

PFAS and CVOOC Remediation Paves Way for Mixed-Use Tower

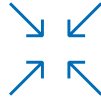
**NY State Brownfield Site Awarded Certificate
of Completion Following Application of
PlumeStop and PersulfOx**



Highlights

**Site Type:**

Former Industrial
Manufacturing

**Project Driver:**

Redevelopment

**Contaminants:**

CVOCs, PHCs, PFAS

**Geology:**

Bedrock

**Treatment:**

Source - *In Situ* chemical
oxidation (ISCO)
Property Boundary -
Sorption enhanced natural
attenuation barrier

**Technologies:**

Source Treatment - PersulfOx
Property Boundary - PlumeStop

**Quantity Injected:**

110,000 gallons

**Other Site Considerations**

Successful remediation effort
earned the site a Certificate
of Completion through New
York State's Brownfield
Cleanup Program

Summary

A legacy brownfield site in New York was found to have high concentrations of chlorinated volatile organic compounds (CVOCs), petroleum hydrocarbons (PHCs), 1,4-dioxane, and PFAS (per- and polyfluoroalkyl substances). To address this contamination, a combined remedy was implemented: PersulfOx® was applied to reduce contaminant mass at the source, while a PlumeStop® barrier was installed to prevent residual migration beyond the site boundary. This approach resulted in a 90% reduction in groundwater contaminant concentrations and significantly lowered the mass flux at the property boundary. The success of the remediation effort earned the site a Certificate of Completion through New York State's Brownfield Cleanup Program, paving the way for environmentally responsible redevelopment in this commercially valuable area.

Results

- **Approximate 90% reduction in contaminants allows mixed use tower redevelopment to proceed.**



Introduction

A brownfield site in New York is the first of two high-rise, mixed-use buildings offering residential, parking and retail space.

The project, administered through the NY State Brownfield Cleanup Program, was a former electroplating facility with numerous open vats of chemical solvents and acids that gradually leaked and migrated into the fractured bedrock subsurface beneath the site.



SESI Consulting Engineers (SESI), a leading environmental engineering services company based in New Jersey, completed several phases of Remedial Investigation, revealing site soil and groundwater impacted by CVOCs, PHCs, metals (chromium and nickel), PFAS, and 1,4-dioxane.

Impacted soil identified during the Remedial Investigation was excavated to remove the source of the bedrock groundwater contamination. With the soil source area addressed, the groundwater contained within a fractured, silicious bedrock unit remained to be treated.

High VOC concentrations, especially 1,1,1-trichloroethane (1,1,1-TCA), persisted in the bedrock at the source. The highest 1,1,1-TCA was detected at 1,000,000 µg/L, indicating the potential for dense non-aqueous phase liquids (DNAPL). In several wells, Trichloroethene (TCE) and 1,1-dichloroethene were also detected at more than 1,000 ug/L.

Additionally, PFAS, including PFOS (perfluorooctanesulfonic acid) and PFOA (perfluorooctanoic acid), were detected in all site monitoring wells but at the highest concentrations near the former electroplating operations. PFOS was commonly used as a chemical fume suppressant to reduce chromium emissions at metal plating facilities.

Borehole geophysics and a geotechnical investigation were used to identify the fractures and water/contaminant bearing zones within the rock strata.



Remediation Design and Application



Phase 1

PersulfOx ISCO
Two Source Zone Treatments
(June and September 2021)

Each of the two applications included:

Shallow Zone	
Injection Wells	6
Injection Depth	12 to 22 ft bgs
PersulfOx	2,535 lbs
Total Volume	1,850 gallons

Deep Zone	
Injection Wells	24
Injection Depth	23 to 43 ft bgs
PersulfOx	13,775 lbs
Total Volume	10,040 gallons

SESI evaluated several different remedial options and determined REGENESIS *in situ* approach to be the most effective and economical for treating the site contamination. The approach involved applying PersulfOx® *in situ* chemical oxidation (ISCO) to reduce the high concentration mass at the bedrock source zone, followed by injection of PlumeStop® in a permeable reactive barrier (PRB) along the western and southern site perimeter to prevent downgradient migration of residual contaminants. Engineering controls to mitigate the potential for vapor intrusion were also prescribed for the building.

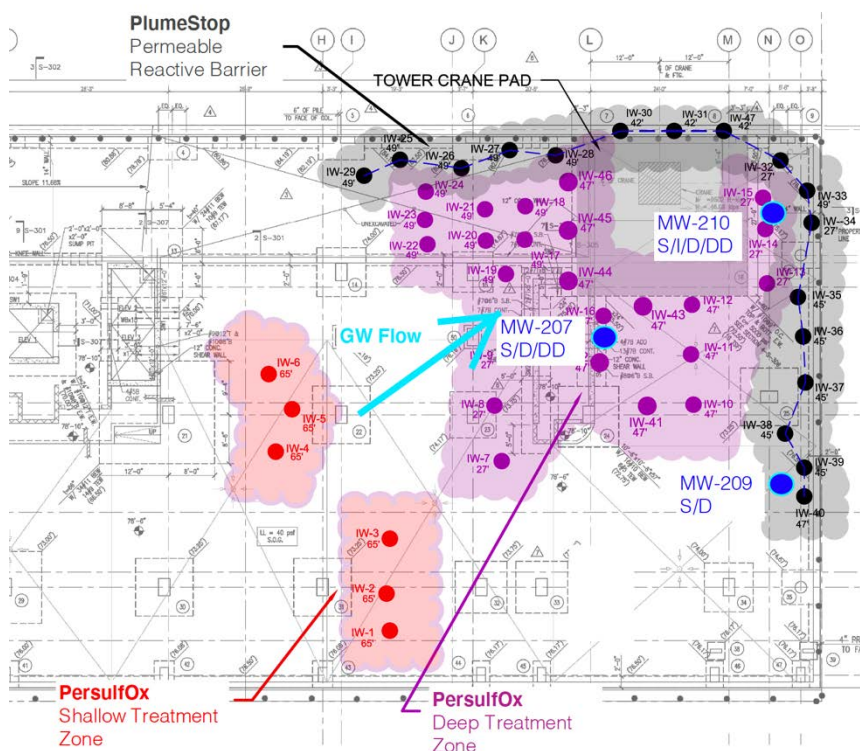
SESI collaborated with REGENESIS to develop a remedial design for this approach. A network of injection wells was installed for the application, screened through shallow and deep zones ranging from 12 to 43 feet below ground surface. REGENESIS Remediation Services (RRS) and an independent applicator completed Phase 1, the two PersulfOx ISCO applications. Phase 2, installation of the PlumeStop PRB, was completed in October 2021. During the applications, RRS monitored injection pressures and modified the application design in the field based on the observed variability in the formation's hydraulic conductivity, leading to a highly optimized and successful application.



Phase 2

PlumeStop PRB
(October 2021)

PlumeStop PRB	
Barrier Length	≈150 ft.
Injection Wells	17
Injection Depth	Varies
PlumeStop Applied	18,800 lbs.
Total Volume	10,200 gallons





Results and Conclusions

The sequential PersulfOx and PlumeStop applications resulted in an approximate 90 percent decrease in total VOCs in monitoring wells in/near the treatment areas. Nested monitoring wells screened across the contaminated bedrock indicate the complete distribution of the reagents through the vertical target interval.

Figure 1

Remediation Performance - Total VOCs in µg/L

Pre-Remedy samples were collected on September 11, 2020. Post Remedy Samples were collected on June 6, 2022.

Well ID	Pre-Remedy	Post-Remedy	Percent Change
209S	2,850	369	-87%
209D	5,529	184	-88%
210I	9,381	1,394	-85%
210D	17,923	784	-96%
210S	3,245	384	-88%
210DD	9,632	265	-97%
207S	142,500	32,913	-77%
207D	61,600	5,020	-92%
207DD	4,206	1,102	-74%

In addition to the reductions in CVOCs, 1,4-Dioxane was reduced by over 80%. PFAS were also substantially reduced in the two well nests on the near upgradient side of the PlumeStop PRB (209 and 210). Results observed in these wells revealed up to 90 percent PFAS reductions. Site construction and limited access prohibited well placement downgradient of the PRB. However, based on the results from these upgradient wells, elimination of contaminant mass flux is likely near complete.

Following the successful completion of the *in situ* remedial program, a Certificate of Completion (COC) was provided by the New York State Department of Environmental Conservation (NYSDEC). The highly effective combined PersulfOx and PlumeStop remedy leading to the COC was essential to transforming this former brownfield into a vibrant community space.



Technology

PersulfOx and PlumeStop



PersulfOx® is an advanced *in situ* chemical oxidation (ISCO) reagent that destroys organic contaminants found in groundwater and soil through abiotic chemical oxidation reactions. It is an all-in-one product with a built-in catalyst which activates the sodium persulfate component and generates contaminant-destroying free radicals without the costly and potentially hazardous addition of a separate activator. The patented catalyst enhances the oxidative destruction of both petroleum hydrocarbons and chlorinated contaminants in the subsurface.



PlumeStop® Liquid Activated Carbon™ is a fast-acting groundwater remediation reagent which captures and biodegrades a range of contaminants, thus accelerating the successful treatment of impacted sites and leading to their permanent closure. As a science-based, *in situ* treatment technology, REGENESIS' PlumeStop rapidly removes contaminants from groundwater and stimulates their permanent degradation.



About the Consultant

SESI Consulting Engineers



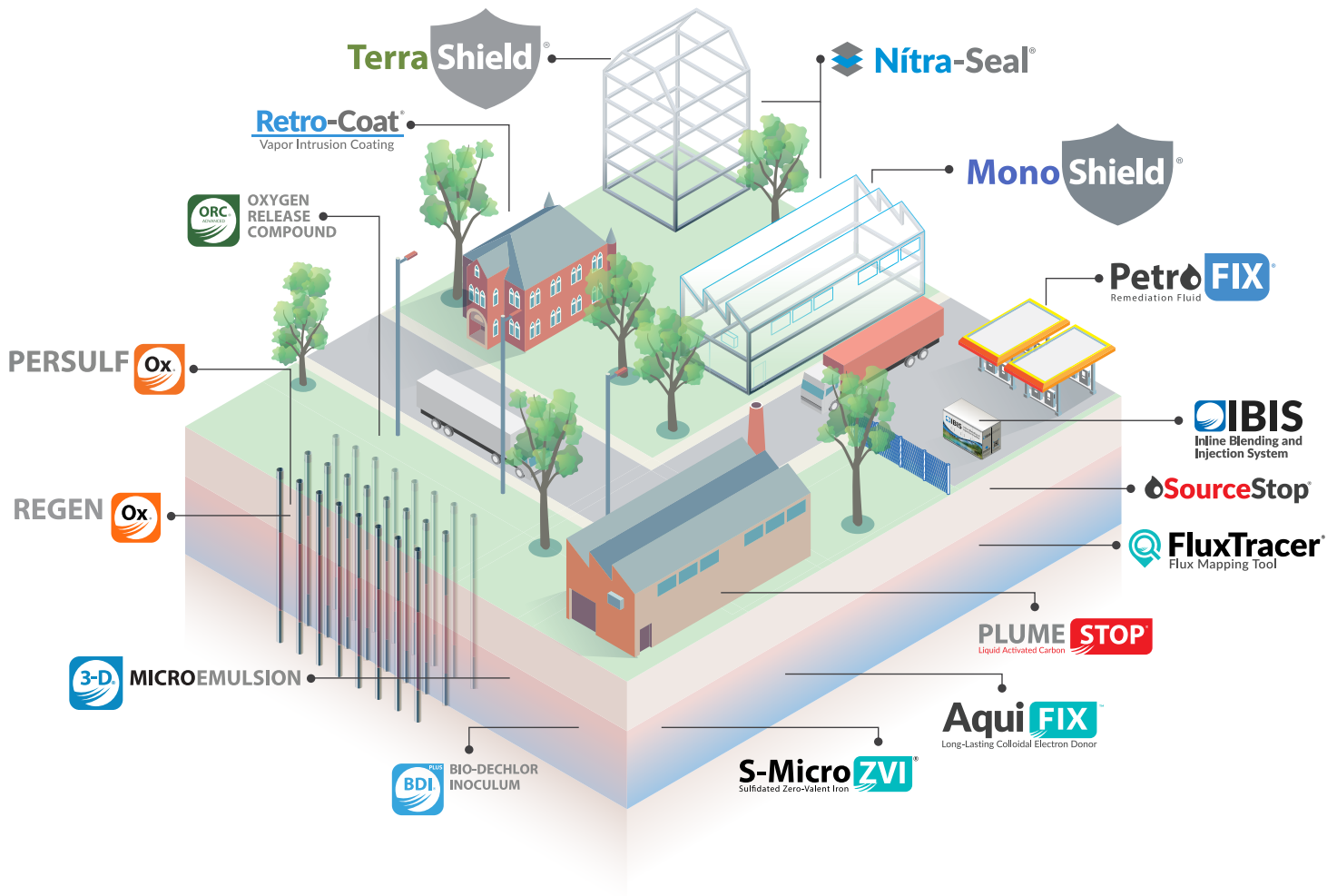
SESI was founded in 1976 and has grown to over 105 employees and retired consultants who continue to support SESI and its growth. SESI Consulting Engineers has earned an excellent reputation for providing comprehensive engineering services. The team executes a coordinated approach to managing projects from concept through completion. SESI approaches each project from a multi-faceted approach, including collaboration across all departments, project leaders, and team members. This means clients get the highest level of innovation, problem-solving, and cost-effectiveness specific to their project.

 For more information about SESI Consulting Engineers, visit www.sesi.org

Fuad Dahan, PhD, P.E., LSRP



Fuad is a Principal at SESI and consistently delivers superior environmental services and support. As a Licensed Site Remediation Professional (LSRP), he has worked on several New York State Brownfield Cleanup Program (BCP) sites. Fuad has over 20 years of diverse environmental experience including brownfield site remediation, environmental treatment system applications, design, research, and monitoring. He has worked on federal, state, and private projects and has managed multimillion dollar projects and programs for large corporations including Fortune 500 companies.



About REGENESIS

At REGENESIS we value innovation, technology, expertise and people which together form the unique framework we operate in as an organization. We see innovation and technology as inseparably linked with one being born out of the other.

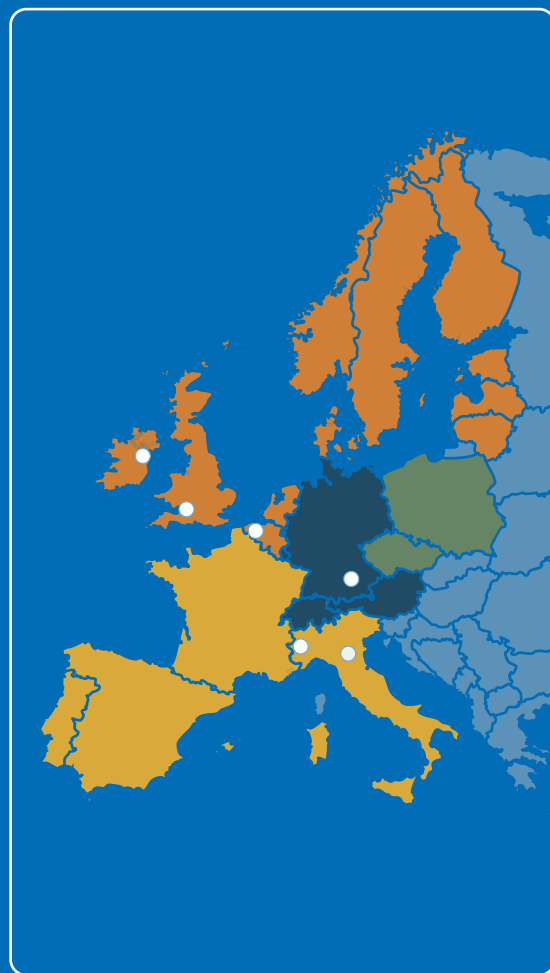
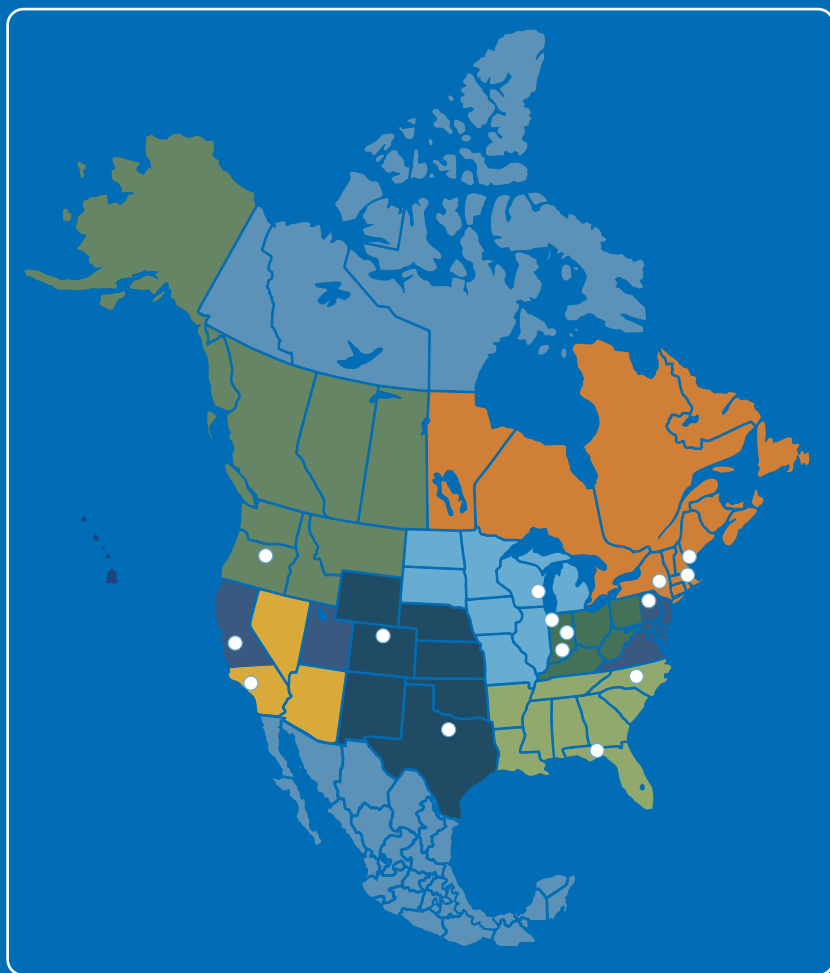
Inherently, innovation imparts new and better ways of thinking and doing. For us, this means delivering expert environmental solutions in the form of the most advanced and effective technologies and services available today.

We value expertise, both our customers' and our own. We find that when our experienced staff collaborates directly with customers on complex problems, there is a high potential for success including savings in time, resources and cost.

At REGENESIS we are driven by a strong sense of responsibility to the people charged with managing the complex environmental problems we encounter and to the people involved in developing and implementing our technology-based solutions. We are committed to investing in lasting relationships by taking time to understand the people we work with and their circumstances. We believe this is a key factor in achieving successful project outcomes.

We believe that by acting under this set of values, we can work with our customers to achieve a cleaner, healthier, and more prosperous world.

We're Ready to Help You Find the Right Solution for Your Site



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