



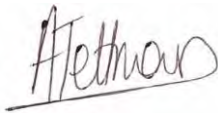
GROUND INVESTIGATION REPORT

for the site at

LAND TO THE REAR OF 36 - 46 MASON STREET, READING, BERKSHIRE RG1 7PD

on behalf of

LAUNCHPAD READING C/O POTTER WESTON ARCHITECTS

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1.0 INTRODUCTION

1.1 General

Ground and Water Limited were instructed by Launchpad Reading c/o Potter Weston Architects on the 14th March 2017 to conduct a Ground Investigation on a redevelopment site on land to the rear of 36 - 46 Mason Street, Reading, Berkshire RG1 7PD. The scope of the investigation was detailed within the Ground and Water Limited fee proposal ref: GWQ2593 dated 14th September 2015.

1.2 Aims of the Investigation

The aim of the investigation was understood to be to supply the client and their designers with information regarding the ground conditions underlying the site to assist them in preparing an appropriate scheme for development.

The investigation was to be undertaken to provide parameters for the design of foundations by means of in-situ and laboratory geotechnical testing undertaken on soil samples recovered from trial holes.

Included within the fee proposal was an allowance to undertake chemical laboratory testing on soil samples recovered from the site to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any potential contamination identified, as detailed in the Conceptual Site Model (CSM) within the Ground and Water Limited Desk Study Report (ref. GWPR1443/DS/November 2015). This Ground Investigation Report must be read in conjunction with the Desk Study Report.

The techniques adopted for the investigation were chosen considering the requirements of the client, anticipated ground conditions, and bearing in mind the nature of the site, limitations to site access and other logistical limitations.

1.3 Conditions and Limitations

This report has been prepared based on the terms, conditions and limitations outlined within Appendix A.

This revision of the report takes into account amendments to the proposed development as detailed in discussions with the client. This revision of the report supersedes any previously issued.

2.0 SITE SETTING

2.1 Site Location

The site comprised a ~520m² triangular shaped plot of land located to the rear of No. 36 – 46 Mason Street and No. 2 – 28 Little Street. The site was located in central north-west Reading to the south-east of a railway line from Reading West Station.

The approximate O.S. National Grid reference for the site is SU 70505 73698. A site location plan is given within Figure 1. A plan showing the site development area is given within Figure 2.

2.2 Site Description

A Site Walkover was undertaken on the 5th November 2015. A description of the site, as noted during the Site Walkover, is tabulated below. An aerial view of the site showing an approximate site boundary, is given within Figure 3.

Site Description: Land to the rear of 36 – 46 Mason Street, Reading RG1 7PD	
Use of site	The site comprised a triangular plot of land to the rear of No. 36 – 46 Mason Street. At the time of the Site Walkover, November 2015, the site was derelict.
Size of site	The site was 520m ² in area.
Area and site topography	The site was generally level with a steep bank along the north-western boundary sloping down in a south-easterly direction. The site's environs were generally flat and level with a very gentle slope down in a north-easterly direction.
Structures on-site	A two-storey derelict wooden structure was noted along the eastern boundary with single storey breeze block extensions to the north and south.
Boundary Features	Southern boundary – ~2m high wood panelled fencing. North-western boundary – ~2m high chain link fencing. Eastern boundary – ~2m high breeze block wall.
Structures off-site/ Use of surrounding ground	The site was located behind two perpendicular rows of terraced two-storey residential properties immediately to the south and east of the site. A railway line was noted ~8m north-west of the site, oriented south-west to north-east.
Site covering	The majority of the site's covering comprised exposed Made Ground and rubble.
Contamination Sources on-site	- Potential asbestos containing roof sheets were noted in the north of the site against the wooden structure. - A bonfire area was noted within the centre of the site. - Made Ground and rubble capping.
Contamination Sources off-site	- A metal recycling centre was noted immediately west of No.46 Mason Street. - The railway line running south-west to north-east ~8m north-west of the site.
Vegetation on-site	~8.0m high trees ran along the north-western boundary.
Vegetation off-site	No significant vegetation noted within site's environs.
Services	Drain cover in south-east corner of the site.
Comments	None.

2.3 Proposed Development

At the time of reporting, July 2017, it was understood that the proposed development will comprise the demolition of the existing structures and the construction of a one and two storey structure comprising 5No. residential dwellings. Decorative chippings will comprise the communal entrance and the areas around the perimeter of the rear of the building. Raised planter beds were planned in the front entrances. No rear access is possible by tenants due to locked gates and only windows at the rear elevation. It is understood the rear of the property will only be accessible by Launchpad Reading or appointed contractors, via locked gates. The rear boundary with the network rail embankment will be cleared and planted with a dominant ground cover, such as Ivy. A plan showing the proposed development can be seen in Figure 4.

2.4 Geology

The BGS Geological Map (Solid and Drift) for the Reading area (Sheet No. 268) revealed that the site was underlain by superficial deposits of the Taplow Gravel Formation over bedrock deposits of the Undifferentiated Seaford Chalk and Newhaven Chalk Formation.

No areas of Worked or Made Ground were noted within a 250m radius of the site.

Taplow Gravel Formation

The Taplow Gravel Formation is part of a complex series of River Terrace Deposits formed by the River Thames and its tributaries. These terraces represent ancient floodplain deposits that became isolated as the river cut downwards to lower levels. The Taplow Gravel Formation is largely encountered along the Thames valley and in the lower parts of the Brent, Wandle, Lea, Cray and Darent valleys and is found at an elevation generally above the current river.

The composition of the River Terrace Gravels varies greatly, depending on the source material available in the river's catchment. Deposits generally consist of sands and gravels of roughly bedded flint or chert commonly in a matrix of silts and clays.

Undifferentiated Seaford Chalk and Newhaven Chalk Formation

The Undifferentiated Seaford Chalk and Newhaven Chalk Formation is a soft white friable microporous limestone composed of coccolith biomicrites with a varying proportion of larger shell fragments. Flint characterises the Undifferentiated Seaford Chalk and Newhaven Chalk Formation, occurring as nodular courses, tabular beds and linings to fractures.

At various levels clay sized material occurs as marl seams and partings. Close to the surface the upper few metres are invariably discoloured brown, due to leaching from the overlying strata. The interface with any overlying stratum is invariably extremely irregular as a result of localised weathering and dissolution. Weathering by frost action may extend to a depth of several metres.

Occasional erosional features, such as pipes, swallow holes and solution cavities, usually in-filled with drift deposits; can be found in the chalk deposits. These features sometimes manifest themselves at the surface as shallow circular depressions. Solution features may be reactivated by the concentrated ingress of water from leaking drains or soakaways. Reactivation may lead to surface collapse.

A BGS borehole ~232m south-west of the site revealed 0.80m of Made Ground overlying gravelly silt to 2.70m bgl and then clayey sands for the remaining depth of the borehole, a depth of 3.50m bgl.

2.5 Hydrogeology and Hydrology

The Desk Study revealed the site to be located on a **Secondary A Aquifer** comprising the superficial deposits of the Taplow Gravel Formation and a **Principal Aquifer** comprising the underlying bedrock deposits of the Undifferentiated Seaford Chalk and Newhaven Chalk Formation.

Superficial (Drift) deposits are permeable unconsolidated (loose) deposits, for example, sands and gravels. The bedrock is described as solid permeable formations e.g. sandstone, chalk and limestone.

Secondary aquifers include a wide range of drift deposits with an equally wide range of water permeability and storage capacities. Secondary A Aquifers consist of deposits with permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as Minor Aquifers.

A Principal Aquifer is a layer of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Examination of the Environment Agency records showed that the site was not located within a Groundwater Source Protection Zone (SPZ) as classified in the Policy and Practice for the Protection of Groundwater.

The nearest surface water features to the site was a drain ~150m north-east of the site and an easterly flowing stream ~240m north-east of the site.

From analysis of hydrogeological and topographical maps groundwater was anticipated to be encountered at moderate depth (3-6m below existing ground level (bgl)) and it was considered that the groundwater was flowing in a northerly direction in alignment with local topography and towards the River Thames.

Examination of the Environment Agency records showed that the site was not situated within a floodplain or flood warning area.

2.6 Radon

BRE 211 (2015) Map 4 of Hampshire, Berkshire and south Oxfordshire revealed the site **was not** located within an area where mandatory protection measures against the ingress of Radon were likely to be required. The site **was not** located within an area where a risk assessment was required.

3.0 FIELDWORK

3.1 Scope of Works

Site works were undertaken in two phases.

Phase I was undertaken on the 16th March 2017 and comprised the drilling of 2No. Windowless Sampler Boreholes (WS1, WS2) to depths of 3.45m bgl. Standard Penetration Tests (SPTs) were carried out in both boreholes (WS1, WS2) at 1.00m intervals to a depth of 3.45m. Soakage testing was undertaken within 2No. trial pits (TP1, TP2). In addition, a Super Heavy Dynamic Probes (DP/WS3) was undertaken from ground level to 8.00m bgl.

Phase II was undertaken on the 17th May 2017 and comprised the drilling of 6No. Hand Augured Boreholes (TPA – TPF) to depths of 1.00m bgl.

The approximate location of the trial holes can be seen within Figure 5.

Prior to commencing the ground investigation, a walkover survey was carried out to identify the presence of underground services and drainage. Where underground services/drainage were suspected and/or positively identified, the exploratory position was relocated away from these areas.

Upon completion of the drilling works, the trial holes were backfilled and made good, in relation to the surrounding area.

3.2 Sampling Procedures

Small disturbed samples were recovered from the trial holes at the depths shown on the trial hole records. Soil samples were generally retrieved from each change of strata and/or at specific areas of concern. Samples were also taken at approximately 0.5m intervals during broad homogenous soil horizons.

A selection of samples were despatched for geotechnical testing purposes. A selection of soil samples were also sent off for analysis for a broad range of contaminants in accordance with the Conceptual Site Model (CSM) developed within the Ground and Water Desk Study Report (ref. GWPR1443/DS/November 2015). and DEFRA/CLEA methodologies.

4.0 ENCOUNTERED GROUND CONDITIONS

4.1 Soil Conditions

The windowless sampler boreholes were logged by Alice Tettmar of Ground and Water Limited and the hand augured boreholes were logged by Dan Pearce on behalf of Ground and Water Limited generally in accordance with BS EN 14688 'Geotechnical Investigation and Testing – Identification and Classification of Soil'.

The ground conditions encountered within the trial holes constructed on the site did generally conform to that anticipated from examination of the geology map. A capping of Made Ground was noted to overlie soils of the Taplow Gravel Formation and the Undifferentiated Seaford Chalk and Newhaven Chalk Formation.

The ground conditions encountered during the investigation are described in this section. The trial hole logs can be seen in Appendix B and the trial hole location plan can be viewed in Figure 5.

Made Ground Taplow Gravel Formation Undifferentiated Seaford Chalk and Newhaven Chalk Formation

Made Ground

Made Ground was encountered from ground level to the base of TP1 and TP2, dug to 0.50m bgl and to a proved depth of 2.20 – 2.40 bgl within WS1 and WS2. During Phase II, Made Ground was encountered from ground level to 0.50m bgl in TPC and TPF and to an unproved depth of >1.00m – >1.10m bgl in TPB, TPD and TPE.

The soils primarily comprised dark brown/dark grey/black clayey very gravelly sand to a sandy gravelly clay within all boreholes and trial holes. The sand was fine to coarse grained. The gravel was occasional to abundant, fine to coarse, sub-angular to angular flints, brick, concrete, plastic, carbonaceous material, slate, rusted metals, glass and ceramics. Possible asbestos containing material (ACM) was noted at 1.30m bgl within WS1 and at 1.80m bgl within WS2. A hydrocarbon type odour was noted at 1.80m bgl in WS2.

Taplow Gravel Formation

Granular soils of the Taplow Gravel Formation were encountered in WS1, WS2, TPA, TPC and TPE, underlying the Made Ground 0.50 – 2.40m bgl, to a proved depth of 2.70m within WS2 and for the remaining depth of WS1, TPA, TPC and TPE (1.10 – 3.45m bgl). The soils were described as a mid to light brown very gravelly sand. Sand is fine to coarse grained. Gravel is abundant, fine to coarse, sub-angular to sub-rounded flints and chalk fragments.

Undifferentiated Seaford Chalk and Newhaven Chalk Formation

Soils of the Undifferentiated Seaford Chalk and Newhaven Chalk Formation were encountered underlying the Taplow Gravel Formation at a depth of 2.70m bgl for the remaining depth of WS2 (3.45m bgl).

The soils were described as structureless chalk composed of compact, white/cream, slightly gravelly sandy SILT. The gravels were very weak, low density, white and rounded. Grade Dm in accordance with CIRIA 574.

For details of the composition of the Made Ground, Taplow Gravel Formation and Undifferentiated Seaford Chalk and Newhaven Chalk Formation, reference must be made to the trial hole logs within Appendix C.

4.2 Roots Encountered

Roots were noted to depths of 0.25m bgl in TP1 and TP2. Decayed roots were noted to 1.70 and 1.80m bgl in WS1 and WS2 respectively. Roots were not noted during the trial holes in Phase II.

It must be noted that the chance of determining actual depth of root penetration through a narrow diameter borehole is low. Roots may be found to greater depths at other locations on the site, particularly close to trees and/or trees that have been removed both within the site and its close environs.

4.3 Groundwater Conditions

Groundwater was not encountered during the investigation.

4.4 Obstructions

The collapse of WS1 and WS2 prevented further drilling past 3.45m bgl.

No other artificial or natural sub-surface obstructions were noted during drilling of the trial holes.

5.0 IN-SITU AND LABORATORY GEOTECHNICAL TESTING

5.1 In-Situ Geotechnical Testing

5.1.1 Standard Penetration Tests (SPTs)

Standard Penetration Tests (SPTs) were carried out in all windowless sampler boreholes at 1.00m intervals. The results of the SPT's have not been amended to take into account hammer efficiency, rod lengths and overburden pressure in accordance with Eurocode 7. The test results are presented on the borehole logs within Appendix B. In addition, a Super Heavy Dynamic Probes (DP/WS3) was undertaken from ground level to 8.00m bgl.

Windowless Sampler Boreholes provide samples of the ground for assessment but they do not give any engineering data. The standard penetration test (SPT) is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The test uses a thick-walled sample tube, with an outside diameter of 50 mm and an inside diameter of 35 mm, and a length of around 650mm. This is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 63.5 kg falling through a distance of 760 mm. The sample tube is driven 150 mm into the ground and then the number of blows needed for the tube to penetrate each 150 mm up to a depth of 450 mm is recorded. The sum of the number of blows is termed the "standard penetration resistance" or the "N-value".

Dynamic Probing involves the driving of a metal cone into the ground via a series of steel rods. These rods are driven from the surface by a hammer system that lifts and drops a 63.5kg (SHDP) hammer onto the top of the rods through a set height, thus ensuring a consistent energy input. The number of hammer blows that are required to drive the cone down by each 100mm increment are recorded. These blow counts then provide a comparative assessment from which correlations have been published, based on dynamic energy, which permits engineering parameters to be generated. (*'Super Heavy' (SHDP) Tests were conducted in accordance with BS 1377; 1990; Part 9, Clause 3.2).*

The granular soils of the Taplow Gravel Formation were classified based on the table below.

Correlation between SPT blow counts (N_1) ₆₀ or equivalent 'SPT's derived from SHDP results	
Classification	Equivalent SPT Blow Counts (N_1)
Extremely Dense	>58
Very Dense	42 – 58
Dense	25 – 42
Medium Dense	8 – 25
Loose	3 – 8
Very Loose	0 – 3

An interpretation of the in-situ geotechnical testing results is given in the table overleaf.

Interpretation of In-situ Geotechnical Testing Results					
Strata	Equivalent 'SPT's derived from SHDP results/ SPT results	Equivalent Undrained Shear Strength (kPa) Cohesive Soils	Soil Type		Trial Hole/s
			Cohesive	Granular	
Taplow Gravel Formation (Granular)	19 - 80	-	-	Medium Dense to Extremely Dense	WS1 (2.00 – 2.45m bgl) WS1 (3.00 – 3.45m bgl) DP3/WS3 (GL – 8.00m bgl)
Undifferentiated Seaford Chalk and Newhaven Chalk Formation	20 - 48	-	-	-	WS2 (3.00 – 3.45m bgl) DP3/WS3 (GL – 8.00m bgl)

It must be noted that field measurements of undrained shear strength are dependent on a number of variables including disturbance of sample, method of investigation and also the size of specimen or test zone etc.

5.2 Laboratory Geotechnical Testing

A programme of geotechnical laboratory testing, scheduled by Ground and Water Limited and carried out by K4 Soils Laboratory and QTS Environmental Ltd, was undertaken on samples recovered from the Taplow Gravel Formation and Undifferentiated Seaford Chalk and Newhaven Chalk Formation. The results of the tests are presented in Appendix C.

The test procedures used were generally in accordance with the methods described in BS1377:1990. Details of the specific tests used in each case are given below.

Standard Methodology for Laboratory Geotechnical Testing		
Test	Standard	Number of Tests
Particle Size Distribution	BS1377:1990:Part 2:Clause 9	3
Determination of Saturation Moisture Content of Chalk	BS1377:1990:Part 2:Clause 3.3	1
Water Soluble Sulphate & pH	BS1377:1990:Part 3:Clause 5	1
BRE Special Digest 1 (incl. Ph, Electrical Conductivity, Total Sulphate, W/S Sulphate, Total Chlorine, W/S Chlorine, Total Sulphur, Ammonium as NH ₄ , W/S Nitrate, W/S Magnesium)	BRE Special Digest 1 "Concrete in Aggressive Ground (BRE, 2005).	2

5.2.1 Particle Size Distribution (PSD) Tests

The results of PSD testing undertaken on three granular samples of the Taplow Gravel Formation encountered are tabulated overpage.

PSD Test Results Summary			
Trial Hole/Depth/Soil Description	Volume Change Potential Range		Passing 63µm sieve Range (%)
	BRE	NHBC	
Taplow Gravel Formation WS1/2.50m bgl Mid to light brown very gravelly SAND (Gravel is fc and sub-angular to sub-rounded).	NO	NO	6.9
Taplow Gravel Formation WS1/2.80m bgl Mid to light brown very gravelly SAND (Gravel is fc and sub-angular to sub-rounded).	NO	NO	2.9
Taplow Gravel Formation WS2/2.50m bgl Mid to light brown very gravelly SAND (Gravel is fc and sub-angular to sub-rounded).	NO	NO	10.8

NB Volume Change Potential refers to BRE Digest 240 (based on Grading test results).
Shrinkability refers to NHBC Standards Chapter 4.2 (based on Grading test results).

Volume Change Potential – BRE 240 states that a soil has a volume change potential when the clay fraction exceeds 15%. Only the silt and clay combined fraction are determined by sieving therefore the volume change potential is estimated from the percentage passing the 63µm sieve.

NHBC Standards Chapter 4.2 states that a soil is shrinkable if the percentage of silt and clay passing the 63µm sieve is greater than 35% and the Plasticity Index is greater than 10%.

5.2.2 Saturation Moisture Content and Dry Density

A precis of results of saturation moisture content testing on one sample of intact chalk fragments recovered from the Undifferentiated Seaford Chalk and Newhaven Chalk Formation can be seen tabulated below.

Saturation Moisture Content Results Summary					
Stratum/Trial Hole/Depth	Moisture Content (%)	Saturation Moisture Content (%)	Bulk Density (Mg/m ²)	Dry Density (Mg/m ³)	CIRIA Dry Density Classification
Undifferentiated Seaford Chalk and Newhaven Chalk Formation WS2/2.80m bgl (Structureless chalk composed of compact, white/cream, slightly gravelly sandy SILT.)	24	24	1.99	1.60	Medium Density

NB: Density in accordance with CIRIA 574 Chapter 3.0, Table 3.7.

5.2.3 Sulphate and pH Tests

A sulphate and pH test was undertaken on one sample of the Taplow Gravel Formation (WS1/2.80m. The sulphate concentration was 0.35g/l (350mg/l) with a pH of 8.20.

5.2.4 BRE Special Digest 1

In accordance with BRE Special Digest 1 'Concrete in Aggressive Ground' (BRE, 2005) two samples of the Taplow Gravel Formation (WS1/2.80m and WS2/2.50m bgl) were scheduled for laboratory analysis to determine parameters for concrete specification.

The results of the chemical analysis undertaken are given within Appendix D and a summary is tabulated below.

Summary of Results of BRE Special Digest Testing			
Determinand	Unit	Minimum	Maximum
pH	-	8.4	8.5
Ammonium as NH ₄	mg/kg	2.5	3.8
Sulphur	%	< 0.02	<0.02
Chloride (water soluble)	mg/kg	26	27
Magnesium (water soluble)	mg/l	1.0	1.3
Nitrate (water soluble)	mg/kg	<3	8
Sulphate (water soluble)	g/l	0.02	0.04
Sulphate (total)	mg/kg	621	619

6.0 ENGINEERING CONSIDERATIONS

6.1 Soil Characteristics and Geotechnical Parameters

Based on the results of the intrusive investigation and geotechnical laboratory testing the following interpretations have been made with respect to engineering considerations.

- Made Ground was encountered from ground level to the base of TP1 and TP2, dug to 0.50m bgl and to a proved depth of 2.20 – 2.40 bgl within WS1 and WS2. During Phase II, Made Ground was encountered from ground level to 0.50m bgl in TPC and TPF and to an unproved depth of >1.00m – >1.10m bgl in TPB, TPD and TPE.

Based upon the SHDP results Made Ground was inferred to be encountered from GL to 1.00m bgl in WS/DP3.

As a result of the inherent variability of Made Ground, it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Made Ground may be found to deeper depth at other locations on the site, especially close to former structures/foundations and service runs.

- Granular soils of the Taplow Gravel Formation were encountered in WS1, WS2, TPA, TPC and TPE, underlying the Made Ground 0.50 – 2.40m bgl, to a proved depth of 2.70m within WS2 and for the remaining depth of WS1, TPA, TPC and TPE (1.10 – 3.45m bgl). The soils were described as a mid to light brown very gravelly sand. Sand is fine to coarse grained. Gravel is abundant, fine to coarse, sub-angular to sub-rounded flints and chalk fragments.

Based upon the SHDP results the Taplow Gravel Formation inferred to be encountered underlying the Made Ground from 1.00 – 3.20m bgl in WS/DP3.

The soils were medium dense to extremely dense (19 – 80 SPT “N” blow count).

The granular soils of the Taplow Gravel Formation were determined to have **no volume change potential** in accordance with BRE240 and NHBC Standards Chapter 4.2.

The granular soils of the Taplow Gravel Formation were considered to be a suitable bearing stratum for **moderately to highly** loaded footings/foundations. Settlements on loading were likely to be low.

- Soils of the Undifferentiated Seaford Chalk and Newhaven Chalk Formation were encountered underlying the Taplow Gravel Formation at a depth of 2.70m bgl for the remaining depth of WS2 (3.45m bgl).

Based upon the SHDP results the Undifferentiated Seaford Chalk and Newhaven Chalk Formation was inferred to be encountered underlying the Taplow Gravel Formation from 3.20m to the base of the dynamic probe at 8.00m bgl.

The soils of the Undifferentiated Seaford Chalk and Newhaven Chalk Formation were described as structureless chalk composed of compact, white/cream, slightly gravelly sandy SILT. Gravels are very weak, low density, white and rounded. Grade Dm in accordance with CIRIA 574. SPT “N” values ranged from 20 – 48. The Equivalent ‘SPT’s derived from SHDP results ranged from 20 – 48.

Geotechnical classification testing revealed the intact chalk fragments to be of medium density in accordance with CIRIA 574.

The Undifferentiated Seaford Chalk and Newhaven Chalk Formation is a weak rock and therefore likely to be a suitable stratum for lightly to moderately loaded traditional footings. The settlements induced on loading are likely to be low to moderate.

- Groundwater was not encountered during the investigation.
- Roots were noted to depths of 0.25m bgl in TP1 and TP2. Decayed roots were noted to 1.70 and 1.80m bgl in WS1 and WS2 respectively. Roots were not noted during the trial holes in Phase II.

6.2 Spread Foundations

At the time of reporting, July 2017, it was understood that the proposed development will comprise the demolition of the existing structures and the construction of a one and two storey structure comprising 5No. residential dwellings. A plan showing the proposed development can be seen in Figure 4.

The proposed development fell within Geotechnical Design Category 2 in accordance with Eurocode 7. The proposed foundation loads were not known to Ground and Water Limited at the time of reporting but are likely to range from 150 - 200kN/m².

The granular soils of the Taplow Gravel Formation were determined to have **no volume change potential** in accordance with NHBC Standards Chapter 4.2 and BRE240.

Given the no volume change potential, foundations should pass through any Made Ground and into the underlying Taplow Gravel Formation in the southern around area WS1. The Taplow Gravel Formation was encountered at a depth of 0.50m, in TPC and TPE and 2.20m and 2.40m in WS1 and WS2 respectively.

The following bearing capacities could be adopted for 5.0m long by 0.75m and 1.00m wide strip footings and 1.5m square pads at a depth of 2.20m and 2.50m bgl. The bearing capacities and settlements were determined based on WS1.

Limit State: Bearing Capacities Calculated (Based on WS1)		
Depth (m BGL)	Foundation System	Limit Bearing Capacity (kN/m ²)
2.20	5.00m by 0.75m Strip	402
	5.00m by 1.00m Strip	393
	1.50m by 1.50m Pad	394
2.50	5.00m by 0.75m Strip	361
	5.00m by 1.00m Strip	367
	1.50m by 1.50m Pad	386

Serviceability State: Settlement Parameters Calculated (Based on WS1)			
Depth (m BGL)	Foundation System	Limit Bearing Capacity (kN/m ²)	Settlement (mm)
2.20	5.00m by 0.75m Strip	125	<6
	5.00m by 1.00m Strip	125	<5
	1.50m by 1.50m Pad	125	<7
2.40	5.00m by 0.75m Strip	125	<6
	5.00m by 1.00m Strip	125	<3
	1.50m by 1.50m Pad	125	<7

Given the underlying chalk and the geotechnical properties, the limit bearing capacity has been lowered to 125kN/m² in order to avoid over-stressing the strata.

At the northern end of the site in the vicinity of WS2, It was considered that the foundations should pass through Made Ground, Taplow Gravel Formation, disturbed and/or desiccated ground, below any roots and into or onto the Undifferentiated Seaford Chalk Formation and Newhaven Chalk Formation.

Foundations constructed on the Undifferentiated Seaford Chalk and Newhaven Chalk Formation can be designed based on a bearing capacity of 125kN/m². This is based on the trial holes logs, reference to CIRIA 574, a 5m long by 1m wide foundation and a maximum settlement of 25mm. Differential settlement may occur where foundations cross between the more matrix dominated chalk to more clast dominated chalk or between the chalk and Taplow Gravel Formation and this should be taken into account in final design.

General Recommendations for Spread Foundations:

- Roots may be found to greater depths at other locations on the site, particularly close to trees and/or trees that have been removed both within the site and its close environs.
- Inspection of foundation excavations, prior to concreting, must be made by a competent and suitably qualified person to check for any soft spots and to check for the presence of roots.
- Any groundwater or surface water ingress must be prevented from entering foundation trenches. Excavations must be kept dry and either concreted or blinded as soon after excavation as possible. If water were allowed to accumulate on the formation for even a short time not only would an increase in heave occur resulting from the soil increasing in volume by taking up water, but also the shear strength and hence the bearing capacity would also be reduced and this could result in increased settlements.

- Foundation excavations must be carefully bottomed out and any loose soil or soft spots removed prior to the foundation concrete or blinding being placed. Failure to ensure that foundation excavations are suitably bottomed out could result in additional settlements.
- Foundations must not be cast over foundations of former structures and/or other hard spots.
- Isolated Pad Foundations must be at least 1.5 times the width of the widest pad apart to keep to the anticipated settlements.
- Given the depth of Made Ground observed, a suspended slab should be considered. The volume change potential of the shallow surface soils must be taken into account in final design (underfloor void diameter/compressible material/void formers etc).
- Final designs for the foundations should be carried out by a suitably qualified Engineer based on the findings of this investigation and with reference to the anticipated loadings, serviceability requirements for the structure and the developments proximity to former, present and proposed trees.

6.3 Piled Foundations

Given the depth of the Made Ground across the site (0.50 – 2.40m) then traditional strip footings may not be cost effective due to the requirement for engineer design, amount of waste produced and concrete required. Should this be the case then an alternative foundation solution like isolated deep pads, a raft or piled foundations should be considered.

The construction of a piled foundation is a specialist job, and the advice of a reputable contractor, familiar with the type of ground and groundwater conditions encountered on this site, should be sought prior to finalising the foundation design, as the actual pile working load will depend on the particular type of pile and method of installation adopted.

Additional investigation in the form of a shell and auger borehole may be required to obtain pile design parameters.

6.4 Excavations and Stability

Shallow excavations in the Made Ground and Taplow Gravel Formation are likely to be marginally stable at best. Long, deep excavations, through both these strata and the Undifferentiated Seaford Chalk Formation and Newhaven Chalk Formation are likely to become unstable.

Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported before excavations are entered by personnel.

6.5 Sub-Surface Concrete

Sulphate concentrations measured in 2:1 water/soil extracts taken from the Made Ground and Taplow Gravel Formation from both the geotechnical and chemical laboratory testing, fell into Class DS-1 of the BRE Special Digest 1, 2005, 'Concrete in Aggressive Ground'. Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) classification of AC-1.

For the classification given, the "mobile" and "natural" case was adopted given the geology encountered and the residential use of the site. The sulphate concentrations ranged from <0.02 –

0.49g/l with a pH range of 7.6 – 8.6. The total potential sulphate concentration ranged from 619-621mg/kg.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1, 2005, 'Concrete in Aggressive Ground' taking into account the pH of the soils.

6.6 Surface Water Disposal

Soakaway tests in accordance with the principles of BRE365 were undertaken within TP1 and TP2 at a depth of 0.50m bgl. The trial holes were bottomed out within the Made Ground comprising a gravelly sandy very silty clay to a gravelly silty clayey sand. The infiltration rates recorded within the trial pits can be seen tabulated below. Due to slow infiltration rates it was not possible to complete 3 fillings of the pit in the one day allowed.

Falling Head Test Results					
Trial hole/Depth of trial hole (m)	Test	Initial Water Level (m bgl)	Final Water Level (m bgl)	Time taken (mins)	Infiltration Rate (m/s)
TP1/0.50 bgl	1	0.280	0.370	320	1.68×10^{-6}
TP2/0.50 bgl	1	0.150	0.340	150	5.78×10^{-6}

Soakaways constructed within the soils of the Made Ground were considered unlikely to perform to a satisfactory standard. Further soakage tests may be required in the Taplow Gravel Formation, which would be likely to perform to a more satisfactory standard due to anticipated high infiltration rates and granular nature.

The Taplow Gravel Formation is a Secondary (A) Aquifer and the Undifferentiated Seaford Chalk and Newhaven Chalk Formation is a Primary Aquifer and consultation with the Environment Agency must be sought regarding any use that may have an impact on groundwater resources.

The principles of sustainable urban drainage system (SUDS) should be applied to reduce the risk of flooding from surface water ponding.

6.7 Road and Hardstanding

Intrusive works revealed a Made Ground thickness of between 0.50 – 2.40m bgl mantling the site. Where roads and hardstanding are to be founded in the Made Ground, a CBR value of 1% could be adopted. Given that the Made Ground encountered beneath the site was a mixture of sandy, gravelly, silty clay-based soils, these deposits are likely to be **frost susceptible**.

Given that the soils encountered beneath the Topsoil or Made Ground are mainly sand based soils these deposits are **not** likely to be frost susceptible.

All formation levels for roads and hardstanding should be proof rolled to highlight any soft areas which should then be dug out and replaced with selected granular material compacted in thin layers to a suitable specification.

7.0 PHASE 2 CONTAMINATION RISK ASSESSMENT

7.1 Results of the Phase 1 Risk Assessment (Conceptual Site Model)

The tabulated Conceptual Site Model developed by the Ground and Water Desk Study (ref. GWPR1443/DS/December 2015) is reproduced in this section and can be seen below.

Tabulated Conceptual Site Model – Plausible Pollutant Linkages Only		
Potential Sources	Potential Absorption Pathways	Potential Receptors
On-site Sources Contaminants introduced on-site by construction activities to embank the railway along the north-west boundary of the site. • Heavy Metals and Semi-Metals including: Arsenic, Cadmium, Chromium, Lead, Copper, Zinc, Beryllium, Vanadium etc; • Poly-cyclic Aromatic Hydrocarbons – Benzo(a)pyrene, Fluorene, Dibenzo(A,H)anthracene etc; • Petroleum Hydrocarbons; • VOCs (incl BTEX), SVOCs; • Others- Asbestos (building materials);	Direct ingestion of soil and soil derived household dust Dermal contact of soil and soil derived household dust Ingestion of soil with elevated concentration of determinants Dermal contact with impacted soils Inhalation of impacted dust (indoors and outdoors) with elevated concentration of determinants	Construction workers (particularly during foundation construction) Service and Maintenance Operatives Site Occupiers
Potential asbestos containing roofing within the northern portion of the site. • Asbestos		
Contaminants introduced on-site by historic demolition and construction activities. • Heavy metals & semi-metals (incl. Arsenic, Cadmium, Chromium, Lead etc); • Combustion products (PAH's, benzo(a)pyrene, fluoranthene, dibenz(a,h)anthracene); • Organic compounds (fuel oils, ash, tar); • Asbestos (building material, pipe lagging).		
	Via underlying geology (Made Ground, Taplow Gravel Formation and the Undifferentiated Seaford Chalk and Newhaven Chalk Formation) Via surface water runoff Via anthropogenic pathways	Secondary A Aquifer (Taplow Gravel Formation) and Principal Aquifer (Undifferentiated Seaford Chalk and Newhaven Chalk Formation) underlying site. Drain and stream to the north-east.

Cont'd overleaf:

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Tabulated Conceptual Site Model – Plausible Pollutant Linkages Only Cont'd		
Potential Sources	Potential Absorption Pathways	Potential Receptors
Contaminants introduced on-site by former builder's yard/joinery workshop. - Heavy metals and semi-metals (incl. Arsenic, Cadmium, Chromium, Lead etc); - Asbestos - Oil/fuel hydrocarbons - Poly-cyclic Aromatic Hydrocarbons (PAH's) - Solvents and inorganic chemicals Contaminants introduced on-site by frequent fires. - Poly-cyclic Aromatic Hydrocarbons (PAH's).	Via underlying geology (Made Ground, Taplow Gravel Formation and the Undifferentiated Seaford Chalk and Newhaven Chalk Formation) Via surface water runoff Via anthropogenic pathways	Construction workers (particularly during foundation construction) Service and Maintenance Operatives Site Occupiers Secondary A Aquifer (Taplow Gravel Formation) and Principal Aquifer (Undifferentiated Seaford Chalk and Newhaven Chalk Formation) underlying site. Drain and stream to the north-east.

Made Ground was encountered from ground level to the base of TP1 and TP2, dug to 0.50m bgl and to a proved depth of 2.20 – 2.40 bgl within WS1 and WS2. During Phase II, Made Ground was encountered from ground level to 0.50m bgl in TPC and TPF and to an unproved depth of >1.00m – >1.10m bgl in TPB, TPD and TPE.

The soils primarily comprised dark brown/dark grey/black clayey very gravelly sand to a sandy gravelly clay within all boreholes and trial holes. The sand was fine to coarse grained. The gravel was occasional to abundant, fine to coarse, sub-angular to angular flints, brick, concrete, plastic, carbonaceous material, slate, rusted metals, glass and ceramics. Possible asbestos containing material (ACM) was noted at 1.30m bgl within WS1 and at 1.80m bgl within WS2. A hydrocarbon type odour was noted at 1.80m bgl in WS2.

The intrusive investigation revealed a hydrocarbon type odour within WS2 at a depth of 1.80m, to 0.50m bgl in TPF and TPD and around 0.80m and 0.50m bgl in TPB and TPA respectively.

Made Ground, with hydrocarbon odours, was anticipated to be on-site, consequently there was no need to modify the tabulated Conceptual Site Model developed by the Ground and Water Desk Study (ref. GWPR1904/DS/March 2017). However, given the depth of the Made Ground encountered, the consideration of ground-gases from deep Made Ground may be required.

7.2 Sampling Locations

The methodology for sampling locations can be seen tabulated below. A trial hole location plan is given within Figure 5. A random sampling strategy was adopted.

Methodology for Sampling Locations			
	Trial Holes	Sampling Strategy	Proposed End-Use
Phase I	WS1	Random Sampling Strategy	Proposed area of restricted access to the rear of the residential dwellings
	WS2		
	TP1		Proposed decorative stone amenity area
	TP2		
Phase II	TPA	Random Sampling Strategy	Proposed decorative stone amenity area
	TPB		Proposed area of restricted access to the rear of residential dwellings
	TPC		
	TPD		
	TPE		
	TPF		

The area investigated as part of the proposed residential development totals ~0.10ha (1000m²) and with ten sampling locations, given an unknown hotspot shape, the sampling density means that a hotspot with an area of approximately 150m² and a radius of approximately 6.91m would be encountered (CLR 4). This sampling density is deemed suitable.

Sampling depths were chosen to reflect the receptor of concern, human health and typically comprised a surface or near surface sample and at approximately 0.5m depth increments thereafter, extending into the underlying natural soils. The human health receptors relevant to the sampling depths were as follows:

Near surface samples	Direct ingestion, dermal contact and dust inhalation. Protection of end-users and maintenance workers e.g. Landscape Gardeners. Protection of shallow rooted plants Perched Water/Surface Water Run-off
>0.5m below ground level	Protection of deep rooted plants Perched Water/Surface Water Run-off

The depth of soil sampling can be seen within the trial hole logs presented in Appendix B.

7.3 Chemical Laboratory Testing – Human Health Risk Assessment

A programme of chemical laboratory testing, scheduled by Ground and Water Limited, and carried out by QTS Environmental Limited, was undertaken on fifteen samples of Made Ground (WS1/0.50m, WS1/1.30m, WS1/2.80m, WS2/1.80, WS2/2.50, TP1/0.25, TP2/0.25m, TPA/0.50m, TPB/0.80m, TPC/0.20m, TPD/0.20m, TPD/1.00m, TPE/0.50m, TPF/0.20m, TP6/0.50m bgl.).

The samples tested and the reason for testing can be seen tabulated overleaf.

Methodology for Sampling Locations and Chemical Laboratory Testing			
Trial Hole	Depth (m bgl)	Sampling Strategy	Proposed End Use
WS1	0.50	Representative samples of Made Ground from across the site.	Rear proposed soft landscaping
WS1	1.30		Rear proposed soft landscaping
WS1	2.80		Rear proposed soft landscaping
WS2	1.80		Rear proposed soft landscaping
WS2	2.50		Rear proposed soft landscaping
TP1	0.25		Front proposed soft landscaping
TP2	0.25		Front proposed soft landscaping
TPA	0.50		Front proposed soft landscaping
TPB	0.80		Front proposed soft landscaping
TPC	0.20		Rear proposed soft landscaping
TPC	0.20		Rear proposed soft landscaping
TPD	1.00		Rear proposed soft landscaping
TPE	0.50		Rear proposed soft landscaping
TPF	0.20		Rear proposed soft landscaping
TPF	0.50		Rear proposed soft landscaping

The analysis suite is presented below and comprised:

- Semi Metals and Heavy Metals incl. Arsenic, Cadmium, Chromium (incl. Hexavalent Chromium), Copper, Lead, Mercury, Nickel, Selenium, Vanadium (WS1/0.50m, WS1/1.30m, WS2/1.80m, TP1/0.25m bgl, TPA/0.50m, TPB/0.80m, TPC/0.20m, TPD/0.20m, TPD/1.00m, TPE/0.50m, TPF/0.20m, TP6/0.50m bgl);
- Asbestos (WS1/0.50m, WS1/1.30m, WS2/1.80m, TP1/0.25m, TPA/0.50m, TPB/0.80m, TPC/0.20m, TPD/0.20m, TPD/1.00m, TPE/0.50m, TPF/0.20m, TP6/0.50m bgl);
- Polycyclic Aromatic Hydrocarbons (PAHs) incl. Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene (WS1/0.50m, WS1/1.30m, WS2/1.80m, TP1/0.25m, TPA/0.50m, TPB/0.80m, TPC/0.20m, TPD/0.20m, TPD/1.00m, TPE/0.50m, TPF/0.20m, TP6/0.50m bgl bgl);
- Fuel Oils – Speciated TPH including full aliphatic/aromatic split (WS1/0.50m, WS2/1.80m, TP1/0.25m bgl);
- BTEX compounds (Benzene, Toluene, Ethylbenzene, Xylene) and MTBE – used as marker compounds for Volatile Organic Compounds (VOCs) (WS1/0.50m, WS2/1.80m, TP1/0.25m bgl);
- PCBs (TP2/0.25).

The chemical laboratory results are presented in Appendix D.

7.3.1 Soil Assessment Criteria

The derivation of Soil Assessment Criteria used within this report can be seen within Appendix F.

7.3.2 Determination of Representative Contamination Concentration

At the time of reporting, July 2017, it was understood that the proposed development will comprise the demolition of the existing structures and the construction of a one and two

storey structure comprising 5No. residential dwellings. Decorative chippings will comprise the communal entrance and the areas around the perimeter of the rear of the building. Raised planter beds were planned in the front entrances. No rear access is possible by tenants due to locked gates and only windows at the rear elevation. It is understood the rear of the property will only be accessible by Launchpad Reading or appointed contractors, via locked gates. The rear boundary with the network rail embankment will be cleared and planted with a dominant ground cover, such as Ivy. A plan showing the proposed development can be seen in Figure 4.

Therefore, the results of the chemical laboratory testing were compared to the LQM/CIEH Sutable 4 Use Levels (S4UL) for a ***'Residential without Home-grown Produce'*** land use scenario, as this was considered the most appropriate land-use scenario. The C4SL LLTC for Lead was compared to a ***'Residential without Home-grown Produce'***.

Where no LQM/CIEH S4UL/C4SL LLTC was available for a particular determinant then preliminary reference was made to the laboratory detection limit of the determinant. If a positive concentration was noted then further risk assessment was undertaken.

For Cyanide, where no SGC/GAC or C4SL LLTC was available a Site Specific Assessment Criteria of 10mg/kg was adopted. This is based on ICRL 59/83, TCL, ATRISK (SOIL) Screening Value and Dutch Intervention Value (ranging from 20 – 34mg/kg). Therefore, a SSAC of ~10mg/kg is considered conservative.

Double plot analysis of the speciated PAH's encountered in Phase 1 and Phase 2 investigation revealed that the majority of the PAH's encountered were from a combustion source, within the urban background source and may be associated fragments of coal. The PAHs detected in three samples (TPC/0.20m, TPD/1.00m and TPF/0.50m bgl) were indicated from a coal tar/creosote derived source. A copy of the LQM PAH Profiling Tool used can be seen in Appendix E.

Based on the results of PAH profiling, all samples were compared to the C4UL for benzo(a)pyrene with the exception of TPC/0.20m, TPD/1.00m and TPF/0.50m, for which the C4UL for Coal Tar was used.

Where a contaminant of concern's LQM/CIEH S4UL/C4SL LLTC varies according to the Soil's Organic Matter (SOM), the SOM recorded for the soil sample was used to derive the appropriate SGV/GAC. The average SOM of the samples analysed was 2.2% (SOM ranged between 0.7 – 3.2%).

The results showing comparison of the representative contaminant concentrations are presented in the table overpage.

Soil Guideline Values and General Acceptance Criteria Results	
Substance	Sample Location Where available LQM/CIEH S4UL and CSL4 LLTC were exceeded for relevant land-use scenario
	"Residential without Home-Grown Produce" Land-Use Scenario
Arsenic	WS1/0.50m bgl (63mg/kg); TPD/1.00m (54mg/kg)
Boron	None
Cadmium	None
Chromium (III)	None
Hexavalent Chromium (VI)	None
Copper	WS1/0.50m (314mg/kg)
Lead	WS1/1.50 (3820mg/kg); WS1/1.30m bgl (2790mg/kg); WS2/1.80m (2920mg/kg); TPC/0.20m (355mg/kg); TPD/0.20m (394mg/kg); TPE/0.50m (751mg/kg); TPF/0.50m (466mg/kg)
Mercury (Elemental)	None
Nickel	None
Selenium	None
Vanadium	None
Zinc	WS1/0.50m (6860mg/kg); WS1/1.30m (3180mg/kg); WS2/1.80m (1950mg/kg); TPC/0.20m (2250mg/kg)
Cyanide (Total)	None
Total Phenol	None
Naphthalene	None
Acenaphthylene	None
Acenaphthene	None
Fluorene	None
Phenanthrene	None
Anthracene	None
Fluoranthene	None
Pyrene	None
Benzo(a)anthracene	None
Chrysene	None
Benzo(b)fluoranthene	WS2/1.80m (6.13mg/kg)
Benzo(k)fluoranthene	None
Benzo(a)pyrene	WS2/1.80m (6.94mg/kg)
Indeno(1,2,3-cd)pyrene	None
Dibenz(a,h)anthracene	None
Benzo(ghi)perylene	None
Coal Tar (benzo(a)pyrene)	None
TPH C5 – C6 (aliphatic)	None
TPH C6 – C8 (aliphatic)	None
TPH C8 - C10 (aliphatic)	None
TPH C10 - C12 (aliphatic)	None
TPH C12 - C16 (aliphatic)	None
TPH C16 - C21 (aliphatic)	None
TPH C21 - C34 (aliphatic)	None
TPH C5 – C7 (aromatic)	None
TPH C7 – C8 (aromatic)	None
TPH C8 - C10 (aromatic)	None
TPH C10 - C12 (aromatic)	None
TPH C12 - C16 (aromatic)	None
TPH C16 - C21 (aromatic)	None
TPH C21 - C35 (aromatic)	None
Benzene	None
Toluene	None
Ethylbenzene	None
Xylene (o, m & p)	None
MTBE	None
Asbestos Screen	WS1/1.30m bgl (Chrysotile), WS2/1.80m bgl (Chrysotile)

Chemical laboratory testing revealed an elevated level of lead in excess of the C4SL LLTC for a **'Residential without Home-grown Produce'** land use scenario of 330mg/kg was detected in seven samples of Made Ground tested: WS1/1.50 (3820mg/kg), WS1/1.30m bgl (2790mg/kg); WS2/1.80m (2920mg/kg); TPC/0.20m (355mg/kg); TPD/0.20m (394mg/kg); TPE/0.50m (751mg/kg); TPF/0.50m (466mg/kg)).

Chemical laboratory testing revealed an elevated level of arsenic in excess of the C4SL LLTC for a **'Residential without Home-grown Produce'** land use scenario of 40mg/kg was detected in one sample of Made Ground tested: WS1/0.50m bgl (63mg/kg).

Chemical laboratory testing revealed elevated levels of Benzo(b)fluoranthene, in excess of the LQM/CIEH Suitable 4 Use Levels (S4UL) for a **'Residential without Home-grown Produce'** land use scenario of 3.90mg/kg was detected in one sample of Made Ground tested: WS2/1.80m (6.94mg/kg)

Chemical laboratory testing revealed elevated levels of Benzo(a)pyrene in excess of the LQM/CIEH Suitable 4 Use Levels (S4UL) for a **'Residential without Home-grown Produce'** land use scenario of 3.20mg/kg was detected in one sample of Made Ground tested: WS2/1.80m (6.94mg/kg).

Chemical laboratory testing revealed cement bound asbestos in two samples of Made Ground tested: WS1/1.30m bgl (Chrysotile); WS2/1.80m bgl (Chrysotile). As a results of the condition of the samples where the asbestos was identified it was not possible to determine the quantity of asbestos in the samples. Consequently, an asbestos risk assessment could not be undertaken. Consideration should be given to further sampling and analyses.

Elevated concentrations of copper were noted in one sample with a value of 314mg/kg in TPC/0.20m above the phytotoxicity threshold trigger value of 50mg/kg.

Elevated concentrations of Zinc were noted in four samples with values of 6860mg/kg in WS1/0.50m, 3180mg/kg in WS1/1.30m, 1950mg/kg in WS2/1.80m and 2250mg/kg in TPC/0.20m bgl above the phytotoxicity threshold trigger value of 1000mg/kg.

Chemical laboratory testing of the Made Ground revealed no elevated levels of determinants above the guideline levels for **'Residential with Home-Grown Produce'** land-use scenario.

The intrusive investigation revealed a hydrocarbon type odour within WS2 at a depth of 1.80m, to 0.50m bgl in TPF and TPD and around 0.80m and 0.50m bgl in TPB and TPA respectively. However, the chemical laboratory results have verified that no elevated concentrations of aliphatic/aromatic hydrocarbons (C5-C35) or BTEX compounds were present in the soils underlying the site that could pose a risk to end-users.

7.4 CLAIRE Statistical Analysis

CLAIRE statistical analysis of the results of contamination testing from both phases of sampling was carried out targeting the contaminants identified as posing an unacceptable risk to end-users (lead and PAH's).

The Made Ground encountered was considered to be of the same population, therefore statistical analysis on all results obtained was deemed appropriate.

CLAIRE statistical analysis looks at the distribution of contaminants across the site to determine if overall levels exceed the critical criteria and whether there are outliers within the sample population which can be treated as hotspots.

Given the results of the double plot analysis of the speciated PAH's, the samples of Made Ground that were found to be from a coal tar/creosote source were omitted from the CLAIRE Statistics.

CLAIRE statistical analysis of the distribution of elevated levels of Arsenic and Lead within the Made Ground analysed revealed the concentrations had a non-normal distribution, no outliers with the mean of the sample population below the LQM/CIEH S4UL and the Upper Confidence Limit of the sample population above the LQM/CIEH S4UL. Therefore, the elevated levels of Lead in samples of Made Ground analysed are thought to pose a risk across the site.

CLAIRE statistical analysis of the distribution of elevated levels of Benzo(a)pyrene within the Made Ground analysed revealed the concentrations had a non-normal distribution, one outlier with the Upper Confidence Limit of the sample population above the LQM/CIEH S4UL. The outlier relates to the elevated levels in WS2/1.80m. Removal of the outliers revealed concentrations in the remaining samples of Made Ground had a non-normal distribution with the Upper Confidence Limit of the sample population below the LQM/CIEH S4UL. Therefore, the isolated elevated levels of Benzo(a)pyrene within WS1 and TPD were considered to pose a potential risk to end-users and should be considered for removal.

CLAIRE statistical analysis of the distribution of elevated levels of Benzo(b)fluoranthene within the Made Ground analysed revealed the contaminants to have a non-normal distribution, no outliers and with the mean and Upper Confidence Limit of the sample population below the C4SL LLTC. Therefore, the elevated levels of Benzo(b)fluoranthene were not considered to pose a significant risk to end-users.

The results of the analysis can be seen in Appendix G. A précis of the results is tabulated overleaf.

Soil Guideline Values and General Acceptance Criteria Results			
Substance	Outliers Present	Upper Confidence Limit of Sample Population (mg/kg)	Does the Upper Confidence Limit of the Sample Population Exceed the C4SL LLTC
			Residential without Home Grown Produce
Lead	NO	2698.28	330mg/kg Yes
Arsenic	NO	46.63	40mg/kg Yes
Benzo(a)pyrene	YES	4.37	3.20mg/kg Yes
Benzo(a)pyrene	NO	1.08	3.20mg/kg No
Benzo(b)fluoranthene	NO	3.09	4.00mg/kg No

7.5 Groundwater Risk Assessment

The Desk Study has revealed the site to be located on a **Secondary A Aquifer** comprising the superficial deposits of the Taplow Gravel Formation and a **Principal Aquifer** comprising the underlying bedrock deposits of the Undifferentiated Seaford Chalk and Newhaven Chalk Formation.

Examination of the Environment Agency records showed that the site **was not** located within a Groundwater Source Protection Zone (SPZ) as classified in the Policy and Practice for the Protection of Groundwater.

The nearest surface water features to the site was a drain ~150m north-east of the site and an easterly flowing stream ~240m north-east of the site.

From analysis of hydrogeological and topographical maps groundwater was anticipated to be encountered at moderate depth (3-6m below existing ground level (bgl)) and it was considered that the groundwater was flowing in a northerly direction in alignment with local topography and towards the River Thames.

Examination of the Environment Agency records showed that the site was not situated within a floodplain or flood warning area.

Given the hydrogeological setting of the site the potential receptors are presented below and comprise:

- Secondary A Aquifer and Principal Aquifer directly underlying the site.
- Drain and stream to north-east.

However, given the concentrations of determinants noted during testing and their likely limited mobility and the increase in hardstanding proposed across the site, the potential for leachates/eluates is reduced. It was unlikely therefore, that the Made Ground posed a significant risk to groundwater.

7.6 Re-Evaluated Phase 2 Conceptual Site Model

Following completion of the Phase 2 Site Investigation, the CSM within Section 7.1 of this report was re-evaluated and can be seen overpage.

The plausible pollutant linkages remaining after risk assessment are shown and where risk assessment has indicated no unacceptable risk to sensitive receptors, the pollutant linkages have been crossed out.

Tabulated Conceptual Site Model – Plausible Pollutant Linkages Only		
Potential Sources	Potential Absorption Pathways	Potential Receptors
On-site Sources Contaminants introduced on-site by construction activities to embank the railway along the north-west boundary of the site. • Heavy Metals and Semi-Metals including: Arsenic, Cadmium, Chromium, Lead, Copper, Zinc, Beryllium, Vanadium etc; • Poly-cyclic Aromatic Hydrocarbons – Benzo(a)pyrene, Benzo(b)fluoranthene, Fluorene, Dibenzo(A,H)anthracene etc; • Petroleum Hydrocarbons; • VOCs (incl. BTEX), SVOCs; • Others- Asbestos (building materials); An Asbestos Management Strategy should be put in place to ensure that any the asbestos containing materials identified are removed from site in a suitable manner to prevent cross-contamination.	Direct ingestion of soil and soil derived household dust Dermal contact of soil and soil derived household dust Ingestion of soil with elevated concentration of determinants Dermal contact with impacted soils Inhalation of impacted dust (indoors and outdoors) with elevated concentration of determinants	Construction workers (particularly during foundation construction) Service and Maintenance Operatives Site Occupiers
Potential asbestos containing roofing within the northern portion of the site. • Asbestos		
Contaminants introduced on-site by historic demolition and construction activities. • Heavy metals & semi-metals (incl. Arsenic, Lead, Copper, Zinc etc); • Combustion products (PAH's, benzo(a)pyrene, (b)fluoranthene, dibenz(a,h)anthracene); • Organic compounds (fuel oils, ash, tar); • Asbestos (building material, pipe lagging).		
Contaminants introduced on-site by former builder's yard/joinery workshop. • Heavy metals and semi-metals (incl. Arsenic, Copper, Zinc Lead etc); • Asbestos • Oil/fuel hydrocarbons • Poly-cyclic Aromatic Hydrocarbons (PAH's) • Solvents and inorganic chemicals		
Contaminants introduced on-site by frequent fires. • Poly-cyclic Aromatic Hydrocarbons (PAH's).		
	Via underlying geology (Made Ground, Taplow Gravel Formation and the Undifferentiated Seaford and Newhaven Chalk Formation) Via surface water runoff Via anthropogenic pathways	Secondary A Aquifer (Taplow Gravel Formation) and Principal Aquifer (Undifferentiated Seaford Chalk and Newhaven Chalk Formation) underlying site. Drain and stream to the north-east.

7.7 Remediation Strategy

Based on the results to date, the following remediation is considered necessary.

At the time of reporting, July 2017, it was understood that the proposed development will comprise the demolition of the existing structures and the construction of a one and two storey structure comprising 5 No. residential dwellings. Decorative chippings will comprise the communal entrance and the areas around the perimeter of the rear of the building. Raised planter beds were planned in the front entrances. No rear access is possible by tenants due to locked gates and only windows at the rear elevation. It is understood the rear of the property will only be accessible by Launchpad Reading or appointed contractors, via locked gates. The rear boundary with the network rail embankment will be cleared and planted with a dominant ground cover, such as Ivy. A plan showing the proposed development can be seen in Figure 4.

The Risk Assessment has revealed the Made Ground posed no risk to groundwater.

CLAIRE statistical analysis revealed that there was site wide Lead and Arsenic contamination with isolated hotspots relating to Benzo(a)pyrene (WS2/1.80m bgl). Asbestos (cement bound chrysotile) was also detected in two samples (WS1/1.30m and WS2/1.80m).

It is understood that to the rear of the site, neighboring the network rail embankment, will have restricted access and ground cover. The gates to the area will be locked and only accessible by Launchpad Reading or appointed contractors. With ground cover and minimised access the risk of exposure scenarios by residents is considered to be low and therefore no further remediation is considered necessary. The maintenance regime for the building should include ensuring access is restricted to the rear of the property and that ground cover through planting is maintained.

Appropriate use of PPE by contractors will minimize risk to maintenance and service personal. Any risk assessment would need to take into account the potential for asbestos to be present in the soil.

Decorative chippings are proposed to cover the communal entrance to the site and around the perimeter of the dwellings. It is recommended that a geotextile membrane is placed below the decorative chippings, and that the chipping thickness is at least 100mm.

As trees and vegetation are proposed on raised beds, no remediation is considered necessary in respect to tree planting or phytotoxicity thresholds.

In relation to end-users the presence of permanent hardstanding (i.e. a building, car parking area or roads) will sever any plausible pollutant linkages present.

7.8 Remediation Method Statement

The following remedial methodology should be undertaken based on the elevated levels of lead, arsenic, benzo(a)pyrene and Asbestos noted:

- Installation of a geotextile/geo-membrane in the front communal entrances, and around perimeter of building, and installation of at least 100mm of decorative stone/chipping on top;
- The maintenance regime for the building should include ensuring access is restricted to the rear of the property and that ground cover through planting is maintained.

- Appropriate use of PPE by contractors will minimize risk to maintenance and service personal. Any risk assessment would need to take into account the potential for asbestos to be present in the soil.
- Stockpiled contaminated Made Ground, destined for removal from site, must be placed on an impermeable liner with raised edge and must be covered at all times.
- Materials to be removed off-site must be classified by carrying out Waste Acceptance Produce (WAP) testing. A registered contractor must undertake the removal of waste. Full liaison must be made with the Environment Agency prior to the removal of any material and must be conducted to meet their full approval.
- Additional verification of any imported soil will also need to occur onsite, once received, to validate the accompanying lab certificate. Any samples taken from a stockpile of imported soil or placed soil should be at a rate of one sample per 50m³ of material and be tested for semi-metals, heavy metals, speciated PAH's and speciated TPH.
- Full liaison must be made with the statutory authority, prior to the implementation of this method statement and/or the removal of any material from site. All works must be undertaken to meet their full approval.

A plan showing the proposed remediation can be seen in Figure 6.

7.9 Discovery Strategy

There may be areas of contamination that have not been identified during the course of the intrusive investigation. For example, there may have been underground storage tanks (UST's) not identified during the Ground Investigation for which there is no historical or contemporary evidence.

Such occurrences may be discovered during the demolition and construction phases for the redevelopment of the site.

Groundworkers should be instructed to report to the Site Manager any evidence for such contamination; this may comprise visual indicators, such as fibrous materials within the soil, discolouration, or odours and emission. Upon discovery advice must be taken from a suitably qualified person before proceeding, such that appropriate remedial measures and health and safety protection may be applied.

Should a new source of contamination be suspected or identified then the Local Authority will need to be informed.

7.10 Waste Disposal

The excavation of foundations is likely to produce waste which will require classification and then recycling or removal from site.

Under the Landfill (England and Wales) Regulations 2002 (as amended), prior to disposal all waste must be classified as;

- Inert;
- Non-hazardous, or;

- Hazardous.

The Environment Agency's Hazardous Waste Technical Guidance (WM2) document outlines the methodology for classifying wastes.

Once classified the waste can be removed to the appropriately licensed facilities, with some waste requiring pre-treatments prior to disposal.

The presence of cement bound Chrysotile Asbestos Fibres within the Made Ground of WS1 and WS2 may mean the waste classification of this material is increased to HAZARDOUS. As a result of the condition of the samples where the asbestos was identified it was not possible to determine the quantity of asbestos in the samples. Consequently, an asbestos waste risk assessment could not be undertaken. Consideration should be given to further sampling and analyses.

Hazardous waste requires pre-treatment prior to removal. The site may need to be registered as a Hazardous waste producer should such waste be removed from the site.

Based on a risk phrase analysis of the remaining chemical laboratory test results, in accordance with EC Hazardous Waste Directive and undertaken by Ground and Water Limited, four samples of Made Ground (WS1/0.50, WS1/1.30m, WS2/1.80m, TPC/0.20m bgl) were classified as **HAZARDOUS** due to the carcinogenic and mutagenic properties of the concentrations of Lead and Zinc determined in the sample.

Hazardous waste will require pre-treatment prior to disposal in order to reduce the waste classification.

The remaining samples of Made Ground encountered on-site were **NON-HAZARDOUS**. The results of the assessment are given within Appendix G. INERT waste classification should be undertaken to determine if the proposed remaining waste confirms to INERT or NON-HAZARDOUS Waste Acceptable Criteria (WAC).

It is important to note that whilst we consider our in-house assessment tool to be an accurate interpretation of the requirements of WM3, therefore producing an initial classification in accordance with the guidance, landfill operators have their own assessment tools and can often come to different conclusions. As a result, some landfill operators could refuse to take apparently suitable waste. It is recommended that the receiving landfill views the results of this assessment and the chemical laboratory results to determine their own classification.

7.11 Imported Material

Any soil which is to be imported onto the site must undergo chemical analysis to prove that it is suitable for the purpose for which it is intended.

The Topsoil must be fit for purpose and must either be supplied with traceable chemical laboratory test certificates or be tested, either prior to placing (ideally) or after placing, to ensure that the human receptor cannot come into contact with compounds that could be detrimental to human health. The compounds that are to be tested for are those given in the LQM S4UL's, which can be viewed in Appendix E of this report.

7.12 Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust were generated as a result of construction activities.

The site should be securely fenced at all times to prevent unauthorised access. Washing facilities should be provided and eating restricted to mess huts.

Risk Assessment will need to take into account the presence of asbestos in soils during construction and subsequent maintenance/management/service work.

APPENDIX A

Conditions and Limitations

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The report has been prepared on the basis of information, data and materials which were available at the time of writing. Accordingly any conclusions, opinions or judgements made in the report should not be regarded as definitive or relied upon to the exclusion of other information, opinions and judgements.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief; as such these do not necessarily address all aspects of ground behaviour at the site. No liability is accepted for any reliance placed on it by others unless specifically agreed in writing.

Any decisions made by you, or by any organisation, agency or person who has read, received or been provided with information contained in the report (“you” or “the Recipient”) are decisions of the Recipient and we will not make, or be deemed to make, any decisions on behalf of any Recipient. We will not be liable for the consequences of any such decisions.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Any Recipient must take into account any other factors apart from the Report of which they and their experts and advisers are or should be aware. The information, data, conclusions, opinions and judgements set out in the report may relate to certain contexts and may not be suitable in other contexts. It is your responsibility to ensure that you do not use the information we provide in the wrong context.

This report is based on readily available geological records, the recorded physical investigation, the strata observed in the works, together with the results of completed site and laboratory tests. Whilst skill and care has been taken to interpret these conditions likely between or below investigation points, the possibility of other characteristics not revealed cannot be discounted, for which no liability can be accepted. The impact of our assessment on other aspects of the development required evaluation by other involved parties.

The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous in ground activities. The ground conditions have been sampled or monitored in recorded locations and tests for some of the more common chemicals generally expected. Other concentrations of types of chemicals may exist. It was not part of the scope of this report to comment on environment/contaminated land considerations.

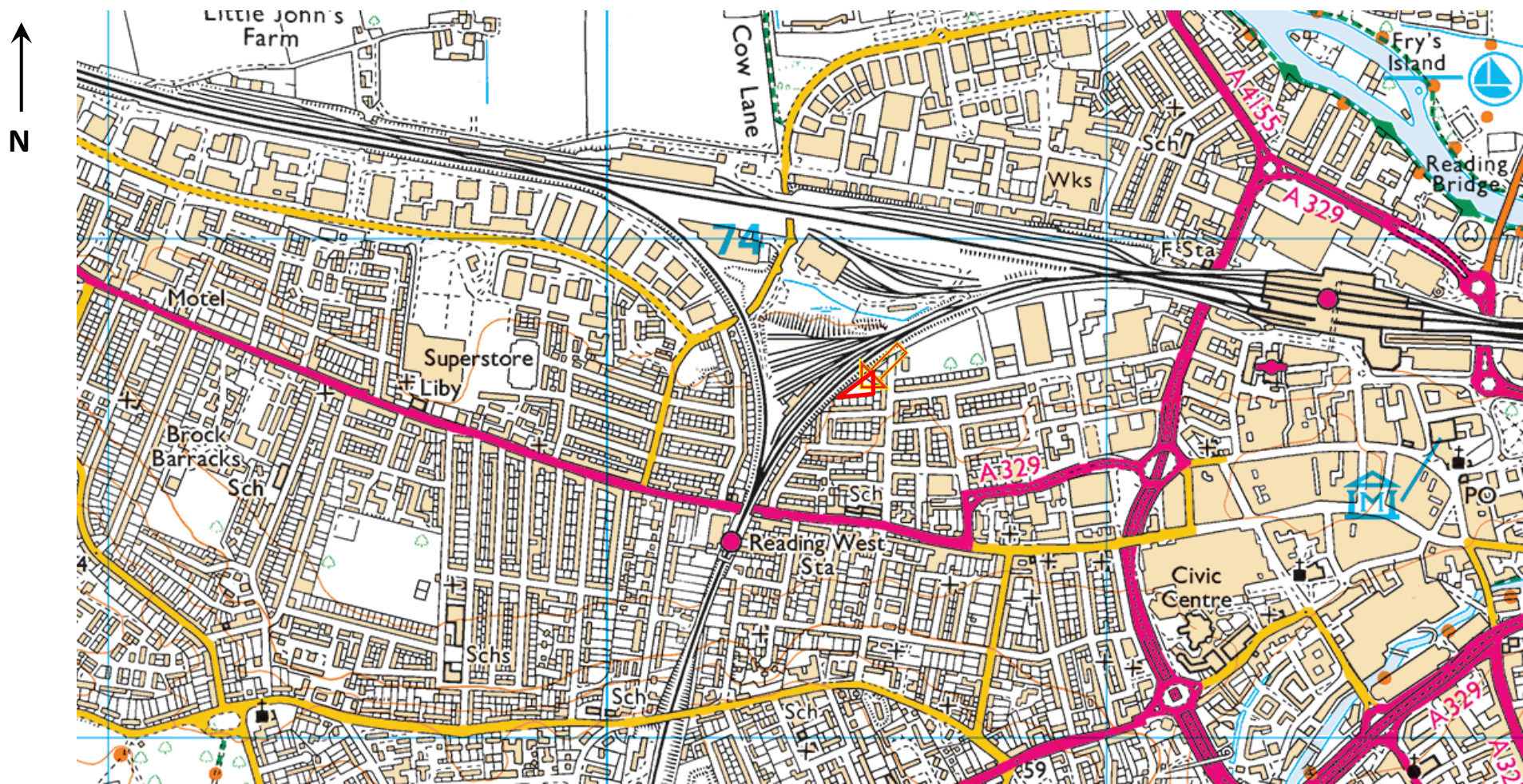
The conclusions and recommendations relate to land to the rear of 36 - 46 Mason Street, Reading, Berkshire RG1 7PD

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sampler borehole implies the specific technique used to produce a trial hole.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot-by-plot basis prior to the construction of foundations. Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 15 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

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Recipients are not permitted to publish this report outside of their organisation without our express written consent.



— APPROXIMATE SITE BOUNDARY

NOTE: NOT TO SCALE

Project:

Land to the rear of 36 - 46 Mason Street, Reading, Berkshire RG1 7PD

Client:

Launchpad Reading

Date:

July 2017

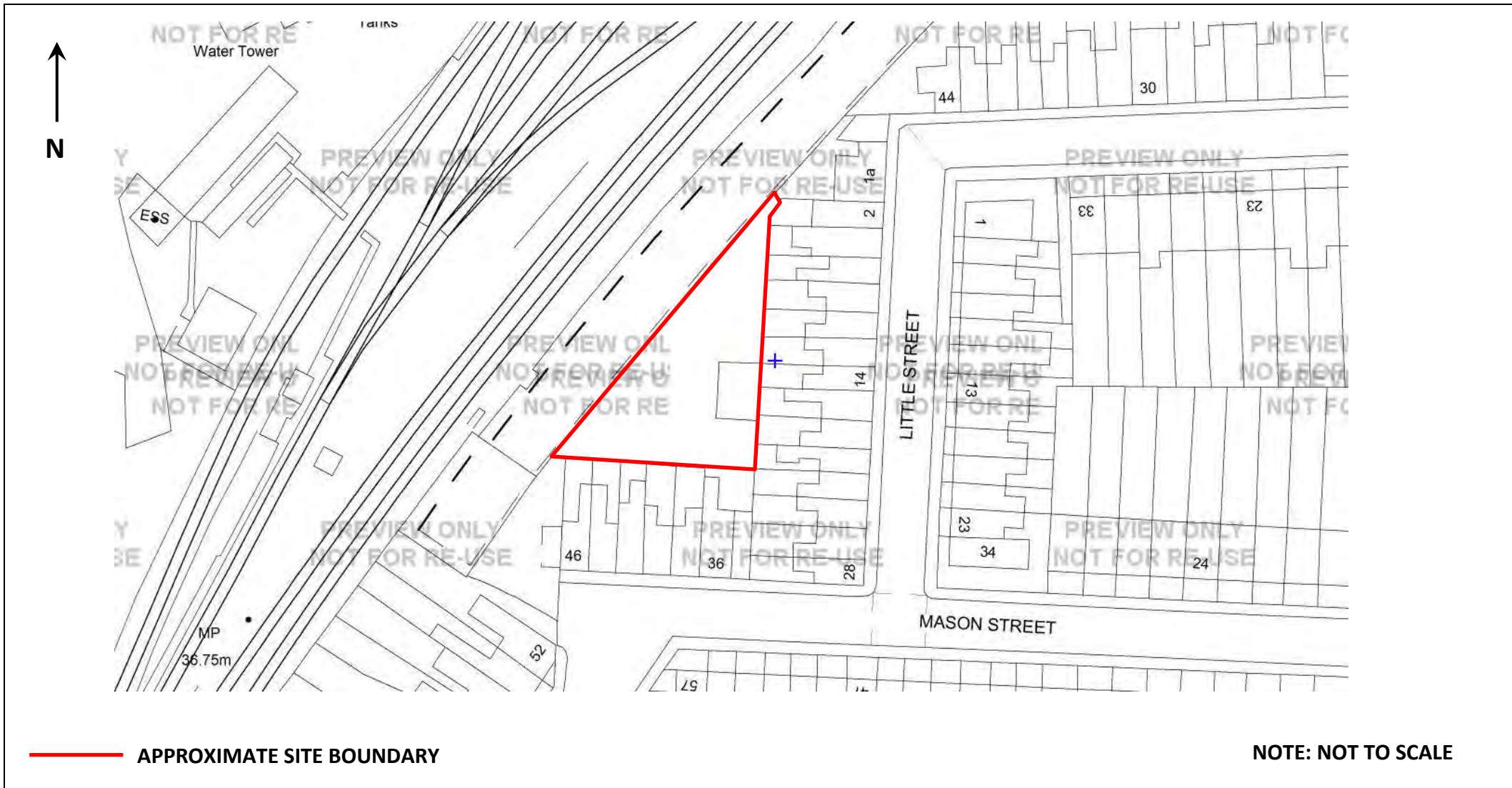
Site Location Plan

Ref:

GWPR2040

Figure 1

ground&water



Project: Land to the rear of 36 - 46 Mason Street, Reading, Berkshire RG1 7PD		Figure 2 
Client: Launchpad Reading	Date: July 2017	
Site Development Area	Ref: GWPR2040	



— APPROXIMATE SITE BOUNDARY

NOTE: NOT TO SCALE

Project:

Land to the rear of 36 - 46 Mason Street, Reading, Berkshire RG1 7PD

Client:

Launchpad Reading

Date:

July 2017

Aerial View of Site

Ref:

GWPR2040

Figure 3

ground&water



Project:

Land to the rear of 36 - 46 Mason Street, Reading, Berkshire RG1 7PD

Client:

Launchpad Reading

Date:

July 2017

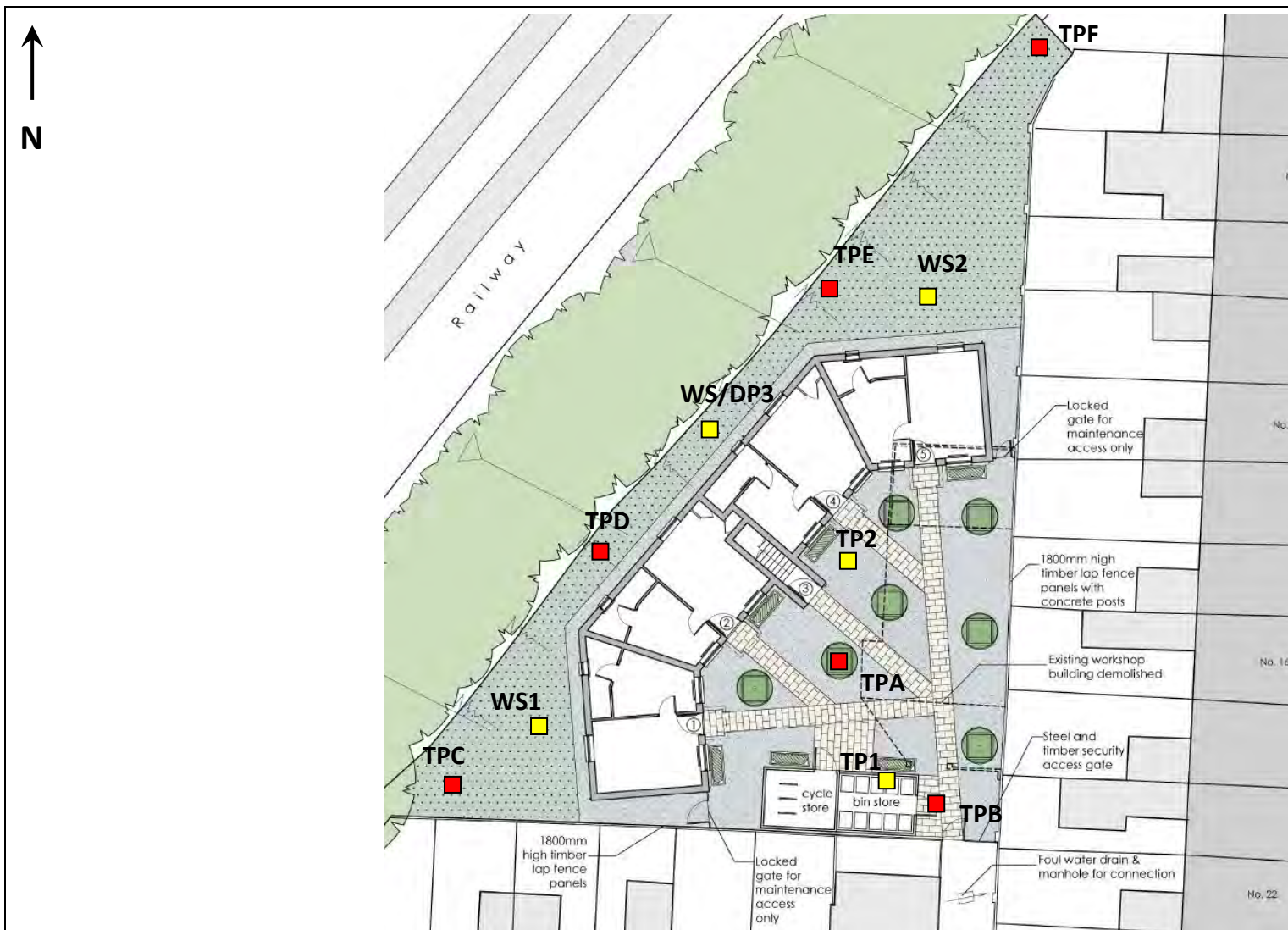
Proposed Development Plan

Ref:

GWPR2040

Figure 4

ground&water



NOTE: NOT TO SCALE

Project: Land to the rear of 36 - 46 Mason Street, Reading, Berkshire RG1 7PD

Client: Launchpad Reading

Date: July 2017

Trial Hole Location Plan

Ref: GWPR2040

Figure 5

ground&water



Project: Land to the rear of 36 - 46 Mason Street, Reading, Berkshire RG1 7PD		Figure 6 ground&water
Client: Launchpad Reading	Date: July 2017	
Proposed Remediation Plan	Ref: GWPR2040	

APPENDIX A

Conditions and Limitations

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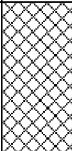
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APPENDIX B

Fieldwork Logs

Ground and Water Ltd								Borehole No TPA Sheet 1 of 1		
Project Name Land to the rear of 36 – 46 Mason Street				Project No. GWPR2040		Co-ords: -		Hole Type WS		
Location: Reading, RG1 7PD						Level: -		Scale 1:50		
Client: Launchpad Reading c/o Potter Weston						Dates: 12/05/2017		Logged By DP		
Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.20	D		0.90 1.10			MADE GROUND: Dark brown slightly sandy silty gravelly clay. Sand is fine to coarse grained, gravel is occasional, fine to medium, sub-angular to angular flints, brick, concrete, tarmac fragments. Strong hydrocarbon smell noted around 0.50m bgl.	1	
		0.50	D							
		0.80	D							
		1.00	D							
								TAPLOW GRAVEL FORMATION: Grey silty clayey SAND. Sand is fine to medium grained.		
End of Borehole at 1.10 m										
										2
										3
										4
										5
										6
										7
										8
										9
Remarks: No groundwater encountered. No roots noted.										
										

Ground and Water Ltd								Borehole No TPB Sheet 1 of 1	
Project Name Land to the rear of 36 – 46 Mason Street				Project No. GWPR2040		Co-ords: -		Hole Type WS	
Location: Reading, RG1 7PD						Level: -		Scale 1:50	
Client: Launchpad Reading c/o Potter Weston						Dates: 12/05/2017		Logged By DP	
Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		1.00			MADE GROUND: Dark brown silty sandy gravelly clay. Sand is fine to coarse grained. Gravel is occasional, fine to medium, sub-angular to angular, tarmac and brick fragments. Hydrocarbon smell noted at 0.80 around crushed tarmac.	1
		0.50	D						
		0.80	D						
		1.00	D						
									2
									3
									4
									5
									6
									7
									8
									9
Remarks: No groundwater encountered. No roots noted.									

Project Name

Land to the rear of 36 – 46 Mason Street

Project No.

GWPR2040

Co-ords: -

Hole Type

WS

Location: Reading, RG1 7PD

Level: -

Scale

1:50

Client: Launchpad Reading c/o Potter Weston

Dates: 12/05/2017

Logged By

DP

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description							
		Depth (m)	Type	Results											
		0.20	D		0.50			MADE GROUND: Dark brown silty sandy gravelly clay. Sand is fine to coarse grained. Gravel is occasional, fine to medium, sub-angular to angular, tarmac and brick fragments.							
		0.50	D					TAPLOW GRAVEL FORMATION: Orangey brown gravelly SAND. Sand is fine to medium grained. Gravel is abundant, sub-rounded to rounded flints.							
		0.80	D		1.00										
		1.00	D				End of Borehole at 1.00 m								
												1			
												2			
												3			
												4			
												5			
												6			
												7			
												8			
												9			

Ground and Water Ltd							Borehole No TPD Sheet 1 of 1			
Project Name Land to the rear of 36 – 46 Mason Street			Project No. GWPR2040		Co-ords: -		Hole Type WS			
Location: Reading, RG1 7PD					Level: -		Scale 1:50			
Client: Launchpad Reading c/o Potter Weston					Dates: 12/05/2017		Logged By DP			
Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.20	D		1.00			MADE GROUND: Dark brown slightly sandy silty gravelly clay. Sand is fine to coarse grained. Gravel is occasional, fine to medium, sub-angular to angular flints, brick, concrete, tarmac fragments. Strong hydrocarbon smell noted to 0.50m.	1	
		0.50	D							
		0.80	D							
		1.00	D							
									End of Borehole at 1.00 m	2
										3
										4
										5
										6
										7
										8
										9
		Remarks: No groundwater encountered. No roots noted.								

[illegible]

Ground and Water Ltd										Borehole No TP1 Sheet 1 of 1	
Project Name Land to the rear of 36 – 46 Mason Street					Project No. GWPR2040		Co-ords: -			Hole Type TP	
Location: Reading, RG1 7PD							Level: -			Scale 1:50	
Client: Launchpad Reading c/o Potter Weston							Dates: 16/03/2017			Logged By AT	
Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.25	D		0.30			MADE GROUND: Dark brown clayey gravelly silty sand. Sand is fine to coarse grained. Gravel is fine to coarse, occasional to abundant, sub-abundant to sub-rounded flint, brick and concrete. MADE GROUND: Dark brown gravelly sandy very silty clay. Sand is fine to coarse grained. Gravel is occasional, fine to coarse, sub-angular to sub-rounded flint, brick, chalk, carbonaceous material and concrete. End of Borehole at 0.50 m			
		0.50	D		0.50						
								1			
								2			
								3			
								4			
								5			
								6			
								7			
								8			
								9			
Remarks: Roots noted to 0.25m bgl.											
											

Ground and Water Ltd							Borehole No WS1 Sheet 1 of 1		
Project Name Land to the rear of 36 – 46 Mason Street			Project No. GWPR2040		Co-ords: -		Hole Type WLS		
Location: Reading, RG1 7PD					Level: -		Scale 1:50		
Client: Launchpad Reading c/o Potter Weston					Dates: 16/03/2017		Logged By AT		
Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D		3.45			MADE GROUND: Dark brown/dark grey clayey gravelly sand. Sand is fine to coarse grained. Gravel is occasional to abundant, fine to medium, sub-angular to angular flint, brick, concrete, plastic and carbonaceous material.	
		0.50	D						
		0.80	D						
		1.20	SPT	N=0					
		1.30	D	(4,2/					
		1.50	D	-, -, -, -)					
		1.80	D						
		2.00	SPT	N=55					
		2.10	D	(7,7/					
				9,13,18,15)					
		2.50	D						
		2.80	D						
		3.00	SPT	N=19					
				(4,4/					
				4,5,4,6)					
End of Borehole at 3.45 m									
Remarks: Groundwater not encountered. Decayed roots noted to 1.70m bgl.									

Project Name

Land to the rear of 36 – 46 Mason Street

Project No.

GWPR2040

Co-ords: -

Hole Type

WLS

Location: Reading, RG1 7PD

Level: -

Scale

1:50

Client: Launchpad Reading c/o Potter Weston

Dates: 16/03/2017

Logged By

AT

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D		0.40			MADE GROUND: Dark brown sandy gravelly clay. Sand is fine to medium grained. Gravel is occasional to abundant, fine to coarse, sub-angular to sub-rounded flint, brick, concrete and slate.	1
		0.50	D						
		0.80	D						
		1.20	SPT	N=16 (0,1/ 3,3,5,5)	1.50			MADE GROUND: Dark brown clayey gravelly silty sand. Sand is fine to coarse grained. Gravel is abundant, fine to coarse, sub-angular to angular flint, brick, glass, concrete, slate and tarmac.	2
		1.50	D						
		1.80	D						
		2.00	SPT	N=22 (3,3/ 3,6,6,7)	2.40			MADE GROUND: Mid brown/grey gravelly silty sand. Sand is fine to medium grained. Gravel is occasional, fine to coarse, sub-angular to angular concrete.	3
		2.30	D						
		2.50	D						
		2.80	D	N=23 (4,5/ 4,5,6,8)	2.70			MADE GROUND: Mid brown clayey gravelly sand. Sand is fine to coarse grained. Gravel is abundant, fine to coarse, sub-angular to angular, brick, concrete, tarmac, flint, rusted/decayed metal fragments and ceramics. Hydrocarbon type odour noted at 1.80m bgl. ACM noted at 1.80m bgl.	4
		3.00	SPT						
					3.45			SEAFORD CHALK AND NEWHAVEN CHALK FORMATION: Structureless CHALK composed of compact, white/cream, slightly gravelly-sandy SILT. Gravels are very weak, low density, white and rounded. Grade Dm in accordance with CIRIA 574	
					End of Borehole at 3.45 m				
								</	

Remarks: Groundwater not encountered.
Decayed roots noted to 1.80m bgl.

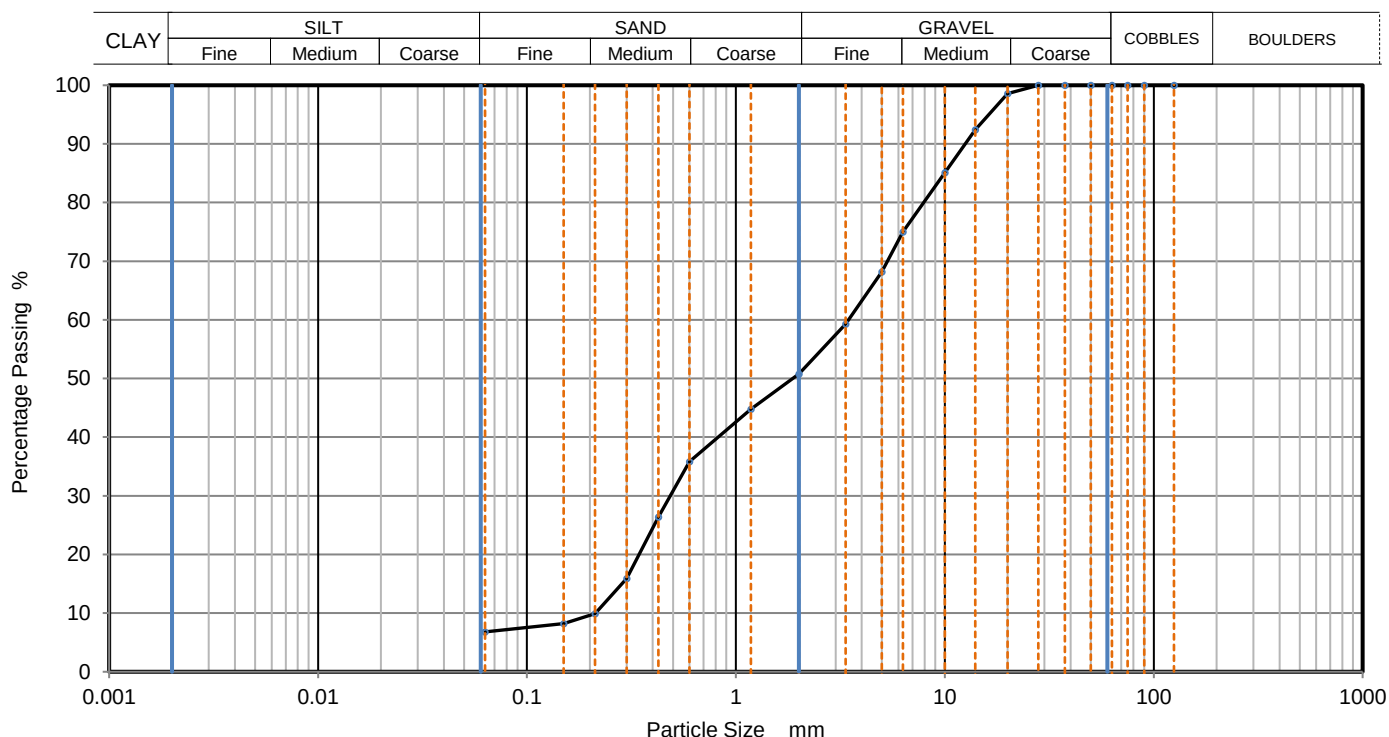


APPENDIX C
Geotechnical Laboratory Test Results



PARTICLE SIZE DISTRIBUTION

Job Ref	22544
Borehole/Pit No.	WS1
Site Name	36-46 Mason Street, Reading
Sample No.	-
Project No.	GWPR2040
Client	Ground & Water Ltd
Depth	2.50 m
Soil Description	Brown clayey very sandy GRAVEL (gravel is fmc and angular to rounded)
Test Method	BS1377:Part 2: 1990, clause 9.0
Sample Type	D
Samples received	29/03/2017
Schedules received	22/03/2017
Project started	29/03/2017
Date tested	12/04/2017



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	92		
10	85		
6.3	75		
5	68		
3.35	59		
2	51		
1.18	45		
0.6	36		
0.425	26		
0.3	16		
0.212	10		
0.15	8		
0.063	7		

Dry Mass of sample, g 1126

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	49.2
Sand	44.0
Fines <0.063mm	6.9

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	16
Curvature Coefficient	0.32

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved
Initials: J.P
Date: 13/04/2017

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3



PARTICLE SIZE DISTRIBUTION

Job Ref 22544

Borehole/Pit No. WS1

Site Name 36-46 Mason Street, Reading

Sample No. -

Project No. GWPR2040 Client Ground & Water Ltd

Depth 2.80 m

Soil Description Brown slightly clayey very sandy GRAVEL (gravel is fm and angular to rounded)

Sample Type D

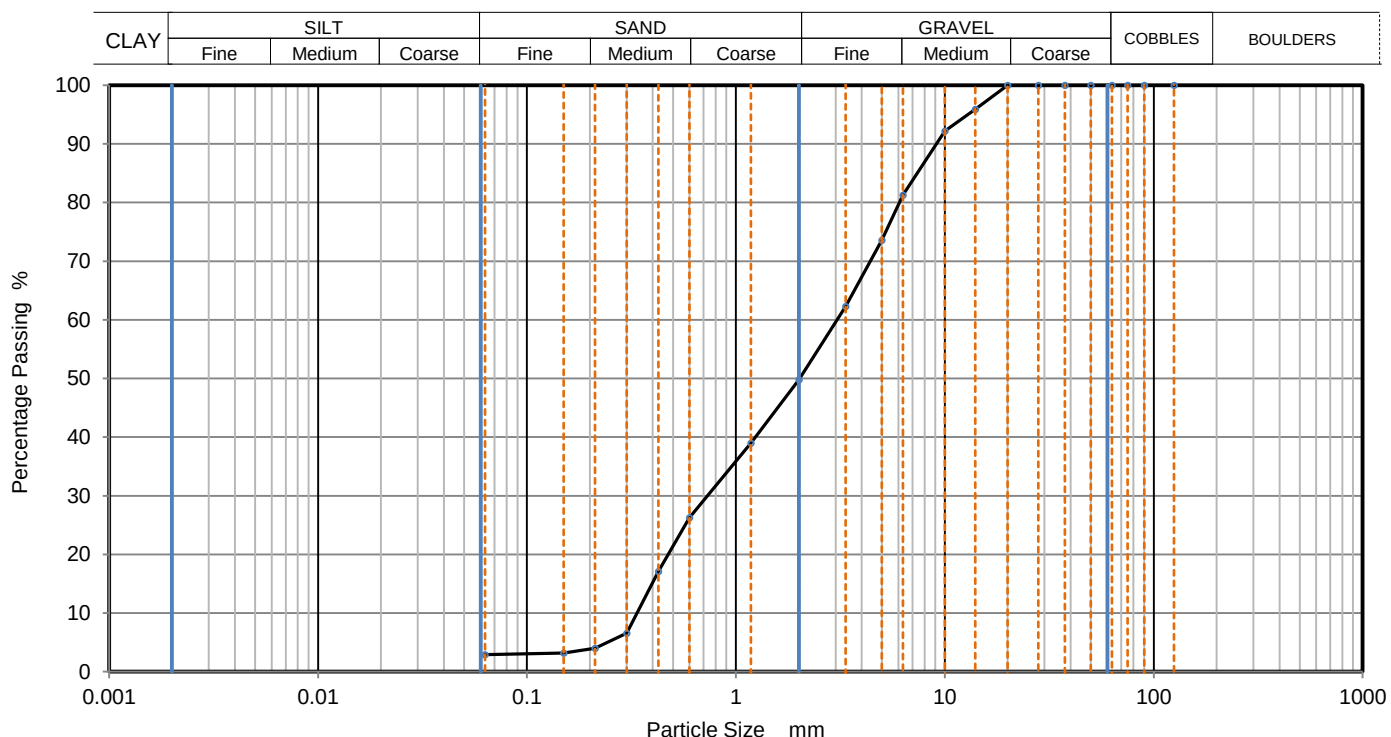
Samples received 29/03/2017

Schedules received 22/03/2017

Test Method BS1377:Part 2: 1990, clause 9.0

Project started 29/03/2017

Date tested 12/04/2017



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	96		
10	92		
6.3	81		
5	74		
3.35	62		
2	50		
1.18	39		
0.6	26		
0.425	17		
0.3	7		
0.212	4		
0.15	3		
0.063	3		

Dry Mass of sample, g 579

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	50.2
Sand	47.0
Fines <0.063mm	2.9

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	9.1
Curvature Coefficient	0.52

Remarks

Preparation and testing in accordance with BS1377 unless noted below



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Email: james@k4soils.com

Tel: 01923 711288

Checked and Approved

Initials: J.P

Date: 13/04/2017

2519

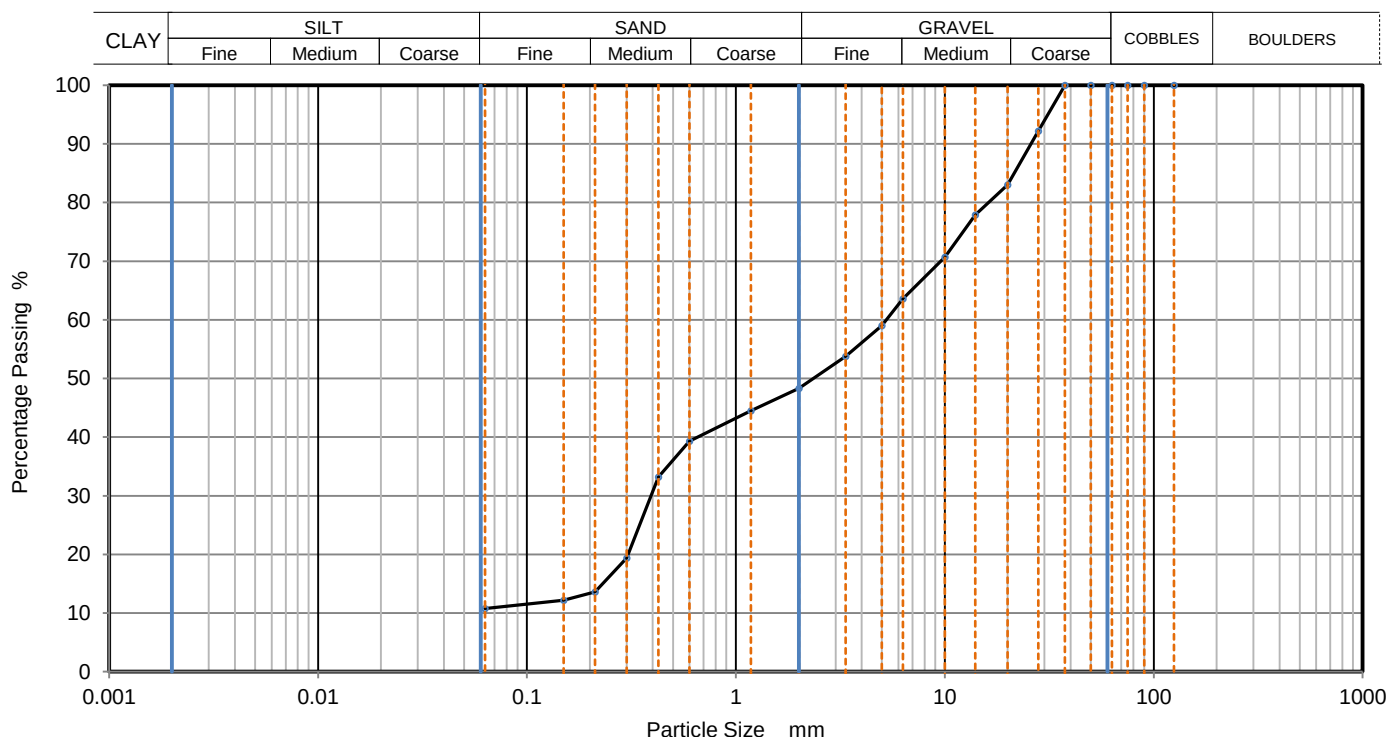
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3



PARTICLE SIZE DISTRIBUTION

Job Ref	22544
Borehole/Pit No.	WS2
Site Name	36-46 Mason Street, Reading
Sample No.	-
Project No.	GWPR2040
Client	Ground & Water Ltd
Depth	2.50 m
Sample Type	D
Samples received	29/03/2017
Schedules received	22/03/2017
Project started	29/03/2017
Date tested	12/04/2017



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	92		
20	83		
14	78		
10	71		
6.3	64		
5	59		
3.35	54		
2	48		
1.18	45		
0.6	39		
0.425	33		
0.3	19		
0.212	14		
0.15	12		
0.063	11		

Dry Mass of sample, g 585

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	51.7
Sand	37.5
Fines <0.063mm	10.8

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



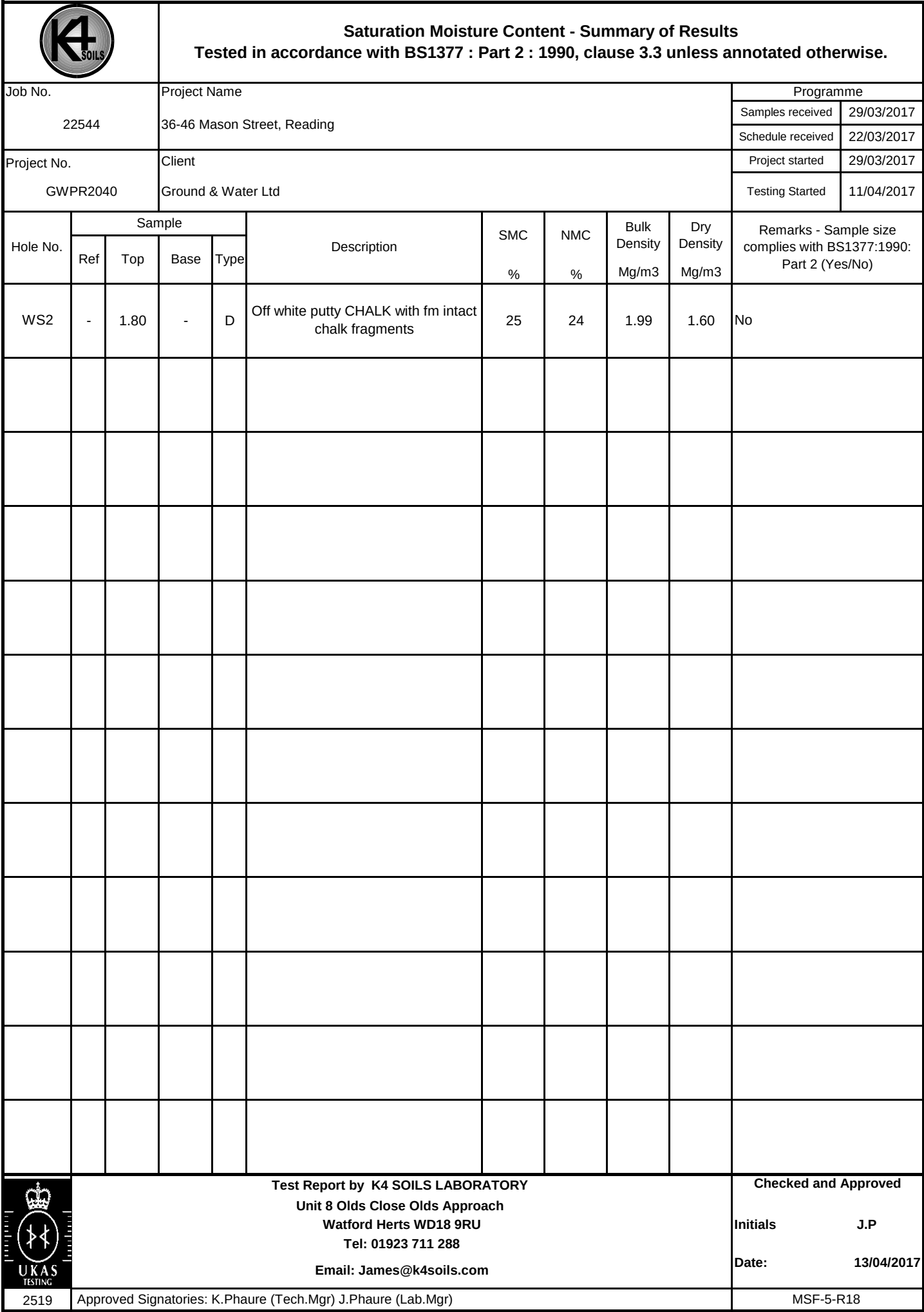
K4 Soils Laboratory
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Email: james@k4soils.com
Tel: 01923 711288

Checked and Approved
Initials: J.P
Date: 13/04/2017

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3



					Sulphate Content (Gravimetric Method) for 2:1 Soil: Water Extract and pH Value - Summary of Results Tested in accordance with BS1377 : Part 3 : 1990, clause 5.3 and clause 9							
Job No.		Project Name 36-46 Mason Street, Reading							Programme			
22544									Samples received		29/03/2017	
Project No.		Client Ground & Water Ltd							Project started		29/03/2017	
GWPR2040									Testing Started		11/04/2017	
Hole No.	Sample				Soil description	Dry Mass passing 2mm %	SO3 Content g/l	SO4 Content g/l	pH	Remarks		
	Ref	Top	Base	Type								
WS1	-	2.80	-	D	Brown slightly clayey very sandy GRAVEL (gravel is fm and angular to rounded)	50	0.30	0.35	8.20			
		Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Tel: 01923 711 288 Email: James@k4soils.com								Checked and Approved Initials J.P Date: 13/04/2017		
		2519								MSF-5-R29		
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)												

APPENDIX D
Chemical Laboratory Test Results



Alice Tettmar
Ground & Water Ltd
2 The Long Barn
Norton Farm
Selborne Road
Alton
Hampshire
GU34 3NB

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 17-56798

Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading

Project / Job Ref: GWPR2040

Order No: None Supplied

Sample Receipt Date: 23/03/2017

Sample Scheduled Date: 23/03/2017

Report Issue Number: 1

Reporting Date: 29/03/2017

Authorised by:

Kevin Old
Associate Director of Laboratory

Authorised by:

Russell Jarvis
Associate Director of Client Services

QTSE is the trading name of DETS Ltd, company registration number 03705645



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
QTS Environmental Report No: 17-56798	Date Sampled	16/03/17	16/03/17	16/03/17	16/03/17	16/03/17
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading	TP / BH No	WS1	WS2	WS1	WS1	WS2
Project / Job Ref: GWPR2040	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	2.80	2.50	1.30	0.50	1.80
Reporting Date: 29/03/2017	QTSE Sample No	259758	259759	259760	259761	259762

Determinand	Unit	RL	Accreditation			Detected	Not Detected	Detected
Asbestos Screen	N/a	N/a	ISO17025					
Sample Matrix	Material Type	N/a	NONE			Cement type material		Cement type material
Asbestos Type	PLM Result	N/a	ISO17025			Chrysotile		Chrysotile
pH	pH Units	N/a	MCERTS	8.5	8.4	8.6	8.6	7.9
Total Cyanide	mg/kg	< 2	NONE			< 2	< 2	< 2
Total Sulphate as SO ₄	mg/kg	< 200	NONE	621	619			
Total Sulphate as SO ₄	%	< 0.02	NONE	0.06	0.06			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	20	42	292	493	258
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02	0.04	0.29	0.49	0.26
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02			
Organic Matter	%	< 0.1	MCERTS			1.5	0.8	3.2
Total Organic Carbon (TOC)	%	< 0.1	MCERTS			0.9	0.5	1.8
Ammonium as NH ₄	mg/kg	< 0.5	NONE	2.5	3.8			
Ammonium as NH ₄	mg/l	< 0.05	NONE	0.25	0.38			
W/S Chloride (2:1)	mg/kg	< 1	MCERTS	26	27			
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS	13.1	13.6			
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS	8	< 3			
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS	4.1	< 1.5			
Arsenic (As)	mg/kg	< 2	MCERTS			28	63	29
W/S Boron	mg/kg	< 1	NONE			< 1	< 1	1.7
Cadmium (Cd)	mg/kg	< 0.2	MCERTS			2.8	5.2	1.6
Chromium (Cr)	mg/kg	< 2	MCERTS			22	37	41
Chromium (hexavalent)	mg/kg	< 2	NONE			< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS			175	314	108
Lead (Pb)	mg/kg	< 3	MCERTS			2790	3820	2920
W/S Magnesium	mg/l	< 0.1	NONE	1	1.3			
Mercury (Hg)	mg/kg	< 1	NONE			< 1	< 1	1.3
Nickel (Ni)	mg/kg	< 3	MCERTS			40	75	33
Selenium (Se)	mg/kg	< 3	NONE			< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE			27	31	28
Zinc (Zn)	mg/kg	< 3	MCERTS			3180	6860	1950
Total Phenols (monohydric)	mg/kg	< 2	NONE			< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Javeed Malik, Rosie Head

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis ^(S)



QTS Environmental Ltd
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Soil Analysis Certificate						
QTS Environmental Report No: 17-56798		Date Sampled	16/03/17			
Ground & Water Ltd		Time Sampled	None Supplied			
Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading		TP / BH No	TP1			
Project / Job Ref: GWPR2040		Additional Refs	None Supplied			
Order No: None Supplied		Depth (m)	0.25			
Reporting Date: 29/03/2017		QTSE Sample No	259763			

Determinand	Unit	RL	Accreditation				
Asbestos Screen	N/a	N/a	ISO17025	Not Detected			
Sample Matrix	Material Type	N/a	NONE				
Asbestos Type	PLM Result	N/a	ISO17025				
pH	pH Units	N/a	MCERTS	8.1			
Total Cyanide	mg/kg	< 2	NONE	< 2			
Total Sulphate as SO ₄	mg/kg	< 200	NONE				
Total Sulphate as SO ₄	%	< 0.02	NONE				
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	28			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.03			
Total Sulphur	%	< 0.02	NONE				
Organic Matter	%	< 0.1	MCERTS	0.7			
Total Organic Carbon (TOC)	%	< 0.1	MCERTS	0.4			
Ammonium as NH ₄	mg/kg	< 0.5	NONE				
Ammonium as NH ₄	mg/l	< 0.05	NONE				
W/S Chloride (2:1)	mg/kg	< 1	MCERTS				
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS				
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS				
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS				
Arsenic (As)	mg/kg	< 2	MCERTS	8			
W/S Boron	mg/kg	< 1	NONE	< 1			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	8			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	12			
Lead (Pb)	mg/kg	< 3	MCERTS	199			
W/S Magnesium	mg/l	< 0.1	NONE				
Mercury (Hg)	mg/kg	< 1	NONE	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	8			
Selenium (Se)	mg/kg	< 3	NONE	< 3			
Vanadium (V)	mg/kg	< 2	NONE	17			
Zinc (Zn)	mg/kg	< 3	MCERTS	92			
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Analysis carried out on the dried sample is corrected for the stone content
The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)
This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.
The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.
Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.
Asbestos Analyst: Javeed Malik, Rosie Head
RL: Reporting Limit
Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).
Subcontracted analysis ^(S)



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Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 17-56798	Date Sampled	16/03/17	16/03/17	16/03/17	16/03/17	
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading	TP / BH No	WS1	WS1	WS2	TP1	
Project / Job Ref: GWPR2040	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	Depth (m)	1.30	0.50	1.80	0.25	
Reporting Date: 29/03/2017	QTSE Sample No	259760	259761	259762	259763	

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	0.87	1.02	2.64	0.14	
Anthracene	mg/kg	< 0.1	MCERTS	0.17	0.19	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	2.13	2.18	4.92	0.47	
Pyrene	mg/kg	< 0.1	MCERTS	1.92	1.94	6.60	0.46	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.89	0.86	3.38	0.28	
Chrysene	mg/kg	< 0.1	MCERTS	1.01	0.97	3.81	0.29	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	1.37	1.30	6.13	0.48	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.47	0.41	1.89	0.16	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.87	0.78	6.94	0.31	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.63	0.59	3.80	0.22	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.56	0.51	3.49	0.18	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	10.9	10.7	43.6	3	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - TPH CWG Banded						
QTS Environmental Report No: 17-56798	Date Sampled	16/03/17	16/03/17	16/03/17		
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading	TP / BH No	WS1	WS2	TP1		
Project / Job Ref: GWPR2040	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.50	1.80	0.25		
Reporting Date: 29/03/2017	QTSE Sample No	259761	259762	259763		

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	4	< 2		
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	7	< 2		
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	86	< 3		
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	4	15	< 3		
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	209	160	< 10		
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	213	273	< 21		
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	10	< 2		
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	13	27	< 3		
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	215	339	< 10		
Aromatic (C5 - C35)	mg/kg	< 21	NONE	229	376	< 21		
Total >C5 - C35	mg/kg	< 42	NONE	442	649	< 42		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Rose Lane
Lenham Heath
Maidstone
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Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 17-56798	Date Sampled	16/03/17	16/03/17	16/03/17		
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading	TP / BH No	WS1	WS2	TP1		
Project / Job Ref: GWPR2040	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.50	1.80	0.25		
Reporting Date: 29/03/2017	QTSE Sample No	259761	259762	259763		

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5		
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - PCB (7 Congeners)						
QTS Environmental Report No: 17-56798	Date Sampled	16/03/17				
Ground & Water Ltd	Time Sampled	None Supplied				
Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading	TP / BH No	TP2				
Project / Job Ref: GWPR2040	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.25				
Reporting Date: 29/03/2017	QTSE Sample No	259764				

Determinand	Unit	RL	Accreditation					
PCB Congener 28	mg/kg	0.008	NONE	< 0.008				
PCB Congener 52	mg/kg	0.008	NONE	< 0.008				
PCB Congener 101	mg/kg	0.008	NONE	< 0.008				
PCB Congener 118	mg/kg	0.008	NONE	< 0.008				
PCB Congener 138	mg/kg	0.008	NONE	< 0.008				
PCB Congener 153	mg/kg	0.008	NONE	< 0.008				
PCB Congener 180	mg/kg	0.008	NONE	< 0.008				
Total PCB (7 Congeners)	mg/kg	< 0.1	NONE	< 0.1				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Lenham Heath
Maidstone
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Bulk Analysis Certificate						
QTS Environmental Report No: 17-56798	Date Sampled	16/03/17	16/03/17			
Ground & Water Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading	TP / BH No	WS1	WS2			
Project / Job Ref: GWPR2040	Additional Refs	Bulk	Bulk			
Order No: None Supplied	Depth (m)	1.30	1.80			
Reporting Date: 29/03/2017	QTSE Sample No	259781	259782			

Determinand	Unit	RL	Accreditation					
Asbestos Type	PLM Result	N/a	ISO17025	Chrysotile	Chrysotile			
Sample Matrix	Material Type	N/a	NONE	Cement type material	Cement type material			

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification) that is in accordance with the Health and Safety Executive HSG 248 Appendix 2.

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Javeed Malik

RL: Reporting Limit



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 17-56798	
Ground & Water Ltd	
Site Reference: Land to the Rear of 36 - 46 Mason Street, Reading	
Project / Job Ref: GWPR2040	
Order No: None Supplied	
Reporting Date: 29/03/2017	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
259758	WS1	None Supplied	2.80	7.6	Brown sandy gravel with stones and concrete
259759	WS2	None Supplied	2.50	8.2	Brown sandy gravel with stones
259760	WS1	None Supplied	1.30	12.5	Brown clayey sand with rubble
259761	WS1	None Supplied	0.50	11.4	Brown clayey gravel with brick
259762	WS2	None Supplied	1.80	14.7	Brown clayey sand with rubble
259763	TP1	None Supplied	0.25	6.6	Brown sandy gravel with brick
259764	TP2	None Supplied	0.25	6.5	Brown sandy gravel with stones and concrete

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{1/S}

Unsuitable Sample ^{U/S}