

Printed from: Interstate Technology & Regulatory Council (ITRC). 2020. *Optimizing Injection Strategies and In situ Remediation Performance*. OIS-ISRP-1. Washington, D.C.: Interstate Technology & Regulatory Council, OIS-ISRP Team. https://ois-isrp-1.itrcweb.org/.

## References

- Allaire, S. E., J.A. Lafond;, A. R. Cabral, S. E. Lang. 2008. "Measurement of Gas Diffusion through Soils: Comparison of Laboratory Methods." *Journal of Environmental Monitoring* 10:1326 1336. doi: 10.1039/B809461F.
- Alleman, B., K. Glover, J. Wolfe. 2018. "Lessons Learned Applying Multiple Remediation Technologiers and Air Force Plan 4." *Presentation at FRTR Annual Meeting, Reston Virginia, May 9th 2018*.
- Atlas, R. M. 1981. "Mocrobial Degradation of Petroleum Hydrocarbons: and Environmental Perspective." *Microbial Review* 45:180 209.
- Atlas, R. M. and R. Bartha. 1992. "Hydrocarbon Biodegradation and Oil Spill Bioremediation." *Advanced Microbial Ecology* 12:287 338.
- Bamforth, S. M. amd I. Singleton. 2005. "Bioremediation of Polycyclic Aromatic Hydrocarbons: Current Knowledge and Future Directions." *Journal of Chemical Technology and Biotechnolog* 80:723 736.
- Bechtel. 1999. "Groundwater Monitoring Plan for Site 11, Old Camden County Landfill U.S. Naval Submarine Base Kings Bay, Georgia." *Prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command* June 1999.
- Burnell, S., Spitzinger J, Jin P, Erickson J, Hauber E, and Nelson D. 2013. "Control of Biofouling: Lessons Learned From a Decade of Carbon Injection System Operation and Maintenance. ." *Remediation* Winter 2013, 23 (2):85-101.
- CCVRWQCB. 2015. "Waste Discharge Requirements General Order for In-Situ Groundwater Remediation and discharge of Treated Groundwater to Land." *California Regional Water Quality Control Board* Order No. R5-2015-0012.
- Chamberlain, W. B. . 2003. "Bionutrient Modeling for Design on In situ Bioremediation." *Pollution Engineering* April 2003:28 33.
- Chang, H. L. and L. Alvarez-Cohen. 1996. "Biodegradation of individual and multiple chlorinated aliphatic hydrocarbons by methane-oxidizing cultures." *Applied Environmental Microbiology* 62 (9):3371-3377.
- Clayton, W.S. . 2007. "Engineering delivery of soluble amendments." *SERDP Symposium, Washington, D.C., December* 4-6, 2007.
- Clayton, W.S. . 2008. "In situ Chemical Oxidation (Basics, Theory, Design and Application)". California DTSC Remediation Technology Symposium, Sacramento, C.A., May 14-16, 2008.
- Cusack, F., S. Singh, C. McCarthy, and J. Grieco. 1992. "Enhanced Oil Recovery Three-dimensional Sandpack Simulation of Ultramicrobacteria Resuscitation in Reservoir Formation." *Journal of General Microbiology* 138 (3):647-655.
- DeFlaun, M. F., S. R. Oppenheimer, S. Streger, C. W. Condee, and M. Fletcher. 1999. "Alterations in adhesion, transport, and membrane polymers in an adhesion-deficient Pseudomonad." *Applied and Environmental Microbiology* 65:759-765.
- Dresel, P. Evan, Dawn M. Wellman, Kirk J. Cantrell, and Michael J. Truex. 2011. "Review: Technical and Policy Challenges in Deep Vadose Zone Remediation of Metals and Radionuclides." *Environmental Science & Technology* 45 (10):4207-4216. doi: 10.1021/es101211t.
- ESTCP. 2005a. "Bioaugmentation for Remediation of Chlorinated Solvents." *Department of Defense (DOD)*Environmental Security Technology Certification Program Technology Development, Status, and Research Needs."

  October 2005.
- ESTCP. 2005b. "A Review of Biofouling Controls for Enhanced In Situ Bioremediation of Groundwater. October." Department of Defense Environmental Security Technology Certification Program
- ESTCP. 2010a. "In Situ Remediation of Chlorinated Solvent Plumes." *SERDP/ESTCP*, Springer Science + Business Media, New York, 2010:374.
- ESTCP. 2010b. "Loading Rates and Impacts of Substrate Delivery for Enhanced Anaerobic Bioremediation." ESTCP Final Report for Project ER-0627.
- ESTCP. 2011a. "Decision and Management Tools for DNAPL Sites: Optimization of Chlorinated Solvent Source and Plume Remediatio Considering Uncertainty." (ESTCP ER-200704).
- ESTCP. 2011b. "Diagnostic Tools for Performance Evaluation of Innovative In Situ Remediation Technologies at

- Chlorinated Solvent Sites." ESTCP Project ER-200318.
- ESTCP. 2016. "Development of an Expanded, High-Reliability and Performance Database for In Situ Remediaion Technologies." *ESTCP* Project ER-201120:93.
- Evans, P., J. Hooper, M. Lamar, D. Nguyen, P. Dugan, M. Crimi, N. Ruiz. 2018. "Sustained In situ Chemical oxidation (ISCO) of 1,4 Dioxane and Chlorinated VOCs Using Slow-release Chemical Oxidant Cylinders." *ESTCO* Project ER-201324:576.
- Fathepure, B. Z. . 1987. "Anaerobic bacteria that dechlorinate perhloroethene." *Applied and Environmental Microbiology* 53 (11):2671-2674.
- Fowler, T., B. Thompson, and J. Mueller. 2011. "Acetone and 2-butanone creation associated with biological and chemical remediation of environmental contamination." *Remediation* 22 (Winter). doi: 10.1002/rem.21296.
- Harkness, M., A. Fisher, M. D. Lee, E. E. Mack, J. A. Payne, S. Dworatzek, J. Roberts, C. Acheson, R. Herrmann, and A. Possolo. 2012. "Use of statistical tools to evaluate the reductive dechlorination of high levels of TCE in microcosm studies." *Journal of Contaminant Hydrology* 131 (1-4):100 -118.
- Harkness, M., P. Freyer, L Reusser. Unpublished Paper.
- He, J., V. F. Holmes, P. K. H. Lee, and L. Alvarez-Cohen. 2007. "Influence of Vitamin B12 and cocultures on the growth of Dehalococcoides isolates in defined medium." *Applied Environmental Microbiology* 73 (9):2847 2853.
- Heald, S, and Jenkins, R.O. 1994. "Trichloroethylene removal and oxidation toxicity mediated by toluene dioxygenase of *Pseudomonas putida." Appl Environ Microbiol* 60:4634-4637.
- ITRC. 2002a. "DNAPL Source reduction: Facing the Challenge." Interstate Technology and Regulatory Council.
- ITRC. 2002b. "A systematic Approach to In Situ bioremediationi in Groundwater, Including Decisioin Trees on In Situ Bioremediation for Nitrates, Carbon Tetrachloride and Perchlorate." *Interstate Technology & Regulatory Council,* ISB-8.
- ITRC. 2003. "Technical and Regulatory Guidance for Surfactant / Cosolvent Flushing of DNAPL Source Zones." *Interstate Technology and Regulatory Council, Washington DC, ITRC DNAPLs-3*.
- ITRC. 2004. "Remediationi Process Optimization Iddentifying Opportunities for Enhanced and More Efficient Site Remediatin." *Interstate Technology and Regulatory Council*.
- ITRC. 2005. "Technical and Regulatory Gudance for In situ Chemical Oxidation of Contaminated Soil and Groundwater, Second Edition" *Interstate Technoloogy and Regulatory Council*.
- ITRC. 2007. "Improving Environmental Site Remediatin through perfroamnce-based Environmental Management." RPO.
- ITRC. 2008a. "Enhanced Attenuation: Chlorinated Organics EACO-1." *Interstate Technology and Regulatory Council Washington D.C.* (EACO-1).
- ITRC. 2008b. "In situ Bioremediation of Chlorinated Ethene: DNAPL Source Zones." Washington, D.C.: Interstate Technology & Regulatory Council, Bioremediation of DNAPLs Team.
- ITRC. 2010. "Use and Measurement of Mass Flux and Mass Discharge." Washington, D.C.: Interstate Technology & Regulatory Council, Integrated DNAPL Site Strategy Team (MASSFLUX-1).
- ITRC. 2011. "Permeable Reactive Barrier: Technology Update." Washington, D.C.: Interstate Technology & Regulatory Council, PRB: PRB-5.
- ITRC. 2011a. "Biofuels, Release Prevention, Environmental Behavior, and Remediation." *Interstate Technology and Regulatory Council, Washington D.C.*
- ITRC. 2011b. Environmental Molecular Diagnostics Fact Sheets. EMD-1. Washington, D.C.: interstate Technology and Regualtory Council.
- ITRC. 2011c. "Integrated DNAPL Site Strategy." Washington, D.C.: Interstate Technology & Regulatory Council, Integrated DNAPL Site Strategy Team. (IDSS-1.).
- ITRC. 2011d. "Project Risk Management for Site Remediation." Interstate TEchnology and Regulatory Council RRM-1.
- ITRC. 2013a. "Environmental Molecular Diagnostics, New Site Characterization and Remediation Enhancement Tools." Washington, D.C.: Interstate Technology & Regulatory Council, Environmental Molecular Diagnostics Team (EMD-2).
- ITRC. 2013b. "Groundwater Statistics and Monitoring Compliance Website." *Interstate Technology and Regulatory Council.*
- ITRC. 2015. "Integrated DNAPL Site Characterization and Tools Selection (ISC-1)." Washington D.C.: Interstate Technology and Regualtory Council, DNAPL Site Characterization Team.
- ITRC. 2016. "Geospatial Analysis for Optimization at Environmental Sites." Interstate Technology and Regualtory Council.

- ITRC. 2017a. "Characterization and Remediation of Fractured Rock." *Interstate Technology and Regulatory Council, Washington D.C.* FracRx-1.
- ITRC. 2017b. "Remediation Managment of Complex Sites." Interstate Technology and Regulatory Council RMCS-1.
- ITRC. 2018. "LNAPL Site Management: LCSM Evolution, Decision Process, and Remedial Technologies." *Intersatate Technologies and Regulatory Council*
- ITRC. 2019. "Implementing Advanced Site Characterization Tools." Washington, D.C.: Interstate Technology & Regulatory Council, ASCT: ASCT-1.
- Johnson, C.D., and M. J. Truex. 2006. "rtFlux: RT3D Flux Plane Utility."
- Krembs, F.J. and W.S. Clayton. 2010. "ISCO design best practices as demonstrated by past case study data." The Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, May 24-27, 2010.
- LARWQB, Los Angeles Regional Water Quality Control Board. 2008. "Technical Reposrt: Subsurface injection of In itu Remedial Reagents (ISRRS) within the Los Angeles Regional Water Quaity Control Board Jurisdiction." 46.
- Lebron, Carmen. 2011. "Development and Validation of a Quantitative Framework and Management Expectation Tool for the Selection of Bioremediation Approaches at Chlorinated Solvent Sites." SERDP ESTCP ER-201129.
- Little, C. D., A. V. Palumbo, S. E. Herbes, M. E. Lidstrom, R. L. Tyndall, and P. J. Gilmer. 1988. "Trichloroethylene biodegradation by a methane-oxidizing bacterium." *Applied Environmental Microbiology* 54 (4):951-956.
- Maillacheruvu, K. Y. and G. F. Parkin. 1996. "Kinetics of Growth, Substrate Utilization, and Sulfide Toxicity for Propionate, Acetate, and Hydrogen Utilizers in Anaerobic Systems." Water Environmental Research 1996 (68).
- Munakata-Marr, J., P. L. McCarty, M. S. Shields, M. Reagin, and S. C. Francesconi. . 1996a. "Enhancement of trichloroethylene degradation in aquifer microcosm bioaugmented with wild type and genetically altered *Burkholderia* (*Pseudomonas*) *cepacia G4 and PR1." Environmental Science and Technology* 30 (6):2045-2062.
- Munakata-Marr, J., P.L.McCarty, M.S. Shields, M. Reagin, S.C. Francesconi. 1996b. "Enhancement of trichloroethylene degradation in aquifer microcosms bioaugmented with wild type and genetically altered Burkholderia (Pseudomonas) cepacia G4 and PR1." Environmental Science and Technology.
- NAVFAC. 2013a. "Best Practices for Injection and Distribution of Amendments." Battelle Memorial Institute and NAVFAC Alternative Restoration Technology Team. March 2013 *Technical Report (TR-NAVFAC-EXWC-EV-1303)*.
- NAVFAC. 2013b. "Sampling and Analysis Plan for Groundwater Sample and Analysis Monitoring Plan At Site 11, Old Camden County Landfill Naval submarine Base Kings Bay, Kings bay, Georgia " N42237 .AR.001228,NSB KINGS BAY 5090.3A.
- NAVFAC. 2015. "Biogeochemmical Transformation Handbook." Engineering and Expeditionary Warfare Center, *Technical Report TR-NAVFAC EXWC-EV-1601*.
- NAVFAC. 2018. "Advances in the State of the Practice for Enhanced In Situ Bioremediatioin." *Technical Report TR-NAVFAC EXWC-EV-1806*.
- Neilsen, D.M. 1991. "Practical Handbook for Groundwater Monitoring." 728.
- NFCSC. 2002. "Surfactant-Enhanced Aquifer Remediation (SEAR) Design Manual." NFESC Technical Report TR-2206-ENV.
- NIOSH. 2006. "Handbook for Methane Control in Mining." Department of Health and Human Services, Center for Disease Control IC 9486 Information (IC 9486 Information Circular/2006.).
- NJDEP. 2017. "In Situ Remediation: Design Considerations and Performance Monitoring Technical Guidance Document."

  NJDEP Site Remediation and Waste Management Program, October 2017. New Jersey Departmenet of Environmental Protection, Site Remediation and Waste Management Program (Versioin 1.0).
- Oldenhuis, R., Vink, R.L.M., Janssen, D.B., and Witholt, B. 1989. "Degradation of chlorinated aliphatic hydrocarbons by Methylosinus trichosporium OB3b expressing soluble methane monooxygenase." Appl Environ Microbiol 55:2819-2826.
- Parker, J., K. Ungtac, P. kitanids, M. Cardiff, L. Xiaoyi, and L. Jonghyum 2011. "Practical Cost-Optimization of Characterization and Remediation at DNAPL Sites with Consideration of Prediction Uncertaintly." (SERDP Project ER-1611).
- PERF. 2013. "Performance evaluation of in situ chemical oxidation of petroleum impacts in soil and groundwater." Petroleum Environmental Research Forum (PERF) Project 2009-01.
- Perolo, L. W. . 2010. "In Situ Bioremediation of Organic Pollutants in Aquatic Sediments A Review." *Journal of Hazardous Material* 177:81 89.

- PNNL. 2015. "Performance Assessment for Pump and Treat Closure or Transition." *Pacific Northwest National Laboratory*Provectus Environmental Products, Inc. "Provect-CH4™ Methane Inhibitor / ERD and ISCR Supplement." Illinois, Freeport,
- Rouse, J. D., D. A. Sabatini, R. E. Brown, J. H. Harwell. 1996. "Evaluation of Ethoxylated Alkylsulfate Surfactants for Use in Subsurface Remediation." Water Environmental Research Foundation, February 6 2014 68:162 168.
- Ryoo, D.; Shim, H. Canada, K. Barbieri, and P Wood 2000. "Aerobic degradation of Tetrachloroethylene by toluene-o-xylene mkonooxygenase of *Pseudomonas stutzeri OX1*." *Nat Biotechnol* 18:775-778.
- Sander, R. 1999. "Modeling Atmospheric Chemistry: Interactions between Gas-Phase Species and Liquid Cloud/Aerosol Particles." *Surveys in Geophysics* (20(1)):1-31.
- Sayler, G. S. and S. Ripp. 2000. "Field applications of genetically engineered microoranisms for bioremediaton processes." *Current Opinion in Biotechnology* 11:286 289.

17 July 2014.

- Schechter., Bourrel M. and R. S. 1988. "Microemulsions and Related Systems: Formulation, Solvency, and Physical Properties" Surfactant Science Series, Marcel Dekker, Inc., New York and Basel, 1988. 30.
- Schink, B. . 1997. "Energetics of Syntrophic Cooperation in Methanogenic Degradation." *Microbiology and Molecular Biology Reviews* 61(2):262-280.
- Semprini, L., G.D. Hopkins. P.L. McCarty, and P.V. Roberts. 1992. "In situ Transformation of Carbon Tetrachloride and other Halogenated Compounds Resulting from Biostimulation Under Anoxic Conditions." *Environmental Science and Technology*.
- SERDP. 2006a. "In Situ Chemical Oxidation for Groundwater Remediation Technology Practices Manual." SERDP ESTCP ER-200623.
- SERDP. 2006b. "In Situ Chemical Oxidation for Groundwater Remediation Technology Practices Manual." SERDP FSTCP.
- SERDP. 2006c. "Loading Rates and Impacts of Substrate Delivery for Enhanced Anaerobic Bioremediation." SERDP ESTCP.
- Shook, G.M.; S.L. Ansley and A. Wylie. 2004. "Tracers and Tracer Testting: Design, Implementation and inmterpretatin Methods." *INEEL/EXT-03-01466*.
- Siegrist, R.L., M.A. Urynowicz, O.R. West, M.L. Crimi, and K.S. Lowe. 2001. "Principles and Practices of In Situ Chemical Oxidation Using Permanganate." *Battelle Memorial Press, Columbus, Ohio,* :348.
- Suthersan, S.S., C. Divine, E. Cohen, K. Heinze. 2014. "Tracer testing: recommended best practice for design and optimization of in situ remediation systems." *Groundwater Monitoring and Remediation* 34 (3):33-40.
- Suthersan, S. J. McDonough, M. Schnobrich, C. Devine. 2017. "In situ chemical treatment: a love-hate relationship." *Groundwater Monitoring & Remediation* 37 (1):17-26.
- TerraSystems. Unpublished Report. "Case Study of pH Adjustment at a New Jersey Remediation Site."
- Turgeon, Magalie, and Karine Drouin. "Fact Sheet: Bioaugmentation in Situ." *Government of Canada*, March 7, 2019. https://gost.tpsgc-pwgsc.gc.ca/tfs.aspx?id=3&lang=eng.
- USACE. 2000. "SEAM3D: A Numerical Model for Three Dimensional Solute Transport and Sequestration Electron Acceptor-Based Bioremediation in Groundwater." *US Army Corp of Engineers, Engineering Research and Development Center* November 2000.
- USACE. 2003. "Rehabilitation of Injection and Extraction Wells." U.S. Army Corps of Engineers
- USEPA. 1997. "BIOSCREEN, Natural Attenuation Decision Support System." Water Research.
- USEPA. 1998. "Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water" (EPA/600/R-98?128).
- USEPA. 2000. "Engineered Approaches to In Situ Bioremediation of Chlorinated Solvents: Fundamentals and Field Applications." *EPA 542-R-00-008*.
- USEPA. 2001. "Use of Bioremediation at Superfund Sites." (EPA 542-R-01-019ITRC).
- USEPA. 2004. "Performance Monitoring of Remedies for VOCs in Groundwater." (EPA/600/R-04/027).
- USEPA. 2006a. "Guidance on Systematic Planning Using Data Quality Objectives Process" (EPA/240/B-001).
- USEPA. 2006b. "In Situ and Ex Situ Biodegradation Technologies for Remediation of Contaminated Sites." *EPA 625-R-06-015*. Engineering Issue.
- USEPA. 2007. "Remediation Evaluation Model for Chlorinated Solvents (REMChlor)." USEPA Water REsearch.

- USEPA. 2008. "A Guide for Assessing Biodegradation and Source Identification of Organic Ground Water Contaminants Using Compound Specific Isotope Analysis." EPA 600-R—08/148.
- USEPA. 2011a. "An Approach for Evaluatiing the Progress of Natural Attenuation in Groundwater." EPA 600/R-11/204.
- USEPA. 2011b. "Environmental Cleanup Best Management Practices: Effective Use of the Project Life cycle Conceptual Site Model".
- USEPA. 2012a. "A Citizen's Guide to In Situ Chemical Reduction." Office of Solid Waste and Emergency Response EPA 542-F-12-012.
- USEPA. 2012b. "Groundwater Sample Preservation at In-situ Chemical Oxidation Sites Recommended Guidelines." EPA/600/R-12/049.
- USEPA. 2013. "Lessons from Greening America's Capitals Projects: Five Helpful Hints for Communities Wanting to be Greener." *EPA-231-F-12-001*.
- USEPA. 2016. "Pilot-scale Demonstration of In Situ Chemical Oxidation Involving Chlorinated Volatile Organic Compounds: Design Deployment Guidelines." *EPA 600-R-16-383*.
- USEPA. 2017a. "Best Practice for Environmental Site Managment: A Practical Guide for Applying Environmental Sequence Stratigraphy to Improve Conceptual Site Models." *EPA /600/R-17/293*.
- USEPA. 2017b. "Superfund Optimization Progress Report 2011 2015." EPA-542-R-17-002.
- USEPA. 2018a. "Examples of Groundwater Remediatioin at NPL Sites." EPA-542-R-18-002.
- USEPA. 2018b. "In Situ Treatment Performance Monitoring: Issues and Best Practices." *Groundwater Forum Issue Paper* EPA-542-F-18-002:15.
- USEPA. 2018c. "Remedial Technology Fact Sheet Activated Carbon-Based Technology for In Situ Remediation."
- USGS. 2009. "Monitoring the Efficiency of Natural Attenuation at the Old Camden County Landfill, Kings Bay Naval Submarine Base." *US Geological Survey* October 2009.
- Waybrant, K., Carol Ptacek, and D. W. Blowes. 2002. *Treatment of Mine Drainage Using Permeable Reactive Barriers: Column Experiments*. Vol. 36.
- West, C. C. and J.H. Harwell. 1992. "Surfactants and Subsurface Remediation." *Environmental Science and Technology* 26:2324-2330.
- Wiedemeier, T. W., H. S. Rifai, C. J. Newell, and J. W. Wilson. 1999. "Natural Attenuation of Fuels and Chlorinated Solvents." *New York: Wiley*.
- Wiedemeier, Todd, J. Wilson, D. Freedman, & B., Lee. 2017. "Providing Additional Support for MNA by Including Quantitative Lines of Evidence for Abiotic Degradation and Co-metabolic Oxidation of Chlorinated Ethylenes." Technical Report ER-201584.
- Wilson, J. T. and B. H. Wilson. 1985. "Biotransformation of trichloroethylene in soil." *Applied and Environmental Microbiology* 49:242-243.
- Yongtian, H., C. Su, J. T. Wilson, R. T. Wilkin, C. J. Adair, T. R. Lee, P. Bradley, And M. Ferrey. 2010. "Identification and Characterization Methods for Reactive Minerals Responsible for Natural Attenuation of Chlorinated Organic Compounds in Ground Water." (EPA/600/R-09/115, 2010.).
- Zheng, C. 2010. "MT3DMS 5.3 Supplimental Users Gude." *Technical Report to the U.S. Army Engineer Research and Development Center: Department of Geological Sciences, University of Alabama*, 5.3:220 p.
- Zheng, C., and Wang, P., . 1999. "A modular three-dimensional multispecies transport model for simulation of advection, dispersion, and chemical reactions of contaminants in groundwater systems; Documentation and user's guide: ."

  Contract Report SERDP-99-1: Vicksburg, Miss., U. S. Army Engineer Research and Development Center.:169.

**Click here** to download the entire document.