
HAL P. DEMUTH, M.S.; SENIOR ENGINEER, HYDROLOGIST

Petrotek Engineering Corporation 5935 S. Zang St., Suite 200 Littleton, Colorado 80127
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EDUCATION

- M.S., Hydrogeology, University of Idaho
- B.S., Petroleum Engineering, University of Tulsa
- Various Short Courses: OSHA 40-Hour Hazardous Waste Training; OSHA 8-Hour Annual Hazardous Waste Training Refresher; OSHA Supervisor of Hazardous Workers Operations Training; 24-Hour MSHA Training

PROFESSIONAL REGISTRATION AND MEMBERSHIPS

- Association of Ground-water Scientists and Engineers (NGWA)
- Society of Petroleum Engineers (SPE)
- Society of Mining Engineers (SME)

AREAS OF EXPERTISE

- More than 30 years of combined experience in ISR uranium mining, petroleum engineering, and hydrogeology and groundwater investigations for hardrock mining projects.
- Management of groundwater projects related to ISR uranium mining permitting and development projects in WY, TX, NM and NE.
- Class I, II, III and V UIC disposal wells for oil and gas operators, industrial facilities, mining operations and municipalities.
- Engineering design and supervision of oil and gas drilling and production operations (offshore Gulf of Mexico and Rocky Mountains).
- Supervision of site characterization and ground-water remediation studies at CERCLA, non-CERCLA and RCRA sites (western and central US).

PROFESSIONAL EXPERIENCE

(2001 - Present) Petrotek Engineering Corporation, *Principal and Senior Engineer/Hydrologist*

(1991 - 2001) Harlan & Associates, Inc., *Senior Engineer/Hydrologist*

(1989 - 1991) University of Idaho, *Research Assistant*

(1983 - 1989) Tenneco Exploration & Production, Inc., *Drilling/Reservoir Engineer*

- Manager of groundwater projects including: In-Situ recovery (ISR) uranium operations (permitting, characterization, design, optimization and regulatory compliance). Team Leader for aquifer testing operations throughout the U.S. Project manager for ground-water modeling studies related to TDS and radionuclide/metals plume remediation and restoration operations and regulatory compliance for uranium ISR operations. Technical lead for assessments and characterization projects involving inorganics, organics (LNAPLs and DNAPLs), and radionuclides.
- Provided expert testimony for State and NRC permit applications related to multiple ISR operations in the US.

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- Expert witness for oil and gas operators related to technical, regulatory and contractual issues, especially related to injection wells.
- Design and operations engineer for Class I, II, III and V disposal wells for multiple industries in the Rocky Mountains (CO, WY, NE, NM), Midwest (KS, IN, MI, OH) and Gulf Coast (TX). Corporate responsibilities also include technical reporting, business development, proposal preparation, contract negotiations and part of management team for Petrotek corporate operations.
- Project Manager/Team Leader for permitting, design, and installation of multiple 8,000- to 10,000-foot Class I disposal wells at an in-situ uranium mine sites in Wyoming.
- Prepared permit applications and modification requests for Class I disposal wells requiring an aquifer exemption for 2,000 mg/l TDS waters in the Lance Formation. Provided technical support during EPA negotiations. After the exemption was granted, designed and supervised re-completion and testing operations.
- Project Manager for the design, permitting, installation, and evaluation of a 3,900-foot Class Underground Injection Control (UIC) disposal well at in-situ uranium mine in Dawes County, Nebraska. This was the first Class I well permitted and installed in the State of Nebraska. In 2010, installed a second Class I well at the same project.
- Designed, permitted, and supervised installation of Class I UIC disposal wells in the central U.S. (Dundee Limestone and Mount Simon Sandstone). Typical depth range 4,000 to 10,000 feet. Coordinated and interpreted reservoir testing and analyses related to Class I wells (injection/falloff tests, DSTs, simulations and modeling).
- Team Leader for groundwater characterization at rare earth element mine in Wyoming. With staff, developed conceptual model of the site; selected locations for monitoring wells; performed and analyzed pumping tests; performed groundwater modeling to assess project impacts, and prepared groundwater sections of the Permit to Mine application.
- Responsible for design, coordination, and supervision of ground-water investigations and remediation programs at sites throughout the western U.S. Performed hydrogeologic analyses, engineering evaluations and remedial designs, and prepared technical reports.
- Designed and supervised installation of 100 bedrock ground-water monitoring wells at a DNAPL site in Colorado (air hammer/coring). Performed 30 pumping tests to evaluate aquifer parameters. Analyzed pumping test results and compiled part of the Remedial Investigation Report and Remedial Measures Plan, Current Conditions/Release Report, and RFI Work Plan and RFI Report.
- Designed and supervised groundwater investigations for copper mine in southern New Mexico, including installation of bedrock ground-water monitoring wells, data evaluation and assessment of impacts from surface leaching operations. Analyzed testing results and compiled part of RCRA compliance/remediation documents.
- Performed hydrogeologic research at the Bunker Hill Mine in Idaho. Developed conceptual model to evaluate influence of major faults on ground water flow within the mine and production of acid mine drainage from specific ore bodies. Designed,

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performed and analyzed results from 30 pumping tests over a 12-month period. Identified areas to be targeted for acid mine drainage abatement.

- Reservoir Engineer for offshore platform with production of 12,000 BOPD. Performed well testing and analysis; systems analysis; recommended and supervised workovers and recompletions. Engineering Team increased production by over 1,000 BOPD in 12 months.
- Supervised offshore oil and gas drilling and production (completions/workover) operations in the Gulf of Mexico (triple-7 schedule). Work including use of steerable motors and MWD systems in over 50 directionally drilled wells (up to 88° deviation), including sub-salt development projects. Member of teams that drilled wells in excess of 20,000 feet, with mud weights up to 18 ppg (sea-water lignosulfonate and oil-based muds), and completion fluid weights up to 16 ppg (CaCl₂ and ZnBr₂).

PUBLICATIONS/PRESENTATIONS

- Fritz, Jack, Mays, John, and Demuth, H.P. "Wastewater Management at a Proposed Uranium In-situ Recover Project" at the *Western South Dakota Hydrology Conference*, April 2014, Rapid City, South Dakota.
- Lawrence, E.P., Demuth, H.P., Mays, John. "Groundwater Modeling of the Hydraulic Effects of the Proposed Dewey Burdock Uranium In-situ Recovery Project, Fall River and Custer County, South Dakota" presentation at the *Western South Dakota Hydrology Conference*, April 2014, Rapid City, South Dakota.
- Cooper, K.J., Demuth, H.P. and Payne, A. "Critical Issues for the Deep Well Injection of ISR Uranium Waste Water" presented at the *U2011 Global Uranium Symposium*, September 21, 2011, Casper, Wyoming.
- Lawrence, E.P., Cooper, K.J., and Demuth, H.P. "A Method for Calculating An Aquifer Exemption Boundary for Uranium In-situ Recovery Projects" presented at the *U2011 Global Uranium Symposium*, September 21, 2011; Casper, Wyoming.
- Lawrence, E.P., Demuth, H.P, and Cooper, K.J. "Application of Numerical Groundwater Flow Models to Uranium ISR Projects... What Can We Learn From Them?" presentation at the *2011 Nuclear Regulatory Commission/National Mining Association Uranium Recovery Workshop*, May 25, 2011; Denver, Colorado.
- Lawrence, E.P., Demuth, H.P., Cooper, K.J., and Wichers, D. "Use of Hydrologic Tests and Numeric Models to Predict Hydraulic Behavior of an Unconfined Aquifer During In-situ Recovery of Uranium" presentation at the *National Groundwater Association 2010 Groundwater Summit*, April 2010, Denver, Colorado.
- Cooper, K.J. and Demuth, H.P. Update: "Class I Injection Well Use at ISR Facilities" presentation at the *2009 Nuclear Regulatory Commission/National Mining Association Uranium Recovery Workshop*, July 2, 2009; Denver, Colorado.
- Lawrence, E.P., Cooper, K.J., and Demuth, H.P. "Groundwater Modeling Application to Uranium In-situ Recovery Projects: Relationship of Sweep Efficiency to Pore Volume

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Removal.” Presented at the *Global Uranium Symposium 2009*, May 2009, Keystone, Colorado.

- Schramke, J.A, Demuth, H.P. and Pelizza, M.S. “Geochemistry of Uranium in In-situ Recovery Aquifers after Restoration.” Presented at the *Global Uranium Symposium 2009*, May 2009, Keystone Colorado.
- Cooper, K.J, and Demuth, H.P. “Wastewater Management via Deep Injection Wells at ISR/ISL Uranium Facilities” presentation at the *2009 Society of Mining Engineers Annual Meeting*, February 25, 2009, Denver, Colorado.
- Cooper, K.J., Demuth, H.P., and Lawrence, E.P. “Overview of Operational Issues Associated with Groundwater, Restoration and Wastewater Management at ISR/ISL Facilities” presentation at the *2008 Ground Water Protection Council Winter Underground Injection Control Meeting*, January 15, 2008, New Orleans, Louisiana.