

## **Alkaline Activated Persulfate to Treat Contamination Beneath Construction of Skyscraper**

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**Background/Objectives:** A 70 story skyscraper was being constructed in the Chelsea neighborhood in Manhattan, New York. Historical site uses included a lumber yard, metal works facility, coal yard, piano manufacturer, livery car service, and a gasoline station. Leaking underground storage tanks observed on-site had impacted groundwater and soils with benzene, toluene, ethylbenzene, and xylene (BTEX), naphthalene, and diesel range organics (DRO) and gasoline range organics (GRO). Average concentrations for BTEX and naphthalene were 3,000 milligrams per liter (mg/L) and 140 mg/L, respectively. DRO and GRO soil concentrations had a combined average concentration of 1,400 mg/L. The objective was to remediate the petroleum contamination to meet regulatory standards while construction for the skyscraper continued.

**Approach/Activities:** An application of alkaline activated persulfate (AAP) was conducted as a result of nine months of planning that included evaluation of the chemical compatibility with the building substructure, bench testing multiple of situ chemical oxidation technologies, design and coordination with the contractors responsible for the tower construction. The highly coordinated field event included obtaining permits to gain street access for the onsite storage and batching of chemicals, daily modification of the injection system to accommodate construction activities, and coordination with the building contractors and union workers. The AAP treatment applied 72,732 pounds (lbs) of sodium persulfate, 31,242 lbs of sodium hydroxide in 35,432 gallons in 6 injection days to accommodate the construction schedule. The injection utilized the RemMetrik® process and Wavefront™ technology to focus treatment targeting and optimize the distribution of reagents.

**Results/Lessons Learned:** The application, the largest in Manhattan at the time, successfully reduced the combined concentration of BTEX compounds in groundwater by 92 to 95 percent and DRO, GRO and BTEX in soil by greater than 99 percent. The groundwater reductions were sustained after the application, leading to the NYSDEC issuing a site closure letter.