

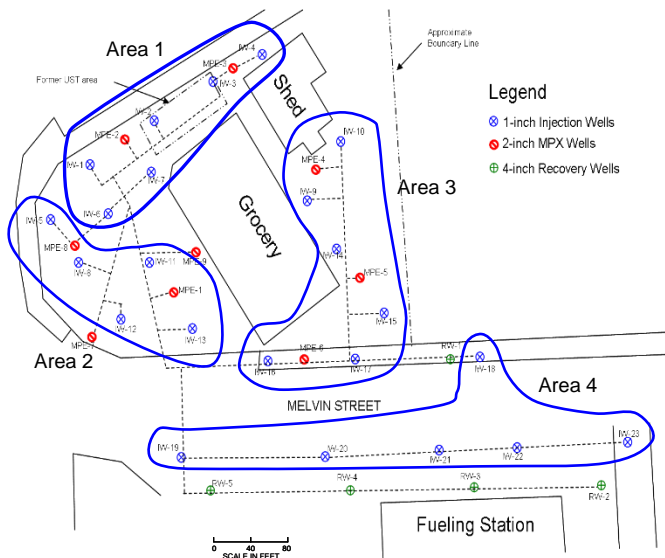
IN SITU AEROBIC BIOREMEDIATION OF GASOLINE CONSTITUENTS SUPER-OX™ SYSTEM & ENHANCEMENTS Former Fueling Station, Brooker, FL

- Type of Project:** Full-scale demonstration
- Contaminants Treated:** BTEX, MTBE, Naphthalene, 1- & 2- methylnaphthalene, TPH
- Concentration:** Maximum of 12,000 ppb total BTEX observed
- Technology Applied:** Multi-phase extraction with aerobic bioremediation via GW augmentation, oxygenation & recirculation
- Geology:** Fine sand
- Treatment Interval:** 6-20 ft bgs
- Average % Reduction:** >93% reduction of BTEX in the on- and off-site area
- Timeframe:** 24 months of active MPX and GW recirculation

DESCRIPTION

A skid-mounted 40-gpm Super-Ox™ system was used at a former fueling station to treat gasoline contaminated soil and groundwater. The full-scale location is the source area and has the dimensions of 90 feet wide by 300 feet long, and a saturated thickness of 10 feet (total volume of 10,000 cubic yards). Saturated zone lithology is fine sand.

The Super-Ox™ equipment was fabricated and installed by ETEC, and was able to oxygenate and re-circulate over 10 million gallons of groundwater over a 24-month timeframe. The re-circulation groundwater was amended with biological enhancements and nutrients.



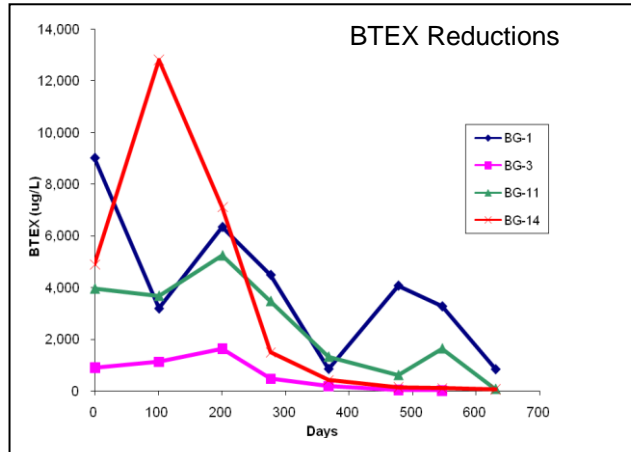
Groundwater was extracted from 9 MPX wells (red MPEs) and 5 recovery wells (green RWs). Following extraction, oxygenation, and amendment, the treatment water was redistributed into 23 injection points (blue IWs).

ETEC trained the consultant to operate the Super-Ox™ equipment. We also provided the appropriate biological product and nutrient application rate, which was based on the mass of fuel constituents and the size of the impacted area. Monitoring wells were used to assess the effectiveness of the approach. Groundwater samples were analyzed for regulated fuel constituents, nutrients (nitrogen, phosphorus, micro-nutrients), bacterial plate counts, and other water quality parameters (pH, DO, ORP, etc.) during the 24-month treatment. This data was used to modify the treatment to maximize efficiency.

RESULTS & DISCUSSION

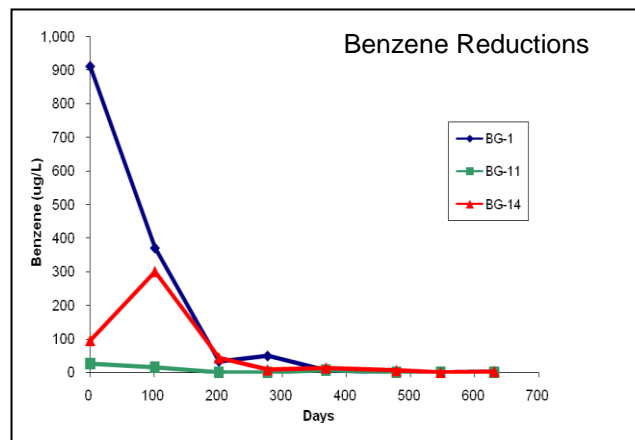
Results and observations from the full-scale implementation include the following:

- BTEX concentrations onsite were reduced by greater than 88% within 12 months
- Benzene concentrations were reduced by more than 99%
- Total impacted area was reduced by 93% within 24 months
- 3,800 lbs. of dissolved oxygen and 3,030 lbs. of secondary electron acceptors were delivered to the subsurface
- Up to 4,300 lbs. of TPH was degraded biologically or removed physically



Benzene across the site was reduced to below 3 ppb within 24 months, showing that achievement of strict regulatory goals can be obtained quickly.

The results demonstrate that aggressive groundwater recirculation can achieve effective electron acceptor delivery that promotes rapid BTEX reductions within a reasonable timeframe.



Incorporating the DO-IT™ system with the MPX/groundwater recovery system enhanced hydraulic control and contaminant recovery. Sewer disposal costs were also eliminated using the automated groundwater re-circulation method, resulting in reduced effort and costs.