

Contrasts in LNAPL Risk Factors for Different Petroleum Products

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Petroleum products released to the subsurface are a potential source of contamination to groundwater and may also cause vapor impacts in buildings. Any petroleum product is a complex mixture of chemicals reflecting aspects of the crude oil from which it was made and the refining process used to bring it to market. Most petroleum fuels are light nonaqueous phase liquids (LNAPL, a.k.a., oil, hydrocarbon, etc.), meaning their density is less than water and there is only a limited propensity for mixing with and dissolution into water. Although oil, water, and vapor exist as separate phases in the subsurface, there is partitioning between the phases resulting in potential contaminant impacts in all phases. Different types of petroleum products will have unique physical/chemical properties that affect the distribution and partitioning of the various phases (ex. dissolved phase, vapor, LNAPL), which has a direct relationship to the associated risk to environment and human health.

In general, lighter and more refined products like gasoline have a much greater propensity to cause environmental harm than heavier products like diesel and heating oils. This is a reflection of both physical and chemical differences between fuels. All other things being equal, gasoline is thousands of times more potentially dangerous in the environment than diesel or other heavier fuels. Despite that, common industry practice tends to treat all “free product” spills in the same manner, often with a leaning to recover that free product to the degree practicable. This can lead to the non-beneficial expenditure of limited resources that would be better spent on higher risk priorities.

This paper explores the specific chemical and physical differences between different petroleum products to contrast their comparative risks to the environment and provides a basis for an enhanced LNAPL site management strategy based on these concepts. As a result, the authors believe that industry cleanup and investigation activities should be modified to account for these real and demonstrable differences in the risk characteristics of these different oils and fuels. It is also important to recognize that a release of any type of petroleum product to the environment can pose real and substantial risks in certain settings. Comprehensive consideration of physical, chemical, transport, and receptor conditions are necessary to make safe and protective decisions to protect water resources and the environment.

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