

**USGS Toxic Substances Hydrology Program  
National Point Source Research Meeting  
January 26-29, 2009, San Diego, California**

**Agenda**

	<b>Sunday, January 25, 2009</b>
5:00 pm - 8:00 pm	Registration Table is Open - <i>Hotel Lobby</i>
<b>Day 1</b>	<b>Monday, January 26, 2009 - <i>Pacific Ballroom A&amp;B</i></b>
7:00 am	Registration Open ( <i>Hotel Lobby</i> ) - Morning Refreshments and Snacks ( <i>Pacific Foyer</i> )
8:00 am - 8:45 am	Opening Remarks, Meeting Goals, and Background on U.S. Geological Survey (USGS) Subsurface Point-Source Contamination Research: <ul style="list-style-type: none"> <li>• Eric Reichard, Director, California Water Science Center, USGS</li> <li>• Matthew Larsen, Associate Director for Water, USGS</li> <li>• Herb Buxton, Coordinator, Toxic Substances Hydrology Program, USGS</li> </ul>
8:45 am - 10:45 am	<b>Session 1 - Contamination in Fractured Rock Aquifers: <i>The Naval Air Warfare Center (NAWC), West Trenton, N.J.</i></b> <ul style="list-style-type: none"> <li>• Contamination in fractured-rock aquifers: National issues, research challenges, and overview of the Naval Air Warfare Center site, by Claire R. Tiedeman</li> <li>• Importance of geologic framework for understanding contaminant transport and designing remediation in fractured sedimentary rocks, by Pierre J. Lacombe</li> <li>• Persistence of separate phase, dissolved, and sorbed chlorinated solvents in fractured-rock aquifers, by Daniel J. Goode</li> <li>• Characterization of contaminant-degrading microorganisms in fractured-rock aquifers, by Paul M. Bradley</li> <li>• Remediation of contaminants in fractured-rock aquifers: Progress and challenges, by Allen M. Shapiro</li> <li>• Synthesis, technology transfer, and future research priorities, by Claire R. Tiedeman</li> </ul>
10:45 am - 11:00 am	Break - Refreshments
11:00 am - 12:00 noon	<b>Session 2 - Petroleum Hydrocarbon Contamination: <i>The Bemidji Research Site, Minn.</i></b> <ul style="list-style-type: none"> <li>• Effects of remediation at the Bemidji, Minnesota Crude Oil Spill Site, by Geoffrey N. Delin</li> <li>• Transferability and application of Bemidji Site Science -- Forensic work at a long-term railroad-diesel oil spill site in Mandan, ND, by Frances D. Hostettler</li> </ul>

<b>Day 1 - continued</b>	<b>Monday, January 26, 2009 - Pacific Ballroom A&amp;B</b>
12:00 noon - 1:15 pm	Lunch (On your own)
1:15 pm - 2:15 pm	<p><b>Session 2 (Continued) - Petroleum Hydrocarbon Contamination: <i>The Bemidji Research Site, Minn.</i></b></p> <ul style="list-style-type: none"> <li>• Long term progression of natural attenuation of petroleum LNAPLs, by Barbara A. Bekins</li> <li>• Integrated investigation of natural attenuation processes at a crude oil spill site, Bemidji MN: Closing gaps in conceptual models and quantification of degradation rates, by R. Ulrich Mayer</li> <li>• Application of knowledge gained and tools developed at the Bemidji Site to a crude oil spill site in Cass Lake, MN, by William N. Herkelrath</li> </ul>
2:15 pm - 2:30 pm	Break - Refreshments and Snacks
2:30 pm - 4:30 pm	<p><b>Session 3 - Contamination by Organic and Inorganic Constituents in Wastewater Effluent: <i>The Cape Cod Research Site, Mass.</i></b></p> <ul style="list-style-type: none"> <li>• Site description, research approach, and hydrologic processes, by Denis R. LeBlanc</li> <li>• Biogeochemical processes and the importance of geochemical zones, by Richard L. Smith</li> <li>• The role of pH and sorption on the fate and transport of metals and minor elements, by Douglas B. Kent</li> <li>• Occurrence and fate of trace organic contaminants and PPCPs, by Larry B. Barber</li> <li>• Subsurface Bacterial Transport: Chemotaxis, by Ronald W. Harvey</li> </ul>
4:30 pm - 6:30 pm	<p><b>Poster Session I:</b> Posters on additional research on issues covered during the day and methodological advancements. Refreshments and snacks will be served.</p> <p style="text-align: center;"><i>Posters are up all day.</i></p> <p style="text-align: center;"><i>Titles listed on separate page.</i></p>

<b>Day 2</b>	<b>Tuesday, January 27, 2009 - Pacific Ballroom A&amp;B</b>
7:00 am	Registration Open ( <i>Hotel Lobby</i> ) - Morning Refreshments and Snacks ( <i>Pacific Foyer</i> )
8:00 am - 10:00 am	<p><b>Session 4 - Contamination from Landfill Leachate: <i>The Norman Municipal Landfill, Okla.</i></b></p> <ul style="list-style-type: none"> <li>• Spatial and temporal migration of a landfill leachate plume at the Norman Landfill Research Site, by Jason R. Masoner</li> <li>• Long- term biogeochemical evolution of a leachate plume from a closed municipal Landfill, Norman, Oklahoma, by Isabelle M. Cozzarelli</li> <li>• Assessing microbial activity in the laboratory and the field and its influence on organic matter quality in a shallow anoxic aquifer: Lessons from the USGS Norman Landfill Site, by Joseph M. Suflita</li> <li>• Implications for anaerobic methane oxidation: The Norman Landfill and beyond, by Victoria Parisi</li> <li>• Endocrine disrupters in contaminated ground and surface water: Application of new technology (GCxGC/ToFMS) to the determination of nonylphenol isomers, by Robert P. Eganhouse</li> <li>• Natural attenuation of landfill leachate contaminants at the ground-water/surface-water interface, Norman Landfill Site, by Michelle M. Lorah</li> <li>• In situ investigations of kinetic controls on sulfate reduction at hydrologic interfaces within a contaminated wetland-aquifer system, by Tara Kneeshaw</li> </ul>
10:00 am - 10:15 am	Break - Refreshments
10:15 am - 12:15 pm	<p><b>Session 5 - Low-Level Radioactive Waste and Other Mixed Wastes in the Vadose Zone in the Arid Southwest: <i>The Amargosa Desert Research Site (ADRS), Nev.</i></b></p> <ul style="list-style-type: none"> <li>• Overview of the Amargosa Desert Research Site: Field laboratory for the study of arid site processes, by Brian J. Andraski</li> <li>• Factors and processes affecting water and gas flow in desert unsaturated zones, by David A. Stonestrom</li> <li>• Monitoring and modeling tritium transport in an arid environment, by Brian J. Andraski</li> <li>• VOC distribution and flux estimates adjacent to an arid waste-disposal site, by Ronald J. Baker</li> <li>• Unsaturated-zone transport of mercury from an arid waste-disposal site, by Michelle A. Walvoord</li> <li>• Tritium releases to the atmosphere adjacent to an arid waste-disposal, by C. Amanda Garcia</li> <li>• Use of results and continuing research, by Brian J. Andraski</li> </ul>

<b>Day 2 - continued</b>	<b>Tuesday, January 27, 2009 - Pacific Ballroom A&amp;B</b>
12:15 pm - 1:30 pm	Lunch (On your own)
1:30 pm - 2:30 pm	<p><b>Keynote Talks - Elements of Efficient Science-Based Approaches to Site Management and Remediation:</b></p> <ul style="list-style-type: none"> <li>• Contaminant fate in unconsolidated aquifers: Thoughts on determining the relevant physical transport processes at a field site, by Denis R. Leblanc</li> <li>• Toward Taming the Complexities of Fractured Rock Aquifers, by Allen M. Shapiro</li> </ul>
2:30 pm - 2:45 pm	Break - Refreshments and Snacks
2:45 pm - 4:45 pm	<p><b>Keynote Talks (Continued) - Elements of Efficient Science-Based Approaches to Site Management and Remediation</b></p> <ul style="list-style-type: none"> <li>• Identifying the relevant biogeochemical processes at sites impacted by organic contaminants, by Isabelle M. Cozzarelli</li> <li>• Development of conceptual models for reactive inorganic contaminant transport, by James A. Davis</li> <li>• Using process understanding to assess the feasibility and timeframe of remediation by natural attenuation, by Barbara A. Bekins</li> <li>• Using process-based environmental research to design effective site remediation strategies, by Francis H. Chapelle</li> </ul>
4:45 pm - 5:00 pm	<b>Next Steps:</b> Discussion of the agenda and goals for the next two days
5:00 pm - 6:30 pm	<p><b>Poster Session II:</b> Posters on additional research on issues covered during the day and methodological advancements. Refreshments and snacks will be served.</p> <p style="text-align: center;"><i>Posters are up all day.</i></p> <p style="text-align: center;"><i>Titles listed on separate page.</i></p>

<b>Day 3</b>	<b>Wednesday, January 28, 2009</b>
7:00 am	Registration Open ( <i>Hotel Lobby</i> ) - Morning Refreshments and Snacks ( <i>Pacific Foyer</i> )
8:00 am - 9:30 am	Panel I: USGS Project Leaders Review Future Research Directions - <i>Pacific Ballroom A&amp;B</i>
9:30 am - 9:45 am	Break - Refreshments
9:45 am - 11:15 am	Panel II: Federal and State Partners Discuss their Priority Research Needs - <i>Pacific Ballroom A&amp;B</i> <ul style="list-style-type: none"> <li>• Skip Chamberlain, Office of Groundwater and Soil Remediation, U.S. Department of Energy</li> <li>• Javier M. Santillan, Air Force Center for Engineering and the Environment</li> <li>• Michael A. Singletary, Naval Facilities Engineering Command (NAVFAC) Southeast, U.S. Navy</li> <li>• Paul Hadley, Department of Toxic Substances Control, California Environmental Protection Agency</li> </ul>
11:15 am - 12:00 noon	Open Discussion - <i>Pacific Ballroom A&amp;B</i>
12:00 noon - 1:30 pm	Lunch (On your own)
1:30 pm - 3:00 pm	USGS Project Breakouts (meetings to discuss stakeholder input and plan research needs) <ul style="list-style-type: none"> <li>• Contamination in Fractured Rock Aquifers: The Naval Air Warfare Center (NAWC), West Trenton, N.J. – <i>Room – Captain 3</i></li> <li>• Petroleum Hydrocarbon Contamination: The Bemidji Research Site, Minn. – <i>Room – Captain 4</i></li> <li>• Contamination by Organic and Inorganic Constituents in Wastewater Effluent: The Cape Cod Research Site, Mass. – <i>Room – Pacific C</i></li> <li>• Contamination from Landfill Leachate: The Norman Municipal Landfill, Okla. - <i>Room - Pacific D</i></li> <li>• Low-Level Radioactive waste and Other Mixed Wastes in the Vadose Zone in the Arid Southwest: The Amargosa Desert Research Site (ADRS), Nev. – <i>Room – East Coast</i></li> </ul>
3:00 pm - 3:15 pm	Break - Refreshments and Snacks
3:15 pm - 5:00 pm	USGS Project Breakouts (Continued)

<b>Day 4</b>	<b>Thursday, January 29, 2009</b>
7:00 am	Morning Refreshments and Snacks ( <i>Pacific Foyer</i> )
8:20 am - 8:40 am	Summary of EPA Ground Water Forum Research Needs and Priorities - <i>Pacific Ballroom A&amp;B</i>
8:40 am - 9:40 am	USGS Facilitated Q&A Session: Facilitators will ask questions and open the floor for discussion - <i>Pacific Ballroom A&amp;B</i>
9:40 am - 10:00 am	Break
10:00 am - 11:00 am	EPA Facilitated Q&A Session: Facilitators will ask questions and open the floor for discussion - <i>Pacific Ballroom A&amp;B</i>
11:00 am - 12:00 noon	Open time for personal contact/discussion - <i>Pacific Ballroom A&amp;B</i>
12:00 noon - 1:30 pm	Lunch (On your own)
1:30 pm - 5:00 pm	Toxics Program Strategic Planning Committee Meeting (USGS project leaders, committee members and managers only) - <i>Room - Pacific C</i>

## Poster Sessions

### **Poster Session I (Monday, January 26, 2009, 4:30 pm - 6:30 pm) - Pacific Ballroom A&B**

#### **Contamination by Organic and Inorganic Constituents in Wastewater Effluent: The Cape Cod Research Site, Mass.**

- No. 1 - Lead tracer tests in the Cape Cod sand and gravel aquifer, by Gillian M. Fairchild\* and Douglas B. Kent
- No. 2 - Impact of variable chemistry on arsenic transport in ground water, by Douglas B. Kent\*, Richard L. Smith, Denis R. LeBlanc, James A. Davis
- No. 3 - Occurrence and turnover of nitric oxide in a nitrogen-impacted sand and gravel aquifer, by Richard L. Smith\*
- No. 4 - Denitrification-coupled iron oxidation in cultures from Cape Cod, MA, aquifer sediments, by Deborah A. Repert\*, Richard L. Smith, Douglas B. Kent, Laura K. Baumgartner, Charles P. Hart
- No. 5 - Response of ground water bacteria from Cape Cod, MA, to low concentrations of antimicrobials, by Jennifer C. Underwood, David W. Metge, Ronald W. Harvey\*, Larry B. Barber, Michael T. Meyer, Deborah A. Repert, and Richard L. Smith
- No. 6 - Subsurface fate and transport of 4-nonylphenol, 17 $\beta$ -estradiol, and sulfamethoxazole., by Larry B. Barber\*, Michale T. Meyer, Lisa Fogarty, David W. Metge, Ronald W. Harvey, Sheridan K. Haack, and Denis R. LeBlanc
- No. 7 - Effects of sulfamethoxazole on ground-water microbial communities in the Cape Cod aquifer, by Michel T. Meyer\*, Lisa Fogarty, Larry B. Barber, David W. Metge, Ronald W. Harvey, Sheridan K. Haack, and Denis R. LeBlanc
- No. 8 - A 20-year history of contaminant distributions in the Cape Cod treated-wastewater plume, 1988-2007, by Charles P. Hart\*, Jennifer G. Savoie, Gillian M. Fairchild, Deborah A. Repert, Richard L. Smith, Douglas B. Kent, and Denis R. LeBlanc
- No. 9 - Natural restoration of a treated-wastewater plume in the Cape Cod sand and gravel aquifer, by Gillian M. Fairchild, Megan Chaisson, Jennifer G. Savoie, and Luke A. Parsons (Presented by Denis R. LeBlanc)
- No. 10 - Treated-wastewater constituents in porewater at a pond-bottom permeable reactive barrier, Cape Cod, Massachusetts, by Timothy D. McCobb\*, Denis R. LeBlanc, and Luke A. Parsons
- No. 11 - Examining the role of topological factors in controlling the hydraulic conductivity of granular deposits through the analysis of geophysical well logs: Results from the USGS Toxic Substances Hydrology Site, by Roger H. Morin\*, Denis R. LeBlanc, and Brent M. Troutman

#### **Contamination in Fractured Rock Aquifers: The Naval Air Warfare Center (NAWC), West Trenton, N.J.**

- No. 12 - Optimized enhanced bioremediation through 4D geophysical monitoring and autonomous data collection, processing, and analysis, by Fredrick D. Day-Lewis\*, John W. Lane, Jr., R.J. Versteeg, W.R. Major, T.C. Johnson, and K.E. Wright
- No. 13 - FLASH: A program for flowmeter analysis of single-holes, by Carole D. Johnson\*, Frederick D. Day-Lewis, Frederick P. Paillet, and Keith J. Halford
- No. 14 - Cross-borehole flow tests and insights into hydraulic connections in mudstone and sandstone, by John H. Williams\*, J. Alton Anderson, Carole D. Johnson, and Pierre J. Lacombe

- No. 15 - Integrated geologic and surface geophysical site characterization at the Naval Air Warfare Center, West Trenton, NJ, by William C. Burton\* and Karl J. Ellefsen
- No. 16 - Importance of geologic framework for understanding contaminant transport and designing remediation in fractured sedimentary rocks, by Pierre J. Lacombe\*, William C. Burton, Thomas E. Imbrigiotta, Daniel J. Goode, Claire R. Tiedeman
- No. 17 - DNAPL removal from fractured rock using thermal conductive heating (TCH)-treatability study and TCH demonstration pilot progress, by Carmen A. Lebrón (U.S. Navy), Bernard H. Kueper (Queen's University), Gorm Heron, John C. LaChance, and Devon Tarmasiewicz (TerraTherm, Inc.), Pierre J. Lacombe\*
- No. 18 - Bioaugmentation in fractured rock--A long-term pilot study at the NAWC site, by Scott R. Drew\* and Mary F. DeFlaun (Geosyntec Consultants), Pierre J. Lacombe
- No. 19 - Modeling bioaugmentation and TCE remediation at the NAWC Site, by Gary P. Curtis\*, Paul A. Hsieh, Mary F. DeFlaun, Thomas E. Imbrigiotta and Claire R. Tiedeman
- No. 20 - Using tracer tests to identify transport pathways and residence times in fractured rock-- Implications for remediation, by Allen M. Shapiro\*, Claire R. Tiedeman, Daniel J. Goode, and Paul A. Hsieh
- No. 21 - Modeling the effects of hydraulic conductivity heterogeneity on contaminant remediation at the NAWC Site, by Paul A. Hsieh\*, Claire R. Tiedeman, and Allen M. Shapiro
- No. 22 - Using ground-water modeling to determine flow paths and rates in fractured rocks at the NAWC site--Implications for monitoring remediation, by Claire R. Tiedeman\*, Pierre J. Lacombe, Daniel J. Goode, Paul A. Hsieh, and Allen M. Shapiro
- No. 23 - Monitoring microbial community structure before and during bioaugmentation at the former Naval Air Warfare Center (NAWC) Site, by Julie D. Kirshtein\*, Thomas E. Imbrigiotta, Claire R. Tiedeman, Daniel J. Goode, and Mary A. Voytek
- No. 24 - Laboratory microcosm studies assess dechlorination in groundwater from a bioaugmented TCE-contaminated site at the former Navel Air Warfare Center, by Elizabeth J. Jones, Julie D. Kirshtein\*, Thomas E. Imbrigiotta, Claire R. Tiedeman, Daniel J. Goode, and Mary A. Voytek
- No. 25 - Techniques for measuring the spatial and temporal variability of ground-water geochemistry, chlorinated solvent contamination, and bioremediation progress in a fractured rock aquifer, by Thomas E. Imbrigiotta\*, Daniel J. Goode, Claire R. Tiedeman, and Allen M. Shapiro
- No. 26 - Change in biogeochemistry and chloroethene degradation potential with depth in a fractured bedrock borehole at NAWC, by Paul M. Bradley\* and Francis H. Chapelle
- No. 27 - Monitoring Natural Biodegradation of TCE in Fractured Sedimentary Rocks Using  $\delta^{13}C$  of TCE and its Degradation Products: Estimating Isotopic Fractionation Factor under Field Conditions, by Kinga M. Revesz\*, Allen M. Shapiro, Claire R. Tiedeman, Daniel J. Goode, Pierre J. Lacombe, and Thomas E. Imbrigiotta
- No. 28 - Field methods for characterizing retention of chlorinated solvents in fractured-rock aquifers-- Screening for separate phase, and sampling dissolved and sorbed phases in the rock matrix, by Daniel J. Goode\*, Thomas E. Imbrigiotta, Allen M. Shapiro, Pierre J. Lacombe, and Claire R. Tiedeman
- No. 29 - Impact of mineral weathering processes on groundwater geochemistry and hydrology, by Majorie S. Schulz\*

### **Petroleum Hydrocarbon Contamination: The Bemidji Research Site, Minn.**

- No. 30 - Loss of volatile hydrocarbons from oil at the Bemidji, MN site determined by solid phase microextraction-gas chromatography/mass spectrometry, by Mary Jo Baedecker, Robert P. Eganhouse\*, Barbara A. Bekins, and Geoffrey N. Delin

- No. 31 - Methanogenic biodegradation of n-alkanes and n-alkylated cyclohexanes and benzenes in the Oil Spill Long-term Study Site at Bemidji, MN, by Frances D. Hostettler and Barbara A. Bekins\*
- No. 32 - Microbially induced temperature changes in a petroleum hydrocarbon plume, by Ean Warren and Barbara A. Bekins\*
- No. 33 - In situ measurement of hydrocarbon biodegradation rates under iron-reducing conditions, by Isabelle M. Cozzarelli\*, Barbara A. Bekins, Robert P. Eganhouse, Ean Warren, and Hedef I. Essaid
- No. 34 - Tools for quantifying biodegradation and transport in a methanogenic aquifer--Bemidji Toxics Program, by Rich T. Amos, K. Ulrich Mayer\*, Barbara A. Bekins, Geoffrey N. Delin, and David W. Blowes
- No. 35 - Modeling of reactive gas transport at the Bemidji Crude Oil Spill Site - An effort towards quantifying fluxes, contaminant degradation rates, and source zone longevity, by Sergi R. Molins and K. Ulrich Mayer\*
- No. 36 - Monitoring dual-pump remediation of a crude-oil spill site, by Geoffrey N. Delin\*, William N. Herkelrath, and S. Lounsbury
- No. 37 - Impacts of remediation at the Bemidji oil-spill site, by William N. Herkelrath\*

**Poster Session II (Tuesday, January 27, 2009, 4:30 pm - 6:30 pm) - Pacific Ballroom A&B**

**Low-Level Radioactive waste and Other Mixed Wastes in the Vadose Zone in the Arid Southwest: The Amargosa Desert Research Site (ADRS), Nev.**

- No. 1 - Dispersion of contaminants by barometric pumping, by David A. Stonestrom\*, David E. Prudic, Michael J. Johnson, and Tyson Smith
- No. 2 - Diurnal distillation for management of water resources impaired by non-volatile toxic substances, by James E. Constantz\* and Greg O. Mendez
- No. 3 - Modeling water movement in desert soils--Implications for waste isolation, by C. Amanda Garcia\*, Brian J. Andraski, David A. Stonestrom, Clay A. Cooper, Jirka \_im\_nek, and Steven W. Wheatcraft
- No. 4 - Natural perchlorate in precipitation, soils, and plants at the Amargosa Desert Research Site, by W. Andrew Jackson, Brian J. Andraski, David A. Stonestrom, Srinath Rajagopalan, and Emily M. Taylor
- No. 5 - Geologic framework characterization--A key task in identifying controls on contaminant transport, by Emily Taylor\*
- No. 6 - Resistivity imaging of hydrogeologic features that may control contaminant migration, by Jeffrey E. Lucius\*, Jared D. Abraham, and Bethany L. Burton

**Contamination from Landfill Leachate: The Norman Municipal Landfill, Okla.**

- No. 7 - Electrical resistivity imaging to map contaminants in an alluvial aquifer, by Jeffrey E. Lucius\*
- No. 8 - The use and comparison of a floating pan to measure evaporation from small limited-fetch water bodies, by Jason R. Masoner\* and David I. Stannard
- No. 9 - Using a wheel-mounted GPS system for rapid data collection and DEM model creation, by Marvin M. Abbott and Jason R. Masoner\*
- No. 10 - A water balance model to determine ground water - surface water fluxes in a contaminated aquifer - wetland system--The Norman Landfill Research Site, Oklahoma, by Itza Mendoza-Sanchez, Mantha S. Phanikumar, Jennifer T. McGurie, Jason R. Masoner\*, and Isabelle M. Cozzarelli
- No. 11 - Temporal variations in the chemical and isotopic signature of a leachate plume at the Norman Landfill Toxics Research Site, Norman, Oklahoma, by Jeanne B. Jaeschke\*, Isabelle M. Cozzarelli, Martha A. Scholl, Scott c. Christenson, and Jason R. Masoner
- No. 12 - Identification of nonylphenol isomers in landfills and waste water, by Caixiang Zhang\*, Robert P. Eganhouse, Isabelle M. Cozzarelli
- No. 13 - An alternate hypothesis for the anaerobic oxidation of methane, by Victoria Parisi\*, Lisa Gieg, Kathleen Duncan, and Joseph M. Suflita
- No. 14 - Identification of reactive geochemical species associated with abiotic tetrachloroethylene and trichloroethylene reductive dechlorination in well-defined microcosms, by Xiaoming Liang, Yiran Dong, Tomasz Kuder, Lee R. Krumholz, R. Paul Philp, Elizabeth C. Butler
- No. 15 - Using sulphur isotopes to look at sulfur cycling in an contaminated alluvial aquifer at the Norman Landfill Research Site, by George N. Breit, Michelle Tuttle, and Isabelle M. Cozzarelli\*
- No. 16 - Evaluating nutrient fate and redox controls in ground water in riparian areas, by Michelle M. Lorah\*, Isabelle M. Cozzarelli and J. K. Böhlke

## Research on Contaminant Transport

- No. 17 - Enhanced bioremediation of chlorinated solvents at the ground-water/surface-water interface, Aberdeen Proving Ground, Maryland, by Michelle M. Lorah\*, Emily H. Majcher, Mary A. Voytek, Elizabeth J. Jones (USGS), Duane Graves (Geosyntec)
- No. 18 - Bench- and field-scale studies to assess the vulnerability of a sole-source, karst limestone aquifer in southeastern Florida to contamination from *Cryptosporidium parvum*, by Ronald W. Harvey\*, David M. Metge, CL Osborne, Allen L. Shapiro, RA Renken, JN Ryan, KJ Cunningham, and LL Landkamer
- No. 19 - *Cryptosporidium parvum* transport through variably charged soil, by A. Mohanram, C. Ray, Ronald W. Harvey\*, David W. Metge, Joseph N. Ryan, Larry B. Barber, and J. Chorover
- No. 20 - Use of microbial-sized microspheres for estimating *Cryptosporidium parvum* oocysts transport within Russian River (Sonoma County, CA) bank filtration sediments, by David W. Metge\*, Ronald W. Harvey, George R. Aiken, and R. Anders
- No. 21 - Research methods to identify and assess sources of ground-water contamination to streams, by Katherine Walton-Day\*, Briant A. Kimball, Robert L. Runkel, Kenneth E. Bencala, Suzanne S. Paschke
- No. 22 - Characterizing aquifer interactions at the Standard Chlorine of Delaware USEPA Superfund Site, New Castle County, Delaware., by Michael J. Brayton\*
- No. 23 - USGS borehole flowmeter testing and applications in limestone in Indiana, by Martin R. Risch\* and Randy Bayless
- No. 24 - Use of diffusion samplers to monitor both inorganic and organic chemicals in ground-water at contamination sites, by Thomas E. Imbrigiotta\*
- No. 25 - Applications of fiber optic distributed temperature sensors for delineating GW/SW interactions, by Fredrick D. Day-Lewis\*, Carole D. Johnson, R.D. Henderson, and John W. Lane, Jr.
- No. 26 - Bedrock depth mapping through spectral analysis of seismic noise, by John W. Lane Jr.\*, Denis R. LeBlanc, and Gillian M. Fairchild
- No. 27 - Rapid subsurface site imaging using a non-contact stepped-frequency electromagnetic system, by John W. Lane Jr.\*, Carole D. Johnson, Troy Brosten, and Eric White
- No. 28 - USGS technical support of the ground-water cleanup at the Massachusetts Military Reservation, Cape Cod, by Jennifer G. Savoie\*, Denis R. LeBlanc, Timothy D. McCobb, Donald A. Walter, and John P. Masterson
- No. 29 - Perchlorate sources and biodegradation, by John Karl F. Bohlke\*
- No. 30 - A brief introduction to the USGS Toxic Substances Hydrology Program's mission, goals, and accomplishments, by David W. Morganwalp\*