

PROJECT DESCRIPTIONS

DESIGN AND INSTALLATION OF A DUAL EXTRACTION AND BIOENHANCEMENT REMEDIATION SYSTEM

DALLAS - FT. WORTH AREA, TEXAS

1998 - PRESENT

INNOVATIVE ENGINEERING SOLUTIONS, INC. has designed, installed and operated a bio-enhanced remediation system at a large industrial facility in Grand Prairie, Texas within the framework of the voluntary cleanup program (VCP). The facility has experienced releases of trichloroethylene (TCE), tetrachloroethylene (PCE), methylene chloride, benzene, toluene, ethylbenzene, xylenes (BTEX), 1,1,1-trichloroethane (1,1,1-TCA), and ketones into the environment over the past 30 years.

The remediation system consists of 12 dual extraction, 4 groundwater extraction, 5 vapor extraction and 18 bioenhancement wells. The remediation system includes groundwater and vapor phase treatment using steam-regenerable granular activated carbon. The dual extraction system is removing the volatile organic compounds (VOCs) in the vadose zone and the dewatered soil, while the bioremediation system is remediating the portions of the saturated zone that are not dewatered. The dual extraction system was required in order to distribute nutrients through the fairly low permeability formation (as well as for VOC mass removal). Electron donors and nutrients (lactate and phosphate) are added to the groundwater via the bioenhancement wells. Large portions of the site also require bioaugmentation (addition of imported ethenogens).

As part of the design process, IESI completed a biogeochemical investigation, biotreatability testing to determine the optimum amendment doses for bioenhancement, and conducted groundwater modeling



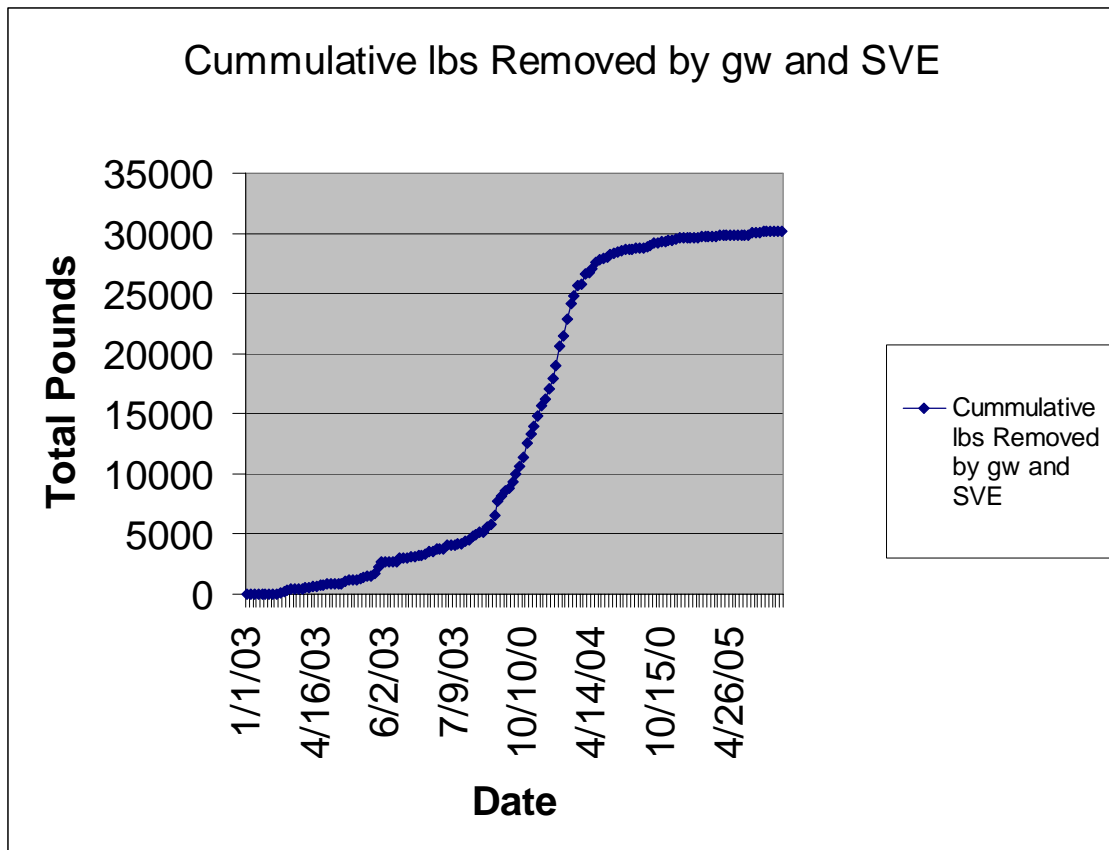
Electron donor storage tank and bioenhancement well network

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(using visual modflow) and vapor extraction modeling (using AIRFLOW™) to determine the optimal locations of the extraction wells.

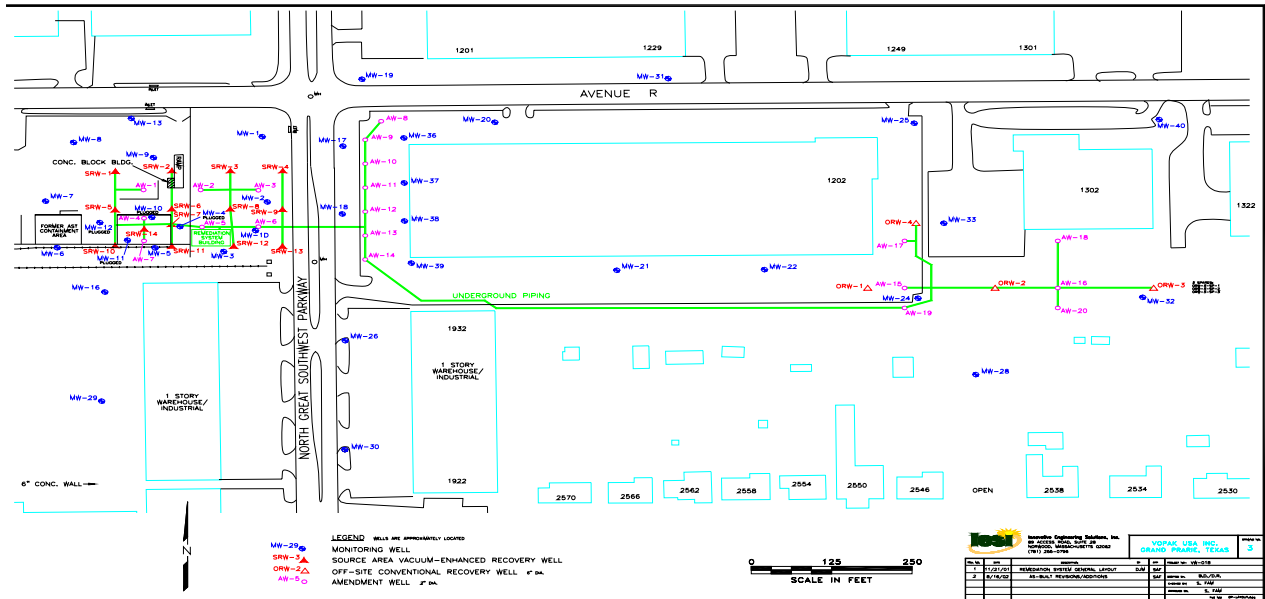
The bioenhancement system is a state of the art automated electron donor mixing and injection system. Combined with the electron donor distribution system is a bioaugmentation delivery system that injects ethenogens (responsible for dechlorination of DCE to ethene) into the enhancement wells. Ethenogens are grown on-site in a 300-gallon reactor and are distributed to areas of the site requiring bioaugmentation.

In 24 months of operation, the remediation system has recovered over 30,000 lbs. of NAPL from the carbon regeneration system. Total VOCs in the source area have been reduced from approximately 600 ppm on average to approximately 10 ppm on average with many of the wells nearing non detectable levels! The near off-site VOC concentrations have been reduced from over 100 ppm to less than 1 ppm.

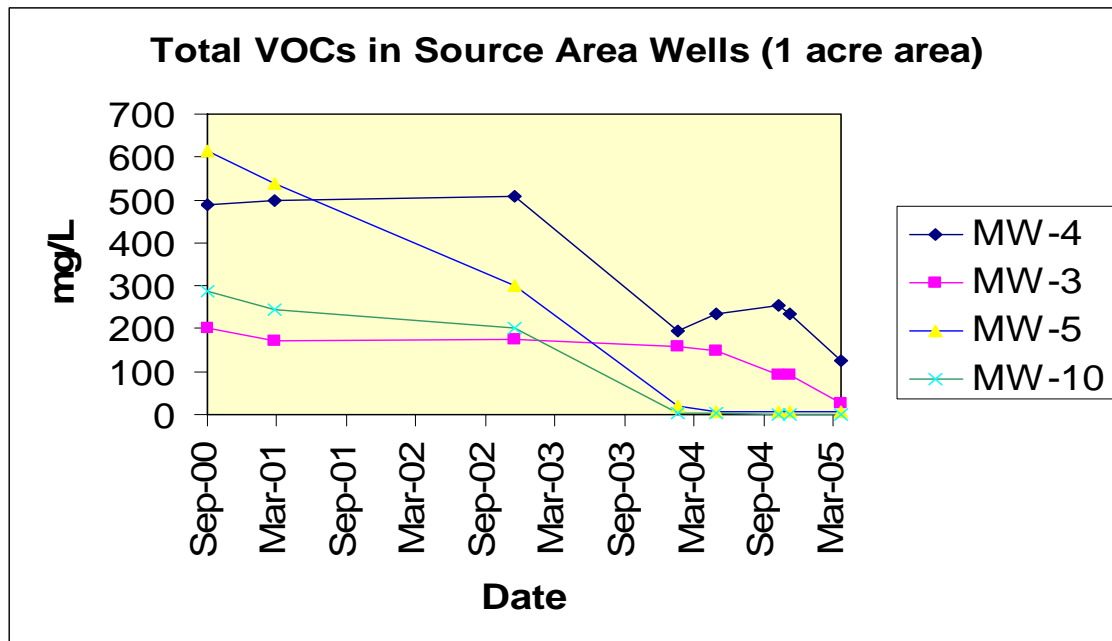


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System Layout



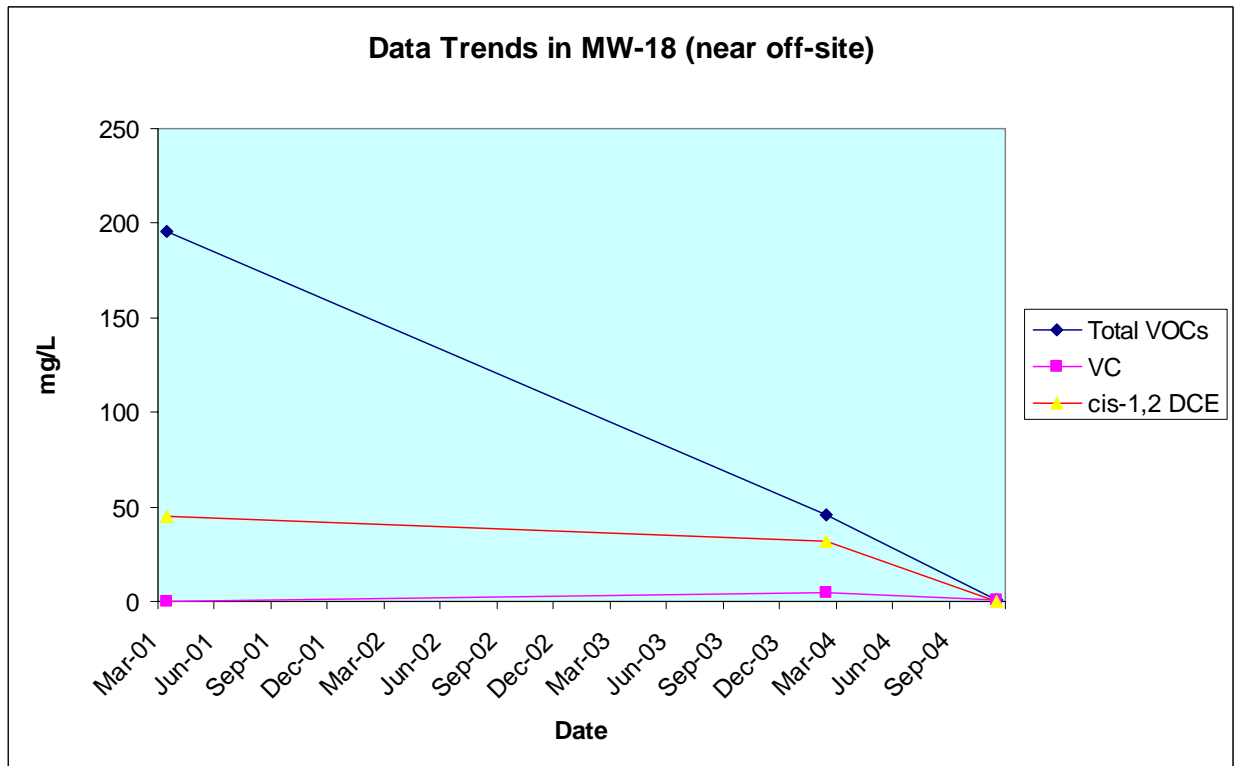
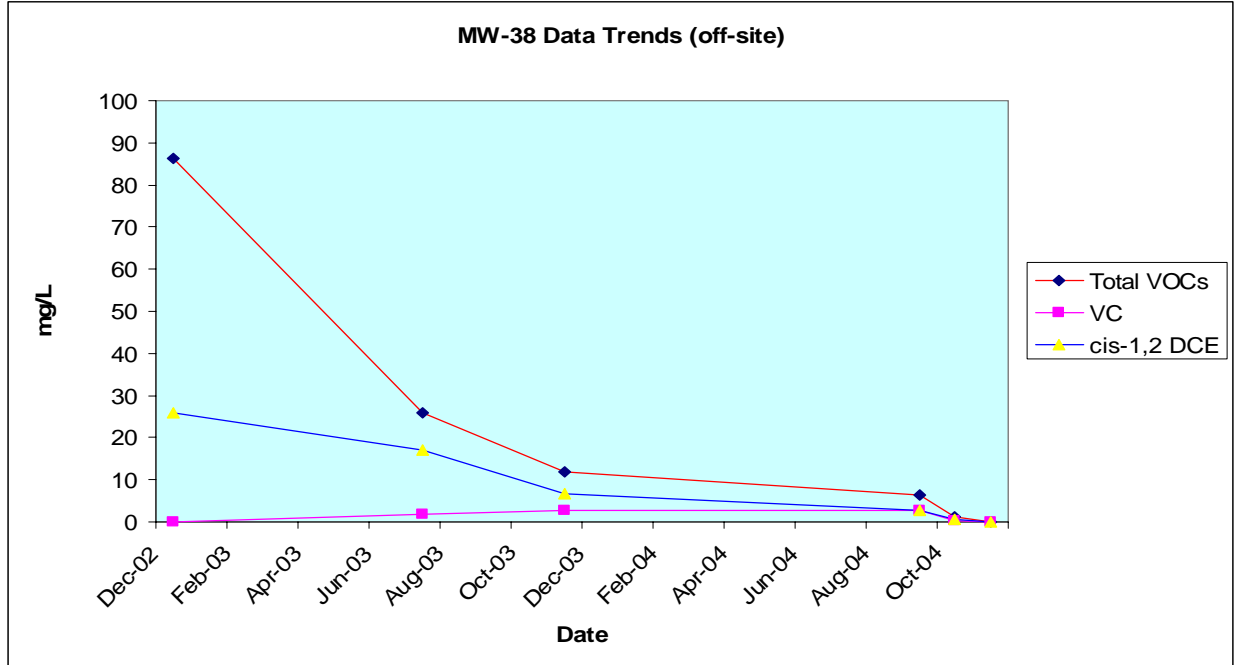
Shown above is a site layout map showing the source area (left); near off-site (Southwest Parkway) and far off-site areas



Shown above is a time concentration trend map for total VOCs in the source area wells



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Show above are time concentration data trends for 2 near-off-site wells