

Your Ref:
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Joe Godfrey
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4th April 2006

Dear Joe

Re: Southern Area Former Proctor & Gamble site, Havant - Remediation of hydrocarbon contamination

Background

The further investigation of the Havant site undertaken by Enviros (reported in April 2005) confirmed that an area of slightly elevated hydrocarbon contamination was present in soils close to the southern site boundary just to the south of the current warehouse frontage; location shown in Figure 1. Available information suggested that an underground oil storage tank (UST) was removed from this locality at some point in the past. The hydrocarbon concentrations recorded during the Enviros investigations were significantly lower than those recorded during a previous investigation undertaken by Entec in the area. However due to the proximity of the area of hydrocarbon soil contamination to Raders Lane stream the Environment Agency (EA) raised a concern in relation to diesel contamination within soil. The EA requested that further investigation and possibly some form of remediation is undertaken so that the risk to the water course is reduced. This letter report details the work undertaken and is intended to form an addendum to the Enviros Additional Assessment Works Havant report dated April 2005.

The previous investigation data suggested that some residual hydrocarbon contamination was present in the soils in the area of the UST but that such contamination was localised. The clay rich nature of the Bognor Sand formation in this locality into which the UST was installed and the underlying London Clay would be likely to have restricted any hydrocarbon movement.

Objectives

The objectives of the work were to:

- Define the area that has been backfilled following removal of the UST;
- Identify any areas of hydrocarbon contamination in natural material surrounding the backfill or within the backfill itself;
- Remove any areas of 'gross' hydrocarbon contamination to a sealed skip;
- Take one sample of groundwater from the excavation or EWS109 if possible;
- Produce a detailed record of all excavations (logs and photographs), take validation samples which will be submitted for chemical analysis;
- Backfill the excavation with arisings following any segregation;

- Produce a validation report which will detail the works undertaken, the results of chemical testing and assess residual risk with the objective of demonstrating successful remediation.

Previous investigation results for the locality

Investigations in the area of the removed UST were undertaken by Entec in July 2003 (location DS9); Enviros in August 2004 (location EWS3) and further investigations were undertaken by Enviros in March 2005 (location EWS109). Table 1 below presented all the chemical data from the three above investigations for the boreholes in the area. There is some uncertainty surrounding the Entec results from DS9 as there appears to be an error in the sample numbering. The Entec data is presented here as it is presented in the Entec report laboratory results section.

Table 1 - Previous investigation chemical data

Location	Depth (mbgl)	EPH mg/kg
DS9	3.0	111
	3.0	155
	4.15	2699
EWS3	0.7 – 0.9	226
	1.2 – 1.5	250
EWS109	0.2	530
	1.7	415
	3.1	15

The sample taken at DS9 4.15mbgl was interpreted as biodegraded diesel by the laboratory.

Remedial Target

It was proposed to remediate the soil in the area of the removed UST to a remedial target of 1000 mg/kg Total Petroleum Hydrocarbons (TPH) based on a mean (US95) value. This figure is based on an adapted Dutch Intervention Value figure for mineral oils in the absence of UK guidance of hydrocarbon concentrations in soil.

Work undertaken

Enviros undertook one day's trial pitting on the 22nd February 2006 in the area of the former UST utilising a JCB excavator and breaker. All excavations and sampling were supervised by Peter Jarvis of Enviros. The location of each excavation is shown in Figure 2.

In total five locations were excavated with excavation numbers three and four extending into one another. The maximum depth excavated to was 3.2mbgl. Excavation logs are presented in Figure 3.

In total 12 samples were taken from both the material that was excavated and removed and material remaining in-situ. Of the 12 samples taken eight were scheduled for chemical analysis. All material not backfilled was stored in a sealed skip awaiting disposal.

Investigation findings

The investigation concentrated in and around the location of EWS109 and the suspected location of DS9 which was encountered during the investigation in EXC4. It soon became apparent during the excavation of EXC1 that a large service pipe had been installed in the area. This was later established to be a plastic water pipe that ran parallel to the Raiders Lane stream and was surrounded by a significant quantity of pea gravel (see Figure 4 Plate 1). The presence of the service pipe prevented

excavation in its vicinity (limiting the depth of EXC1 and 2) therefore excavation work had to be limited to either side of the pipe run and was concentrated adjacent to Raiders Lane stream. The appearance of the pipe run suggests that it was installed fairly recently (within the last 10 years) and therefore possibly during or after the removal of the UST.

Soils investigation

The presence of the pipe run made it impossible to fully delineate the area of backfill. However the excavations did identify areas of significant backfill around EXC3 and 4 to the south but not at EXC5 to the north of the pipe run. It is therefore considered that the backfilled area is located close to the southern site boundary where the majority of excavations were undertaken during this investigation.

The investigations confirmed that the Made Ground was significantly thicker to the south of the service pipe and that the brick and clay Made Ground is not contaminated with hydrocarbons. Plate 2 illustrates the typical backfill material. The investigation did identify a thin layer of material at the Made Ground / natural clay interface which had been slightly impacted by hydrocarbons. Plate 3 illustrates the appearance of this material which was located around DS9

During the excavation work visual and olfactory evidence of hydrocarbon contamination was limited to EXC3 at 2.85mbgl, EXC4 at 2.8mbgl and EXC5 at 2.8mbgl. In addition field screening of samples was undertaken using a flame ionisation device (FID) to assess the presence of volatile organic compounds.

Chemical analysis of selected samples was undertaken for speciated TPH. A summary of the chemical results is presented below and the full chemical results are presented in Appendix 1.

Table 2 – Chemical analysis results summary

Location	Depth (mbgl)	TPH (C12-C35) mg/kg	FID data (ppm)
EXC2	0.7	8.6	0
EXC3	1.0 3.0	34.8 1670	0 150
EXC4	3.2	108	120
EXC5	1.5 2.8 3.1	460 82.9 81.8	25 170 65

Text in **bold** identifies samples that were excavated based on visual, olfactory and FID evidence

The chemical results largely confirm the visual, olfactory and FID readings with the exception of EXC5 at 3.1mbgl which had a significantly lower TPH concentration than anticipated.

Only one sample exceeded the remedial target, i.e EXC3 at 3.0mbgl which recorded a maximum TPH concentration of 1670mg/kg. The impacted clay was observed not to extend beneath the Made Ground / natural clay interface and chemical testing from just beneath the layer (EXC4 3.2mbgl – 108mg/kg TPH) showed that elevated concentrations of TPH are not present.

Remediation

The impacted layer was noted to the east of EXC3 and the west of EXC4 and was chased out (hence why the two excavations join). The impacted layer was removed until clean clay was visible and placed in the sealed skip. It is known the impacted layer does not extend to the north of EXC3 and 4 due to the presence of the service pipe and its absence from EXC5 (though a small quantity of material was removed from this locality as a precaution during site works). The impacted layer did not

appear to extend to the south beyond the fence line off site. Validation sample EXC4 3.2mbgl characterised the natural clay beneath the impacted layer as uncontaminated by hydrocarbons; samples from EXC2 at 0.7mbgl and EXC3 at 1.0mbgl characterised the Made Ground as uncontaminated by hydrocarbons.

The material in the sealed skip was removed by a suitably licensed contractor in accordance with duty of care documentation.

Groundwater

No groundwater was present in EWS109 during the works. Groundwater seepage occurred in EXC3, 4 and 5 though insufficient sample could be recovered for accredited analysis. The speciated TPH analysis shows that the majority of the hydrocarbons detected are heavy hydrocarbons (i.e. C16-C35) which are not very soluble. Therefore any contamination is likely to remain sorbed to the solid phase and not partition into groundwater.

Conclusion

This further investigation encountered a thin layer of impacted material at approximately 2.8mbgl at the Made Ground / natural clay interface in the area surrounding DS9. The excavation work found that this layer appeared to be localised to that area. The impacted material was excavated and removed to a sealed skip. While it was not possible to fully delineate the area of tank backfill due to the presence a service pipe the investigation has established that due to the depth of fill in these areas it appears likely that the tank was located around EXC3 and 4 and to the north where the service pipe is now located.

Enviros consider that the removal of the thin layer of hydrocarbon contamination at the Made Ground / natural clay interface has removed the contamination recorded at DS9 by the ENTEC investigation. The remaining material does not have elevated concentrations of TPH above the remedial target and no evidence of any other significant hydrocarbon contamination was encountered. Additionally the low solubility of the heavy hydrocarbons detected make it unlikely that contamination of groundwater (when present) would occur. Enviro consider that the residual risk to the Raiders Lane Stream from mobile hydrocarbon contamination is low following the investigation and remedial works.

Yours sincerely,
for Enviro Consulting Limited.

Reviewed by:

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