



Highlights

ERDENHANCED™ cVOC BIOSTIMULATION

safe, sustainable, effective

- Faster Kinetics
- Expedited Solubilization
- Increased Bioavailability
 - Greater Longevity
- Complete Biotransformation

ERDENHANCED™ Superior Performance realizing complete biotransformation faster

ERDENHANCED™ Sustainable extended effect-residency times and longer reducing conditions

ERDENHANCED™ Biostimulates native microbial populations, expedites residual source mass solubilization, and dissolved-phase contaminant destruction

ERDENHANCED™ Cost-effective lowering overall remediation impacts and costs

Call **TerraStryke®** to realize safe, sustainable, and effective cVOC destruction!!

www.terrastryke.com

TerraStryke® ERDENHANCED™

Deep Aquifer cVOC Groundwater Remediation Evaluation Process Using Simple Additive Delivery Approach; NASA, Stennis Space Center Area D

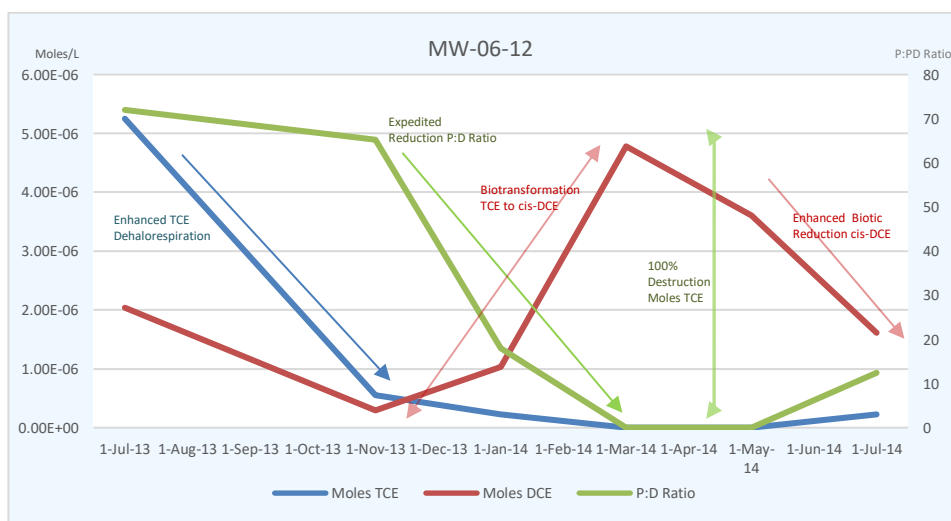
TerraStryke® Products LLC (*TerraStryke®*) develops and distributes biostimulation additives proven to enhance any bioremediation project using low-impact, cost-effective biostimulation.

Background: Passive Release Sock (PRS) Pilot Study performed at NASA Stennis Space Center to evaluate additive efficacy under actual biogeochemical conditions. Past Site use impacted several water bearing groundwater units with Trichloroethylene (TCE). PRS based pilot implemented at Area D using monitoring well MW06-12, screened within the 3rd and deepest water bearing unit impacted with TCE. Lab based microcosm evaluation also performed.

Process: MW06-12 amended using ERDENHANCED™ filled PRS units suspended vertically in screened well interval. PRS units replaced 5-times over 14-month study creating ≈3ft AOI. Baseline/Performance groundwater monitoring, sampling, analytical testing completed each replacement event. Additive efficacy determined by comparing performance data to baseline.

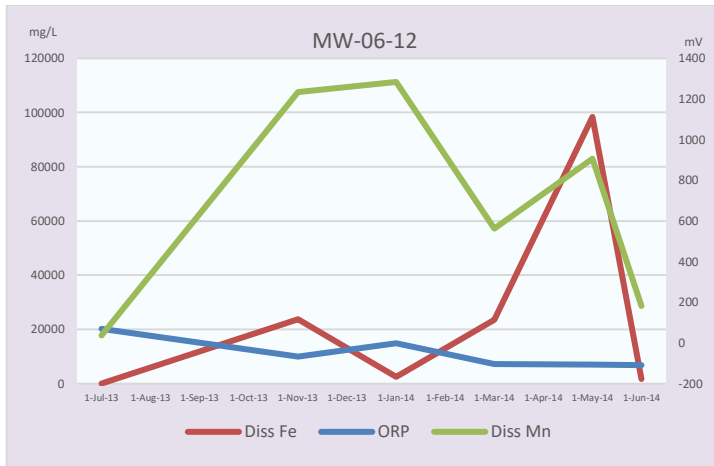
RESULTS: ERDENHANCED™ amended MW06-12 groundwater realized >99.99%_{REDUCTION} TCE; an overall 95.7%_{REDUCTION} moles TCE, 82.7%_{REDUCTION} total moles cVOC^s, and 82.7%_{REDUCTION} in P:PD Ratio. Specifically, field monitoring and analytical testing recorded the following:

- >99% reduction TCE by month 7 of evaluation
- >85%_{REDUCTION} moles cis-DCE followed by > 1,530% increase during months 6-8; then,
- >66%_{REDUCTION} moles cis-DCE from peak bioavailability with continued downward trend.
- No Vinyl chloride recorded throughout evaluation
- Secondary geochemistry provides evidence supportive of biotic dechlorination



ERDENHANCED™ is a Carbon based additive which leverages existing site biogeochemical conditions to realize safe, sustainable and complete biotransformation of chlorinated volatile organics (cVOC^s); ERDENHANCED™ represents today's low-impact, low-cost solution to groundwater remediation.

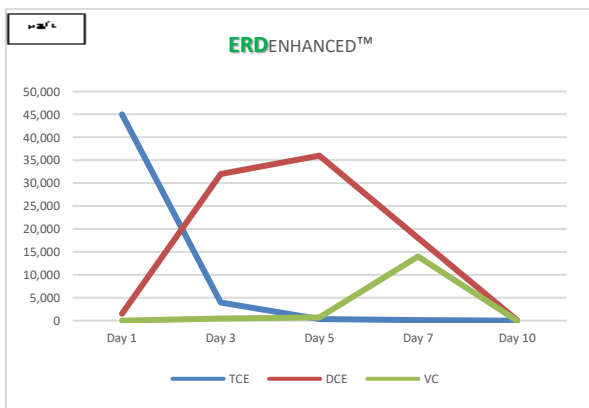
Secondary Lines of supportive evidence are plotted in the following graph:



- **98.3% decrease** dissolved Iron after 4-fold increase
- **85.7% decrease** dissolved manganese after > 3,000% increase
- 30,000% increase sulfate by month 6; complete **depletion** by end of evaluation period
 - Sustained decrease in ORP
 - General increases methane

Changes in treatment zone geochemistry provide secondary supportive evidence of additive enhanced reductive dechlorination by native microbial populations

Microcosm Study: Independent lab-based microcosm study was performed by CB&I Environmental & Infrastructure at their Lawrenceville NJ facility; purpose being to compare the efficacy of **ERDENHANCED™** to Lactate as sole electron donors to enhance reductive dechlorination. Microcosms used Site groundwater spiked with 45,000 µg/L TCE and consortium of *Dehalococcoides* (SDC-9) at initial concentration of 1 x 10⁷ cells/mL. Electron donors each added at 1.35 g/L. Killed Control/treatment microcosm with no additive established for comparison purposes. The following graphs plot the results.

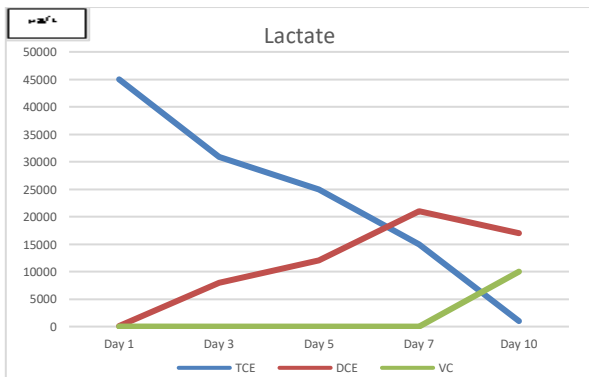


ERDENHANCED™ amended microcosm realized superior performance:

- ✓ >99.9%REDUCTION TCE by day 5
- ✓ >99.7%REDUCTION CIS-DCE by day 10 after >2,300% increase
- ✓ >99.9%REDUCTION [VC] at day 7 after **Four** Order-Magnitude Increase

ERDENHANCED™ amended microcosm demonstrated superior performance with complete biotransformation of cVOC contaminants.

Safe, Sustainable, Effective cVOC destruction!



Lactate amended microcosm:

- Required twice the time to biotransform same parent [TCE]
- Attained < 20% reduction in [cis-DCE] after lesser daughter production
- [VC] continuing to increase at the end of the evaluation after 3-fold increase

