Biosolvent Flushing and High Vacuum Extraction Of Heavy Waste Oil

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An in-situ remediation method has been developed to effectively recover heavy waste oil, which spilled into the former tank pit at a northern California facility. Free product was measured as high as 16-inches prior to the treatment event. Weekly free product measurements and bailing were performed for several months. A passive hydrophobic oil skimmer was installed in one well, but the waste oil was too viscous to flow into the trap. A remedial treatment was designed to remove the heavy oil, a requirement for regulatory site closure.

The proprietary remedial process included high-pressure air-injection to displace the trapped oil within the pore space, which lies within the saturated zone, an injection of a biosolvent to thin and increase the mobility of the heavy oil, and a high-vacuum extraction to recover both the heavy oil and the biosolvent from the subsurface. The final stage was to separate the heavy oil from the unspent biosolvent and groundwater. Prior to field-testing, several non-toxic surfactants and biosolvents were bench tested. The biosolvent CytoSol® proved to be the most effective at reducing the viscosity of the heavy oil.

The air/biosolvent delivery/extraction system included nine 4-inch diameter liquid recovery wells and nineteen temporary ¾-inch diameter injection rods on ten-foot centers. High-pressure compressed air was initially used to dislodge the submerged heavy oil from the pore spaces. The floating oil was vigorously mixed with 300 gallons of biosolvent injected into the pit gravels at 200 to 600 psi. A 20-hp water ring vacuum pump was used to extract oil, biosolvent and groundwater. The waste oil was skimmed and the extracted unspent biosolvent was reinjected for three complete flushes of the tank pit. Extracted vapors were treated with a thermal oxidizer. A total of 550 gallons of heavy waste oil and 480 gallons of spent biosolvent/water mixtures were recovered from the former UST pit. A total of 7,790 gallons of groundwater was extracted and treated by aqueous-phase activated carbon vessels, and discharged to the sanitary sewer. One month after treatment, maximum waste oil thickness was 1/2-inch.

NOTES:

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