Interstate Technology & Regulatory Council

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DNAPL Source Reduction: Facing the Challenge (DNAPLs-2)

1.0 INTRODUCTION

The ITRC DNAPLs (Dense Nonaqueous-Phase Liquids) Team was initially formed in 1999 to review several sampling and analysis plans commissioned by the Interagency DNAPL Consortium (IDC) and was later expanded to address emerging issues in DNAPL characterization and remediation. In 2000, the DNAPLs Team prepared a technology overview document summarizing recent developments in this field entitled *DNAPLs: Review of Emerging Characterization and Remediation Technologies* (ITRC, 2000).

The goal of the DNAPLs Team is to identify and reduce barriers to the deployment of technologies that efficiently treat DNAPL source zones. This document summarizes current regulatory attitudes toward DNAPL source zone remediation and outlines the pros and cons of partial source removal. Along the way, it challenges assumptions about the infeasibility of removing DNAPLs from certain geological settings where recent advances have made significant source reduction more feasible and cost-effective.

While our goal is to see DNAPL sources cleaned up faster and more effectively, we acknowledge the technical difficulties and uncertainties surrounding this issue. In recent months, a number of scientific and policy panels have convened for the purpose of discussing under what conditions DNAPL source zone treatment may be beneficial—and where it may have little or no impact. Although these panels have highlighted the fractious nature and diversity of opinions on this issue, areas of agreement have emerged, including the need to continue to develop the most promising technologies in the field so as to improve their predictability in terms of cost and performance. Also identified as an area for further research is the need to study the impacts of reduced source zone mass on groundwater quality and risk to human health and the environment. Providing answers to these questions should help reduce some of the uncertainty faced by decision makers at DNAPL sites. Therefore, we support the rigorous assessment of the performance of DNAPL source reduction technologies and encourage the collection and sharing of data from full-scale deployments of innovative DNAPL source zone treatment technologies.

Despite federal and state guidance citing the long-term benefits of source removal and recommending that DNAPL sources be remediated to the extent feasible (EPA, 1996), there is apprehension in the regulated community over the presumed high cost and uncertain benefit of aggressive source zone treatment. In certain situations, responsible parties can come away with a fear that, despite removing considerable DNAPL mass from the subsurface, little or no reduction in risk or regulatory relief will be realized. The result is that responsible parties and regulators alike can be "paralyzed into inaction" or retreat to the more conventional strategy of source zone containment as opposed to treatment. Partly for this reason, the remedial objective for the majority of sites with recalcitrant sources of DNAPL has been simply to contain the source material and prevent further contaminant migration.

Source containment systems have typically been based on groundwater extraction and treatment (pump and treat). While the up-front capital costs of installing an active hydraulic containment system may be more attractive from a net present value perspective as compared to the costs for source treatment, the estimated life-cycle costs of operating a typical pump-and-treat system for possibly 100 years or more are obviously considerable. In recent years, passive in situ source containment technologies, including permeable reactive barriers and enhanced biologically active zones, have been deployed that overcome some of the disadvantages of pump-and-treat systems. However, they still require long-term maintenance and don't hasten the reduction in DNAPL mass. Long-term costs associated with maintaining a permeable barrier may be lower.

This document describes some aggressive in situ technologies being deployed that target DNAPL source zones for elimination or substantial reduction in hopes of achieving more rapid remediation and speedier site closure. We recognize that many of these innovative technologies have not been sufficiently demonstrated (particularly in bedrock) to the point where they can be considered reliable or cost-competitive at this time. Therefore, we recommend that more studies be undertaken to evaluate their implementabilility and efficacy under a variety of geologic conditions and range of contaminants. Documenting these deployments through case studies to demonstrate the benefits and negatives of DNAPL source reduction is a short-term goal of the ITRC DNAPLs Team. These case studies will form the basis for technical/regulatory guidance documents and training modules to be produced in 2002 and 2003.