

PERFORMANCE-BASED OBJECTIVES ACHIEVED AT SCOTT AFB

CASE STUDY:
**PetroFix Reduces Benzene
Levels to Non-Detect**





Overview

Corrective Action Plan (CAP) Proposed Direct Push Injection Using Combined Remedy



Impacted soil was caused by leaking underground piping and removal of two large UST's



Second round of direct push injection included PetroFix to treat lingering BTEX



One month following application of PetroFix, BTEX levels were at non-detect and have continued to remain at that level for 5 sampling events

Scott Air Force Base (AFB) is a large military base located in Southwestern Illinois spanning 3.7 square miles of U.S. government owned land. The site's petroleum impacted soil was a result of a removal of underground piping in 1993, as well as two large underground storage tanks (USTs), one of which had previously been used to store gasoline. Groundwater samples taken on site indicated that BTEX was above the groundwater remediation objectives. As a result, remediation of this area was necessary. Additional well installation and delineation occurred from 2004 to 2009.

The site underwent long-term monitoring in accordance with Illinois Environmental Protection Agency (EPA) Leaking Underground Storage Tank (LUST) program requirements starting in 2010.

The final Corrective Action Plan (CAP) Addendum proposed two rounds of groundwater treatment by injection at Former Tank 85 to reduce benzene concentrations below the groundwater remediation objectives. The first round of injections was completed in February through March 2018 and consisted of the use of REGENESIS' RegenOx®, coupled with ORC Advanced® (ORC-A) to stimulate aerobic bioremediation.

The initial injection was successful in reducing most contaminants within the affected area. The second round of injection at the former UST was completed in March 2019 using REGENESIS' PetroFix™ micron-scale remedial fluid. Groundwater injection activities for the second round were completed via 24 injection points, injecting PetroFix from an interval of 7 to 14 feet below ground surface (bgs) using a 3-foot deployable multi-port injection screen. PetroFix included the recommended electron acceptor amendment using both nitrate and sulfate to stimulate sorbtion of the benzene mass.

One month following the application event, contaminant levels reached non-detect. Benzene continued to remain non-detect for another 5 sampling events through March 2020 and the site was recommended for no-further-action (NFA).

Background

Uniquely Challenging Site Conditions



The treatment site is a former Air Force Base, located in St. Clair County in Southwestern Illinois, 25 miles southeast of St. Louis, Missouri. Following the excavation of all underground piping and two large underground storage tanks, groundwater samples indicated BTEX contamination was at a level exceeding groundwater remediation objectives. From 2004-2009, the site underwent long-term monitoring in accordance with EPA and LUST program requirements. Initial remediation strategies at the site were successful in mass reduction of all contaminants except benzene. Following the application of PetroFix micron-scale remedial fluid, Scott AFB has been recommended for no-further-action (NFA) status.

Timeline

PetroFix Reduces Benzene Levels to Non-Detect



1993

Initial contamination occurs as a result of onsite pipeline, two USTs are removed



2004-2009

Well installations take place and delineations applied



2010

Site is monitored for contamination levels



2017

Completed benzene delineation via direct push groundwater sampling



February 2018

First application using combined remedy of RegenOx and ORC-Advanced applied



March 2019

PetroFix application occurs to treat remaining contaminants



March 2020

Site continues to be at non-detect following 5 monitoring events and has been recommended for NFA status



Treatment

Effective Treatment Using a Combined Remedy Approach Achieves Non-Detect



3-foot deployable multi-port injection screen used to apply PetroFix

The first round of injections were completed in February through March 2018 and consisted of the use of REGENESIS' sodium percarbonate based oxidant, RegenOx, coupled with Oxygen Release Compound (ORC-A) technology to stimulate aerobic bioremediation.

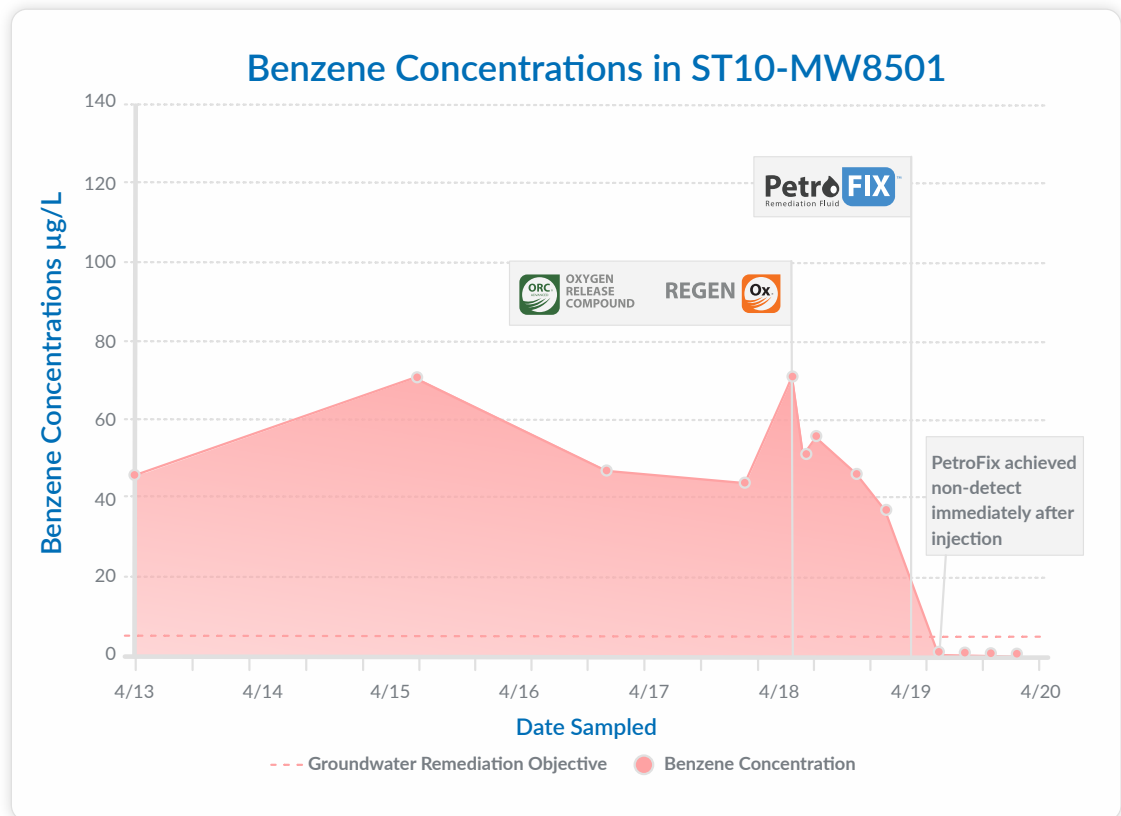
The second round of REGENESIS injections were completed in March 2019 and used PetroFix to treat lingering contamination. PetroFix included the recommended electron acceptor amendment using both nitrate and sulfate to stimulate anaerobic biodegradation of sorbed benzene mass. Groundwater injection activities for the second round were completed via 24 injection points and involved applying PetroFix from an interval of 7 to 14 feet below ground surface using a 3-foot deployable multi-port injection screen. During the injection, PetroFix was observed in the monitoring well which confirmed its distribution in the subsurface. The well was subsequently flushed post-injection to remove any lingering injection micron-scale material.



Results

PetroFix Successfully Treats Lingering Contaminants

The remedial approach utilized by REGENESIS successfully treated the lingering contamination. The initial combination of RegenOx and ORC Advanced, coupled with the secondary measure of PetroFix has provided the contaminant mass reduction needed. The site is currently in place to receive a 'No Further Action' status following 5 sampling events at non-detect .





Technology

PetroFix, RegenOx, and ORC-Advanced



PetroFix has a dual function: it removes hydrocarbons from the dissolved phase by adsorbing them on to activated carbon particles and then stimulates hydrocarbon biodegradation by adding electron acceptors. PetroFix is a highly concentrated water-based suspension consisting of micron-scale activated carbon and biostimulating electron acceptors. The environmentally-compatible formulation of micron-scale activated carbon (1-2 microns) is combined with both slow and quick-release inorganic electron acceptors. Practitioners can select between a sulfate and nitrate combination blend (recommended) or sulfate only for the additional electron acceptors required.



RegenOx *in situ* chemical oxidation (ISCO) directly oxidizes contaminants while its unique catalytic component generates a range of highly oxidizing free radicals that rapidly and effectively destroy a range of target contaminants including both petroleum hydrocarbons and chlorinated compounds. RegenOx is an injectable, two-part ISCO reagent that combines a solid sodium percarbonate based alkaline oxidant (Part A), with a liquid mixture of sodium silicates, silica gel and ferrous sulfate (Part B), resulting in a powerful contaminant destroying technology.



ORC Advanced® is an engineered, oxygen release compound designed specifically for enhanced, *in situ* aerobic bioremediation of petroleum hydrocarbons in groundwater and saturated soils. Upon contact with groundwater, this calcium oxy-hydroxide based material becomes hydrated producing a controlled-release of molecular oxygen (17% by weight) for periods of up to 12 months on a single application. Oxygen is required by microorganisms to transform organic contaminants (such as petroleum hydrocarbons) into carbon dioxide, water and microbial cell mass. More importantly, the new and readily available oxygen produced by ORC Advanced accelerates aerobic biodegradation processes up to 100 times faster than natural degradation rates. ORC Advanced provides remediation practitioners with a significantly faster and highly effective means of treating petroleum contaminated sites.



The Consultant About AECOM

AECOM's environmental services help industrial and public sector clients around the world balance growth with resiliency — achieving compliance and reducing, or eliminating, risks while protecting our natural environment.

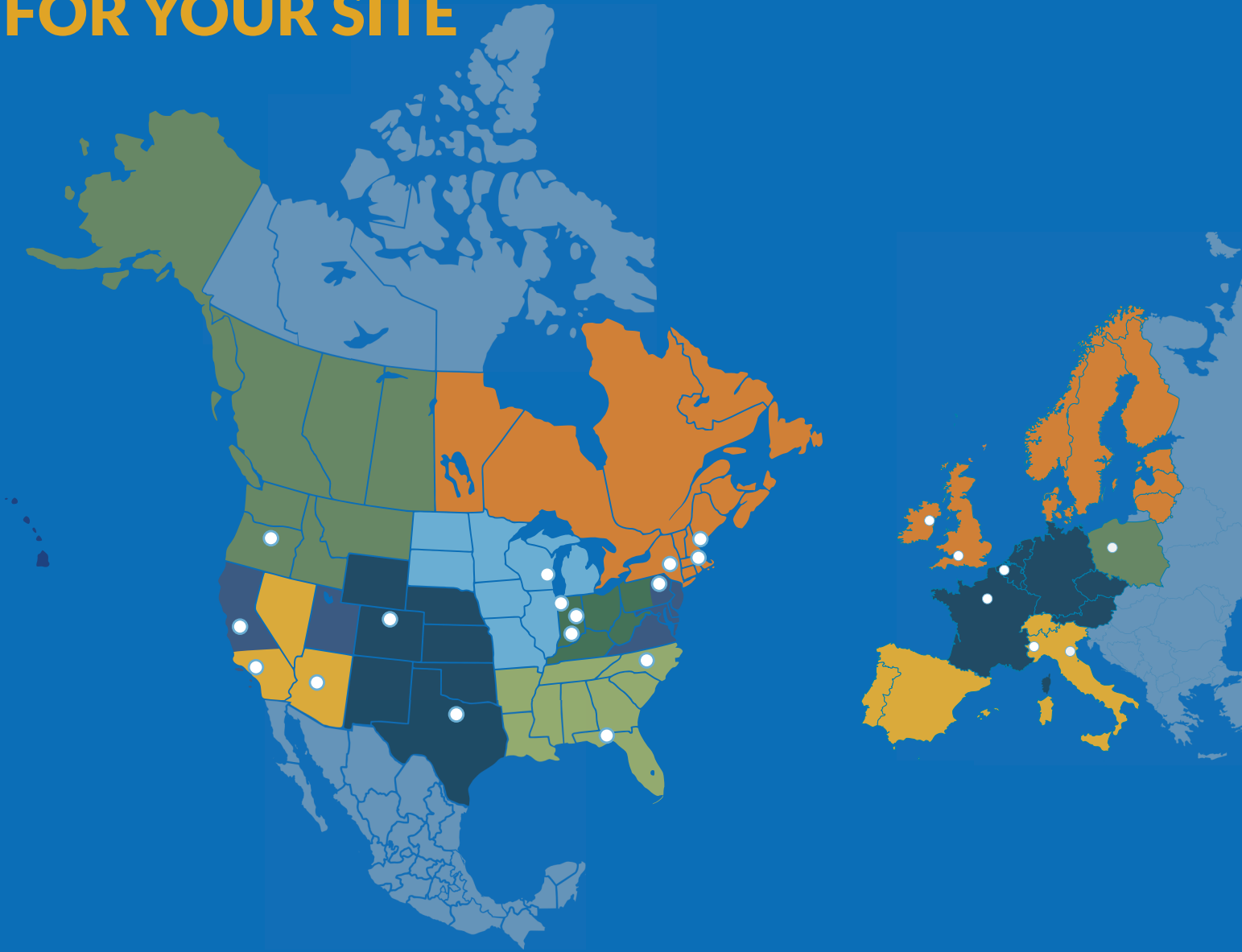
AECOM works closely with clients and communities to solve the most complex environmental challenges throughout the business life cycle: asset development, operations optimization, integrated products, and restoration and reuse. Our core value of Safety underpins all our work.



About the Project Manager Ben Christensen, PE

Mr. Christensen is a Project Manager at AECOM and has managed remediation projects for Department of Defense (DoD) facilities in Illinois, Nebraska, and Nevada. Mr. Christensen is a Professional Engineer (PE) in multiple states with 14 years of experience preparing and implementing remedial designs at various Hazardous, Toxic and Radioactive Waste (HTRW) sites. His specific experience includes implementing groundwater and soil remediation by in-situ chemical and bio-remediation injections, groundwater pump and treat systems, soil-vapor extraction (SVE) systems, bioventing, and excavation for Performance-Based Remediation (PBR) contracts.

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