

## Terra Systems Core Competencies

### Treatability Study Laboratory

Terra Systems has conducted over 200 treatability studies and is one of the most experienced. Typical treatability studies and lab services include:

- In Situ Anaerobic Bioremediation Microcosm Studies of Chlorinated Solvents
- In Situ Chemical Oxidation Studies
- Column Studies for Bioremediation and pH Buffering
- In Situ Aerobic Bioremediation Studies of Petroleum
- Monitored Natural Attenuation Studies of Chlorinated Solvents and/or Petroleum Hydrocarbons
- Petroleum Hydrocarbon Utilizer Counts
- Total Heterotrophic Bacteria Plate Counts
- Inorganic Nutrient Additions
- Oxygen Sources from Sparged Oxygen, Slow Release Oxygen Compounds, or Hydrogen Peroxide
- pH Control

pH control at anaerobic sites is a key driver of success with an optimal pH range between 6.5 and 8.5. The reductive dechlorination process produces acidic conditions therefore to achieve optimal pH conditions; we recommend that the pH buffering capacity of the site's soil and groundwater be determined. We determine the quantity of several potential amendments to neutralize the acidity of the groundwater at a potential bioremediation site, which include:

1. sodium bicarbonate
2. calcium carbonate
3. sodium carbonate or soda ash
4. magnesium oxide

The objective is to select a buffering agent that can be added to increase the groundwater pH and maintain neutral conditions needed for biological reductive dechlorination. The criteria for selecting the pH buffering agent are the following:

1. Increases the pH to between 7 and 9
2. Does not exceed pH 11
3. The lowest price (either the lowest cost per unit or lower price for a larger quantity)
4. Is relatively soluble or has fine particles that can be suspended in the chase water

The Treatability Lab supports new product development, which includes formulation design and testing.



Recent products, which were designed in conjunction with real customer site problems include:

1. **SRS<sup>®</sup>-Z** emulsified vegetable oil and zero valent iron for improved injectability and radius of influence
2. **SRS<sup>®</sup>-M** for mixed chlorinated and Cr<sup>6+</sup> plumes
3. **SRS<sup>®</sup>-FR** for high groundwater flow rate aquifers



Michael Lee, Ph.D. has over 25 years experience conducting treatability studies and provided oversight for the first successful anaerobic bioaugmentation project for TCE and cDCE at Dover AFB, DE in 1997. To discuss a potential treatability study with Dr. Mike Lee or to obtain a '**sample**' treatability report call him at the lab at **302-798-9553** or email him at [mlee@terrasystems.net](mailto:mlee@terrasystems.net).