



ENVIRONMENTAL BIO-SYSTEMS, INC.

www.ebsinfo.com; jimjacobs@ebsinfo.com

707 View Point Road, Mill Valley, CA 94941

TEL: 415-381-5195; FAX: 415-381-5816; CELL: 510-590-1098

JAMES A. JACOBS, P.G., R.E.A.II, C.H.G., C.P.G.
Chief Hydrogeologist

Expert Witness and Due Diligence
Environmental Assessment and Remediation
Assessment and Remediation at Oil & Gas Fields



EDUCATION

M.A. Geology, University of Texas, Austin, TX, 1981

B.A. Geology, English, Franklin and Marshall College, Lancaster, PA, 1978

Post-Graduate Classes

Environmental Law, Rice University Extension, Houston, Texas; 1989

Fundamentals of Groundwater Hydrology, University of California, Berkeley Extension, 1985

Groundwater and Soil Remediation, University of California, Berkeley Extension, 1993

Intro, Contaminant Transport in Groundwater, University of California, Berkeley Extension, 1994

Ecological Risk Assessment for a Sustainable Environment, University of Massachusetts, 2010

Assessment Design/Professional Experience Panel, University of California, Berkeley Extension, 2010

SPECIALTIES

Contamination Assessment and Remediation

- Project Management of Complex Remediation Sites
- Evaluation of industrial properties, including oil and gas fields, pipelines and facilities,
- Assessment, remedial design and implementation of cleanup for hydrocarbons, metals, and solvents,
- Development and implementation of free-product removal technologies at various sites,
- Development of bench testing, pilot testing and full scale remedial programs, and
- Negotiate with owners and regulatory agencies for settlement agreements and site closure.

Litigation Support and Expert Witness

- Perform litigation and technical support for various environmental and engineering cases from evaluating remediation history to well damage to erosion control;
- Estimate reasonable and necessary remedial costs for settlement conferences
- Serve as a objective peer reviewer; and
- Provide expert witness testimony on environmental cases;

SUMMARY

Mr. Jacobs has over 20 years of experience in the environmental industry on the assessment and remediation of soil and groundwater impacted by petroleum hydrocarbons, chlorinated solvents, and heavy metals. He is especially interested in infusing gases into water for remediation. He is a Fulbright Senior Scholar winning 3 awards in environmental engineering and science teaching post-graduate workshops and a graduate class in environmental assessment and *in-situ* remediation methods. He taught Sustainable Remediation Methods for Soil and Water in the Spring 2011 semester for the University of California, Berkeley Extension Program. Mr. Jacobs has bachelors and masters degrees in geology and 20 years of experience in *in-situ* remediation as a project manager and contractor. In addition, he had nine



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years of experience in the oil and gas industry as an oil exploration geologist working in Alaska and California. Reviewing farm-in opportunities in California, he reviewed the economics and technical issues of the resource potential as well as the environmental liabilities associated with site restoration and redevelopment.

As a technical writer and geologist, he has co-authored/edited two CRC Press books: *MTBE: Effects on Soil and Groundwater Resources* (2000) and the *Chromium (VI) Handbook* (2005). He has co-authored over 100 technical articles on water treatment and environmental issues and has given over 50 technical presentations. A current book, on acid mine drainage, is being worked on for John Wiley & Sons.

As a public policy specialist and an elected public official, Mr. Jacobs has also been involved with storm-water and wastewater issues and treatment at two local sewer plants. Since 2002, he has served on the Board of Directors of the Tamalpais Community Services District (<http://www.tcsd.us/>), the local sewer, refuse and recycling agency serving 2,500 homes. He is an elected Commissioner of the Sewerage Agency of Southern Marin since 2002, and (2009-2011) is president to the wastewater agency that operates the treatment facility in Mill Valley, California. Since 2002 he has been a TCS D representative to the Sausalito-Marín City Sewer Agency. He has promoted and supported sustainable environmental practices within the TCS D, a certified green business which now offers residents recycling of electronic waste, fluorescent bulbs, medicines, batteries, paper and cardboard. In 2009, 1 million less lbs of waste were processed by TCS D than in 2006.

He has performed *in-situ* soil and groundwater treatment of chromium (VI), petroleum hydrocarbons, solvents as well as recalcitrant compounds such as perchlorate, MtBE and metals. He has served the environmental community as an officer or board member in a variety of professional societies, including the Groundwater Resources Association, the California Council of Geoscience Organizations and the California Section of the American Institute of Professional Geologists. He is on the Scientific Advisory Board of the Association for Environmental Health and Sciences.

BIOTREATMENT AND REMEDIATION CONSULTING: In 1990, he co-founded an environmental consulting company which included an inter-disciplinary team of scientists and engineers. The company currently has more than a dozen employees performing *in-situ* geochemical studies and environmental remediation, and for the past twenty years, Jacobs has been the Chief Hydrogeologist. His most recent inter-disciplinary research is associated with infusion of hydrogen gas and carbon substrates into waste liquids and water for anaerobic biotreatment of chlorinated solvents, metals, and high-strength organic waste products.

BIOTREATMENT AND REDOX RESEARCH AND TEACHING: Jacobs is a Fulbright Scholar, who has won 3 separate awards from the Council for International Exchange of Scholars (CIES) for teaching environmental engineering and science seminars, workshops, and graduate classes on optimizing geochemistry and *in-situ* remediation methods. Participants included graduate students, professionals, and regulators. He is teaching Sustainable Remediation Methods for Soils and Groundwater (X451) at the University of California at Berkeley (Extension Program), spring 2011.

AWARDS

ACADEMIC AWARDS:

1981: R.K. DeFord Field Scholarship Award; University of Texas at Austin

2003: Fulbright Senior Scholar Award, Univ. of West Indies, Kingston, Jamaica; February–March; CIES

2004: Fulbright Senior Scholar Award, Univ. of West Indies, Kingston, Jamaica; March–April; CIES

2008: Fulbright Senior Scholar Award, Afeka Engineering College, Tel Aviv, Israel; March–April; CIES

2007–2011: Selected and Served on Fulbright Peer Review Committee; CIES



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PROFESSIONAL AND TECHNICAL AWARDS:

1999–2004: Elected to the Board of Directors, Groundwater Resources Association of California
1996–1998; 2009–2010: Elected President of San Francisco Branch, Groundwater Resources Association
1998: Groundwater Resources Association; President's Tribute Certificate
2000: Elected National Advisory Board, American Institute of Professional Geologists
2001: American Institute of Professional Geologists, National Presidential Certificate of Merit
2004: California Council of Geosciences (CCGO) "Gold Award"
2010: American Institute of Professional Geologists, National Presidential Certificate of Merit
2005–2011: Selected for Advisory Board, Association for Environmental Health and Sciences
2002–2013: Publicly Elected Official: Tamalpais Community Services District; President-Vice President 8 years
2002–2011: Elected Official: Sewerage Agency of Southern Marin; President 3 years

PROFESSIONAL ASSOCIATIONS: Jacobs has served as president for several professional societies: the California Section of the American Institute of Professional Geologists, and the Groundwater Resources Association of California, San Francisco Branch. He is also a member of many other professional organizations. He served as president and co-founder of two non-profit organizations: the California Council of Geoscience Organizations, which educates legislators and the public about geologic and environmental issues, and CORE Environmental Foundation, which focuses on funding environmental remediation projects. With his interest in water treatment optimization, recycling, and energy use, Jacobs has served for nine years as president or vice president on the Board of Directors of the Tamalpais Community Services District providing local sewer, refuse, and recycling services to 7,500 residents. For the last nine years, he has been an elected commissioner of the local publicly owned treatment works, and has served as president for the past two years.

PROFESSIONAL WORKSHOPS:

Jacobs designed and taught the Sustainable Remediation Methods for Soils and Water for the University of California, Berkeley Extension program in Spring 2011. Jacobs has taught other environmental workshops at national meetings, including the following:

Two Phase Extraction Methods, Application for Groundwater and Soil Remediation. A four hour Workshop presentation given by Mehmet Pehlivan, James Jacobs and others:

- American Institute of Professional Geologists, 2009 National Meeting, Grand Junction, Colorado
- Association for Environmental Health and Sciences, 2008, National Meeting, San Diego, California
- Association for Environmental Health and Sciences, 2010, National Meeting, San Diego, California
- Battelle Chlorinated Solvent Conference, 2008, Monterey, California

RBCA Grows Up: Introduction to Environmental Hazard Evaluation and Advanced Approaches for Site Investigations. A four hour Workshop presentation given by Roger Brewer, James Jacobs and others:

- Association for Environmental Health and Sciences, 2009, National Meeting, San Diego, California



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REGISTRATIONS / LICENSES / CERTIFICATIONS

Registered Geologist: California #4815; Alaska #A227, Arizona #39066, Idaho #693, Oregon #G-1147,

Pennsylvania: # 1152G, Wyoming: #PG-2328, Washington #1815

Certified Hydrogeologist: California #0088, Washington #1815

Registered Environmental Assessor I: California # 1511; REA II: #20171

Certified Professional Geologist, American Institute of Professional Geologists, # 7760

Registered Asbestos Inspector and Management Planner: AHERA Accredited; OLA Registration # 0000450

Responsible Managing Officer: License #624461: General Engineering Contractor,

Certified for Asbestos Abatement, Hazardous Materials Removal, C-57 Well Drilling.

California Commercial Driver License: C with Hazmat Endorsement

PEER REVIEW

Mr. Jacobs serves in a peer review capacity for several organizations. He served from 2006 to 2011 on the Fulbright Peer Review Committee, screening potential Fulbright scholars in environmental sciences. From 2005 to 2010, he served on the National Screening Committee for the American Institute of Professional Geologists for candidates applying for the Certified Professional Geologist designation. Since 2005, he has been on the Advisory Board for the Association for Environmental Health and Sciences. The duties include the review of abstracts submitted for presentations for the annual San Diego, California Soils, Sediments, and Water conference and reviewing student presentations. For litigation support services, offered since 1990, professional peer review is occasionally required.

PROFESSIONAL HISTORY

1990- present; Chief Hydrogeologist; Environmental Bio-Systems and The Auger Group, Inc.,

Areas of work: California, Arizona, Oregon, Washington, Montana, Pennsylvania

1989-1990 Project Geologist, Harding & Lawson Associates (now MACTEC), Novato, California

Areas of work: California

1986-1989 Senior Oil Geologist, Petrofina Delaware (now Total), Houston, Texas

Areas of work: California offshore and onshore basins and prospects

1981-1985 Exploration Oil Geologist, SOHIO Petroleum (now BP), San Francisco, California and

Anchorage, Alaska Areas of work: Beaufort Sea, Chukchi Sea, Prudhoe Bay area

1979-1981 Consulting Hydrogeologist, Institute of Applied Sciences, North Texas State

University, Denton, Texas

Areas of work: Northeast Texas

1975-1978 Geology Technician, United States Bureau of Mines Coal Research Station,

Bruceton, Pennsylvania Areas of work: southwestern Pennsylvania

SAFETY TRAINING

40 Hour OSHA (29 CFR 1910.120), 1989

8 Hour OSHA Confined Space Training, 1995.

8 Hour OSHA Competent Person Training, 1994.

8 Hour OSHA Supervisors Management Training, 1993

Transportation Training: DOT 49 CFR Parts 171-177, 1994

Corporate Health and Safety Officer: 1990 to 2000

Current 8-hr. refresher classes for OSHA and Asbestos Inspector/Management Planner



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PROFESSIONAL AFFILIATIONS

Groundwater Resources Association of California

Director: 1999 to 2005

Technical Committee Chair: 2000 to 2005

Treasurer: 1999, 2002

Board of Directors of Groundwater Resources Association 1999 - 2004

GRA San Francisco Bay Chapter: President: 1996-1998, 2009-2010

GRA SF Vice President: 1995

GRA SF Past President/Advisor: 1998, 2011

GRA SF Field Trip Coordinator: 1998

GRA SF Technical Chairman: 1994

American Institute of Professional Geologists

Elected National AIPG Advisory Board: 2000

President California Section: 1996-1998; 2007-2011; Vice Pres.: 1996; 1999-2006

California Section Treasurer: 1994-1995;

California Section Delegate to National AIPG Meetings: 1996-7, 1999, 2004, 2008-2010

National Screening Committee: 2005-2010

Sponsor of University of California at Davis AIPG Student Chapter: 2010-2011

California Council of Geoscience Organizations:

CCGO Board of Directors: 1998 to present

CCGO President: 2001, 2002, 2009, 2010

CCGO Vice President/President Elect: 2000

CCGO Membership Chairman: 1998-2005

CCGO Secretary 2007

Charter member representing California Section of AIPG: 1996-1998

Lobbying: plan and develop annual Sacramento Drive-In: 1996 to 2010

National Water Well Association

Active Member 1989 to present

American Association of Petroleum Geologists

Active Member 1981 to 1998

Association for Environment, Health and Sciences

Scientific Advisory Board: 2005 to present

CORE Environmental Foundation (non-profit)

Co-founder and President 2009-present

ECON Magazine

Editorial Advisory Board, 1994 to 1996



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REPRESENTATIVE EXPERIENCE

Oil and Gas Field Environmental Projects– Performed Phase I Environmental Assessments at oil and gas production facilities. The environmental work was associated with site restoration, property transfer back to the land owners, bank refinancing and environmental regulatory responses to site conditions. Site remediation occurred on several sites. Cost estimates were prepared for settlement purposes. Assessment and remediation of hydrocarbons at hundreds of sites was designed and implemented over the past twenty years.

Site Remediation and Closure – Project Manager of dozens of underground tank removal projects. After the initial assessment, dozens of soil and groundwater remediation projects in California were performed for properties impacted with petroleum hydrocarbons or chlorinated solvents. Many of these projects were closed using *in-situ* remediation methods. Some of these projects used risk based corrective action (RBCA) models or risk assessment data showing limited exposures. From this approach, dozens of sites were closed.

Bioremediation of Contaminated Soils-Project manager for bioremediation of approximately 800 cubic yards of hydrocarbon-contaminated soils. Original diesel contamination exceeded 8,000 parts per million. After two months the levels of diesel in the soil were below 350 parts per million. On-site treatment lowered the disposal costs by allowing for Class III landfill disposal rates instead of Class II rates.

Bioremediation of Diesel and Gasoline Contaminated Aquifer – Developed above ground treatment equipment and supervised the installation of treatment equipment for a aerobic bioremediation treatment system for a rental car agency at the San Francisco International Airport. The treatment was part of a regulatory driven requirement on the site. Treatment of the groundwater was performed so that the treated effluent was disposed directly into the sanitary sewer.

In-Situ Chemical Oxidation of Diesel Free-Product – Directed the contracting portion of the project to inject hydrogen peroxide and acetic acid at high concentrations to remove diesel free-product near a well in Oakland, California. After the treatment event, the free product was reduced from 5 cm to 0 cm.

Phase II Subsurface Investigations-Program director and project manager responsible for dozens of Phase II subsurface investigations of commercial, agricultural, industrial and residential properties. The projects involve preparing work plans, supervising the drilling of borings and installation of Geoprobe® borings and monitoring wells, well development and sampling and report preparation.

Soil Remediation-San Francisco, California-Directed removal of underground storage tanks beneath the sidewalk and undercutting a major street in the city. Subsequent remediation was required by the regulators and was designed and performed using a three-foot diameter bucket auger rig to drill out the contaminated areas adjacent to the street and over a BART tunnel. The bucket auger holes were filled immediately after being drilled with a light neat cement grout. Supervised all field activities. The client was a contractor

Underground Storage Tank Removal and Soil Remediation-Permitted and supervised two 2,000 gallon underground storage tanks containing diesel and gasoline. After the tanks were removed, 20,000 gallons of highly contaminated water containing free product was removed from the former tank area. Soil remediation was performed by over-excavation of approximately 500 cubic yards. Reports were submitted and site closure is pending. The project from start to completion was less than two weeks. The client was a major bank.



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Water Procurement - As a publicly elected official and President of the local services district board, Mr. Jacobs oversaw the purchase of irrigation water for local park facilities. Water rates at various use tiers were examined and Mr. Jacobs led the board discussion to select a favorable long-term rate schedule for irrigating the landscaping at area parks.

Water Treatment Planning – Working with the board, and the two sewer plants, Mr. Jacobs participated on the board evaluation and discussion in the negotiation of a long-term (10 year) contract with one of the treatment plants at favorable rates. Part of the agreement included a successful financing of the required improvements.

Pipeline Improvement Projects and Financing – As the President of the board, Mr. Jacobs worked with the general manager and board to prioritize the sewer repair projects on the 28-mile sewer transportation network in the district. The district and the nearby treatment plants include several pump stations and other aging facilities. Mr. Jacobs reviewed several financing options for the projects, and led the board to approve the rate hikes. Later, a \$3,000,000 loan at 4.5 % interest was obtained to pay for the project, allowing for a more gradual increase in the sewer rates for ratepayers.

Regulatory Guidelines for Water Treatment – As a Fulbright award winner, Mr. Jacobs taught at the University of the West Indies in Kingston, teaching a graduate class in Environmental Engineering. In addition, he taught workshops related to establishing water treatment goals in Jamaica. Participants included regulatory officials, environmental consultants, students, petroleum company employees and others. Mr. Jacobs also organized for others to participate in the teaching of the materials. Continued training is proposed for upcoming workshops in Jamaica.

***In-Situ* Chemical Geofixation of Chromium (VI)** – Directed and performed the contracting portion of the project to inject calcium polysulfide for chromium (VI) at a former wood treating plant in northern California. The chromated copper arsenic (CCA) chemicals found on-site included the arsenic (V) oxide, chromium (VI) oxide and copper (II) oxide used in the wood treating process. The CCA wood was used in the construction of cooling towers. Calcium polysulfide was used as the reducing agent, which successfully lowered the chromium (VI) concentration at the site over a period of 18 months.

***In-Situ* Perchlorate Study** – Developed with the client, a field pilot study program for a rocket fuel burn test site in Hollister, California. The project was designed to inject water into the shallow vadose zone at high pressure to solubilize the perchlorate and to pump it out. The lithology at the site was clay. Groundwater was shallow (10-15 feet below ground surface). The water was injected using a high-pressure pump system connected to specialized rods driven into the ground by direct push rigs. Results indicated that although the approach was reasonable, at this site, the clays were too tight to allow for significant desorption of the perchlorate from the clay matrix.

Wetlands Sampling Project-Developed sampling plan for a wetlands sampling project and designed tooling and applications for a limited access, continuous core drilling program in a tidal wetlands. The samples included 5 soil samples to a maximum of 18 feet below ground surface and into peats and the Bay Mud to evaluate the presence of metal in the contaminated soils.

Aquifer Mapping and Potentially Responsible Party Study-Task manager for Preferred Pathways study over a two square mile industrial area at a Federal Superfund Site in Santa Clara, California. Designed the aquifer mapping study using thousands of groundwater monitoring wells and soil boring reports to define underground channel systems. The information was used to facilitate installation of remedial measures. In conjunction with the Preferred Pathways Study, a Potentially Responsible Party (PRP) study was designed and performed in the area. After evaluating over 400 businesses, a ranking system was



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developed. The results from the project allowed the client to try to recover some of the costs of remediation.

Environmental Impact Report-Designed and wrote the geology and hydrogeology sections of an environmental impact report for a proposed hazardous waste incineration facility in the San Francisco Bay Area. The client was a municipality.

Geological Feasibility Study - King City, California-Performed a geological feasibility study and a natural hazard assessment for an 800-acre university site. Project included compilation of historic aerial photographs, geologic and historic maps, soil surveys and previous engineering and architectural studies. The client was a private university.

Subsurface Drilling Programs - Supervised subsurface exploration drilling programs including interpretation and evaluation of data for vertical and lateral extent of contamination for hydrocarbons, volatile organic compounds and metals contamination at various sites. Designed and supervised the use of proprietary drilling tools for limited access drilling activities under canopies, in buildings, and in salt marshes. The clients include numerous consultants in the San Francisco Bay Area.

BOOKS

Jacobs, J., Guertin, J., and Herron, C., eds., 2001, MTBE and its effect on Soil and Groundwater Resources, Lewis Publishers/CRC Press, Boca Raton, Florida; 264 p. Jacobs co-authored many of the articles within this volume.

Guertin, J., Jacobs, J., and Avakian, C., eds., 2005, Chromium (VI) Handbook, CRC Press, Boca Raton, Florida; 784 p. Jacobs co-authored 19 of the articles within this volume.

ABSTRACTS, CHAPTERS, JOURNALS AND GENERAL PUBLICATIONS

Baker, S. and Jacobs, J., The Government's New Environmental Role, Sacramento Business Journal, March 17, 1997

Goldberg, L., and Jacobs, J., 2000, Brownfields, Standard Encyclopedia of Environmental Science and Technology, Jay Lehr, ed., McGraw Hill, New York, NY; p. 16.21 -16.32.

Hartman, B., and Jacobs, J., 2000, Soil Vapor Principles, Standard Encyclopedia of Environmental Science and Technology, Jay Lehr, ed., McGraw Hill, New York, NY; p. 11.87 -11.95.

Hartman, B., and Jacobs, J., 2000, Applications and Interpretation of Soil Vapor Data to Volatile Organic Compound Contamination, Standard Encyclopedia of Environmental Science and Technology, Jay Lehr, ed., McGraw Hill, New York, NY; p. 11.96 – 11.112.

Jacobs, J., Adini, A., and Rau, D. 2010, Revisiting a Closed Site: Expedited Treatability Testing and High Pressure Injection of Activated Sodium Persulfate to Move Site toward Closure, Again, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 15-18, 2010, San Diego, California

Jacobs, J., and Testa, S., 2010, Comparison of Two Metals Treatment Technologies in Soil, Sludges and Water: 1990-2010, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 15-18, 2010, San Diego, California



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Jacobs, J., and Elam, J., 2010, Improving Water Quality by Reducing Pharmaceutical and Residential Wastes, Managing Resources and Preventing Contamination, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 15-18, 2010, San Diego, California

Jacobs, J., and Elam, J., 2009, A Model of Environmental Sustainability for Managing Resources, Minimizing Wastes and Reducing Groundwater Contamination at a California Community Services District, National AIPG Meeting Proceedings; October 3-7, 2009, Grand Junction, Colorado

Jacobs, J., 2009, Free Product Removal of Diesel-Range Hydrocarbons Using a 3 Step Flushing, Extraction and Infusion Process, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 9-12, 2009, San Diego, California

Jacobs, J., and Brewer, R., 2009, Cleanup Planning and Design using Remediation Management Zones: Ozone with Enhanced Bioremediation Case Study, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 9-12, 2009, San Diego, California

Jacobs, J., Nelson, L., Begley, J., 2008, Innovative Free Product Removal Advances in Enhanced Flushing Processes for NAPL Recovery, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 10-13, 2008, San Diego, California

Jacobs, J., 2008, In-Situ Chemical Oxidation including Ozone/Perozone in the Netherlands Over 5 Years: Review of the SKB Report, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 10-13, 2008, San Diego, California

Jacobs, J., and Brewer, R., 2008, An Integrated Simultaneous Approach to Groundwater Remediation using Environmental Hazard Evaluation and Remediation Management Zone Maps, American Institute of Professional Geologists, National AIPG Meeting Proceedings, September 20-24, 2008, Flagstaff, Arizona

Jacobs, J., Nelson, L., and Begley, J., 2008, Two Rapid Enhanced Flushing NAPL Recovery Methods, Battelle Conference, Abstract, Battelle Chlorinated Solvent Meeting Proceedings, May 19-22, 2008, Monterey, California

Jacobs, J., Begley, J., and Murphy, N., 2008, Significant Improvement of In-Situ Gas Mass Transfer Performance for Groundwater Remediation Projects, Battelle Conference, Abstract, Battelle Remediation of Chlorinated and Recalcitrant Compounds Meeting Proceedings, May 19-22, 2008, Monterey, California

James A. Jacobs and Don McEdwards, 2007, Passive In-Situ Oxygen and Nutrient Injection Project in Santa Rosa, California, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 19-22, 2007, San Diego, California

James A. Jacobs and Don McEdwards, 2007, Gas Infusion Subsurface Recirculation Systems for Enhanced Bioremediation and Abiotic Geochemical Fixation, Association for Environmental Health and Sciences, Abstract, AEHS Proceedings March 19-22, 2007, San Diego, California

Jacobs, J., Nelson, L., and Begley, J., 2007, Rapid NAPL Recovery Using Two Different Enhanced Flushing Processes, National AIPG Meeting Proceedings; October 7-11, 2007, Traverse City, Michigan



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Jacobs, J., 2006, Viscous Waste Oil Remediation Using High Vapor Extraction with Biosolvent Flushing, National Ground Water Association, Petroleum Hydrocarbons and Organic Chemicals in Ground Water Meeting Proceedings; November 6-8, 2006, Houston, Texas

Jacobs, J., and McEdwards, D., 2006, A Case Study of Indirect Geochemical Indicators, National Ground Water Association, Petroleum Hydrocarbons and Organic Chemicals in Ground Water Meeting Proceedings; November 6-8, 2006, Houston, Texas

Jacobs, J., and Ryder-Smith, M., 2006, Biosolvent Flushing and High Vacuum Extraction of Heavy Waste Oil, Battelle Conference, Abstract, Battelle Remediation of Chlorinated and Recalcitrant Compounds Meeting Proceedings, May 21-26, 2006, Monterey, California

Jacobs, J., and Ryder-Smith, M., 2006, Hotspot Well Treatment of Petroleum Hydrocarbons for Site Closure, Battelle Conference, Abstract, Battelle Remediation of Chlorinated and Recalcitrant Compounds Meeting Proceedings, May 21-26, 2006, Monterey, California

Jacobs, J., and McEdwards, D., 2006, Update: Passive In-Situ Oxygen and Nutrient Injection Project in Santa Rosa, California, Battelle Conference, Abstract, Battelle Remediation of Chlorinated and Recalcitrant Compounds Meeting Proceedings, May 21-26, 2006, Monterey, California

Jacobs, J., and McEdwards, D., 2004, Chemical Indicators for In-Situ Bioremediation of Petroleum Hydrocarbons, National Ground Water Association, Petroleum Hydrocarbons and Organic Chemicals in Ground Water Meeting Proceedings; December 13-17, 2004, San Francisco, California

Jacobs, J., 2003, Chemical Oxidation and Enhanced Natural Attenuation for Oil Field Remediation, Pacific Section American Association of Petroleum Geologists, Pac Section AAPG Annual Meeting Proceedings, May 19-24, 2003, Long Beach, California

Jacobs, J., and Testa, S.M., 2003, Design Considerations for *In-Situ* Chemical Oxidation Using High Pressure Jetting Technology, AEHS Soil, Sediment and Water, March/April p. 51-60.

Jacobs, J., 2002, Overcoming Limitations of *In-Situ* Remediation using Chemical Oxidizers and Bio-Amendments for Petroleum Hydrocarbons and Chlorinated Solvents, Association of Engineering Geologists and American Institute of Professional Geologists Annual Meeting, Reno, Nevada, abstracts, p. 53.

Jacobs, J., and Parker, T., 2002, Low Concentrations of Organic Contaminants in the Hydrologic System, Abstracts and presentation, 11th Annual Groundwater Resources Association Meeting and Conference, Long Beach, California, September 18-19, 2002.

Jacobs, J., 2001 Optimization of Existing Soil Vapor Extraction and Pump and Treat Systems using *In-Situ* Hydraulic Fracturing, Groundwater Resources Association of California, 10th Annual Meeting and 23rd Biennial Groundwater Conference, Sacramento, California, October 30, Abstracts, p. 65.

Jacobs, J., 2001, *In-Situ* Delivery Methods for Remediation of Hexavalent Chromium in Soil and Groundwater, National Joint Meeting of the Association of Engineering Geologists and American Institute of Professional Geologists, St. Louis, October 5, St. Louis, Missouri, Abstracts, p. 62.



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Jacobs, J., 2001, Insights into Remediation of Recalcitrant Compounds using *In-Situ* Liquid Delivery Systems for Chemical Oxidation, Bioremediation, and Metals Stabilization, Groundwater Resources Association of California, 2nd Symposium in the Series on Groundwater Contaminants: Characterization & Remediation of Emerging and Recalcitrant Contaminants, June 14-15, 2001, Proceedings, 12 p.

Jacobs, J., Kram, M., and Lieberman, S., 2000, Direct Push Technology Sampling, Standard Encyclopedia of Environmental Science and Technology, Jay Lehr, ed., McGraw Hill, New York, NY; p. 11.151 – 11.163.

Jacobs, J., and Phillips, J., 2000, Global Positioning Systems (GPS) and Environmental Projects, Standard Encyclopedia of Environmental Science and Technology, Jay Lehr, ed., McGraw Hill, New York, NY; p. 11.1 – 11.15.

Jacobs, J., 2000, Monitoring Well Construction and Sampling Techniques, Standard Encyclopedia of Environmental Science and Technology, Jay Lehr, ed., McGraw Hill, New York, NY; p. 11.46 – 11.68.

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