

Site Name: Linnton Terminal
Location: Willamette River, Portland, Oregon
Type of Site: Riverbank remediation on an active fuel terminal
Contaminants of Concern: LNAPL
Remedy: Multilayer cap
Current Site Status: Monitoring effectiveness of remedy

Case Study Objectives: To eliminate the visible sheens of petroleum LNAPL and to reduce the concentrations of dissolved-phase organic contaminants to below the remedial action levels.

Site Description: The site is situated near river mile 4, along the west bank of the Willamette River in Portland, Oregon. The site is an active 100-year-old fuel terminal, is zoned as heavy industrial, and is bounded by Highway 30 / NW Saint Helens Road and the Tualatin Mountains to the west and the Willamette River to the east. The site is located on approximately 17 acres with about 1,000 feet of shoreline. The site is generally flat, with a slight incline toward the Willamette River, which flows at the foot of a steep bank, 15 to 16 feet below the grade of the rest of the terminal.

Site Investigation and Conceptual Site Model Summary: Visible sheens of LNAPL are a common occurrence on surface water bodies adjacent to facilities with upland LNAPL impacts. This challenge was encountered at the 100-year-old Linnton Terminal adjacent to the Willamette River in Portland, Oregon. Release of LNAPL related to upland impacts caused occasional sheens on a portion of the river within the Portland Harbor Superfund Site. Installation of upland source control measures (a barrier wall and hydraulic containment wells) diminished the intensity and frequency of sheens but did not fully eliminate them. While these ephemeral sheens were contained with adsorbent booms, design and construction of a riverbank cap was identified as a more robust, long-term strategy for sheen control. During cap design, the USEPA issued their ROD for the Portland Harbor Superfund Site; the ROD identified the terminal riverbank as a remediation area and presented riverbank cap requirements, such as the requirement to provide a sufficient CIL to reliably contain underlying contamination. The cap, therefore, needed to meet the objectives of eliminating sheen to the Willamette River as well as reducing concentrations of dissolved-phase organic groundwater contaminants to below the Portland Harbor ROD remedial action levels after discharge through the cap.

Remedy Design and Construction: To meet the cap objectives, a novel multilayered cap was designed and constructed. It consists of an oleophilic biobarrier (OBB) to mitigate sheen, augmented with an activated carbon layer to capture dissolved-phased contaminants. The OBB is an emerging technology for shoreline sheen mitigation developed at Colorado State University (patent no. US 10,112,854 B2). The OBB adsorbs petroleum NAPL (either light or dense) and promotes biodegradation. The cap was constructed in two phases; the second portion was constructed approximately a year after the first. Both were built during low river stage.

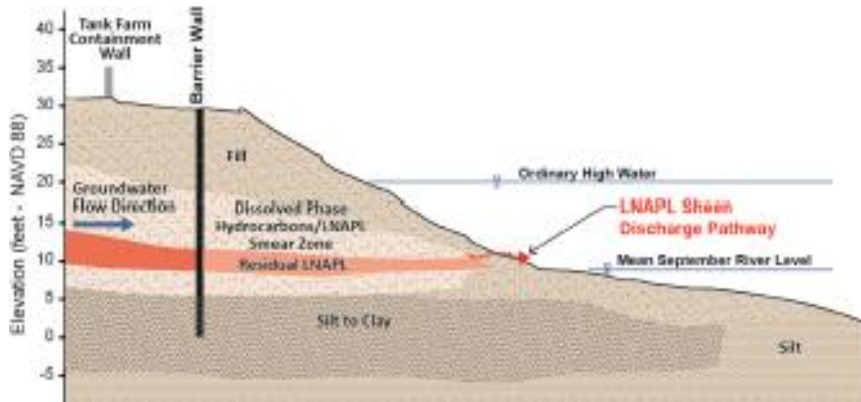
Post-Remedy Monitoring: Sheening was eliminated shortly after the first phase of cap installation in 2017. No sheens have been observed since completion of the cap. Approaches for monitoring of dissolved-phase constituents are being evaluated.

RAOs Achievement: The final cap met the RAOs of preventing sheens and dissolved-phase constituents from reaching the river. Additional ROD requirements, such as no net-fill or net-rise within the 100-year floodplain and preservation of beneficial habitat, were also achieved

Reference:

Gentry, J.L., A. Salter-Blanc, K. Sheets, B. Sharma, L. Tochko, and S. Martin. 2020. Novel shoreline cap for controlling sheen and dissolved-phase constituent discharge. Remediation. 30:5–14.

Figures/Photos (used with permission):



Simplified conceptual site model for the LNAPL at and near the riverbank.



Unrolling the oleophilic biobarrier geocomposite during Phase 1 of cap construction.