



Project Highlights

- **ERDENHANCED™** Pilot Study
>72% reduction in PCE molar mass in 8-month period.
- **ERDENHANCED™** Proven Cost-Effective **Green** Source Mass Destruction Strategy
- **ERDENHANCED™** Proven Cost-Effective **Sustainable** Biostimulation Strategy
- **ERDENHANCED™** evaluation performed under Ministry of Environment (MOE) approval
- **ERDENHANCED™** Pilot Study Demonstrated Contaminant Reductions in 8-months:
 - >81% PCE
 - >92% TCE
 - >80% cis-DCE
- **ERDENHANCED™** Reduces Site Time, Operational Costs
- **ERDENHANCED™** Provides Long-Term Complete cVOC Biotransformation
- **ERDENHANCED™** Maximum Solubility Providing Multiple Deployment Options with Minimal Water Usage



Dry Cleaner Facility Redevelopment Opportunity DNAPL Source Zone **ERDENHANCED™** In-Situ Remediation Pilot Study Stoney Creek, Ontario Canada

BioStryke® Remediation Products, LLC, provide innovative and cost-effective amendment formulations designed to biostimulate treatment zone conditions and enhance the in-situ destruction of Site contaminants. **BioStryke® ERDENHANCED™** leverages existing conditions facilitating passive-aggressive destruction of cVOC dissolved, sorbed, residual source mass eliminating above-ground, energy-consuming emissions-generating equipment. **ERDENHANCED™** is proven effective in terms of both cost and performance, allowing Site compliance with less environmental impact, working with Mother Nature, not against.

A current Site activity at the multiuse building includes retail dry cleaning distribution. Past Site use included dry cleaning operations with the handling of the chlorinated volatile organic compound (cVOC) tetrachloroethylene (PCE) resulting in adverse impacts to subsurface soils and groundwater. Previous remedial efforts have proven costly, and additional work is required to facilitate redevelopment. In an effort to identify a sustainable in-situ remedial strategy, the City of Hamilton Ontario and the Site Owner implemented a Pilot Study to evaluate the efficacy of **ERDENHANCED™** under actual Site conditions. Within 8-months of the evaluation treatment zone cVOC concentrations realized the following:

- Tetrachloroethylene (PCE) decreased **>81%**
- Trichloroethylene (TCE) decreased **>92%**
- cis-DCE decreased **>80%** and
- **100%** reduction in VC after short generation period

The City of Hamilton sponsored Pilot Study demonstrated **BioStryke® ERDENHANCED™** a cost-effective strategy for passive-aggressive source zone cVOC contaminant destruction. The Pilot Study provided a low-cost low-risk efficacy evaluation process prior to full-scale remedial strategy commitment. Pilot Study groundwater was amended using Passive Release Sock (PRS) deployment units filled with **ERDENHANCED™**. PRS units fit within existing 2-inch groundwater monitoring well. PRS units remain suspended within the screened interval of the test well, undisturbed, passive-aggressively amending a vertical column with an area-of-influence (AOI) of < 3-ft. Groundwater sample/analytical testing events are performed at the start, and at regular intervals throughout the evaluation, to include replacement of PRS deployment units. PRS Pilot Study provides a low-cost, low-risk process for Owner(s), Regulators, and Practitioners to evaluate amendments ability prior to full-scale remedial commitment.

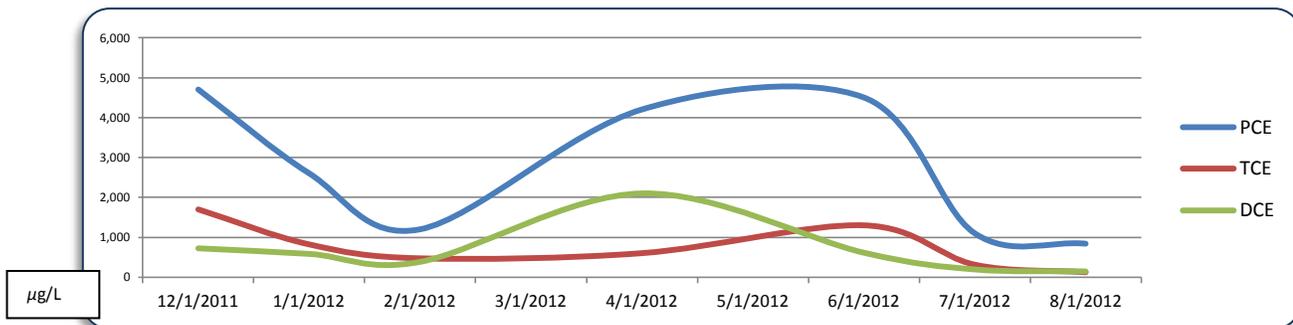
BioStryke® amendments are suitable for any type of deployment such as Direct Push Technology (DPT), infiltrations gallery, and direct application due to enhanced solubility.

BioStryke® amendments are easy to handle, requiring less water, less pore space displacement, less site time, less overall remedial costs.

BioStryke® amendments maximize project margins while minimizing project impacts.

At the site, source area PCE groundwater concentrations \approx 5,000 micrograms per liter ($\mu\text{g/L}$). As noted on the previous page, the AOI of the amended test well is very limited, resulting in no long-term impact to site geochemical conditions. As such, Pilot Study impacts are very short lived with groundwater conditions typically returning to baseline conditions in less time than it took to complete the evaluation. However, due to the proprietary components found in **ERDENHANCED™**, full-scale amendment is proven sustainable after a single deployment event.

BioStryke® ERDENHANCED™ facilitates both dissolved phase and residual source mass contaminant destruction by stimulating native microbial populations to scavenge competing terminal electron acceptors (TEAs) such as oxygen, nitrate, oxidized iron/manganese, and sulfate which typically limit cVOC dechlorination. **ERDENHANCED™** also facilitates the generation of volatile fatty acids (VFAs) which provide a surfactant affect, assisting desorption and increased bioavailability of residual contaminants. The graph below summarizes the performance data ($\mu\text{g/L}$) collected during the herein described Pilot Study.



It is of great importance to note **prior** to the deployment of **ERDENHANCED™** the majority of site cVOC contaminants were parent PCE concentrations with little to no detectable concentrations of the daughter products TCE, DCE or VC indicating minimal biodegradation occurring. Subsequent to deployment of **ERDENHANCED™**, contaminant destruction rates increased dramatically, as did residual source mass flux, and continued providing cost-effective and sustainable biotransformation.