Persimmon Homes (Thames Valley Ltd

Decontamination Validation Report, Earley Rise, Reading

February 1999

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CONTENTS

1. INTRODUCTION

1.1. Symonds Travers Morgan (STM) were retained by Persimmon Homes (Thames Valley) Ltd (Persimmon) to undertake the tasks set out in the Draft Project Brief (rev 2) dated 16th March 1998 and forwarded to STM by Persimmon's agent Glanville & Associates (now Glanville Consultants) in their letter of 23rd March 1998 (ref: SPW/DW/ML3984).

1.2. The Draft Project Brief was developed by Glanville Consultants in consultation with Wokingham District Council to appoint an Independent Consultant whose overall task was to:

"Supervise, manage, oversee and certify the investigation of contamination and subsequent decontamination of the whole of the site, and those parts of land off site reasonably designated by the Council, so as to leave the Site Suitable for residential use."

1.3. Detailed tasks in this regard were set out in the Draft Project Brief as:

1) Review all previous information available from Shell, Persimmon Homes (Thames Valley) Ltd and Wokingham District Council about the Old Shell Site ("the site").

2) Review the site investigation report by STATS Geotechnical dated November 1997, including the audit trail provided by STATS.

3) Assess whether all sampling, analysis and interpretation of results (including the assessment of off-site contamination) has been carried out to current best practice and is sufficient to determine the levels of contamination site and prepare suitable remediation proposals.

4) Recommend further investigations (if any) needed to determine the levels of contamination on site and prepare suitable remediation proposals.

5) Review and assess the method statement prepared by STATS to determine if the proposed remediation works are in accordance with best practice and compatible with the future use of the site for dwellings.

6) Recommend alterations to the proposed method statement and remediation works (if any) to ensure that remediation works are in accordance with best practice and compatible with the future use of the site for dwellings.

7) Ensure that suitable systems are in place to ensure that all works of remediation are carried out in accordance with the method statement and to current best practice, and that the site is left suitable for the end use proposed.

8) Ensure that there is a continuous audit trail which can be independently verified to prove the foregoing.

9) Carry out site visits, supervisions and other inspections and verification to enable certification as required by the overall task.

10) Certify that all works have been carried out to specified current best practice standards and the agreed method statements and that the site is suitable for the proposed end use.

11) Produce a certification report.

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1.4. This report addresses activities carried out under tasks 5) to 11) listed above. Tasks 1) to 4) have been addressed in our previous report entitled "Review of Previous Site Investigations", May 1998.

1.5. The report addresses the decontamination works carried out and includes consideration of:

- A summary of background information
- Remediation proposals remediation standards
- Details and roles of parties involved in the remediation works
- Clean up targets and methods used
- Description of the site works
- Validation testing
- Assessment of final site conditions.

1.6. This report is for the use of the Persimmon Homes Ltd only and should not be relied upon by other parties without prior written agreement from STM.

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2. BACKGROUND INFORMATION

Site Location

2.1. The site is located between Reading and Wokingham at Earley Rise on the A 329 Wokingham Road. The site is centred on National Grid Reference 4772 1714. A site location map is included as Figure 2.1.

Site History

2.2. The site has been used as an oil products storage depot since the 1930s. It is reported that the site acted as distribution depot with supplies being brought in by rail and being distributed by road tanker. Oil products distributed included paraffin, kerosene, petrol, diesel and fuel oils.

2.3. On surrounding land a railway has passed the northern boundary of the site since before 1881 and to the north west a small scale metal plating works has been present for over 50 years. In general the remaining land has been developed for residential use.

Geology, Hydrogeology, Hydrology

2.4. Previous site investigations had shown the site to be underlain by Made Ground, Sands and Gravels and London Clay. The depth to London Clay was generally between 1.9 and 2.5m with the top of the London Clay falling away across the site to the south east.

2.5. Groundwater has been recorded to flow across the site to the south east through the Made Ground and Sands and Gravels across the top of the low permeability London Clay.

2.6. A drain along the northern and eastern boundaries has partially intercepted groundwater flowing through the site and directed it to surface water sewer.

Previous Remediation

2.7. The site has previously been subject to remediation works undertaken by W. A. Fairhurst & Partners for the benefit of Shell U.K. who operated the oil depot at the site. The purpose of the remediation works was to reduce levels of hydrocarbon contamination to levels acceptable for the use of the site for industrial purposes and to minimise environmental risk and liabilities.

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3. REMEDIATION PROPOSAL

3.1. The works reviewed in this report relate to a proposal to redevelop the former oil depot site for residential housing. As the remediation works previously carried out were aimed at an industrial use of the land, the standard of remediation was unlikely to be sufficient to meet the stricter requirements for residential use.

3.2. Further investigations were carried out by STATS Geotechnical Ltd in 1996 who developed a remedial strategy for the site based upon excavation and disposal of the contaminated made ground and sand and gravel horizons and their replacement with clean fill. Initially it was intended that part of the made ground and sand and gravel deposits to the east of the site would remain in place although further contamination testing suggested the material would be incompatible with the use of the site for housing and this material was also identified for excavation and replacement.

4. PARTIES TO THE REMEDIATION WORKS

4.1. The following companies were parties to the remediation works / contract:

Client:	Persimmon Homes (Thames Valley) Ltd 45-47 Station Road Gerrards Cross Bucks SL9 8ES
Engineer:	Glanville Consultants Corinthian Court 80 Milton Park Abingdon Oxon OX14 4RY
Engineer's sub contractor (site investigations, contamination sampling)	STATS Geotechnical Ltd Porterswood House Porters Wood St Albans Hertfordshire AL3 6PQ
Principal Contractor:	Shanks and McEwan Ltd Dunedin House Auckland Park Mount Farm Milton Keynes MK1 1BU
Sub Contractor: (excavation/ haulage)	Kane Haulage Ltd Construction House Porters Wood Valley Road industrial Estate St Albans AL3 6NW
Sub Contractor: (dust /odour monitoring, validation testing of imported fill)	Mayer Environmental Services Ltd Transport Avenue Brentford Middlesex TW8 9HA
Contamination Testing Laboratory	Environmental Analysis Ltd 15 Burgess Road Ivyhouse Lane Industrial Estate Hastings East Sussex TN35 4NR

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Contamination Testing Laboratory (used by Kane Haulage)	Voelcker Science 380 Bollo Lane London W3 8QU
Independent Consultant	Symonds Travers Morgan Symonds House Wood Street East Grinstead West Sussex RH19 1UU

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Table 5.2 Dependant Analyses

The following dependant analyses were to be undertaken when the criteria specified in Table 5.1 were exceeded

Criteria	Dependant Analysis	Acceptance Level (mg/kg)
Total Chromium > 25mg/kg	Chromium (VI)	25
Total Cyanide > 25mg/kg	Free cyanide	25
Total Cyanide > 50mg/kg	Thiocyanate	50
Total Cyanide> 250mg/kg	Complex cyanide	250

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6. DESCRIPTION OF SITE WORKS

Activities

6.1. Activities carried out included:

(i) Boundary survey

(ii) Felling of trees along the western boundary

(iii) Establishment of site offices and "clean" and "dirty" site boundaries and facilities

(iv) Clearance of vegetation and debris

(v) Excavation of concrete hardstanding and foundations

(vi) Establishment of site roads

(vii) Excavation of made ground, sands and gravels starting in the east of the site moving west

(viii) In-filling of voids with clean fill

(ix) Relocation of an underground high voltage electricity cable

(x) Decommissioning site offices

6.2. Photographs showing the site before, after and during the decontamination works are included as Appendix 3.

Disposal of Contaminated Soil

6.3. Tables 6.1 and 6.2 below represents a breakdown of contaminated materials removed from site:

Table 6.1 Waste Carrier and Disposal Site Details

Carrier	Disposal Site	Volume
Kane Limited Station Road Redbourne	Shanks & McEwan Brogborough Landfill Woburn Road Brogborough Bedfordshire MK43 0TN	1,853 lorry loads = approx.18,530 M^3 or 24,000 tonnes

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Table 6.2 Weekly Disposal Volumes

Week Ending	Volume of Soil Removed (m^3)
20.06.98	490
27.06.98	2290
04.07.98	2180
11.07.98	1580
18.07.98	2260
25.07.98	2120
01.08.98	1900
08.08.98	870
15.08.98	580
22.08.98	370
29.08.98	630
05.09.98	490
12.09.98	1400
19.09.98	1210
26.09.98	160
03.10.98	0
Total =	**18530**

6.4. Waste Transfer notes were provided for all waste shipments. Records were maintained by the site engineer, samples of these records were inspected during site visits by STM and were found to be in order. Individual waste transfer note records are held by SME only the summary above is presented in this report.

6.5. Copies of Waste Carriers Licences were provided by Kane Haulage and are included in Appendix 4.

Imported Fill

6.6. Two types of imported fill were used a general clay fill (cohesive fill) and a granular fill for areas designated for house foundations. Rates of input are given in Table 6.3.

6.7. The final depth of in fill across the site varied from between 1.5 to 2.5m, The site was regraded to obtain a flatter profile than the original site, hence the volume of infill was lower than the volume of material excavated and disposed of.

6.8. In assessing the adequacy of the remediation works no account was taken of additional infilling required for completion of the housing development e.g. topsoil for gardens, road surfacing. Such items to be undertaken during construction of housing on the site are beyond the scope of this project brief.

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Table 6.3 Input Rates for Imported Fill

Week Ending	Volume of clay fill (m^3)	Volume of granular fill (m^3)	Total volume of fill (m^3)
20.06.98	0	0	0
27.06.98	0	0	0
04.07.98	0	0	0
11.07.98	0	0	0
18.07.98	380	0	380
25.07.98	350	0	350
01.08.98	0	0	0
08.08.98	600	0	600
15.08.98	370	0	370
22.08.98	150	1100	1250
29.08.98	380	1580	1960
05.09.98	1320	340	1660
12.09.98	1110	0	1110
19.09.98	80	0	80
26.09.98	1340	310	1650
03.10.98	0	710	710
Total =	**6080**	**4040**	**10120**

6.9. Sources of fill and approximate volumes for each source are given in Table 6.4 below

Table 6.4 Sources of Fill, Types and Volumes

Source of fill	Type	Volume (m^3)
Pipeline Pumping Project, Chalfont Road, Maplecross	Clay	3020
Groundons, Star Quarry, Star Lane, Knowl Hill near Reading	Clay	3060
Hall Aggregates, Padworth Lane, Aldermarston	Granular	4040
	Total	**10120**

6.10. In addition to imported granular material, approximately 450m^3 of concrete was crushed in situ to create granular material for reuse.

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7. ENVIRONMENTAL MONITORING AND VALIDATION TESTING

Environmental Monitoring

Dust and Odour Monitoring

7.1. Both nuisance dust and odour were perceived to be possible issues during the decontamination works due to the presence of residential housing on adjacent land. As subcontractors to SME, Mayer Environmental undertook regular dust and odour surveys of the site during the works. The methods adopted for the monitoring were agreed with STM and issued by Glanville Consultants to SME as instructions on 23rd June (details are included in Appendix 1).

7.2. Monitoring reports for odour and dust produced by Mayer Environmental are included in Appendix 5. No further comment is made on these monitoring reports as this validation report focuses on the final condition of the site.

Drainage Discharge Monitoring

7.3. Consent to discharge standing water to foul sewer was obtained from Thames Water Utilities who proposed to undertake monitoring of the discharge on a regular basis (see Appendix 6). In fact Thames Water did not visit the site nor take any samples.

7.4. No groundwater was pumped from the site except water which had accumulated in excavations and which would have impeded the progress of the earthworks.

7.5. Disposal of accumulated water to sewer was mainly limited to two occasions, hence weekly sampling of discharges as proposed by STM was not required. The main discharges were: once where water had accumulated in voids in the south east of the site; and once where water had accumulated in excavation void in the north west of the site.

7.6. Mayer Environmental sampled the actual discharge to sewer on one occasion under instruction from SME. The results for the sampling of the discharge are included in Appendix 6 and indicate that the discharge met the terms of the discharge consent issued by Thames Water Utilities.

7.7. Laboratory certificates of analysis for samples of standing water taken from excavation voids around the site by STATS Geotechnical are included in Appendix 7. The sample locations are included in the sketch of sample locations also included in Appendix 7. Of these samples 132 and 135 contain elevated levels of cadmium and total petroleum hydrocarbons:

(i) Cadmium 7µg/l Sample 132 - standing water south east corner of the site
23µg/l Sample 135 - standing water north west corner of the site

(ii) Total Petroleum Hydrocarbons Samples 132 - 3688mg/l

7.8. Should the actual discharge to sewer have contained these determinands at the concentrations measured then it is likely that they would have been outside the consent limits set.

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7.9. The volumes of water represented by samples 132 and 135 was not recorded, the only record of a bulk discharge to sewer is that provided by Mayer Environmental which indicated that the bulk volume discharge met the consent limits set.

7.10. Evidently in this case the records of the works undertaken are less than would have been expected.

Validation Testing of Excavation Bases and Side Walls

7.11. Following excavation of contaminated soil the base and side walls of the excavation were subject to validation testing to determine the effectiveness of the decontamination works. The laboratory certificates of analysis for the tests are included in Appendix 7 together with notes on the type of samples taken prepared by STATS.

7.12. The sampling locations are shown in Figure 7.1. The sample locations shown in Figure 7.1 represent only the samples taken to validate the remediation works. The locations of samples taken during the site works to assess progress are not shown in Figure 7.1. Laboratory certificates of analysis for all chemical testing results including interim or progress samples and a sketch map showing the locations of all samples taken are included in Appendix 7.

7.13. Tables 7.1 and 7.2 shows a comparison of the final validation test results to the contamination clean up targets for the side walls and base, respectively, of the excavated voids. Within these tables only results in excess of the clean up targets are shown on the table. All other results were below the specified clean up values. Further results for progress or interim chemical contamination testing of soil samples are not tabulated. These results are contained in the laboratory certificates of analysis contained in Appendix 7. For this reason the numbering of results shown in Tables 7.1 and 7.2 is not sequential.

Provision of an Audit Trail

7.14. An essential feature of validating site remediation is the maintenance of full records for the origin of samples from the site to the laboratory and through to the presentation of results.

7.15. Problems were encountered with obtaining results rapidly after they were available from the laboratory this made outside tracking of the works week by week difficult.

7.16. Some difficulties were also encountered with the presentation of the analytical results firstly in their numbering and secondly in errors which appear to have been made by the analytical laboratory in collating the results into tables. In particular two sets of errors were identified within the results supplied:

(i) A sidewall sample was misnamed as an excavation base sample. This was a significant error as the sample contained a high level of cadmium. On enquiry to STATS Geotechnical who undertook the sampling exercise and maintained the sample chain custody records the error was noted and a corrected set of results supplied.

(ii) In the second instance the results for several metals across several samples was reversed across the spreadsheet supplied by the analytical laboratory. Upon enquiry to the laboratory the error was acknowledged and a corrected set of results supplied by the laboratory.

Table 7.1a Validation Tests for Sidewall Samples : Northern Boundary

Determinand	Acceptable Level	Sample Location	10	65	66
		Depth (m)	-1.0	+1.47	+0.52
Arsenic	40				
Cadmium	3				
Chromium (total)	600				4.2
Copper	130				
Nickel	70				
Lead	500				
Mercury	1				
Selenium	3				
Zinc	300				
Water Soluble Boron	3				
pH (units)	>5				
Total Sulphate	2000				
otal Phenols	5		2100		
otal Cyanide	25				
Sulphide	250				
Total Petroleum Hydrocarbons	70				
Total PAH	50				

Notes: All concentrations in mg/kg unless otherwise stated
Depths are relative to final ground levels

Table 7.1b Validation Tests for Sidewall Samples : Southern Boundary

Determinand	Acceptable Level	Sample Location	17	20	21
		Depth (m)	-1.05	+0.1	-0.9
Arsenic	40				
Cadmium	3				
Chromium (total)	600				
Copper	130				
Nickel	70				
ead	500				
rcury	1				
nium	3				
Zinc	300				
Water Soluble Boron	3				
pH (units)	>5				
Total Sulphate	2000				
Total Phenols	5				
Total Cyanide	25				
Sulphide	250				
Total Petroleum Hydrocarbons	70				
Total PAH	50				

Notes: All concentrations in mg/kg unless otherwise stated
Depths are relative to final ground levels

67	68	69	70	71	72	73	74	110	111
48	-1.18	+0.15	-0.85	+0.08	-0.72 to -0.98	-0.34	-1.14 to -1.34	-1.42	-1.54
								8.4	50.7
					88.2				

2	23	24	75	76	77	121	122	126	127	128
9	-0.27	-1.27	-0.82	-1.82	-2.82	+0.2	-0.8	-0.05	-1.05	-1.35
										4

Table 7.1c Validation Tests for Sidewall Samples : Eastern Boundary

Determinand	Acceptable Level	Sample Location	1	2	3	4	
		Depth (m bgl)	-0.63	-0.63 to -1.33	+1.07 to +0.37	-0.31	-1.31 t
Arsenic	40						
Cadmium+A91	3						
Chromium (total)	600						
Copper	130						
Nickel	70						
Lead	500						
Mercury	1						
Selenium	3						
Zinc	300						
Water Soluble Boron	3						
pH (units)	>5						
Total Sulphate	2000						
Total Phenols	5						
Total Cyanide	25						
Sulphide	250						
Total Petroleum Hydrocarbons	70						
Total PAH	50		157.7		76		

Notes: All concentrations in mg/kg unless otherwise stated
Depths are relative to final ground levels

Table 7.1d Validation Tests for Sidewall Samples : Western Boundary

Determinand	Acceptable Level	Sample Location	78	79	80	81	
		Depth (m bgl)	+0.35	-0.55	-1.55	-2.5	
Arsenic	40						
Cadmium	3		211.6	6.6	5.2	6.9	
Chromium (total)	600						
Copper	130						
Nickel	70						
Lead	500					77	
Mercury	1						
Selenium	3						
	300		597				
Water Soluble Boron	3						
pH (units)	>5						
Total Sulphate	2000						
Total Phenols	5						
Total Cyanide	25		130				
Sulphide	250						
Total Petroleum Hydrocarbons	70						
Total PAH	50						

Notes: All concentrations in mg/kg unless otherwise stated
Depths are relative to final ground levels