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**CONSULTING CIVIL & STRUCTURAL ENGINEERS**

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**HEMSLEY CONSULTING LTD**  
**21 HOSKINS ROAD, OXSTED, SURREY, RH8 9HT**  
**SITE INVESTIGATION REPORT**

**Client:**  
**One Oak Development Ltd**  
**105-107, Station Road East**  
**Oxted**  
**Surrey**  
**RH8 0AX**

**HC 5895**  
**Date: 10.03.2020**

Directors: G J Hemsley W K Elson Ph.D., C.Eng., M.I.C.E.  
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SITE INVESTIGATION

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## **1.0 Introduction**

One Oak Development Ltd plan to build a new house on a site at 21, Hoskins Road, Oxted, Surrey. Drawing FD10 by Lovell Design Ltd shows details of the proposed site plan. The land is considerably lower than Hoskins Road and access is via a short steep drive. The small buildings on the site were formerly used by a business that serviced lawnmowers.

The 1/50,000 geological map, Sheet 285, indicates the area to be underlain by the Folkstone Formation. A borehole available from the British Geological Survey to the north of the site proved the Folkstone Beds to be approximately 20m thick with a water level at a depth of 16m. Given the steep eastern boundary of the site it is likely the area was once a small sand pit.

## **2.0 Soil Conditions**

Hand augured boreholes were drilled at each end of the proposed house where access was available and a third shallow hole was used to take a sample for the assay of contaminants. Undisturbed sands of the Folkstone Beds were encountered in all the boreholes. The sands were brown in colour and were generally ironstained. In Borehole N<sup>o</sup>2 partings of a reddish clay were noted. Borehole N<sup>o</sup>1 was in the access drive to the property and fill to a depth of 1.1m was present in this area.

Water was encountered at a depth of 0.53m in Borehole N<sup>o</sup>2, however this was believed to be the result of a leaking water supply pipe in the adjacent toilet. Borehole N<sup>o</sup>1 was dry and the normal water table in the Folkstone Beds would be at a considerable depth.

The sands were generally slightly clayey and this is reflected in the relatively high water content. In Borehole N<sup>o</sup>1 the sands were well graded with a wide range of particle size. The sands at depth in Borehole N<sup>o</sup>2 contained a high percentage of silt and clay. Ground level was higher in this area of the site suggesting the sand was unsuitable for sale. Insitu tests with a Perth penetrometer gave  $\bar{N}_{60}$  values in the range 20 to 25 blows/300mm indicating the deposit was in the medium dense state of compaction.

## **3.0 Foundation Design**

The site level is to be raised to reduce the slope of the drive, however the foundations for the proposed house should be taken on to the undisturbed sand i.e. to a depth of 1.2m at Borehole N<sup>o</sup>1. Such foundations would be preferable to the alternative of re-compacting the existing fill and founding the house on a reinforced concrete raft.

The undisturbed sands are of a medium relative density and based on the Perth penetrometer test results an allowable bearing capacity of 200kN/m<sup>2</sup> may be adopted for the design of the foundations.

#### **4.0 Site Drainage**

A falling head permeability test was undertaken in Borehole N<sup>o</sup>1 and the calculated coefficient of permeability was  $1.1 \times 10^{-6}$  m/s. This value is low for sand of the Folkstone Beds and will be due to the slightly clayey nature of the sand at this site.

Conventional soakaways will not be effective with such a permeability and it is suggested a drainage trench or plane soakaway in the garden be considered.

#### **5.0 Contamination Assessment**

The site was formerly a workshop for the servicing of lawnmowers and is currently used as a temporary office for a steel erector. The site is on various levels and the whole area is covered by the small buildings or by concrete slabs. Three trial holes were broken through the concrete slabs and samples of soil taken for chemical assays. The samples were assayed for a range of common contaminants and the results are given in Analytical Report AR 21-32193 by The Environmental Laboratory Ltd (Appendix D).

The assayed concentrations of the various contaminants may be compared with published screening values for residential occupation with plant uptake (Table 1).

##### **5.1 Metals**

The concentration of most of the metals is below the relevant screening value, however the sample BH2/0.30m contains lead, copper and zinc above the screening value. Copper and zinc are phyto-toxic metals and are below the screening values with respect to human health.

The soils are alkaline in reaction and most metals will be relatively insoluble.

##### **5.2 Poly-aromatic Hydrocarbons**

The concentration of total poly-aromatic hydrocarbons is low and the concentration of benzo- -pyrene in all the samples was less than the published screening value of 2.5mg/kg.

There were no odours of fuel or solvents in any of the boreholes, however the interior of the small buildings was not inspected.

### **5.3 Remediation**

Some remediation of the site will be necessary to reduce the concentration of lead to an acceptable level. It is proposed the following measures are taken:

- (i) During demolition of the existing buildings all the concrete slabs hardcore etc be removed to expose the undisturbed sand or to a maximum depth of 0.40m.
- (ii) Ground levels are to be raised in the lowest part of the site and where the new fill exceeds 0.60m in thickness removal of the existing soils will not be necessary. The imported fill should be assayed to ensure the material is not contaminated. A rate of testing of one sample per 20m<sup>3</sup> of fill is suggested.
- (iii) The garden area to be restored with a minimum of 300mm of certified clean topsoil.
- (iv) The Local Authority may require a Validation report to confirm no long term risks to residents or to the environment are present on completion of the development.

### **6.0 Conclusions**

The site at 21, Hoskins Road, Oxted, RH8 9HT was occupied by a number of small buildings, including an office and a workshop. The area was underlain by sands of the Folkstone Formation and was once believed to have been a small sandpit. The western end of the site had been filled, however it was not possible to determine the extent or maximum depth of the fill. The underlying sands were in a medium dense state of compaction and will form a stable formation of a high bearing capacity.

The site levels will be raised somewhat to reduce the gradient of the driveway and it is recommended the proposed house be founded on mass concrete trench fill footings bearing in the top of the undisturbed sand.

Three samples were assayed for a range of contaminants and one sample was contaminated with lead copper and zinc. Some remediation of the site will be required although filling parts of the site will ensure the bulk of the areas is covered with an inert material or sealed by new construction.

Investigation & Report by

W K Elson Ph.D., C.Eng., M.I.C.E.  
Director

**TABLE 1**

**Site Screening Values for Soils with Residential Occupation and Plant Uptake**

**Metals**

Determinand	Screening Value	Reference
Arsenic	37 mg/kg	DEFRA SP1010 <sup>1</sup>
Boron (water soluble)	3 mg/kg 290 mg/kg	MAFF (1998) <sup>3</sup> LQM/CIEH <sup>2</sup>
Cadmium	17 mg/kg	DEFRA SP1010 (2014) <sup>1</sup>
Chromium	910 mg/kg	LQM/CIEH <sup>2</sup>
Copper	130 mg/kg 2400 mg/kg	MAFF (1998) <sup>3</sup> LQM/CIEH <sup>2</sup>
Lead	200 mg/kg	DEFRA SP1010 <sup>1</sup>
Mercury (organic)	40 mg/kg	LQM/CIEH <sup>2</sup>
Nickel	130 mg/kg	LQM/CIEH <sup>2</sup>
Selenium	250 mg/kg	LQM/CIEH <sup>2</sup>
Zinc	300 mg/kg 3700 mg/kg	MAFF (1998) <sup>3</sup> LQM/CIEH <sup>2</sup>
Asbestos	No fibres should be present	

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**Site Screening Values for Soils**

**Organic Compounds**

Determinand	Screening Value for Soil Organic Matter of 1%	Reference
Total PAH	50 mg/kg	WRAS Paper 9-04-03 <sup>4</sup>
Naphthalene	2.3 mg/kg	LQM/CIEH <sup>2</sup>
Acenaphthylene	170 mg/kg	LQM/CIEH <sup>2</sup>
Acenaphthene	210 mg/kg	LQM/CIEH <sup>2</sup>
Fluorene	170 mg/kg	LQM/CIEH <sup>2</sup>
Phenanthrene	95 mg/kg	LQM/CIEH <sup>2</sup>
Anthracene	2400 mg/kg	LQM/CIEH <sup>2</sup>
Fluorathene	280 mg/kg	LQM/CIEH <sup>2</sup>
Pyrene	620 mg/kg	LQM/CIEH <sup>2</sup>
Benzo(a)anthracene	7.2 mg/kg	LQM/CIEH <sup>2</sup>
Chrysene	15 mg/kg	LQM/CIEH <sup>2</sup>
Benzo(b)fluoranthene	2.6 mg/kg	LQM/CIEH <sup>2</sup>
Benzo(k)fluoranthene	77 mg/kg	LQM/CIEH <sup>2</sup>
Benzo(a)pyrene	2.2 mg/kg	LQM/CIEH <sup>2</sup>
Indeno(1,2,3-cd)pyrene	27 mg/kg	LQM/CIEH <sup>2</sup>
Dibenzo(a,h)anthracene	0.24 mg/kg	LQM/CIEH <sup>2</sup>
Benzo(g,h,i)perylene	320 mg/kg	LQM/CIEH <sup>2</sup>

<sup>1</sup> DEFRA Category 4 Screening Values SP1010 July 2014

<sup>2</sup> Generic Assessment Criteria for Human Health Assessment by Land Quality Management and Chartered Institute of Environmental Health, 2015 (S4UL).

<sup>3</sup> The Soil Code MAFF 1998. Phyto-toxic criteria for plant growth.

<sup>4</sup> Selection of Materials for Water Supply Pipes to be Laid in Contaminated Lane, WRSA Paper 9-04-03, October 2002.

**APPENDICES**

- A. Site Plan**
- B. Borehole Logs**
- C. Laboratory Test Results**
- D. Contaminations**
- E. Contamination Assays**



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**APPENDIX A**

**Site Plan**

**APPENDIX B**

**Borehole Logs**

**APPENDIX C**

**Laboratory Test Results**

**Water Content**

Borehole No	1	1	1	1	1	2
Depth (m)	0.50	1.00	1.20	1.50	2.00	0.60
Water Content (%)	12.0	17.1	16.0	14.8	16.9	15.1

Samples in BH2 below 0.60m were wetted by ground water.

**Grading Analysis**

Sample Reference	Gravel (%)	Sand			Fines (%)
		Coarse (%)	Medium (%)	Fine (%)	
BH1 2.00m	26	24	33	14	3
BH2 1.50m	18	21	22	9	30

**APPENDIX D**

**Contamination Assays**