Simultaneous Remediation of a Former Gasoline Filling Station and Construction of a 10-Story Mixed Use Development

Brian Gochenaur (bgochenaur@langan.com), Howard Nichols (hnichols@langan.com)
Stewart Abrams, Michael Burke, and Jason Hayes (Langan Engineering)

Background/Objectives. The New York State Brownfield Cleanup Program (BCP) site in Brooklyn, New York, a former gas station and car wash, is undergoing remediation that includes the removal of underground storage tanks (USTs), excavation and disposal of petroleum contaminated soil and historic fill, installation and operation of a dual-phase extraction (DPE) system, and mitigation of soil vapor intrusion via a basement ventilation system. The former structures were demolished to make way for a 10-story mixed-use residential and commercial building in a densely populated residential neighborhood in Brooklyn. Voluntary remediation is being conducted simultaneously with site development in accordance with a Brownfield Cleanup Agreement with the New York State Department of Environmental Conservation (NYSDEC).

A remedial investigation identified petroleum impacts extending from approximately 20 feet below grade to the regional groundwater table located 130 feet below grade surface (bgs). The site is located within a terminal moraine, resulting in heterogeneous stratigraphic sequences, varying from large cobbles and boulders to clay and silt lenses with perched groundwater. Analyses of soil samples determined that petroleum impacts exceeding the applicable residential cleanup criteria extended to roughly 45 feet bgs. Development related construction included site wide excavation to roughly 25 feet bgs, and a risk-based corrective action consisting of a soil vapor extraction system was proposed to treat residual petroleum-impacted soil below the development depth.

Approach/Activities. During pilot testing, methane was recorded at concentrations above the lower explosive limit, and perched petroleum-impacted groundwater was encountered at various depths within the treatment zone. A biorespiration test conducted during the pilot test showed that biosparging was not a viable option for petroleum remediation, and that DPE was the most effective alternative. The presence of methane in the unsaturated soils added design complexity to the system, and resulted in classifying the DPE control room as a Class I, Division 2 area requiring an explosion-proof dual-phase extraction system and accessories to remove impacted vapors and liquids.

Results/Lessons Learned. Site development began in February 2016 and is ongoing. Approximately 30,500 tons of soil has been excavated and disposed off-site, and 23 USTs have been removed. Rusmar foam was used to suppress nuisance odors during excavation and tank removal, as needed. A total of nineteen DPE wells, seven vapor probes/air inlet wells, and four regional groundwater monitoring wells were installed at the base of the excavation simultaneously with ongoing earthwork and footing installation. Pneumatic modeling was used to determine optimal DPE and air inlet well locations. Extraction well piping was routed beneath the building slab, and was coordinated with column and foundation installations. Continuous coordination with the construction foreman and individual trades was required to integrate the separate tasks and prevent delays to the project. The DPE equipment has been integrated into the basement parking of the proposed building, and the control room is considered a Class I Division 2 area. The hazard area classification required all operating equipment and electrical wiring to be explosion proof. Soil cleanup objectives are anticipated to be met within two to three years (2019-2020).