10 Stevens Road
Fitchburg, MA 01420
Phone: (978) 343-0300
Fax: (978) 343-2727
jlachance@terratherm.com
www.terratherm.com

JOHN C. LACHANCE

Vice President of Project Quality and Management

PROFESSIONAL HISTORY

TerraTherm, Inc.	(2002 – present)
ENSR Consulting, Engineering, and Remediation	(1986 – 2002)
Gruber, Kirshen and Associates	(1984 – 1986)

EDUCATION

MS (Water Resources - Environmental Sciences) College of Environmental Science and Forestry at Syracuse, NY
BS (Biology - Chemistry) SUNY at Oneonta, NY

REGISTRATIONS AND TRAINING

HAZWOPER Training (40-hr. plus annual 8-hr. refresher)

SUMMARY OF EXPERIENCE

Mr. John LaChance is TerraTherm's VP of Project Quality and Management. Mr. LaChance has over 25 years of experience characterizing and remediating contaminated sites. For the last 10 years, Mr. LaChance has been involved with the design, implementation, and assessment of in situ thermal remediation (ISTR) systems at numerous sites both in the U.S. and overseas. He currently manages several ISTR projects and research efforts and provides technical leadership in the design and implementation of ISTR. He is also the author of numerous papers and presentations on ISTR and the hydrogeology of DNAPL sites. Mr. LaChance is a member of TerraTherm's Senior Management Team and is responsible for developing programs and providing guidance to ensure that all of TerraTherm's projects are implemented to the highest standards and that project performance metrics and client expectations are met within budget and on schedule.

TerraTherm, Inc., Fitchburg, MA.

- Brownfields Redevelopment, Teterboro, NJ – ISTD. ISTD. Senior technical review of hydrogeology of CVOC source zone to determine appropriate groundwater control, heating strategy, and vapor extraction design to achieve the remedial objectives above and below the water table. The treatment zone consists of interbedded sand, silt, and clay down to a depth of 20 to 30 ft. The area and volume of the source zone is approximately

3.2 acres and 123,000 cy, respectively. A slurry wall will be installed around the treatment area to cutoff horizontal groundwater flux. The estimated mass present in the treatment zone is 50,000 lbs of CVOCs and 25,000 lbs of chloroflurocarbons (CFCs). Over 920 heater wells will be installed to heat the treatment zone and more than 3,000 ft of horizontal vapor extraction wells will be installed to remove volatized contaminants and steam. Multiphase extraction wells will also be used to control groundwater flux. The detailed design has been completed and construction and implementation are expected to occur in 2012 and 2013. The total price for the project is ~$14M.

- Former Carter Carburetor Site, St. Louis, MO – ISTD. Senior technical review of hydrogeology of PCB source zone to determine appropriate groundwater control and heating strategy to achieve the required target treatment temperature of 325C above and below the water table. The treatment zone consists of silty fill overlying silty clay down to the top of bedrock (~30 ft). The area and volume of the source zone is approximately 31,000 ft2 and 33,300 cy, respectively. Heating will extend ~5 feet into the bedrock to off-set heat losses across the bottom. The bedrock underlying the site consists of fractured and karstic limestone. A slurry wall will be installed around the treatment area to cutoff horizontal groundwater flux and to allow dewatering and heating to 325C. Hydraulic tests and analyses were performed to determine the connection between the bedrock and overburden in order to estimate the rate of groundwater flux into the treatment zone during dewatering and treatment. These data will be used to design the dewatering and subsurface heating system (heater density and power output rates) to ensure that the target treatment temperature is achieved throughout the treatment zone. The project is currently in design and implementation is expected to occur in 2012 and 2013. The total estimated cost of the project is ~$7M.

- Confidential Client, Edison, NJ – ISTD. Technical director responsible for oversight of conceptual design of a full-scale project utilizing ISTD for remediation of methylene chloride in weathered and competent fractured bedrock extending above and below the water table. The target treatment zone ranges between 6,600 ft2 and 8,700 ft2 depending on which of two scenarios are selected, with the depth varying from 25 to 75 ft. The total treatment volume ranges between 10,700 and 17,200 cy. The remedial objective is 3 ug/L of methylene chloride in groundwater. Rock cores were recovered and samples collected approximately every foot for crushing and microwave extraction to determine the concentrations in the matrix in order to define the limits of the treatment zone. Detailed design and implementation are scheduled to occur in 2012. The total price for design and implementation of the project is ~$5.

- Confidential Client, St. Petersburg, FL – ISTD and SEE. Project manager and technical director for full-scale project for remediation of CVOCs and other constituents of concern within an overburden DNAPL source area comprised of approximately 1.6 acres and 104,000 cy of interbedded sands and silts located above and below the water table. Approximately 90% of the treatment zone is located beneath a building. Steam will be used to target the sand units and ISTD will target the silts. The total mass of CVOCs estimated within the treatment zone is approximately 70,000 lbs. The remedial goal is to remove all DNAPL present within the treatment zone. Groundwater will be extracted during steam injection to ensure hydraulic control. This will also result in the removal of 1,4-dioxane present in the treatment zone. Following ISTD treatment of the CVOCs, ISCO will be used to address any remaining 1,4-dioxane. The off-gas treatment system

will rely on steam-regenerated sorptive synthetic media as the primary removal mechanism. The design and permitting phase of the project is complete and implementation is scheduled for April 2012 to April 2013. The total cost for the project is ~$12M.

- Former Upjohn Facility, North Haven, CT – ISTD. Project manager and technical director for pilot project to evaluate the use of ISTD to remediate VOCs, SVOCs, and PCBs within an overburden DNAPL source area comprised of approximately 1,050 ft2 and 1,030 cy fill and waste water treatment residuals located above and below the water table. The remedial goal is to remove all DNAPL present within the treatment zone. An initial design has been completed and the wellfield is scheduled to be installed in October 2011. The pilot test design includes two phases of operation, one at 100C and a second at 325C to evaluate the relative effectiveness of these two target treatment temperatures on removal of DNAPL and PCBs. The test will include installation of a sheet pile wall around the treatment area to control groundwater flux during the high temperature portion of the test and a high R-value insulating vapor cover. Implementation is expected to occur in 2012. Total price of the project is estimated to be $3.9M.

- Silresim Superfund Site, Lowell, MA – ET-DSP. Technical director for full-scale project utilizing ET-DSP (an advanced form of ERH) for remediation of CVOCs and other constituents of concern (COCs) within an overburden DNAPL source area comprised of approximately 1.1 acres and 60,000 cy of low permeability silty sand and fill located above and below the water table. It is estimated that the treatment zone contains more than 100,000 lbs of COCs. Remedial objectives are achievement of moderate soil and groundwater concentrations for contaminants of concern (e.g., 650 ug/Kg and 870 ug/L for TCE). Operations started in July 2011 and are expected to end January 2012. The total price for the project is ~$7M.

- Groveland Superfund Site, Groveland, MA – ET-DSP and SEE. Project manager and technical director for full-scale project utilizing ET-DSP (an advanced form of ERH) for remediation of CVOCs and other constituents of concern within an overburden DNAPL source area comprised of approximately 0.3 acres and 16,510 cy of interbedded sands and silts located above and below the water table. The treatment zone extended both inside and outside a manufacturing building. Remedial objectives were stringent soil and groundwater concentrations for contaminants of concern (e.g., 77 ug/Kg and 5 ug/L for TCE). Operations occurred between August 2010 and February 2011, when the remedial goals were met and the system was shutdown. The total price for the project was ~$3.5M.

- Confidential Client, New Windsor, NY – ISTD. Project manager and technical director for full-scale project for remediation of CVOCs and other constituents of concern within an overburden DNAPL source area comprised of approximately 0.5 acres and 31,385 cy of sands, silts and clayey till located above and below the water table. The majority of the mass is located within 10 feet above and below the till unit overlying bedrock. Remedial objectives are 99% removal of the contaminant mass and consequent reductions in soil and groundwater concentrations of CVOCs. An initial design has been completed and the wellfield has been partially installed. Soil samples collected during installation of selected wells has been used to refine the extent of the treatment zone. Final design and implementation are expected to occur in 2012 and 2013. Total price of the project is estimated to be $3.6M.

- Solvents Recover Service of New England Superfund Site, Southington, MA – ISTD. Project manager and technical director for full-scale project for remediation of CVOCs and other constituents of concern within an overburden DNAPL source area comprised of approximately 1.7 acres and 47,298 cy of sands and silty till located above and below the water table. The total mass estimated within the treatment zone is approximately 1,000,000 lbs. The remedial goal is to remove all DNAPL present within the treatment zone. The project will use a specially designed phased approach to operations to reduce peak loads and the size of the off-gas treatment system and to minimize the potential for exceeding the capacity of the treatment system. This approach results in significant cost savings and ensures that the stringent emission requirements are met. In addition, because of the large amount of CVOC mass and DNAPL present in the treatment zone, an advanced drilling program utilizing sonic drilling and high temperature grout has been developed to minimize the potential for mobilization of DNAPL into the bedrock. The design and permitting phase of the project is complete and implementation is scheduled for April 2012 to April 2013. The total cost for the project is $11.2M.

- Confidential Client, Sauget, IL – ISTD and SEE. Project manager, engineering design, and technical support for field pilot study to evaluate the most cost-effective approach for using ISTD and Steam Enhanced Extraction for the full-scale remediation of a former chemical manufacturing facility contaminated with chlorobenzenes. Total volume of pilot study area is 500 cy. Over 15,000 lbs of contaminants were removed from the pilot area during the study resulting in greater than 99% reductions in soil concentrations. Total project value is $900K. Period of performance: February 2008 to September 2009.

- ESTCP Funded Project, W. Trenton, NJ – ISTD. Project manager and co-designer of research study to evaluate the use of ISTD for the remediation of CVOCs from bedrock. Field implementation of a small pilot was performed at the USGS' CVOCs/Fractured Bedrock research site at the former Naval Air Weapons Center in NJ. Controlled laboratory tests are also being performed to verify field results and to examine the removal processes for a variety of bedrock types. Total project value is $1M. Period of performance: February 2008 to December 2010.

- Confidential Client, Taunton, MA – ISTD. Project manager, technical support, and hydrogeologic evaluation for remediation of former drum disposal area contaminated with chlorobenzenes, BTEX, and CVOCs using ISTD. Total volume of treatment zone was ~3,000 cy to 20 ft depth. Remedial goals were mass reduction in treatment zone and thermally enhanced biodegradation in downgradient zone. Period of performance: April 2006 to May 2007. Total project value: $1.2M. Project was successfully completed on time and within budget. Over 14,500 lbs of contaminant mass removed from the source zone.

- Confidential Client, SE US – ISTD. Project manager, technical support, and hydrogeologic evaluation for remediation of former solvent tank area contaminated with CVOCs (TCE) using ISTD. Total volume of treatment zone was 8,700 cy to 95 ft depth, including 20 feet of fractured bedrock. Clean-up goals for constituents of concern: TCE ≤ 0.6 mg/kg. Period of performance: July 2006 – June 2007. Total project value: $1.3M. Goals were met (95% UCL of mean TCE concentration was 17 µg/kg) and project was completed on time and under budget.

- Pioneer Companies, Syracuse, NY – ISTD. Project technical support and hydrogeologic evaluation for implementation of ISTD system for the remediation of 16,200 cy of soil containing CVOCs. Site soils consisted of low-permeability silts and clays located below the water table. Clean up objectives included attaining 5.6 mg/kg of PCE in soil within treatment the zone. Project duration: July 2006 to September 2007. Total project value: $2.6M without power. Project successfully completed with 4 additional months of heating due to higher than expected groundwater flux.

- Richmond Redevelopment Agency, Richmond, CA – ISTD. Project manager/technical support for remediation of former tank farm area contaminated with CVOCs (PCE, TCE, DCE, DCA, VC) using ISTD. Total volume of treatment zone was 6,700 cy to 20 ft depth. Successfully achieved clean-up goals for constituents of concern: PCE – 1 mg/kg; TCE – 2 mg/kg; cis-1,2 DCE – 17 mg/kg; VC – 1 mg/kg. Project was on time and on budget. Period of performance: January 2005 – November 2005. Total project value: $2M.

- NASA, Huntsville, AL – ISTD. Project technical support for design and implementation of a large-scale ISTD pilot test for the remediation of soil containing CVOCs. Site soils consisted of silts and clays located below the water table. Project duration: September 2006 to May 2007. Total project value: $0.6M without power. Project successfully completed on time and within budget.

- Confidential Client Chlorinated VOC Site, Urbana, OH – ISTD. Project Manager responsible for oversight and implementation of ISTD system for the remediation of 11,500 cy of soil containing TCE, 1,1,1-TCA, and PCE. Site soils consisted of low-permeability, dense clays that were partially to fully saturated with water. Clean up objectives included attaining 1 mg/kg of TCE in soil within treatment zone. Project duration: September 2002 to December 2003. Total project value: $1.4M.

- Confidential Client Chlorinated VOC Site, Carson, CA – ISTD. Project technical support responsible for oversight of implementation of ISTD system for the remediation of 6,700 cy of soil containing 1,1-DCA. Site soils consisted of low-permeability, dense clays located below the water table. Clean up objectives included attaining 1 mg/kg of 1,1-DCA in soil within treatment zone and reducing concentrations in groundwater in underlying permeable aquifer. Project duration: November 2003 to June 2005. Total project value: $1M.

- National Grid, North Adams, MA – ISTD. Technical support for former Manufactured Gas Plant (MGP) gas holder containing soil, water, debris, coal tar, polyaromatic hydrocarbons (PAHs), BTEX, naphthalenes, and petroleum hydrocarbons. Thermal wells were used to thermally-enhanced free-product recovery, followed by implementation of ISTD. Total volume of gas holder was ~2,000 cy to 18 ft depth. Clean-up goals: all constituents of concern less than Massachusetts Contingency Plan (MCP) “Upper Concentration Limits” (UCLs). Period of performance: September 2003 – March 2005.

ENSR Corporation, Acton, MA. **Sr. Program Manager/Hydrogeologist** (1986-2002)
Served as nationwide technology leader for hydrogeology and DNAPL remediation. Example projects include:

- TEXACO Inc., Superfund Site - Chlorinated Solvent/DNAPL in Overburden and Fractured Bedrock, Clinton, IA, EPA Region 5 CERCLA Site. Technical project manager responsible for design and implementation of field investigations and modeling studies for detailed characterization of dissolved and Dense Non-Aqueous Phase contaminants in a fractured karst bedrock setting. Developed design of state-of-the-art groundwater remediation system involving a hydraulic containment system for suspected DNAPL source areas and a pump-and-treat system for areas with dissolved phase contaminants only.

- Naval Weapons Industrial Reserve Plant, Chlorinated Solvent Superfund Site, Bedford, MA, EPA Region 1 CERCLA Site. Senior oversight and management of investigation, modeling, and remedial assessment activities. Activities included: Negotiations with agencies and other PRPs concerning modeling approach and results; nature and extent of contamination; DNAPL occurrence in overburden and bedrock; site hydrogeology; delineation of plumes and responsibility, and implementation of remedial measures; including evaluation and pilot testing of in-situ thermal technologies.

- Zeneca Inc., Evaluation and Remediation of Chlorinated Benzenes/DNAPL, Dighton, MA, EPA Region 1 RCRA Site. Developed detailed conceptual model relating site geology, groundwater flow, surface water flow, contaminant distributions, and contaminant fate and transport for chlorinated benzene/DNAPL site. The conceptual model was presented to the agencies and provided the basis for focusing remaining investigation efforts and developing appropriate remedial objectives and approaches. Remedial technologies and approaches considered included: phytoremediation for source degradation/stabilization and containment; groundwater extraction for containment, and high temperature in-situ thermal desorption for source zone treatment (chlorinated benzenes).

- U.S. ACOE, Cold Regions Research and Engineering Laboratory, Design and Implementation of $KMnO_4$ ISO Pilot Test, Hanover, NH. Design and implementation of in situ chemical oxidation (ISO) pilot test to evaluate the effectiveness of injecting potassium permanganate into the subsurface to remove immiscible phase trichloroethene (DNAPL) from low permeability silt layers in the unsaturated zone. The conceptual design included injection of the potassium permanganate into permeable sand zones above and below the silt layers containing the DNAPL and allowing advective/diffusive processes to deliver the permanganate. Activities included: detailed profiling of the pilot areas to refine subsurface geology and contaminant distributions; installation and sampling of suction lysimeters for collection of in situ pore water samples from the unsaturated zone; and evaluation and design of the pilot systems.

- U.S. ACOE, Cold Regions Research and Engineering Laboratory, Deep Subsurface Hydrogeologic Characterization and Delineation of DNAPL, Hanover, NH. Developed and managed detailed subsurface characterization program for determining the presence of DNAPL in the subsurface and collecting information for the evaluation and design of two deep in situ air sparging pilot tests. Activities included: collection of over 1,000 feet of continuous soil cores, to depths of 170 feet, using roto-sonic drilling methods; and field screening and sampling of soil cores for DNAPL, contaminant distributions, and physical and hydraulic soil properties. Developed detailed conceptual

model of site geology and DNAPL/contaminant distributions. Data and conceptual model provided basis for evaluation of air sparging pilot test results and evaluation of alternative remedial measures.

- Naval Air Station South Weymouth, Superfund Site - Evaluation of Hydrogeology and Review of ISO Pilot Test, Weymouth, MA. Senior hydrogeologist responsible for: 1) Review of hydrogeologic and contaminant data and development of conceptual models of groundwater flow and contaminant fate and transport; 2) Development of Phase II hydrogeologic investigation work plans; 3) Negotiations with agency relative to site conceptualization, nature and scope of hydrogeologic investigations, and remedial strategies; and 4) Development and oversight of monitoring program to evaluate the effectiveness of an in situ oxidation pilot test for the remediation of chlorinated solvents in a fractured bedrock setting.