DCHWS 2019 Abstract Submission #36

CATEGORY: Technology

Use of Phytoremediation to Augment Standard Pump and Treat Technologies at Superfund Sites.

While standard pump and treat technologies are effective in controlling the migration of a contamination plume, their ability to be modified to adapt to changes in site conditions is limited. The use of phytoremediation to enhance groundwater capture and treatment in shallow localized hot spots is an effective and natural way to augment a standard groundwater collection and treatment system.

The LaSalle Electrical Utilities (LEU) Superfund site, a 16-acre abandoned electrical equipment manufacturing plant near a residential neighborhood, was one of the nation's largest incineration/remediation projects. Soil on site, along roads, and in residential yards was contaminated with PCBs; PCBs and solvents in the groundwater. Once PCB soil contamination was remediated using an on-site incinerator, residual TCE groundwater contamination was addressed using conventional collection and treatment.

While the contaminant plume was captured, subsequent investigations conducted to refine the understanding of the site hydrology determined that the contaminant migration is slower than the original model predictions and that there were previously unidentified VOC source areas, which lead to the selection of implementing phytoremediation to augment the existing treatment system.

Based on an extensive literature search and in cooperation with two universities, two phytoremediation systems were installed. The first was located in the northwest corner of the site to address TCE-contaminated groundwater. The second was installed along the eastern side of the groundwater treatment unit (GTU). The GTU phytoremediation system was installed to enhance collection of the TCE groundwater plume.

In the northwest corner, an area approximately 95 feet by 235 feet was planted with fast-growing poplar, willow, and bald cypress trees. Due to an unseasonably hard freeze on May, some poplar and all of the willow clones suffered significant stunting and/or mortality. The affected poplars and willows were subsequently replanted. A non-dedicated mobile spray gun irrigation system was used to provide watering in this area.

In the GTU area, a space approximately 90 feet by 300 feet was planted with fast-growing poplars and willows. Planting in the GTU was completed in the fall of 2003. In order to prevent tree roots from coming into contact with the thermally treated ash, a hole was bored to native soil for each individual tree, and the borehole was lined with high-density polyethylene (HDPE) pipe. All the GTU trees were planted by lowering rooted whips to the bottom of the boring and then filling with a mixture of sand, soil, bark, and peat. A dedicated drip irrigation system was also installed within this plot. Additionally, E & E successfully developed a real time monitoring to determine the amount of PCE that an individual tree had adsorbed.

Approximately 1,000 trees were planted, and it was determined that for first full growing season, the average tree took up approximately 210 gallons of groundwater. Multiplying this by the total number of trees, the approximate water uptake by both phytoremediation systems was 209,000 gallons of groundwater. After several growing seasons, the phyto-plot successfully reduced shallow groundwater contamination below site-specific groundwater risk-based remediation goals allowing for site closure.

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PANELIST INFORMATION:

Name: **Neil J. Brown**

Title: **Regional Engineering Manager**

Organization: **Ecology and Environment, Inc,**

Address: **33 W Monroe, Suite 1410 Chicago, IL 60603**

Telephone Number: **312-578-9243**

E-mail Address: **nbrown@ene.com**

BRIEF PANELIST BIOGRAPHY:

Neil J. Brown is the Regional Engineering Manager for Ecology and Environment, Inc. A chemical engineer with over 30 years of experience, he has designed and successfully implemented multiple types of innovative remedies for Superfund sites across the continental United States and Alaska.

ADDITIONAL CONTRIBUTING AUTHORS/ORGANIZATION:

None

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