



Plate 1 - The housing development at the site (Persimmon 2005)

Completion Date: October 2005

Development: Residential Development

Developer: Persimmon Homes

Main Contractor: Envirotreat Limited

Consultant: Leyden Kirby Associates

End Value: £1.5M

### Site Overview

Historically the 0.17 hectares site was occupied by a Petrol Filling Station and vehicle service/repair garage, with associated under ground fuel storage tanks and pipe work.

The intrusive investigations revealed the main contamination source to be an area previously occupied by underground storage tanks where elevated concentrations of Total Petroleum Hydrocarbon (TPH) and BTEX were identified.

Ultimately, the site was to be developed into a housing estate (Plate 1.) comprising of a mixture of two storey houses with associated gardens, landscaping, car parking and an access road.

### Objective

The remediation strategy for the site was designed to address the on-site source contamination (Figure 2.) and indirectly, the pathway contamination issues with the intention of protecting the end user and the locally important underlying aquifer located in sands and gravels beneath the site.



Plate 2 - Contaminated soils with free phase hydrocarbon – typical of the contamination throughout the site.

### Methodology

Envirotreat employed an *ex-situ* soil mixing remediation strategy for the treatment of over 300m<sup>3</sup> of contaminated soils.

The works were conducted over a one week period under the auspices of Envirotreat's Mobile Process Licence (MPL).



Plate 3 - Excavation of contaminated soils.

The identified contamination was excavated (Plate 3.), stockpiled and treated on-site using the Envirotreat E-clay® technology. The treatment operation utilised a slurry production unit with a mixing zone.

The slurry production set up comprised of a 1000L paddle mixer where the E-clay® reagents were combined before being pumped to the mixing zone.

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An excavator mounted with a conventional bucket then mixed the E-clay<sup>®</sup> slurry and contaminated soils (Plate 4).

The soils were mixed in 5m<sup>3</sup> batches to allow known quantities of contaminated soils to be combined with known quantities of the E-clay<sup>®</sup> slurry. The treated soils were then temporarily stockpiled before being reused on-site as a substitute for imported clean fill, thus preventing the need for off site disposal.



Plate 4 - Set-up of the excavator and skip to mix the contaminated soils with the E-clay<sup>®</sup> slurry.

As with all Envirotreat projects, the Woore remediation scheme required both foresight and attention to detail. The limited site space and restricted access onto the site gave rise to a number of potential issues.

Envirotreat approached this situation in a logical and professional manner which allowed the excavation and treatment work to progress efficiently whilst good access to the site was maintained.

Site access was disrupted for a minimal time (one day) by initially excavating material from the road frontage part of the site, stockpiling the material at the rear of the site for treatment and refilling the excavation with clean material sourced on site.

### Validation

Validation of the treated material was carried out on 5 No. batch samples, which were leached and analysed on behalf of Envirotreat by a UKAS accredited laboratory.

## Results

Table 1 illustrates the Maximum Contaminant Levels (MCL) of the identified pollutants prior to remediation and the results of leachate analysis post-treatment. The Site Specific Target Levels (SSTL) have been derived from the Dutch Intervention Values as agreed with the Environment Agency.

Contaminant of concern	MCL in soils prior to clean up (mg/kg <sup>-1</sup> )	Leachate (µg l <sup>-1</sup> )	
		SSTL*	Mean Treated Soil
TPH	6239.00	7.51	<10
Benzene	0.90	26.80	<1
Toluene	5.69	810.00	<1
Xylene	33.17	26.80	<1
MTBE	14.08	4.47	<1

\* SSTL adopted by Envirotreat is equivalent to Dutch Intervention Values.

Table 1 – Summary of treated soils leachate results compared to SSTL derived from the Dutch Intervention Values as agreed with the Environment Agency.

The remediation project was successfully completed, with the results illustrating that the objective of protecting the underlying aquifer and site end users have been achieved. The contaminants of concern have been fully addressed with leachate levels falling below the agreed SSTL's, thus allowing the material to be re-deposited on-site (Plate 5).



Plate 5 – Treated soils redeposited on-site awaiting site levelling.

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