IMPLEMENTATION OF PASSIVE DNAPL CONTROL MEASURES AT AN ACTIVE WOOD-TREATING SITE

This is a case study of an active wood-treatment plant that has operated in southwestern Kentucky since 1913. Historically, creosote dripped from treated rail cross ties following their removal from a pressure cylinder. Drip tracks were reengineering in early 1990s to contain creosote drippings. Historically-released DNAPL had migrated along the fill-soil interface and had impacted the drainage ditch, soil and seep locations.

A multi-faceted remediation consisted of material removal, as well as, installation of shallow groundwater interceptor trenches and passive DNAPL barrier trenches at the site. The approximate 200-ft. long passive DNAPL barrier trench was designed with 4,500 square feet of organoclay Reactive Core Mat® along the downgradient wall (see Figure 1). The RCM was added as an added precaution to adsorb DNAPL droplets that may be too small to gravity settle before crossing the trench.

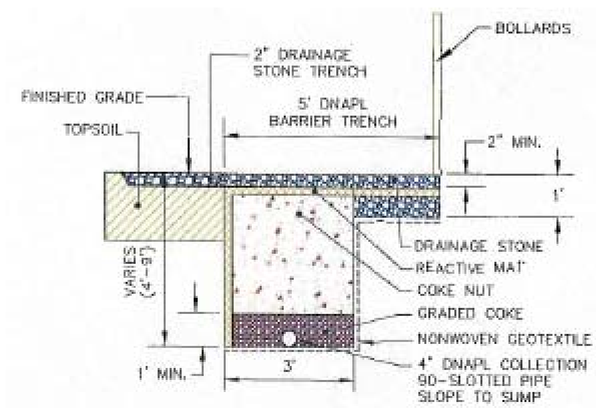

Figure 1. Passive DNAPL Barrier Trench Design

Construction of the remedial activities was performed in the fall of 2004. The trench was excavated by backhoe utilizing open trench technique. The 15' wide panels of RCM were unrolled along the downgradient wall with several feet of extra panel flapped back from the top of the trench (see Figure 2). After the trench was filled with the collection pipe and coke, this RCM was then draped over the top of the trench and covered with drainage stone.

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Figure 2. Passive DNAPL Barrier Trench Installation

To date, no sheen or appearance of DNAPL has been observed downgradient of the passive barrier in the drainage ditch (see Figure 3).

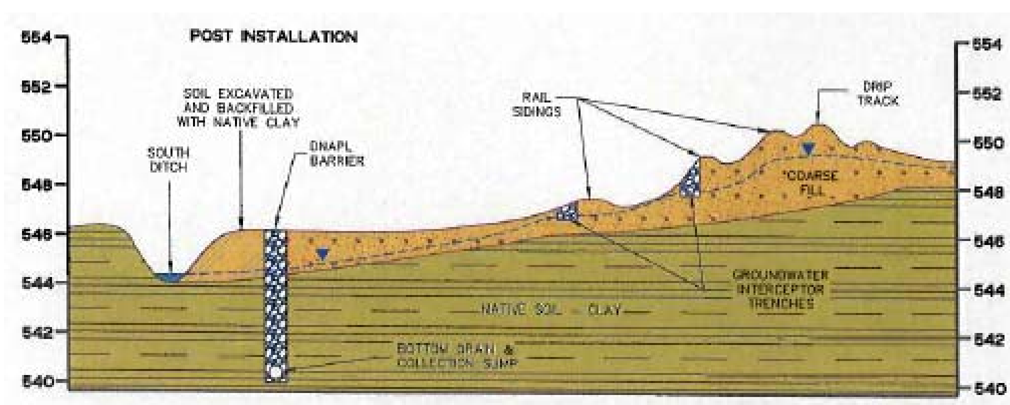

Figure 3. Post Installation Site Profile

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Implementation of Passive DNAPL Control Measures at an Active Wood-Treating Site

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Remediation at active manufacturing sites presents several challenges, particularly when dense nonaqueous-phase liquids (DNAPL) are present. Remedial efforts often must consider facility operations and how measures to address DNAPL source zones may be affected by those operations. The operation and maintenance costs of pumping groundwater to collect DNAPL and control its migration may be significant. Pumping may also have unwanted impacts on facility operations.

At an active railroad-tie wood-treating facility, creosote is present in gravel comprising the rail bed and surrounding work yard. DNAPL had been observed discharging to a nearby drainage ditch. The DNAPL in the gravel has contributed to nearby ground-surface staining associated with periodic surface discharges of groundwater. A multi-faceted remedial approach that consisted of material removal, as well as the installation of shallow groundwater interception trenches and passive DNAPL barrier trenches that did not necessitate groundwater pumping, was implemented at the site. The systems were designed and constructed to minimize impact to facility operations while maintaining the desired DNAPL migration and groundwater control. This included minimizing loss of work space in the rail yard, evaluating equipment loadings and equipment use areas, and considering future access for maintenance and monitoring.

Two parallel groundwater interception trenches were installed to control surface discharge of groundwater and DNAPL, thereby mitigating surface staining and eliminating a potential exposure pathway. Water collected by each interception trench passes through a passive filtration bed filled with coke before discharging to the drainage ditch. The filtration beds were designed to provide a sorptive medium high in organic carbon and included a sump as a monitoring and removal point in the event that DNAPL entered the trenches.

To prevent DNAPL from continuing to discharge to an adjacent drainage ditch, an approximately 200-foot-long passive DNAPL barrier was installed on the site side of the ditch. The barrier consisted of a 4- to 6-foot-deep trench filled with coke nut as a high-permeability filter medium. A CETCO Reactive Core Mat filled with organoclay was incorporated vertically along the downgradient wall of the trench as an added precaution to address sheens and DNAPL droplets that may be too small to gravity settle before crossing the trench. The trench therefore uses a combination of gravity separation and sorption to intercept DNAPL. A high-density polyethylene pipe was installed along the bottom of the trench to facilitate removal of settled DNAPL. In addition, a similar trench 60 feet long was installed during construction when DNAPL was observed discharging to the site drainage ditch at a second area.

Construction of the DNAPL control measures was completed in fall 2004. To date, surface staining has not re-occurred, and DNAPL has not been observed discharging to the site drainage ditch.