

## IN SITU AEROBIC BIOREMEDIATION OF BTEX AND MTBE SUPER-OX™ SYSTEM & ENHANCEMENTS

<b>Type of Project:</b>	Full-scale
<b>Contaminants Treated:</b>	BTEX, MTBE and gasoline-range hydrocarbons
<b>Concentration:</b>	2,000 ppb dissolved benzene and 10,000 ppb dissolved MTBE
<b>Technology Applied:</b>	Aerobic Bioremediation via GW augmentation, oxygenation & recirculation
<b>Geology:</b>	Silty sand
<b>Treatment Interval:</b>	GW and smear zone at 4-9 feet bgs
<b>Average % Reduction:</b>	benzene <5 ppb and MTBE concentrations <20 ppb sitewide
<b>Timeframe:</b>	total of 3 years
<b>Project Reference:</b>	Mr. Chad Hunter, Chambers Environmental Group, Bellefonte, PA (814) 355-2241 main office

**SITE DISCUSSION:** ETEC, LLC installed an automated Super-Ox™ system to operate in conjunction with an existing pump-and-treat (P&T) system to treat BTEX- and MTBE-contaminated soil and groundwater. The gasoline release originated from leaking underground storage tanks (USTs) and dispenser piping. ETEC worked with the environmental site consultant to retrofit the Super-Ox™ equipment within an existing remediation compound. In this configuration, extracted groundwater was pre-treated using the existing equipment, processed through the Super-Ox™ equipment to deliver >40 ppm DO levels along with nutrients and bacteria, and re-injected by the Super-Ox™ equipment into former AS/SVE wells throughout the plume. Existing monitoring points were used to track remediation progress.

**GOALS:** The closed-loop groundwater recirculation system has several remediation goals, including:

- hydraulic control of the existing plume
- degradation of the persistent MTBE and benzene to PA Statewide Health Standards
- no contaminant rebound during post-remedial monitoring

**SYSTEM LAYOUT:** Remediation system operation included:

- Ongoing delivery of appropriate masses of nutrients and MTBE-utilizing bacteria
- Aerobic plume conditions constantly maintained through automatic, programmed delivery of 40-ppm DO concentrations
- Injection/extraction well layout creating recirculation “cells” for optimum DO, nutrient, and bacteria delivery

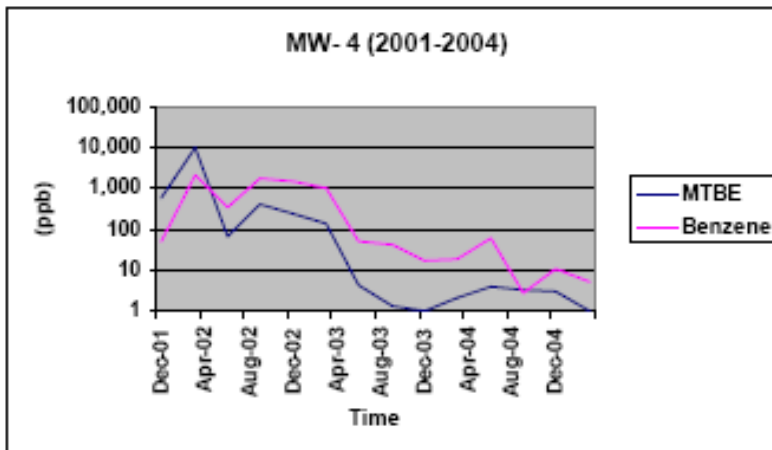
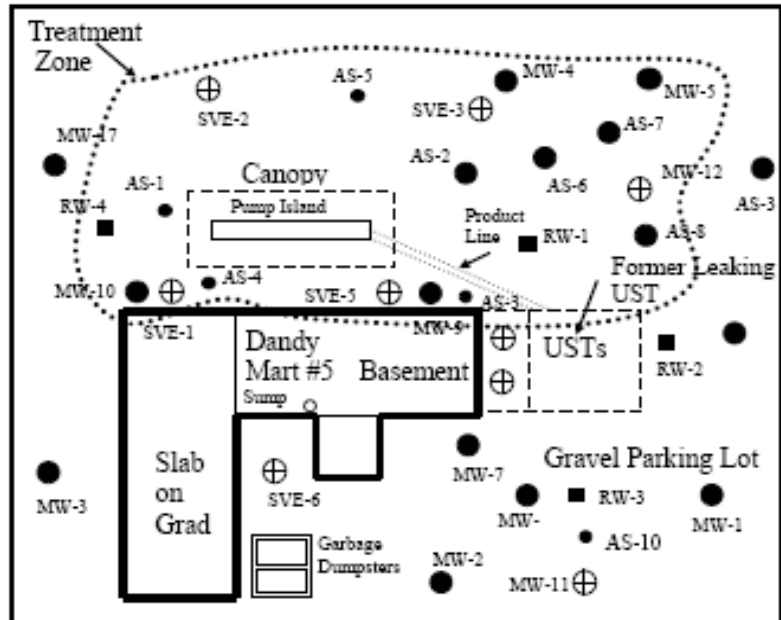


# CASE STUDY

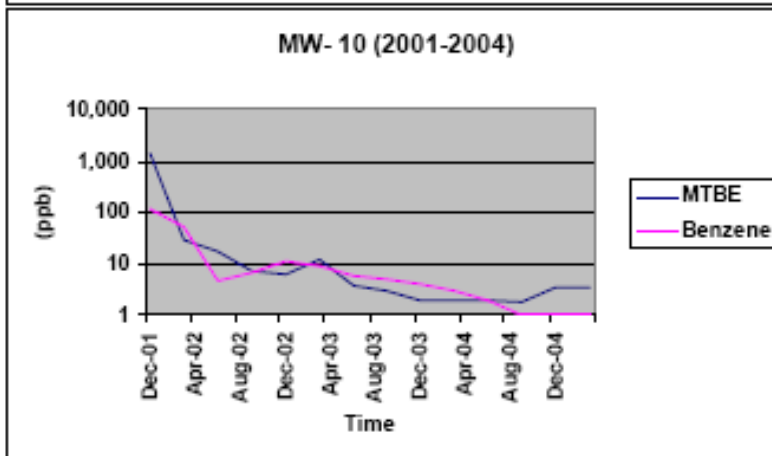
TYPE: In Situ Bioremediation (TPH)  
 COMPONENTS: Oxygenation Equipment and Amendments

## RESULTS:

- During the 3-year life of the project, more than 2 million gallons of oxygenated water was recirculated
- By circulating multiple GW pore volumes, the Super-Ox™ equipment maximized oxygenation and contact with dissolved MTBE
- Within the first 9 months of treatment, the system achieved 97% reductions in dissolved benzene, and 96% reductions in MTBE concentrations across the entire plume.



*The most important aspect of this remediation project was the consistent reductions in MTBE, which were directly attributable to aerobic biological degradation.*



*This aerobic biological activity was only possible with constant delivery of dissolved oxygen, nutrients, and MTBE-utilizing bacteria.*

*The total remediation cost for the equipment and biological enhancements over the 3-year treatment timeframe was \$160,000.*