of Wisconsin, Water Resources Institute, 2 proposals
2003 McGraw-Hill, CD-ROM, Spencer, *Earth Science: Understanding Environmental Systems*
2003 McGraw-Hill, CD-ROM, Plummer et. al., *Physical Geology*, 10th. Ed.
2004 McGraw-Hill, Bender, *Introduction to Geology*, 1st Ed, ch. 1-8
2004 State of Wisconsin, Water Resources Institute, Proposal 05-GSI-01, "An integrated modeling approach to analyze groundwater/lake interactions in response to changes in climate/land cover: Trout Lake watershed, northern Wisconsin"

State of Wisconsin, Water Resources Institute, Proposal 06-GSI-06, "Groundwater Mounding and Contaminant Transport Beneath Stormwater Infiltration Basins", Dec. 2004, Project Investigator: Anita Thompson

- Science Center programs of the U.S. Department of State. 'New technology for environmental cleanup of oil spills or hazardous materials spills (chlorine, acid, etc.)' (STCU # 3322). Dec. 2004
- 2006 State of Wisconsin, Water Resources Institute, Proposal 07-HDG-05, "Application of LSQR TO Calibration of a Regional MODFLOW Model: Trout Lake Basin, Wisconsin", Dec. 2005, Project Investigators: Mary Anderson & H. Zhang
- 2009 Reviewed 8 proposals for USDOD SERDP program SON 10-2

Supervision (i.e., advisor, committee chair) of student research and thesis projects

- Scott Dennis M.S., 1987. Effects of well development on slug tests
- Paul D. G. Miller. Laboratory experiments with oil spills
- Peter M. Haff. Modeling heat and water flow in dry soils
- Paul Miccicche. Soil-gas monitoring
- Ross B. Wagner M.S. 1996. A new tool for oil spill delineation
- Timothy V. Adams M.S. 1991. Laboratory experiments with DNAPLs
- Kathleen Hewitt M.S. 1990. Two and Three-Dimensional models of contaminant transport
- Steven A. Ricci Two and Three-Dimensional models of contaminant transport
- Linda Jones M.S. 1993. Hydrogeology of a municipal well field
- Hugh G. Heuvelhorst M.S. 1993. Optimizing gravel packs for oil recovery wells
- Stephen J. Shank M.S. 1994. Optimizing gravel packs for oil recovery wells
- Amy Lachance M.S. 1992. Statistical analysis of landfill water quality data
- Tom Barrett M.S. 1993. Optimizing gravel packs for oil recovery wells
- Blair Dudley M.S. Earth Science 1993. Improving bailer test methods
- David Schmidt. Laboratory experiments with DNAPLs
- Brett Coulter. 2 and 3D models of contaminant transport
- Jennifer Bergen M.S. 1994. Tracers of free product movement underground
- Jodie McNeil (with W. Sauck) M.S. 1994. Can ground-penetrating radar find free product?
- Bill Hunsberger M.S. 1997. Thermal impacts of cooling water recharge lake
- Hans Neve M.S. 1995. Effects of air sparging on hydraulic conductivity of sparged area
- Paul Pare M.S. 1995. Analysis of repeated pump tests at Asylum Lake
- Laura Krol M.S. 1995. Analysis of bail-down tests on hydrocarbon wells
- John Ring M.S. 1995. Organic carbon and CO₂ movement through deep vadose zone
- Chris Christensen M.S. 1996. BIOPLUME II modeling of two hydrocarbon spill sites
- Robert Buechler M.S. 1996. Effects of city well field pumping on Kleinstuck Pond
- Kristen Buecher M.S. Earth Science 1996. Epidemiological study of increased disease near former incinerator
- Phil Lowe M.S. Earth Science 1997. Air sparging of former gas station--A success
- Renuka Fernando M.S. 1997. Laboratory study of hydrocarbon recovery trench design
- Sherry Calloway M.S. Earth Science 1997 Study of grouting methods for water wells
- W. Richard Laton Ph.D. 1997. Groundwater interactions with Kalamazoo River
- Kurt Elliot M.S. Vertical resistivity electrode array to locate immiscible fluids
- Chris Amore M.S. 1997. Effects of well screen slots on slug test permeability values
- Clayton Novak M.S. Earth Science 1999 Methods for measuring soil water content & potential
- Brad Green. M.S. 1998 LNAPL entry to wells due to well development, open area & gravel pack
- Jim Ferrito. M.S. Earth Science 1998. Landfill studies.
- Amy Hall. M.S. Earth Science 1998. Industrial ecology.

Adrienne Carr. Honors College Thesis. 1998. Vadose zone transport of viruses.
 Michael Kirby Transport and storage of nitrate in the vadose zone vs agricultural practices
 Mike Dalman M.S. 1999 Integrated hydrologic study of proposed municipal wells in Ross Township
 Shafiu Chowhury Ph.D. 1999. Aquifer vulnerability studies. Member of committee
 Russell Downey M.S. Earth Science 2000. Member of committee
 Andy Hudak M.S. 2001. Member of committee.
 Gerald Unterreiner Ph.D. 2002. Member of committee
 James Brode, M.S. 2002. Model of part of Gelman Sciences Contaminant Plume, Ann Arbor.
 Casey Smith. M.S. Earth Science. 2003.
 David Beck. M.S. 2003. Laboratory testing of select geotextiles as biointrusion barriers and sediment filters
 Andy Hudak Ph.D. 2004. Member of committee
 Neil Couch, M.S. student. Advisor.
 Delwar Ahmed, Member of Ph.D. committee
 Laura Sherrod Smart, Ph.D. 2007. Member of committee
 Lisa Anderson, Ph.D. 2009. Member of committee
 Rennie Kaunda, Ph.D. 2007. Member of committee
 Nathan Brandner, M.S. 2006 Hydrophobic gravel packs for free product wells.
 Lauren Beuving, M.S. student. Member of committee
 Jason Spannier, M.S. Earth Science, 2006. Member of committee
 Amanda Walega, M.S. student. Member of committee
 Tamara Defrain, M.S. 2008. Free product recovery in Schumasoil well screens
 Nathan Bolles, M.S. student. Member of committee
 Chris Jones, M.S. 2007. Member of committee
 Adam Milewski, Ph.D. 2008. Member of committee
 Tony Clark, M.S. student. Advisor.
 Farsheed Keshavarz Rock, M.S. student. Member of committee.
 Melanie Haveman, M.S. 2009. Member of committee.
 Zhanay Sagintayev, Ph.D. 2010. Member of committee
 Kyle Patterson, M.S. Member of committee
 Joy Gryzenia, M.S. 2010. Member of committee
 Meghan Good, M.S. 2010. Member of committee
 Heather Qualman, M.S. 2010. Member of committee
 Rachel Salim, M.S. Student. Advisor.
 Amy Manley, M.S. Student. Advisor.
 Hussain Al'Faifi, Ph.D. Student. Advisor.

Other relevant professional activities

CLASSES TAUGHT

YEARS TAUGHT

Water Resources Engineering	1982
Civil Engineering Analysis	1982-84
Surface Water Hydrology, GEOS 609, then 5090	1983-84, 89, 94, 96, 98, 99, 2002, 4, 5, 7, 9
Hydrology, CCE 4350	2009

Groundwater Modeling, GEOS 6050	1987-93, 95-98, 2000, 2, 4, 6, 8, 9
Hydrogeology, GEOS 5120	1987, 89, 93, 95-97, 2003-6, 8
Introduction to Hydrogeology, GEOS 412	1998
Hydrogeology Summer Field Course, GEOS 5260, Conducting and analyzing pump tests	1988-98, 2000, 2002-10
Hydrogeology review for field course: 434/634/710	2005-10
Contaminant Hydrogeology, GEOS 615	1990-99, 2001, 3, 4
Environmental Geology, GEOS 544	1990-91
Oil in Porous Media, GEOS 634	1990
Advanced Hydrogeology (Vadose zone), GEOS 6120	1993, 97, 2000, 3, 5, 7, 10
Environmental Earth Systems, ENV5 230	1999-2000
Earth Studies, GEOS 1000	1999-2009
Groundwater Concepts & Activities, GEOS 502	1998-1999
Groundwater Protection for Teachers, Seminar on Carbon Sequestration, GEOS 6340	2002-3, 2005-6 2009
Climate Change: Geological Perspective, GEOS 2200	2010

Committees, Departmental, College and University Service
(service continuing to present is italicized)

1988	Authored a successful proposal to equip a Geology Department computer lab with 6 micros, 2 plotters, 3 printers, and ancillary hardware and software.
1989	WMU College of Arts and Sciences ad hoc committee on computer policy Technical Program Committee for Midwest Groundwater Conference Chair, Department of Geology Computer Committee through 2001
1990	Directed Dept. of Geology Seminars, Winter, 1990
1991	Arranged Water Law (Winter 1992) and recruited instructor for it. Geology Dept. Sabbatical Review Committee
1992	Advisor for Field Hydrogeology and Hydrogeology undergraduate majors; Master's Degree programs in Geology (emphasis Hydrogeology), Environmental Earth Science and 2nd Masters; Ph.D. in Hydrogeology. Over 100 students, nearly half at the graduate level.
1993-2007	Advisor for Hydrogeology undergraduate major.
1995-96	Member of Geophysics faculty search committee
1996-1997	Chair, Hydrogeology faculty search committee (hired Dan Cassidy)
1996-2004	Member, Geology Dept. Executive committee
1997-1998	Board Member, College of Arts & Sciences Environmental Research Center
1997-1999	Member, College of Arts & Sciences Faculty Council
1997-2001	Member, Campus Radiation Safety Committee
2000-2002	Member, FRACAS review board
2000-2002	Faculty Senator, Geosciences
2001-2003	Earth Science Educator search committee, finally hired Heather Petcovic

- 1999 Authored successful proposal to build joint math/geoscience computer lab in 3rd floor Rood Hall. Collaborators: Jay Treiman and John Petro, Math.
Geosciences Dept. Sabbatical Review Committee Chair
Member, Asylum Lake area research board of Environmental Institute
Directed Dept. of Geology Seminars, Fall 1999
- 2000 Directed Dept. of Geology Seminars, Winter 2000
- 2001 Civil Engineering Chair search committee, College of Engineering
- 2003 Member, Geosciences tenure committee, handled two cases.
- 2004 State of Michigan, Dept. of Education, June 18, 2004, member of Earth Science review panel, reviewed applications from 10 universities & colleges to approve their programs for educating majors and minors in earth science education
Member, Geosciences tenure committee, handled three cases, responsible for one.
Appointed at-large member of Asylum Lake Policy & Management Council
Member of advisory committee for WMU Civil & Construction Engineering
- 2005 Revised Hydrogeology Major after 4-year effort
Geosciences Dept. Sabbatical Review Committee, 2005—2008
Geosciences Dept. Tenure Review Committee
Geosciences Dept. Undergraduate curriculum committee
Geosciences Dept. Graduate Admission Committee
Geosciences Dept. Policy Committee, 2005—2008
Geosciences Dept. Assessment Committee, 2005—2008
- 2006 Chair, Geosciences Dept. Endowment Committee
Chair, Geosciences Dept. Publicity Committee
- 2007 *Spring, led Geosciences majors recruitment effort, including developing and making presentations in most of our Geosciences general education classes*

Spring 2007—present, advising prospective Geosciences majors and minors.

Chair, Geosciences Dept. Recruitment Committee, 2007—present

Geosciences Dept. Fund Raising Committee, 2007—present
- 2008 Worked on departmental brochures for recruitment & fundraising

Professional Memberships

American Association of University Professors
 American Geophysical Union, Hydrology Division
 Member, American Society of Civil Engineers
 Geological Society of America, Hydrogeology Division
 International Association of Hydrogeologists
 National Ground Water Association
 Soil Science Society of America

Consultation activities and Expert witnessing

2008 to 2010: consulting with BLDI, Grand Rapids, MI

2005: Expert reviewer of remediation at Lansing Michigan Dept. of Transportation facility with TCE spill.

2000 - 2001: Expert witness for defendant in AeroMotive vs. Becker, deposed.

1999: Consulting assignment for Peerless Midwest in Mishawaka, Indiana

1999: Expert review for Burlington Northern/ Santa Fe Railroad, proposed Hauser, ID, Fueling Facility, subcontracted by Farr & Associates, Granite Bay, California.

1998 – 1999: Expert witness for defense in U.S. v John A. Rapanos et al., US District Court, Eastern District of Michigan, Southern Division, Case No. 94-CV-70788-DT, a wetlands case, was deposed and testified in court.

1997 - 1998: consulting for MI Dept. of Envir. Qual. through Snell Envir. Group, Lansing, MI

1991 - 2007: consulting with American Hydrogeology Corp., Portage, MI

1989: A consulting assignment with McNamee, Porter and Seeley in Ann Arbor, MI

1985 - 1986: employed as hydrogeological consultant for ERT

Community Service

Member, Portage Groundwater Commission, 1992 - Jan. 1996.

Appointed by Governor Engler as Member, State of Michigan Hazardous Waste Site Review Board, 1995. Reappointed 1999. Service ended 2002.

Lay leader, Church of Jesus Christ of Latter-Day Saints, 1989 – present. Serving April 1996—June 2001 as 2nd Counselor in Portage Ward Bishopric. June 2001—Jan 2002, Kalamazoo 2nd Ward, 1st Counselor in Bishopric. Jan 2002—Dec 2003, Branch President, Kalamazoo University Branch. Dec. 2003—June 2005, 2nd Counselor in Young Men Presidency, Kalamazoo Stake. June 2005—Sept. 2006, High Priests group leader, Kalamazoo 2nd Ward, Sept. 2006—June 2008, Seminary teacher, Kalamazoo Stake. June 2008—2009, 2nd Assistant in High Priests Group, Kalamazoo 3rd Ward. Feb. 2009—present, co-leader of Addiction Recovery Groups, LDS Social Services.

Boy Scout Troop 222 and Cub Scout Pack 222 service since 1987 in various capacities, including pack committee chairman, chartered organization representative and member of troop committee. Aug. 1999 Woodbadge training course. Received Woodbadge beads. Led crews to Boundary Waters Canoe Area Wilderness (BWCAW), Minnesota, 1995, 2002, 2007. Troop

committee chair, 2007 (222)—2009 (298).

Southwest Michigan Council, Pathfinder District: Commissioner for troops 222, 291, and 167, pack 291 and venturer crew 167. 2001—June 2005.

Advised local Trout Unlimited chapter, Natural Resources subcommittee, on groundwater options for cooling Augusta Creek flows, Dec. 1999.

Kalamazoo Gospel Mission, volunteer, 3rd Saturday, odd months, 2004—2006.

Kalamazoo County Democratic Party, volunteer canvasser, 2 hours every other Saturday during 4 months preceding election, 2004, 2006

French voyageur re-enactor, Oct. 1-2, 2005; Oct. 6-8, 2006; Sept. 2008; 2009; Feast of the Hunters Moon, W. Lafayette, IN

REPRESENTATIVE CONSULTING EXPERIENCE

- Railroad fueling site near Hauser, ID. Reviewed free product modeling of product release scenarios for various hypothetical releases.
- Wetlands sites near Midland, MI. Evaluated analytical element models used to recreate previous wetlands hydrology at about four sites. Gave deposition and testified.
- Crystal Refinery - Carson City, MI. Installed 36+ wells, 12 with different gravel pack designs. Conducted several kinds of bailer tests: single well; automated single well; and simultaneous dual well free product pumping tests. Site investigation with ground-penetrating radar (GPR) and resistivity.
- Pipeline Spill Site - Muskegon, MI. Installed 2 wells. Compared different gravel pack designs in these wells by pumping and bailing. Site investigation with ground-penetrating radar (GPR) and resistivity as well as new tool for measuring product location.
- Pipeline Spill Site - Constantine, MI. Conducted bailer tests. Compared product thickness measuring devices. Cored and sampled soil profile using split-spoon and hand augers. Took samples from split-spoon and from test pit. Compared techniques for estimating actual product thickness. Developed and evaluated new tool for measuring product location in sand.
- Laboratory Studies of Free Product in Sands. Built Plexiglas sand box. Studied free product thickness in 2", 4" and 6" wells in box and in sand around wells. Used different sands. Conducted bailer test. Compared well screens made from different materials. Studied layered systems and biodegradation. Designed gravel packs.
- Hydrogeological Assessment - Paint Manufacturing Plant, MI. Reviewed efforts to characterize the extent and source of organic chemical contamination by a storage tank farm at a paint plant. Met with responsible parties and their consultants, gave advice, and reviewed all

reports prior to submitting them to the regulatory agency.

- Burlington Northern Railroad - Paradise Tie Treating Plant, MT. Conducted multi-well pump test. Took water and soil samples. Determined aquifer parameters. Studied various groundwater corrective action alternatives using the computer model mentioned below. Reported the results and recommended an alternative.
- Attorneys for Contractor Operating an Ammunition Plant. Prepared for litigation by reviewing twenty-nine reports produced by several consultants on volatile organic contamination (including TCE) at the CERCLA site and at several municipal well fields in the area. Critiqued the assumptions, conclusions, procedures and methodologies related to contaminant transport in the eleven most relevant reports. Evaluated the consistency of these reports. Presented opinions on horizontal and vertical migration of contaminants both on and off site.
- Burlington Northern Railroad - Montana Fueling Sites. Designed and located monitoring wells at four sites to determine the extent of lenses of diesel fuel and other petroleum products. Wrote investigation plans for these sites. Supervised installation of monitoring wells and collection of soil samples at two of these sites. Wrote chapters in final report.
- Texas Eastern - Sims Tire Stores, CO, WY. Conducted environmental audits of nine auto stores to determine the potential liability at each site. This included conducting site reconnaissance, researching site history, locating underground tanks, using geophysical equipment, contacting state and local agencies and reviewing their files.
- Burlington Northern Railroad - Brainerd Tie Treating Plant, MN. Preparation of closure and post-closure plans for a surface impoundment contaminated with creosote. Prepared sections for a Part B application for land treatment of the contaminated soils. Wrote hydrogeologic assessment for Part B application for a waste pile at this RCRA/CERCLA site.
- PRP Technical Committee - Sand Creek Industrial Superfund Site, CO. Technical oversight of EPA contractor's remedial investigation (RI), including field observation of drilling and groundwater sampling. Critiqued RI work plan and Phase I RI Report. Critiqued report by another EPA contractor on Sand Creek oil seep. Results of the critiques were presented in reports to the PRP Committee.
- Burlington Northern Railroad - Somers Tie Treating Plant, MT. Revised Phase I Remedial Investigation (RI) Report to respond to EPA comments. Measured groundwater levels for all wells. Interpreted results of chemical analyses of soil samples taken from several newly-installed wells at this CERCLA site.
- McFarland Cascade - Idaho Pole Company, MT. Reviewed RI and recommended hydrogeologic alternatives for remediation at this CERCLA site.
- Koppers - Wood Treating Wastes. Revised report on the general feasibility of land treatment of creosote and pentachlorophenol-contaminated soils.

- City of Cheyenne, WY - Firefighter Training Field. Investigation of a pit contaminated with flammable organic chemicals. Defined the extent of soil contamination with soil vapor headspace analysis. Used Giddings auger to obtain soil samples, and HNU photoionization detector to ascertain contamination by volatile organics.
- Celeron/All American Crude Oil Pipeline EIS, TX. Wrote sections on impacts and mitigation measures for groundwater and geology. The primary issue was the effects of surface oil spills upon groundwater quality.
- Diamond Chuitna Coal Mine EIS, AK. Revised portions of EIS in response to agency comments. Work dealt with predictions of mine inflow quantity and quality, and the effects upon adjacent streams.
- Attorneys for Hudson Oil - Cushing Refinery, OK. Developed monitoring wells for RCRA closure of an oil refinery.

MODELING EXPERIENCE

- Field Application of Computer Model. Applied two-dimensional axisymmetric finite element model of coupled heat and water flow in aquifers to a well field near Mobile, Alabama. Used the results to compare with field measurements and with the input to a research computer model.
- Development and Validation of Computer Model. Developed a finite element model of two-dimensional, transient coupled heat and water flow in saturated and unsaturated media. The results were verified using analytical solutions and experimental data.
- Modification of Computer Model. Modified McWhorter and Sunada groundwater model to employ "link" transmissivities. Coupled this model with a Kalman filtering routine to estimate transmissivities. Added an incremental dynamic programming code that identified the optimal sequence of wells to drill in order to develop a new basin.