

Remediation

In-Situ Radio Frequency Heating (ISRFH) – Manston, Kent.

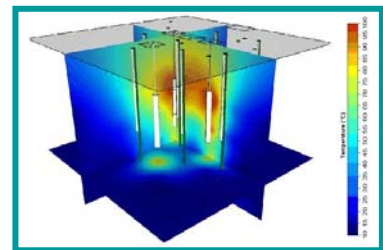
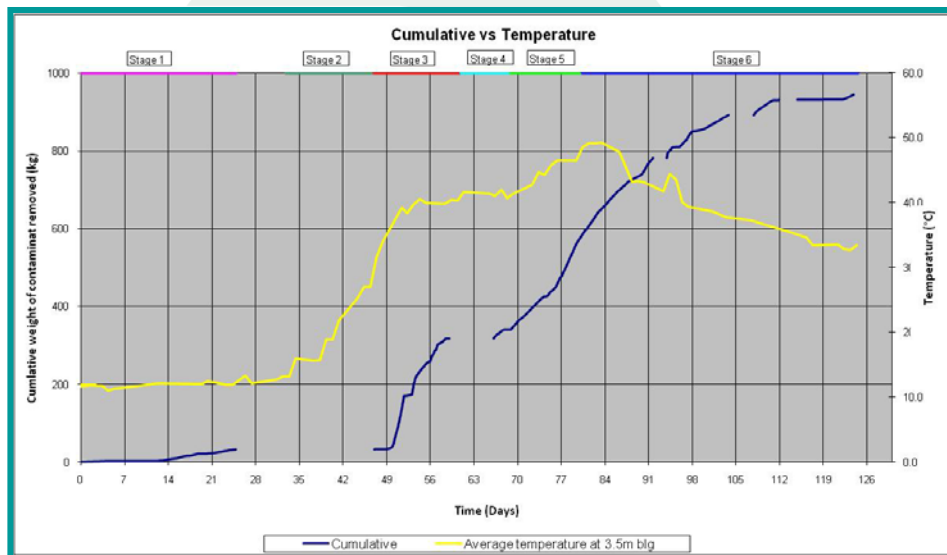
Total UK appointed Ecologia to carry out a remediation assessment for In-Situ Radio Frequency Heating (ISRFH) at a former service station located in a groundwater vulnerable area (overlying a Chalk aquifer) in Manston, Kent. The contamination was mostly associated with Petroleum Hydrocarbons and confined within unsaturated Chalk strata, approximately 10 m below ground level (mbgl). For this site ISRFH electrodes were deployed in a triangular array between 3m and 6 m bgl together with eight multilevel SVE extraction wells. The site is typical of a decommissioned medium sized service station in an area with high groundwater vulnerability.

The remediation was performed in six Stages in order to demonstrate the added benefits of coupling ISRFH to a traditional SVE system.

The ISRFH system achieved a maximum soil temperature of 96.4°C, with an average of 49.1°C across an area of 57m². Increased soil temperatures produced by the ISRFH technology resulted in a significant improvement of the extraction rate of Volatile Organic Compounds (VOCs) when compared to SVE alone. The rate of extraction increased approximately 1200% (i.e. 12 fold) when the average soil temperature reached 36.1°C. The average improvement generally recorded when soil was actively heated was approximately 10 fold higher than SVE alone. Extraction rates of VOCs initially showed an exponential increase as average soil temperature increased, but generally levelled out at approximately half of the maximum peak recorded in Stage 3 and 5 when ISRFH was in operation.

Soil cooling as result of the SVE operation was very gradual, therefore extraction rates of VOCs remained significantly higher (on average approximately 5 fold) than SVE with no heating after the heating was switched off line.

The validation sampling undertaken at the end of the trial confirmed that volatile compounds (BTEX and TPH >C₈-C₁₀) were almost completely removed from the soil (i.e. >99% reduction) and importantly the matrix of The Chalk. Higher molecular weight hydrocarbons (TPH fraction >C₁₀-C₁₆) were also significantly reduced (approximately 80% on average).



A comparison of using SVE alone, ISRFH+SVE operated continuously or ISRFH + SVE operated intermittently to remove approx 1 tonne of VOC contamination was also performed. *The comparison revealed that the application of the ISRFH+SVE operated intermittently would reduce the time required for remediation by 86% (46 days vs. 325 days) and decrease the energy input by 42% when compared to a traditional SVE with no heating.*

The project has also been selected by CL:AIRE as technology demonstration project (TDP 28) and won the Brownfield Briefing 2009 award for the most innovative remediation method.