

Project Highlights

- **TPHENHANCED™** proven to expedite biodegradation of saturated soil/groundwater PHC contaminants, *anaerobically*
- **TPHENHANCED™** facilitated **>83%** reduction in total [TPH] over 13-week evaluation period.
- **TPHENHANCED™** proven **Green** and **sustainable** strategy, minimizing environmental impact and remedial costs.
- **TPHENHANCED™** **cost-effective** site compliance reducing long term monitoring, operations, and maintenance.
- **TPHENHANCED™** leverages existing Site conditions to realize enhanced in-situ contaminant biodegradation.
- **TPHENHANCED™** eliminates above-ground support equipment costs/needs; ideal for remote site locations with limited access and energy.



TPHENHANCED™ Pilot Study - Residual Petroleum Remediation Various Fuel Oils (JP, JP4, No 2) Searsport Pipeline Pump Station Argyle, Maine: Former Loring Air Force Base

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

The Maine Department of Environmental Protection (MEDEP) implemented a Pilot Study to evaluate the efficacy of **TPHENHANCED™** under actual Site conditions. The 105 day evaluation realized a **> 83%** decrease in total extractable petroleum hydrocarbons (EPH) *without* the use of costly aboveground, fuel consuming, emissions generating equipment. The MEDEP sponsored Pilot Study demonstrated **BioStryke®** amendment **TPHENHANCED™** a cost-effective in-situ strategy for the destruction of source zone PHC contaminants.

Pilot Study groundwater was amended using Passive Release Sock (PRS) deployment units. Each amendment filled PRS unit fits in an existing 2-inch groundwater monitoring well. PRS units remain suspended, undisturbed, within the screened interval of the test well, passively-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's provide a low-cost, low-risk process for Owner(s), Regulators, and Practitioners to evaluate the amendments ability prior to full-scale remedial commitment.

BioStryke® amendments, due to enhanced solubility, are suitable for multiple deployment strategies including Direct Push Technology (DPT), infiltration gallery, or direct application.

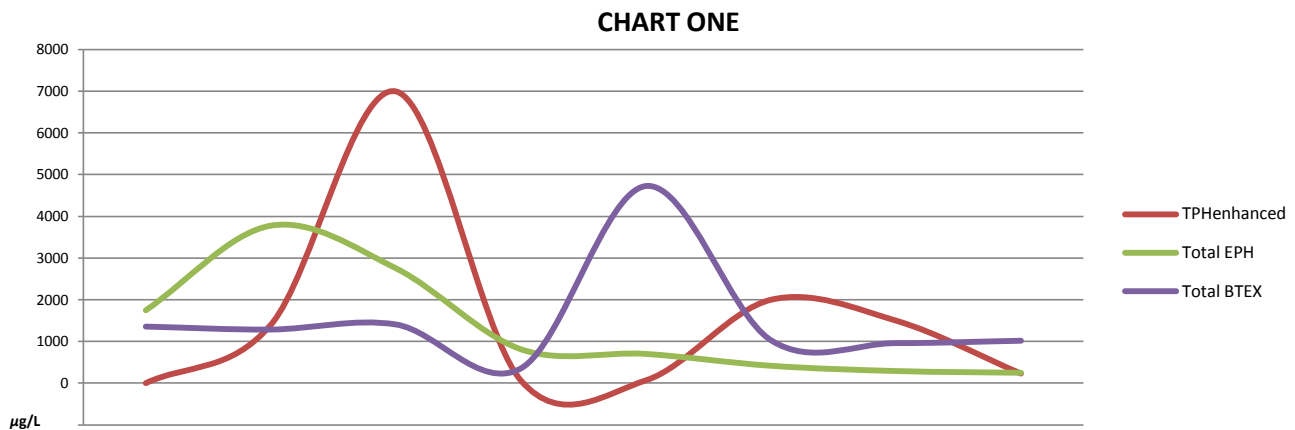
BioStryke® amendments provide ease of handling, requiring less water, less pore space displacement, less site time, less overall remedial costs.

BioStryke® amendments maximize project margins while minimizing project impacts.

The Argyle Pump Station (Site) is located in a sparsely populated rural area of Maine, established in 1952 by the Air Force, the 6-inch diameter welded pipe buried 2-feet deep served to convey aviation gas (AVGAS) and jet fuel (JP-4) from an Atlantic Ocean terminal to the inland Loring Air Force Base (AFB). The Site is typical of many sparsely populated, energy limited sites with residual smear zone and dissolved phase contaminants, recalcitrant in terms of cost and performance against traditional physical and/or O₂ based remedial strategies. **TPHENHANCED™** leverages the momentum Mother Nature provides to passively-aggressively enhance the bioavailability of residual source mass contaminants.

TPHENHANCED™ provides consistent and cost-effective biodegradation of dissolved phase petroleum hydrocarbon contaminants as well as residual source mass. As indicated on the previous page, **TPHENHANCED™** biostimulates existing Site conditions and native microbial populations to facilitate increased rates of contaminant biodegradation, passive-aggressively, without the use of costly and emissions-generating equipment. As with other **TPHENHANCED™** Pilot Study evaluations and full-scale amendment applications, petroleum hydrocarbon compound (PHC) concentrations decrease by greater than 80% in less than 3 months post initial amendment deployment. Throughout any period where amendment availability is consistent, while trending downwards overall, PHC contaminant concentrations will cycle, representing periods of dissolved phase contaminant assimilation followed by a corresponding desorption of residual source mass.

At Argyle the overall rate of EPH biodegradation was markedly superior to that of either TPH or BTEX; however, significant desorption of residual source mass was observed during the evaluation and, from Day 0 to 61 total [VPH+EPH] decreased 71% while total BTEX compounds decreased 75%. From day 62 to 105 BTEX compounds decreased 80% which, several weeks prior, observed a massive flux of residual source mass (spike in dissolved phase concentrations) and increased bioavailability into the groundwater. The chart below graphs the concentrations of total TPH, EPH and BTEX contaminants during the 105-day period. No amendment was replaced after the completion of the evaluation.



BioStryke® Remediation Products LLC estimates full-scale amendment costs to remediate both soil and groundwater adversely impacted by TPH contaminants at the Site to approximate **less than \$5.00 per treated ton**; with no off-site transportation, no off-site disposal, and/or any on-site soil import needs while, eliminating any long-term on-site energy consumption.