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NASA Site Uses Advanced In-Situ Chemical Oxidation for Successful Subsurface Soil and Groundwater Remediation

SAN CLEMENTE, CALIFORNIA, Sept. 17, 2008 — The National Aeronautics & Space Administration's Kennedy Space Center in Cape Canaveral, FL, has undertaken aggressive groundwater and soil remediation to treat an area of on-site petroleum hydrocarbon contamination. Faced with the challenge of removing the contamination while maintaining the integrity of underground utilities, piping, and infrastructure, NASA and its consultant Tetra Tech chose RegenOx™, a proven, non-corrosive, and cost-effective in-situ chemical oxidation technology developed by Regenesis (San Clemente, CA).

The Launch Equipment Shop, part of NASA's famed Vehicle Assembly Building complex, has conducted highly specialized manufacturing, fabrication, and assembly work for the space program since the early 1960s. Leaks from a 4,000-gallon underground fuel oil tank, subsequently decommissioned and removed, led to notable contamination of soil and groundwater, including a layer of light non-aqueous phase liquid up to 15" thick, with total recoverable petroleum hydrocarbon (TRPH) levels as high as 20,000 parts per million (ppm) in soil and 42 ppm in groundwater.



NASA's Vehicle Assembly Building (left), about 400 yards from Launch Equipment Shop, was the world's largest building when completed in 1962-65. Tetra Tech used re-injectable wells (left and center) to emplace RegenOx™ into contaminated soil and groundwater behind the LES.

The tank and 178 tons of readily accessible contaminated soil were excavated and properly disposed of early on, but other, harder-to-reach contaminated soils had to be left in place beneath and near building foundations, where essential underground utilities were located. Although Tetra Tech's engineering evaluation identified excavation as the preferred approach for remediating the remaining contamination, the cost of excavating the hard-to-reach soils was prohibitive, at over \$1 million. After examining alternative remediation technologies, in-situ chemical oxidation (the application into the subsurface of highly reactive chemicals, which chemically oxidize and destroy contaminants on contact) was chosen as a more cost-effective means of site remediation. Most conventional in-situ chemical oxidation chemistries were ruled out, however, due to their corrosivity and tendency to generate intense heat and/or explosive pressures.

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Considering the challenges posed with the potential use of conventional chemical-oxidation chemistries, Tetra Tech proposed RegenOx™, a powerful yet non-corrosive, low-temperature, low-pressure chemical oxidation technology. RegenOx is a commercially available, two-part product which includes an alkaline oxidizer powder and a liquid activator. When combined they produce a cascade of chemical oxidation reactions that effectively destroy a range of contaminants but do not pose a destructive risk to subsurface infrastructure and other equipment.

Tetra Tech injected approximately 50,000 pounds (137,000 gallons) of RegenOx into the site via 52 injection wells. After treatment, the area of TRPH-impacted soils was reduced to approximately one-fourth of its original size. Site-wide groundwater contaminant concentrations of TRPH were also reduced substantially, and the thickness of the free-product layer was reduced by 80 percent. The program originally included a more costly soil-removal phase to address the free product contamination, however after further investigation the RegenOx dosing was adjusted to handle the phase separated material.

Based on the current progress and success of the RegenOx treatment regimen, NASA and Tetra Tech may choose to cease or continue treatment based upon their remediation goals.

Regenesis, San Clemente, CA, has been advancing the state of the art in cost-effective groundwater and soil remediation technologies for more than 14 years. Built on the principles of proven science, innovative products, and client partnerships, Regenesis' suite of advanced technologies for contaminated site remediation have been applied on more than 14,000 sites worldwide. Regenesis' RegenOx technology was honored with the 2006 ICU (International Clean Up) Innovation Award and a *Wall Street Journal* Innovative Technology Award. For further information visit Regenesis online (www.regenesis.com) or contact Bryan W. Vigue, Vice President of Marketing, at 949-366-8000, x122 or bvigue@regenesis.com.

Tetra Tech, based in Pasadena, CA, has served NASA in multiple capacities for more than three decades, in the process helping the agency save millions of dollars in environmental cleanup costs. The company also acted as EPA's field office liaison and team leader for NASA and other government agencies following the *Columbia* Space Shuttle disaster. A leading provider of consulting, engineering, and technical services worldwide, Tetra Tech ranks No. 6 on the ENR list of top 200 environmental firms for 2008.

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