

# Complex Challenges at Light Nonaqueous Phase Liquid Sites: An Overview of the NAVFAC Fact Sheet

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**Background/Objectives.** There are a variety of site-specific characteristics that can increase the complexity of managing a light nonaqueous phase liquid (LNAPL) contaminated site. These site conditions may result in the need for specialized techniques to characterize and remediate the LNAPL to achieve remedial action objectives (RAOs) in a reasonable timeframe and cost. A Naval Facilities Engineering Command (NAVFAC) Remedial Project Manager (RPM) survey indicated that the top five challenges that add complexity to their LNAPL sites are: 1) the presence of co-contaminants, 2) highly-heterogeneous conditions, 3) the presence of fractured bedrock (including karst), 4) LNAPL sites within arctic regions, and 5) sites contaminated with long-chained hydrocarbons such as Navy Special Fuel Oil (NSFO), Bunker C, and heating oils.

**Approach/Activities.** Conceptual site model (CSM) elements to consider for an improved understanding of these challenges are provided including the effects it has on LNAPL site management. There are two main drivers in LNAPL site management that should be addressed in the CSM:

- the potential risks posed to human and ecological receptors by mobile LNAPL (saturation-based risks), and the migration of any associated dissolved-phase and vapor-phase plumes (composition-based risks); and
- constraints on remediation selection, design, and operation, which often requires targeted investigation and pilot testing of the system.

For each challenging site condition noted above (No. 1 to 5), impacts to the CSM, and the main drivers, and how remediation may be constrained by these challenging site conditions are discussed.

**Results/Lessons Learned.** An overview will be presented that notes how the challenging site conditions impact LNAPL CSMs and suggestions for managing these complex LNAPL sites. This includes site characterization methods and considerations for remedial technology selection and design to better address these site complexities, risks associated with LNAPL components, and the potential for LNAPL migration. This is bracketed in a context of understanding the best practices for managing composition- and saturation-based risks at these complex LNAPL sites.