



TERRATHERM

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RALPH S. BAKER, Ph.D. **Chairman and Chief Scientist**

PROFESSIONAL HISTORY

TerraTherm, Inc.	(2000 – present)
ENSR Consulting, Engineering, and Remediation	(1989 – 2000)
University of Massachusetts, Amherst	(1985 – 1989)
Ralph S. Baker Associates	(1976 – 1985)
USDA Soil Conservation Service	(1975 – 1976)

EDUCATION

Ph.D. (Soil Physics) University of Massachusetts, 1989
M.S. (Soil Chemistry) University of Maine, 1986
B.S. (Natural Resources) Cornell University, 1972

REGISTRATIONS AND TRAINING

Certified Professional Soil Scientist (State of Maine)
HAZWOPER 40 hr + 8 hr Refresher Training Current

SUMMARY OF EXPERIENCE

Dr. Baker has 30 years of experience in selection, design, implementation, oversight and evaluation of in-situ remediation technologies for treatment of contaminated soil and water, including in-situ thermal remediation (ISTR), soil vapor extraction (SVE), in-situ air sparging (IAS), and multi-phase extraction (MPE). He draws on experience gained from over 100 major projects, of which 35 utilized ISTR, 30 SVE, 20 IAS, and 20 MPE; of these, approximately half were dense non-aqueous phase liquid (DNAPL) sites. Most of these projects were conducted for industrial or governmental clients, and several were focused primarily on research objectives. In addition, he has authored over 65 technical publications on in-situ/on-site remediation and applied environmental soil physics.

TerraTherm, Inc., Fitchburg, MA. **Chairman/Chief Scientist** (2010 – present); **CEO** (2000 – 2010)

Co-founder, Chairman and Chief Scientist. Frequent spokesperson for company, marketing manager, and intellectual property manager. Dr. Baker serves as a Technical Director on selected TerraTherm's projects. Representative project experience includes:

Southern California Edison Co. (SCE) – ISTD RD and RA at a Former Wood-Treating Site in Alhambra, CA. TerraTherm treated 16,500 cy of creosote-contaminated soil, for which the contaminants of concern, PAHs, PCP and dioxins were treated to residential cleanup standards, to a maximum depth of 105 ft beneath former treatment tanks and piping, in two phases. Dr. Baker's roles included preparation and oversight of design and work plan documents, including the Air Discharge Permit through the SCAQMD; speaking at several DTSC-convened public hearings; design and oversight of a thermal conductivity test at the site; and coordination of simulation modeling. He served as the technical and QA manager during the RA effort, which included construction, operation and assessment of an ISTD system comprising 785 thermal wells, Air Quality Control, Continuous Emissions Monitoring, and electrical distribution, control and monitoring equipment.

Strategic Environmental Research and Development Program (SERDP) – Principal Investigator for research project funded by the DoD to evaluate and quantify the removal and in-situ destruction mechanisms associated with using ISTD to remediate CVOCs. Laboratory and large tank experiments were conducted at the VEGAS research institute located at the University of Stuttgart in Germany. Period of performance April 2005 – June 2009. Total project value: \$500K.

U.S. Army Corps of Engineers - Remediation Engineering Guidance Document. Contributing author of Engineering and Design Manual for U.S. Army Corps of Engineers (USACE) Hazardous, Toxic, and Radioactive Waste - Center of Expertise (HTRW-CX) on In Situ Thermal Remediation.

ENSR International, Acton, MA. Technical Director (1989-2000)

Served as ENSR's corporate-wide in-situ remediation technology leader. As Technical Director, Dr. Baker chaired the company's Bioremediation and In-Situ Remediation Skill Centers, which provided technology transfer and technical coordination among representatives from more than 20 offices. Among more than 100 major project contributions, major project management and technical assignments included:

- U.S. Army Corps of Engineers - Remediation Engineering Guidance Documents. Project Manager and principal coordinating author of three comprehensive Engineering and Design Manuals for U.S. Army Corps of Engineers (USACE) Hazardous, Toxic, and Radioactive Waste - Center of Expertise (HTRW-CX): (1) SVE and Bioventing (EM 1110-1-4001); (2) IAS (EM 1110-1-4005); and, (3) MPE (EM 1110-1-4010). .

SELECTED PUBLICATIONS (THERMAL REMEDIATION RELATED ONLY)

Baker, R.S., T. Burdett, S.G. Nielsen, M. Faurbye, N. Ploug, J. Holm, U. Hiester, and V. Schrenk. 2010. "Improving the Sustainability of Source Removal." Paper C-027, in K.A. Fields and G.B. Wickramanayake (Chairs), *Remediation of Chlorinated and Recalcitrant Compounds—2010*. Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Monterey, CA; May 2010). Battelle Memorial Institute, Columbus, OH.

Baker, R.S., J.M. Bierschenk, J. LaChance, G. Heron, D. Phelan, and J.A. Clock. 2010. "In Situ Thermal Treatment of MGP Waste and Creosote." Paper H-057, in K.A. Fields and G.B. Wickramanayake (Chairs), *Remediation of Chlorinated and Recalcitrant Compounds—2010*.

- Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Monterey, CA; May 2010). Battelle Memorial Institute, Columbus, OH.
- Baker, R.S. and U. Hiester. 2009. *Final Report: Large-Scale Physical Models of Thermal Remediation of DNAPL Source Zones in Aquitards*. SERDP Project ER-1423. May 2009, 250 pp. available at: www.serdp.org/content/download/6039/81933/file/ER-1423-FR.pdf
- Baker, R.S., Smith, G.J., and H. Braatz. 2009. "In-Pile Thermal Desorption of Dioxin Contaminated Soil and Sediment." In: *Proceedings of the 29th International Symposium on Halogenated Persistent Organic Pollutants* (Dioxin 2009), Beijing, China, Aug. 23-28, 2009.
- Baker, R.S., J.M. Bierschenk, J. LaChance, J.P. Galligan, D. Tarmasiewicz, G. Heron and W.R. Leach. 2008. Why In Situ Thermal Desorption Can Be the Most Cost-Effective Remediation Method for Many Sites. Paper N-003, in: Bruce M. Sass (Conference Chair), *Remediation of Chlorinated and Recalcitrant Compounds—2008*. Proceedings of the Sixth International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Monterey, CA; May 2008). Battelle Press, Columbus, OH.
- Baker, R.S., G. Heron, J. LaChance, A. Färber, L. Yang and U. Hiester. 2008. 2-D Physical Models of Thermal Conduction Heating for Remediation of DNAPL Source Zones in Aquitards. *Proceedings of the 10th International UFZ-Deltares/TNO Conference on Soil-Water Systems (ConSoil 2008)*, 3-6 June, 2008, Milano, Italy.
- Baker, R.S., D. Tarmasiewicz, J.M. Bierschenk, J. King, T. Landler and D. Sheppard. 2007. Completion of In-Situ Thermal Remediation of PAHs, PCP and Dioxins at a Former Wood Treatment Facility. *2007 International Conference on Incineration and Thermal Treatment Technologies (IT3)*, May 14-18, 2007, Phoenix, AZ. Air & Waste Management Association, Pittsburgh, PA.
- Baker, R.S., J.C. LaChance, G. Heron, U. Hiester, H.-P. Koschitzky, O. Trötschler, A. Färber, and M. Kuhlman. 2006. "DNAPL Removal from the Saturated Zone using Thermal Wells." *Remediation of Chlorinated and Recalcitrant Compounds: Proceedings of the Fifth International Conference* (May 22-25, 2006). Battelle, Columbus, OH.
- Baker, R.S., D. Brogan and M. Lotti. 2006. "Demonstration of Tailored Levels of In-Situ Heating for Remediation of a Former MGP Site." Proceedings of the International Symposium and Exhibition on the Redevelopment of Manufactured Gas Plant Sites (MGP2006), Reading, England, April 4-6, 2006. *Journal of Land Contamination and Reclamation*, 14(2):335-339.
- LaChance, J.C., R.S. Baker, J.P. Galligan, and J.M. Bierschenk. 2004. "Application of 'Thermal Conductive Heating/In-Situ Thermal Desorption (ISTD)' to the Remediation of Chlorinated Volatile Organic Compounds in Saturated and Unsaturated Settings." Proceedings of the 4th International Conf. on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA, May 24-27, 2004. Battelle, Columbus, OH.
- Baker, R.S. and G. Heron. 2004. "In-Situ Delivery of Heat by Thermal Conduction and Steam Injection for Improved DNAPL Remediation." Paper 2B-18, in: A.R. Gavaskar and A.S.C. Chen (Eds.), *Remediation of Chlorinated and Recalcitrant Compounds—2004*. Proceedings of the Fourth International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Monterey, CA; May 2004). ISBN 1-57477-145-0. Battelle Press, Columbus, OH.
- Baker, R.S., H.J. Vinegar, and G.L. Stegemeier. 1999. "Use of In Situ Thermal Conduction Heating to Enhance Soil Vapor Extraction." pp. 39-57. In: P.T. Kosteki, E.J. Calabrese and M. Bonazountas (eds.) *Contaminated Soils*, Volume 4. Amherst Scientific Publishers, Amherst, MA.