Title: Field tracer Test to Examine Natural Attenuation of MTBE, NCBC-24-98

Date/Duration:
Initiated - 06/98
Completed - 06/00 (est.)

Abstract:
A natural attenuation study is being conducted at Port Hueneme, California, to gather information on the behavior and degradation of MTBE under conditions common to fuel contaminated sites, specifically under oxygen depleted conditions, resulting from microbial degradation of other petroleum hydrocarbons.

A solution of perdeuterated MTBE (\(^{2}H_{12}\)-MTBE) is being used in the study as a tracer to measure the natural attenuation of MTBE in an existing plume. Since deuterated molecules have a slightly higher molecular weight than the commonly occurring (\(^{1}H_{12}\)-MTBE) molecules, the \(^{2}H_{12}\)-MTBE tracer and its degradation products can be distinguished from existing MTBE using a gas chromatograph with a mass selective detector.

The tracer solution contains \(^{2}H_{12}\)-MTBE, sodium bromide (NaBr), and fluorescein. Hydrogen atoms occur in nature with masses of one (\(^{1}H\)) and two (\(^{2}H\)); these molecules are non-radioactive unlike produced hydrogen tritium with a mass of three (\(^{3}H\)). The \(^{2}H_{12}\)-MTBE is a 98 % isotropic purity custom chemical. The target concentration of \(^{2}H_{12}\)-MTBE within the tracer plume was 1 ug/L. Bromide, whose transport is similar to MTBE, was added in concentrations of 500 ug/L. The bromide was added as a conservative (non-volatile, non-biodegradable) tracer, with which the remaining mass of \(^{2}H_{12}\)-MTBE can be compared. The fluorescein dye was added to provide an indication that \(^{2}H_{12}\)-MTBE and NaBr might be present in the groundwater.

Groundwater samples were collected immediately after the tracer injection was completed to define the extent and assess the \(^{2}H_{12}\)-MTBE mass of the initial plume. The distribution and concentration of the \(^{2}H_{12}\)-MTBE and bromide within the MTBE plume will be characterized using temporary sampling points after 4 months, 8 months, 1 year, and 2 years of plume migration. At each sampling point, samples will be collected at a minimum of five discrete depths to determine the vertical distribution of the tracer plume.

Results of the bromide analysis and/or presence of fluorescein will be used to further refine the sampling density within the plume.

The data will be evaluated as discussed above. The tracer test will yield quantitative information on the fate of MTBE during migration under reducing conditions in the presence of other fuel hydrocarbons. This information will help assess the role of natural attenuation as a plume management strategy for MTBE.

From late 1984 to early 1985, approximately 10,800 gallons of gasoline leaked from two storage tanks and piping under the Naval Exchange (NEX) gas station at the Naval Base Ventura County Port Hueneme Site (NBVC). Since 1985, the Navy has taken actions to prevent any further damage to the environment from the leaks. The MTBE remediation technologies demonstrated at NBVC Port Hueneme Site are part of the overall strategy in the NEX Plume Management plan for containment and control of the plume to prevent any further damage to the environment.

Results/Conclusions:
Field demonstration on going.
Publications: None