

## CASE STUDY

# REMEDIATION

# rethink remediation



An aerial view of the site



Oil-water separator containing oil



Cumulative LNAPL recovery

## The application of steam-enhanced dual-phase extraction in the treatment of high-viscosity-oil-contaminated soil and groundwater

### Background

Hydrocarbon contamination on a site in the historically industrial area of north-western England was first identified in 1999 when heavy fuel oil was found in the site drainage system. The heavy fuel oil was entering the drainage system through a broken below-ground drainage pipe.

RemedX was commissioned to undertake a remediation pilot study to assess the feasibility of steam-enhanced dual-phase extraction of the high-viscosity oil from the soil and groundwater. The trial's success initiated the use of this technique during the full-scale works.

### Remediation

RemedX drilled 31 remediation, 18 steam-injection and 4 temperature monitoring wells in November 2009, and installed the steam-enhanced dual-phase extraction system in February 2010. The remediation was implemented using a strategy that involved dividing the plume area into five phases. Each phase was targeted individually to maximise the abstraction of light non-aqueous phase liquids (LNAPL).

The system included a three-phase generator; a soil vapour extraction unit; a 30-kW chiller; a total fluids compressor unit; a buffer tank; a 1600-L sand filter, two 1600-L carbon vessels; a 20-m<sup>3</sup> oil-water separator, a dissolved air flotation unit; and a 2-m<sup>3</sup> vapour phase carbon vessel.

A targeted strategy was implemented in June 2012, during which a successful new method for LNAPL gauging was trialled to provide accurate measurements of the LNAPL thicknesses in the wells. Accurate LNAPL gauging was impossible before implementation of the new gauging method owing to the high viscosity of the heavy fuel oil. This enabled better conceptualisation of the LNAPL to enhance the targeted extraction phase. Following the remediation operation on-site and the targeted strategy implementation, the LNAPL recovery was declared asymptotic in October 2012 with LNAPL mass and mobility reduced to acceptable levels. This was subsequently validated and agreed with the authority.

In total, the system extracted 129,845 L of LNAPL and treated 10,575 m<sup>3</sup> of groundwater.



### For further information, please contact:

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