



CHURCHILL RETIREMENT LIVING LIMITED

38 & 40 EAST STREET & 35 FITZALAN ROAD, LITTLEHAMPTON, WEST SUSSEX, BN17 6AN

GEOTECHNICAL ASSESSMENT REPORT

1. PROJECT BACKGROUND

Churchill Retirement Living Limited are currently in the process of redeveloping a site at 38 & 40 East Street and 35 Fitzalan Road, Littlehampton, for residential purposes. The location of the site is shown on Figure 1. The site presently comprises residential properties (shortly to be demolished), as shown on Figure 2. The proposed development comprises a three-storey block of apartments, together with associated car parking facilities and areas of managed soft landscaping. A plan showing the proposed development layout is presented on Figure 3.

Following a ground investigation, undertaken by Crossfield Consulting Limited in February 2017, a risk based assessment of potential contamination and a foundation assessment is included in a Ground Investigation Report, to which reference should be made. Reference should also be made to the Desk Study Appraisal Report.

Crossfield Consulting Limited has since been commissioned to undertake a supplementary investigation to include data obtained from soakaway testing and to provide additional assessment regarding the foundation solution for the proposed development.

This report presents the results of the supplementary ground investigation and provides an additional geotechnical assessment together with details of in situ soakaway tests. The supplementary investigation confirms the shallow ground conditions and foundation solution identified in the previous reports. With reference to the soakaway test data, it is noted that soakaway drainage is shown not to provide a viable solution. An environmental assessment is outside the scope of this report.

2. SITE DESCRIPTION

The following site description is based on observations made at the time of the supplementary ground investigation works in April 2017.

The site comprises a roughly rectangular plot of land with an area of approximately 0.31 ha. The site slopes gently down to the north of the site with an approximate drop in elevation of 1.5 m across the site. There is further drop in elevation of approximately 1.0 m from the site to East Street to the north.

The site comprises two, single-storey houses (No. 40 East Street and No. 35 Fitzalan Road) and one, two-storey house (No. 38 East Street), and their associated outbuildings and grounds. Some outbuildings and extensions have been demolished at properties 38 & 40 East Street, as shown on Figure 2. The grounds include gardens comprising lawns, planting and patio areas. Concrete and tarmac surfaced driveways are present to the front of No. 38 and No. 40 East Street properties. Mature trees are present within the site and around the site boundaries. Hedges are also present along the boundaries separating the individual properties.

3. PUBLISHED GEOLOGY

The 1:50,000 Scale Solid and Drift Geology map of Chichester and Bognor (Sheet 317/332), together with the digital map published by the British Geological Survey, indicates that the superficial deposits beneath the site comprise River Terrace Deposits which consist of sand, silt and clay. Formerly, these deposits (where clays) were classified as brickearth.

The underlying solid geology comprises the Cretaceous Upper Chalk including Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk and the Culver Chalk Formation. These strata comprise chalk, but may include weathered strata at shallow depth.

4. GROUND CONDITIONS AND GEOLOGICAL MODEL

A supplementary ground investigation was carried out on 28th April 2017 and comprised four trial pits to depths of between 2.0 m and 3.0 m together with two soakaway tests. Factual records from the supplementary investigation, including the exploratory hole records and exploratory hole location plan, are presented in Appendix I.

The ground conditions as now identified are compatible with the previous ground investigation data and reference should be made to the Ground Investigation Report for full details on the strata encountered and associated test data. An outlined of the strata encountered is provided below.

4.1 Buried Foundations and Services

Neither investigation identified the presence of any buried obstructions. Underground services are present beneath the site. Buried foundations currently remain on site in the area of the existing houses. It is presumed that the site clearance operations now commencing will remove much or all of these existing foundations.

4.2 Strata Encountered

Made Ground/Topsoil

Made Ground was encountered across the site, generally extends to depths of approximately 0.5 m and comprises clayey strata with fragments of brick with occasional coal, ceramic and glass fragments. In some of the garden areas only topsoil materials are present at surface.

Brickearth Deposits

Brickearth Deposits were encountered below the Made Ground /Topsoil and are generally recorded to extend down to depths of approximately 1.0 m and locally to 1.7 m depth in the northern end of the site. These strata are generally described as soft to firm consistency, brown slightly gravelly silty clay.

River Terrace Deposits

River Terrace Deposits, encountered below the Brickearth, are generally recorded to depths of between 1.6 m and 4 m and comprise firm to stiff consistency, medium to high strength sandy gravelly clays and medium dense sands. A characteristic undrained shear strength of 75 kN/m^2 is indicated within fine-grained horizons.

Lewes Nodular Chalk Formation

Chalk strata were encountered below the River Terrace Deposits. The deposits comprise structureless chalk comprising gravelly clayey silt (Grade Dm) and with some areas of slightly silty slightly sandy gravel (Grade Dc).

4.3 Groundwater

Groundwater was not encountered during the supplementary ground investigation (April 2017) which extended to a maximum depth of 3.0 m. During the previous ground investigation (in February 2017), groundwater was encountered in all exploratory holes except WS3, and seepages were observed at depths of between 4.0 m and 4.9 m.

The groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

5. FOUNDATION RECOMMENDATIONS

5.1 Design Approach

Consideration is given to the assessment of ultimate limit state (ULS) conditions, where full collapse or failure conditions are considered, and relevant design information is presented in Appendix II in this regard. In addition, the assessment considers serviceability limit states (SLS), to ensure that the recommended design parameters are compatible with an acceptably low risk of serviceability criteria being exceeded during the standard design life of the structure. It is noted that the SLS has a greater influence on the design parameters in comparison to ULS conditions and this is considered in the following assessment.

In compliance with the requirements of the National Annex of BS EN 1997-1:2004 the geotechnical design assessment is based on Design Approach 1 (as defined in BS EN 1997-1:2004). As the structural loads for the proposed building are well defined, uncertainty and risks of potential unfavourable conditions (or deviations from characteristic values) are primarily associated with the ground conditions.

Consideration is given to the assessment of ultimate limit state (ULS) conditions, where full collapse or failure conditions are considered, and relevant design information is presented in Appendix III of the Ground Investigation Report in this regard. In addition, the assessment considers serviceability limit states (SLS), to ensure that the recommended design parameters are compatible with an acceptably low risk of serviceability criteria being exceeded during the standard design life of the structure. It is noted that the SLS has a greater influence on the design parameters in comparison to ULS conditions and this is considered in the following assessment.

5.2 Proposed Structural Loadings and Serviceability Criteria

Details of imposed foundation loads (i.e. actions imposed by the building structure) and serviceability limit values are not currently available for the proposed structures. The geotechnical assessment presented in the

report has considered generic values for the proposed development type, which is considered appropriate for the appraisal of engineering solutions and preliminary design, and these are listed below:

Preliminary Values, for appraisal purposes:

Maximum Imposed Load on Foundations : 190 kN/m run (three-storey building)

Serviceability Limit Values (associated with above action)

5.3 Geotechnical Category of Proposed Structures

In view of the nature of the proposed structure(s), comprising a three- to four-storey apartment development, and with reference to the indicated ground conditions, as outlined in Section 4, it is considered that the development is compatible with Geotechnical Category 2, as defined in BS EN 1997-1:2004, and the necessary information relating to the Ground Investigation and Geotechnical Design Reports has been obtained and assessed on this basis.

5.4 Assessment of Foundation Solutions

With reference to the recorded ground conditions and corresponding Geological Model presented in Section 4, characteristic values relating to the geotechnical properties of the strata within influencing distance of the proposed structures are presented in Appendix III of the Ground Investigation Report. Salient elements of the geotechnical model are outlined below.

The proposed structure could be founded on the medium to high strength sandy gravelly clays or medium dense sands of the River Terrace Deposits. Foundations should extend through the Made Ground and Brickearth soils (which include localised loose or low strength strata). Strip or trench fill foundations are considered to be an appropriate solution for the proposed development. Foundation precautions within the influence zones of trees will be required as outlined in Section 5.5.

5.5 Recommended Foundation Design Parameters: Trench Fill Footings

On the basis of the foregoing assessment and the details presented in the Ground Investigation Report, it is considered that conventional trench-fill foundations provides an appropriate foundation solution for the proposed structure. On the basis of the ground conditions and structures described in the report, the recommended parameters for the foundation design are as follows:

<i>Foundation Strata :</i>	Firm to stiff consistency, medium to high strength sandy gravelly clays and/ or Medium dense sands (River Terrace Deposits) and/or Firm to stiff consistency, medium to high strength (Weathered Chalk – Grade Dc or Dm)
<i>Foundation Depth :</i>	Minimum 0.75 m, deepened within influence of trees, or through Made Ground/Brickearth as required.
<i>Foundation Width/Size:</i>	2.0 m (maximum)
<i>Nett Allowable Bearing Pressure:</i>	125 kN/m ²

It is considered that total settlement of foundations designed on the above basis should be less than the normal serviceability limit state for this development (i.e. total settlements of 25 mm) as outlined in the assessment presented in Appendix III of the Ground Investigation Report.

Based on guidance published within BRE Special Digest 1 (2005), the specified DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-1.

5.6 Building Near Trees

Laboratory testing results indicate that the clayey horizons beneath the site are classified as having a “low volume change” potential, as defined in NHBC Standards (2017). It is noted that two mature trees formerly located in the south of the site, were positioned both within and in close proximity to the proposed building footprint. Within the influence zones of former, existing and proposed trees, suitable foundation precautions should be adopted, as outlined in NHBC Standards (2017), and there will be a requirement to deepen footings locally in relevant areas of the site.

5.7 Floor Slab Recommendations

Due to the presence of potentially shrinkable clay, it is recommended that a suspended floor slab be used for the new building. A minimum under floor void of 200 mm should be provided in accordance with NHBC Standards (2017).

5.8 General Construction Advice

All formations should be cleaned, and subsequently inspected by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.

Care should be taken to ensure that any field drains encountered are carefully and satisfactorily blocked to prevent water seeping through the drains and into any excavations.

6. TEMPORARY WORKS

Conventional plant is considered appropriate for shallow excavation works at this site. However the use of hydraulic breakers may be required to break up any remaining foundations during demolition of existing structures.

Shallow excavations may remain stable in the short term, However instability may occur in excavations left open for extended periods of time. Support should be provided, or the sides battered back, in any excavations requiring man entry in compliance with the relevant risk assessment.

Groundwater is expected not to be encountered within shallow excavations. Should shallow perched water be encountered during groundworks, it is expected that the resultant seepages may be controlled by conventional sump pumping.

7. ASSESSMENT OF SOAKAWAY DRAINAGE

Based on the high proportion of fines encountered within the River Terrace Deposits, conventional soakaway drainage is unlikely to be feasible. The Lewes Nodular Chalk Formation deposits encountered beneath the site are recorded as being weathered to a gravelly clayey silt and are also unlikely to be suitable for soakaway drainage.

In-situ infiltration testing has been undertaken at the site (BRE DG365:2016 method) within the River Terrace Deposits and the Lewes Nodular Chalk strata. The test results, as presented in Appendix I, are compatible with the variable nature of the ground conditions and expected low permeability strata. Within TP1, a soil infiltration rate of 3×10^{-6} m/s has been recorded, which reflects the strata at the base of the pit but is still indicative of a very low permeability. Within TP2, an estimated soil infiltration rate of less than 1×10^{-6} m/s, has been recorded, and water infiltration was indicated not to be complete within 24 hours. This value is compatible with the recorded silty and clayey nature of the shallow soils across much of the site.

On the basis of the soakaway testing performed at the site, it is considered that conventional soakaways are effectively precluded for the proposed development due to the presence of variable and very low permeability strata. Hence, an alternative method of drainage should be identified.

ATTACHMENTS

FIGURE 1	-	Site Location Plan
FIGURE 2	-	Site Plan
FIGURE 3	-	Proposed Development Plan
APPENDIX I	-	Supplementary Ground Investigation

REFERENCES

Site Specific References

Crossfield Consulting Limited (January 2016) *Desk Study Appraisal* Report No. CCL02814.CA27

Crossfield Consulting Limited (March 2017) *Ground Investigation* Report No. CCL02814.CD22

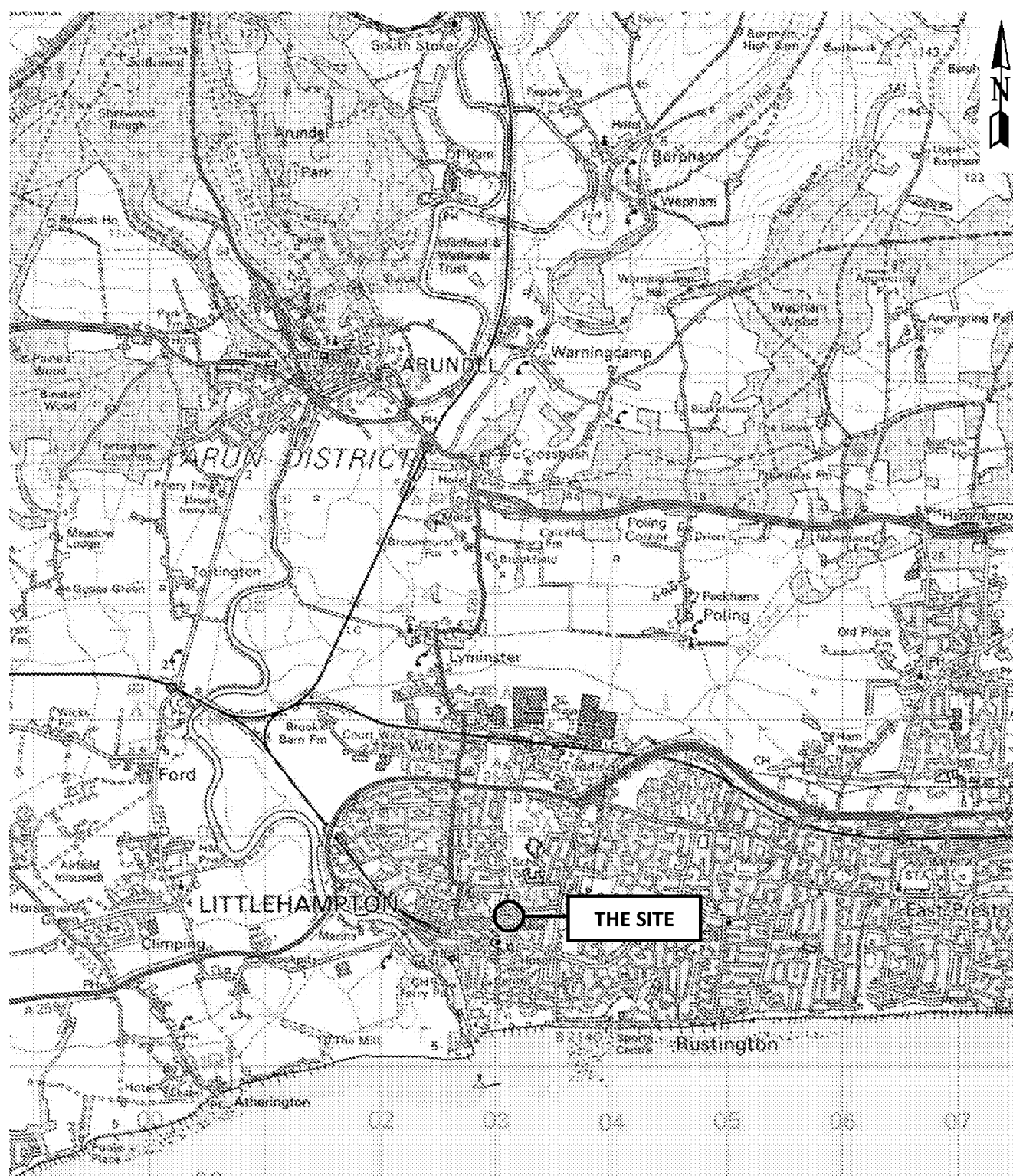
Note: For technical references, details are given in the above-listed reports.

GENERAL NOTES

1. This report is provided in the context of the stated development proposals and should not be used in a different context.
2. The accuracy of map extracts cannot be guaranteed and it should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.
3. Any borehole data from the British Geological Survey sources are included on the following basis: "The British Geological Survey accept no responsibility for omissions or misinterpretation of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation.
4. Where any data supplied by the Client or by other external sources, including previous site investigation data, have been used it has been assumed that the information is correct unless otherwise stated. No responsibility can be accepted by Crossfield Consulting Limited for inaccuracies within the data supplied by others.
5. Exploratory hole locations provided in the report are generally established by tape measurement from existing features or boundaries. Hole locations are not accurately surveyed and ground levels at these locations are not obtained unless specifically requested.
6. Any assessments made in this report are based on the ground conditions indicated by the trial pits and/or boreholes, together with the results of any field or laboratory testing undertaken and, where appropriate, other relevant site data which may have been obtained for the site. Variations in ground conditions may occur between exploratory hole locations and there may be special conditions appertaining to the site which have not been revealed by the investigation and which have not been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.
7. The report is provided for the sole use by the Client or its assignees and is confidential to the Client's professional advisers. No responsibility whatsoever for the contents of this report will be accepted to any person other than the Client or its assignees.
8. New information, improved practices and legislation may necessitate an alteration to the report in whole, or in part, after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Crossfield Consulting Limited for re-assessment and, if necessary, re-appraisal.

FIGURES

FIGURE 1

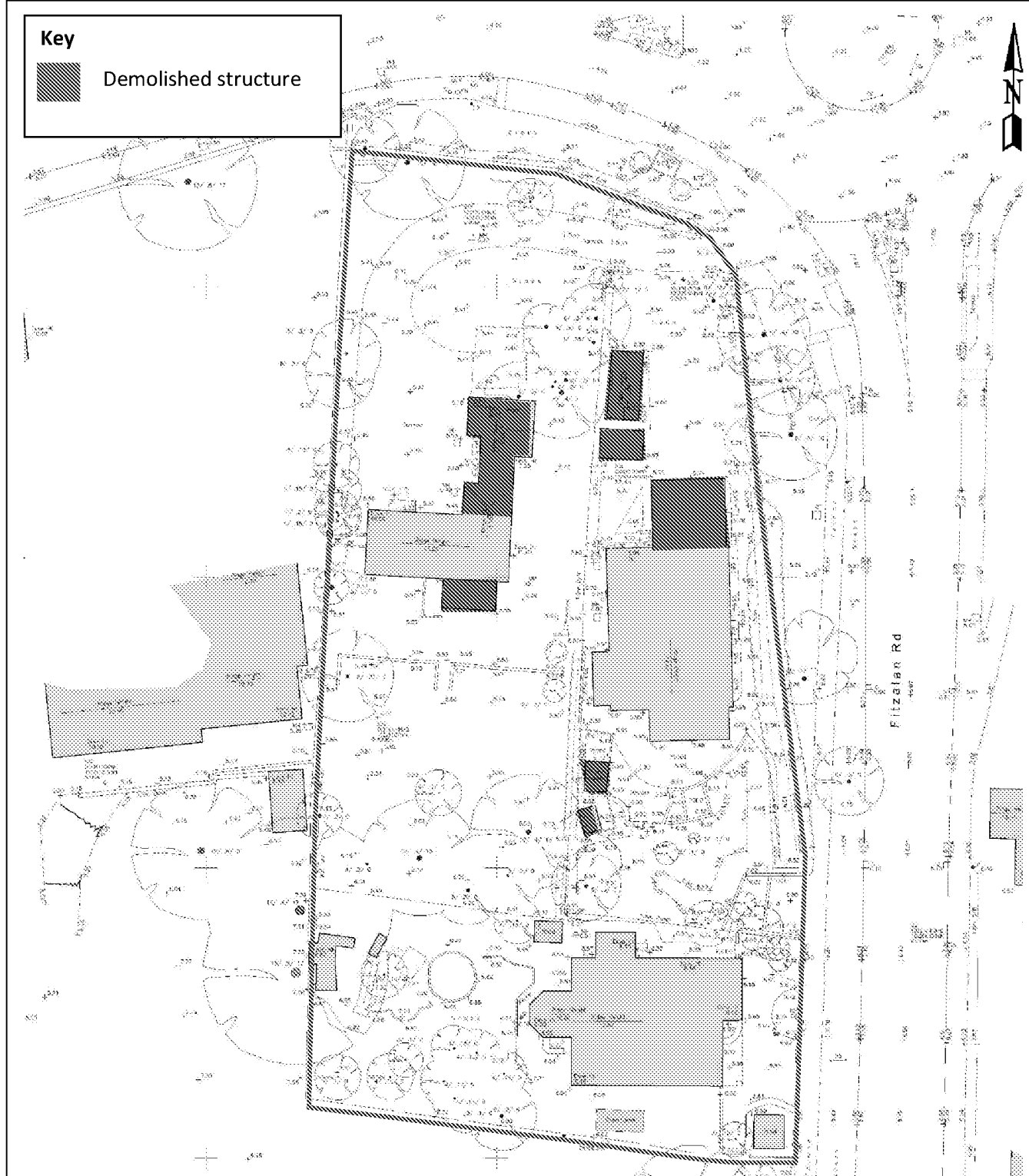


SITE LOCATION PLAN

Scale 1: 50,000

Reproduced from the 2012, 1:50,000 Ordnance Survey map with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. Licence No.100014660

FIGURE 2

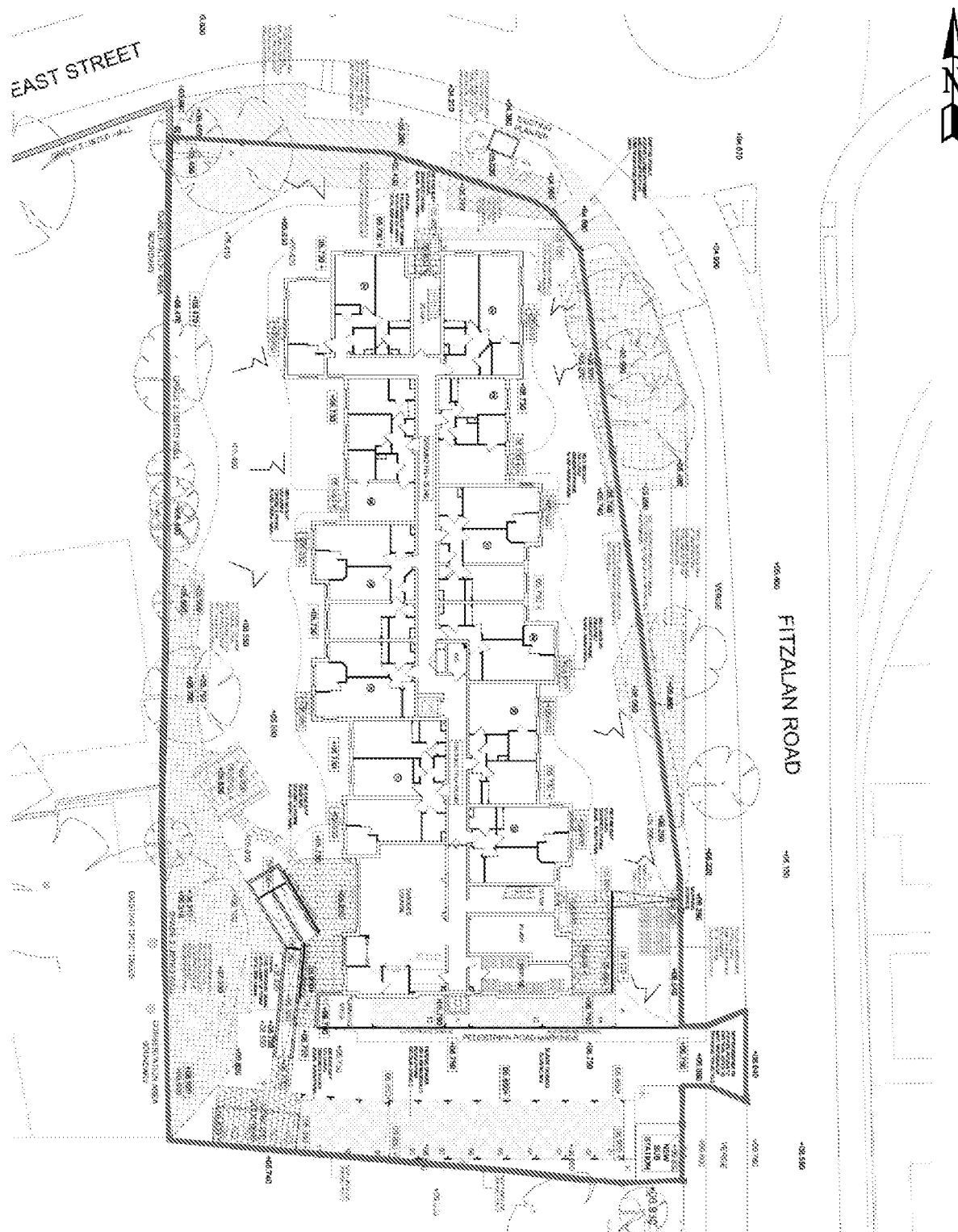


EXPLORATORY HOLE LOCATION PLAN

Scale 1:500

Reproduced from the January 2016 1:200 scale Drawing No. SU-01 produced by D&H Surveys

FIGURE 3



PROPOSED DEVELOPMENT PLAN

Scale 1:500

Reproduced from the November 2016 1:200 scale Drawing No. 200651 H:206 produced by planning issues

APPENDIX I

APPENDIX I – SUPPLEMENTARY GROUND INVESTIGATION

Introduction

The supplementary investigation was carried out on 28 April 2017 under the supervision of a geoenvironmental engineer from Crossfield Consulting Limited. The scope and rationale for the design of the investigation is presented in Table I-1.

The ground investigation was designed and supervised by qualified and experienced geoenvironmental specialists from Crossfield Consulting Limited. Where appropriate, and as outlined below, specialist drilling/sampling equipment was procured together with trained and experienced operators. Unless otherwise indicated, sampling and logging remained the responsibility of trained staff from Crossfield Consulting Limited and field records were prepared on site, during or immediately following drilling/sampling or in situ measurements/tests. The results of in situ tests are presented on the relevant record sheets in this Appendix

An exploratory hole location plan is presented as Figure I-1.

Trial Pits

Four trial pits, denoted as TP1 to TP4, were excavated by a JCB 3CX excavator. The trial pit records from the investigation are presented in this Appendix and these records include the descriptions and depths of the strata encountered, together with sample depths, groundwater observations and other pertinent comments.

In situ hand vane tests were carried out on fine-grained soils, where appropriate, to provide undrained shear strength data representative of the tested horizon. The tests were carried out using Pilcon-Edeco hand vane tester, with extension rods in accordance with the site health and safety method statement. With reference to the guidance published in Serota & Jangle (1972), it is noted that this instrument is calibrated and scaled to provide a direct reading of undrained shear strength, such that application of additional correction factors on the recorded measurements is not necessary. Published correlations with undrained shear strength, as measured by immediate undrained triaxial tests, indicate this hand vane tester provides measurements with a significantly lower scatter in comparison to triaxial tests, with fewer anomalous results. Specific test measurements are listed on the exploratory hole records.

In Situ Soakaway Tests

In situ soakaway tests were performed in Trial Pits TP1 and TP2 generally in accordance with the requirements of BRE Digest 365 except that they were filled only once. Trial Pits were filled with 'clean' water and the fall in water level measured with time. The results of the in situ testing are presented in this Appendix.

TABLE I-1

RATIONALE FOR THE DESIGN OF THE SUPPLEMENTARY GROUND INVESTIGATION

The scope of the supplementary ground investigation was designed with reference to the published geology and ground conditions indicated in the desk study information the findings of the February 2017 ground investigation.

In compliance with the guidance published in BS EN 1997-2:2007, the ground investigation was designed to verify the preliminary ground model, established from the desk study information and to characterise the ground conditions within influencing distance of the proposed structures. In this regard, the exploratory holes were targeted within relevant areas of the site to provide information on the strata profile down to competent materials. With reference to the desk study information and the support requirements of the proposed development, it is evident that adequate support is provided by the strata that continue below the depths of the exploratory holes.

Exploratory Hole and Technique	Rationale for Hole Location	Depth (m)	Sampling/In Situ Testing and Monitoring
TP1 – TP4	Trial pits were located to provide coverage of the site with regards to the proposed development layout and confirming ground conditions for an assessment of foundation and other engineering solutions.	2.0 – 3.0	Hand vanes
TP1 TP2	Trial pits located to enable in-situ soakaway tests to be undertaken, to assess suitability of soakaway drainage for proposed development.	2.0 2.0	In situ soakaway tests undertaken.

Key

TP X Machine dug trial pit

TRIAL PIT RECORDS

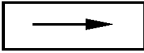
KEY

	J	Disturbed Jar Sample	}	Category B Samples
	G	Soil Sample in Glass Container		
	g	Soil Sample in Glass Vial		
	B	Disturbed Bulk Sample		
	C	"Undisturbed" CBR Mould Sample (denoted Category A: OS-TK/W in BS EN 22475-1:2006)		
	W	Water Sample		
FVT	{	c_{fv}	Undrained Shear Strength (from hand vane shear vane test)	
		c_{rv}	Undrained Remoulded Shear Strength (from hand vane shear vane test)	
		c_{fv}^*	Undrained Shear Strength from Hand Vane Shear Strength Test on block sample dug from pit by excavator	

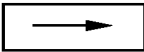
Notes:

1. All measurement values on record sheets are uncorrected, unless otherwise indicated.
2. For corrected test values, refer to report.
3. Identification and classification of strata is based on the guidance published in the current edition of BS5930 together with BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004, BS EN ISO 14689-1:2003
4. Consistency (soft, firm, stiff etc.) relates to a manual test/inspection on site (in compliance with BS EN ISO 14688-1:2002 Section 5.14)
5. Undrained shear strength (low, medium, high etc.) relates to in situ or laboratory test data and the associated assessed strength of a stratum (in compliance with BS EN ISO 14688-2:2004 Section 5.3 and Table 5).
6. The density of coarse-grained soils is based on SPT N values (or equivalent Dynamic Probe test or CPT data) as outlined in BS5930 and BS EN ISO 14688-2:2004.
7. Rock strength (weak, strong etc.) is based on field identification (and/or strength test data), as outlined in BS EN ISO 14689-1:2003 Table 5.

Crossfield CONSULTING GEO-TECHNICAL ENVIRONMENTAL		Trial Pit Record Sheet				Hole Ref. TP1	
Project East Street/Fitzalan Road, Littlehampton		Sheet 1 of 1		Job No. CCL02814			
Date 28/04/2017		Ground Level 5.42 m OD		Co-ordinates		Logged by TW Logged on site during excavation	
Bearing: North		Shoring None used		Checked by <i>JA</i>			
Plant JCB 3CX		Stability Pit remained stable					
Trial Pit Plan A → B C		Water None encountered					
Depth	Face A		Face B		Face C		Depth
0.30			(1)				0.30
1.00			(2)				1.00
1.80			(3)				1.80
2.00			(4)				2.00
			Base of Pit				
Sampling							
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description		
0.50	c _{iv}	60, 60, 65	1	0.00-0.30	Brown slightly gravelly sandy silty clay with roots and rootlets. Occasional bricks and rare metal fragments. (MADE GROUND)		
1.10	c _{iv}	70, 75, 90	2	0.30-1.00	Firm consistency brown very silty CLAY. (BRICEARTH) becoming light brown below 0.8 m		
1.80-2.00	J, B		3	1.00-1.80	Firm to stiff consistency light brown slightly gravelly sandy CLAY. (RIVER TERRACE DEPOSITS)		
			4	1.80-2.00	Structureless CHALK composed of light brown slightly silty slightly sandy angular GRAVEL with occasional cobbles. Clasts are moderately weak (LEWES NODULAR CHALK FORMATION: GRADE Dc)		
Remarks					Notes		
Ground levels estimated from Drawing No. SU-01 by D&H Solutions					1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated		

Crossfield CONSULTING GEO TECHNICAL ENVIRONMENTAL		Trial Pit Record Sheet				Hole Ref. TP2	
Project East Street/Fitzalan Road, Littlehampton		Sheet 1 of 1		Job No. CCL02814			
Date 28/04/2017		Ground Level 5.94 m OD		Co-ordinates		Logged by TW Logged on site during excavation	
Bearing: Northwest		Shoring None used		Checked by <i>JH</i>			
Plant JCB 3CX		Stability Pit remained stable					
Trial Pit Plan A  C		Water None encountered					
Depth	Face A	Face B	Face C	Depth			
0.40		(1)		0.40			
0.70		(2)		0.70			
1.10		(3)		1.10			
1.60		(4)		1.60			
2.00		(5)		2.00			
		Base of Pit					
Sampling			Strata				
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description		
0.50	c _{fv}	70, 70, 75		0.00-0.40	Brown slightly sandy silty clay with roots and rootlets. Rare brick and ash (MADE GROUND)		
1.00	c _{fv}	100, 95, 110		0.40-0.70	Firm consistency brown very silty CLAY. (BRICKEARTH)		
				0.70-1.10	Firm to stiff consistency orangish brown very sand silty CLAY. (RIVER TERRACE DEPOSITS) becoming stiff consistency below 0.90 m		
				1.10-1.60	Stiff consistency orangish brown mottled grey CLAY. (RIVER TERRACE DEPOSITS)		
				1.60-2.00	Orangish light brown slightly gravelly clayey SAND. Gravel is fine to coarse flint (RIVER TERRACE DEPOSITS)		
Remarks Ground levels estimated from Drawing No. SU-01 by D&H Solutions	Notes 1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated						

Crossfield CONSULTING GEO-TECHNICAL ENVIRONMENTAL		Trial Pit Record Sheet				Hole Ref. TP3	
Project East Street/Fitzalan Road, Littlehampton		Sheet 1 of 1		Job No. CCL02814			
Date 28/04/2017		Shoring None used		Ground Level m OD			
Bearing: South		Stability Pit remained stable		Co-ordinates			
Plant JCB 3CX		Water None encountered		Logged by TW		Logged on site during excavation	
Trial Pit Plan 				Checked by <i>JH</i>			
Depth	Face A		Face B		Face C		Depth
0.50			(1)				0.50
0.70			(2)				0.70
1.20			(3)				1.20
2.50			(4)				2.50
			Base of Pit				
Sampling							
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description		
0.70	c_{fv}	85, 90, 90		0.00-0.50	Brown slightly sandy silty clay with rootlets and roots. (TOPSOIL)		
1.00	c_{fv}	120		0.50-0.70	Firm consistency brown silty CLAY. (BRICEARTH)		
				0.70-1.20	Stiff consistency orangish light brown slightly gravelly silty CLAY. Gravel is fine to coarse rounded flint with rare flint cobbles. (RIVER TERRACE DEPOSITS)		
				1.20-2.50	Stiff consistency sandy gravelly silty CLAY. Gravel is fine to coarse sub-angular to rounded flint (RIVER TERRACE DEPOSITS) becoming very stiff consistency orangish brown mottled grey with quartz gravel below 2.00 m thickly laminated below 2.20 m		
Remarks					Notes		
Ground levels estimated from Drawing No. SU-01 by D&H Solutions					1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated		

		Trial Pit Record Sheet			Hole Ref. TP4	
		Project East Street/Fitzalan Road, Littlehampton			Sheet 1 of 1	
		Date 28/04/2017			Job No. CCL02814	
Bearing: Southeast		Shoring None used			Ground Level m OD	
Plant JCB 3CX		Stability Pit remained stable			Co-ordinates	
Trial Pit Plan 		Water None encountered			Logged by TW Logged on site during excavation Checked by 	
Depth	Face A		Face B		Face C	
0.35			(1)			
0.60			(2)			
1.20			(3)			
1.60			(4)			
1.80			(5)			
2.60			(6)			
3.00			(7)			
			Base of Pit			
Sampling			Strata			
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description	
0.50	c _{fv}	60, 55	1	0.00-0.35	Dark brown sandy silty CLAY with roots and rootlets (TOPSOIL)	
			2	0.35-0.60	Firm consistency brown silty CLAY (BRICKEARTH)	
			3	0.60-1.20	Firm to stiff consistency orangish brown slightly gravelly silty CLAY (RIVER TERRACE DEPOSITS)	
1.20	c _{fv}	105, 120, 110	4	1.20-1.60	Stiff consistency orange mottled brown silty CLAY (RIVER TERRACE DEPOSITS)	
			5	1.60-1.80	Yellowish orange fine to medium SAND (RIVER TERRACE DEPOSITS)	
			6	1.80-2.60	Yellowish orange slightly clayey fine to medium SAND (RIVER TERRACE DEPOSITS)	
2.60-3.00	J, B		7	2.60-3.00	Structureless CHALK composed of light brown silty slightly sandy angular GRAVEL and COBBLES. Clasts are moderately weak (LEWES NODULAR CHALK FORMATION: GRADE Dc)	
Remarks					Notes	
Ground levels estimated from Drawing No. SU-01 by D&H Solutions					1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated	

In Situ Percolation Test

Hole Ref. **TP1**

Project: East Street/Fitzalan Road, Littlehampton

Sheet 1 of 2

Job No. CCL02814

Date: 28/04/2017

Test by: TW

Checked by: *JAW*

Trial Pit 1

Depth 2.00 m
Length 2.10 m
Width 0.40 m

Depth to water at start of test 0.94 m
Max Effective Depth 1.06 m
75% Effective Depth 0.80 m
25% Effective Depth 0.27 m

Water Level Measurements

Time (Minutes)	Depth to Water (metres)	Effective Depth (m)
0	0.94	1.06
0.5	0.94	1.06
1	0.95	1.05
1.5	0.95	1.05
2	0.96	1.04
5	0.97	1.03
10	1.00	1.00
15	1.01	0.99
30	1.02	0.98
45	1.05	0.95
60	1.08	0.92
90	1.13	0.87
120	1.16	0.84
150	1.19	0.81
180	1.21	0.79
210	1.24	0.76
240	1.26	0.74

75% Effective Depth - 170 - 0.80
25% Effective Depth - 900 - 0.27

Outflow Volume

Volume outflowing between 75% & 25% effective depth:

$$V_{p75} = 0.45 \text{ m}^3$$

The mean surface area through which the outflow occurs, taken to be the pit sides to 50% effective depth and the base.

$$a_{p50} = 3.49 \text{ m}^2$$

Time for outflow

$$t_p = 730 \text{ mins}$$

Soil Infiltration Rate

$$f = V_{p75} / a_{p50} * t_p$$

as defined in

BRE Digest 365 (1991)

$$f = 2.9E-06 \text{ m/sec}$$

In Situ Percolation Test

Hole Ref. **TP1**

Project: East Street/Fitzalan Road, Littlehampton

Sheet 2 of 2

Job No. CCL02814

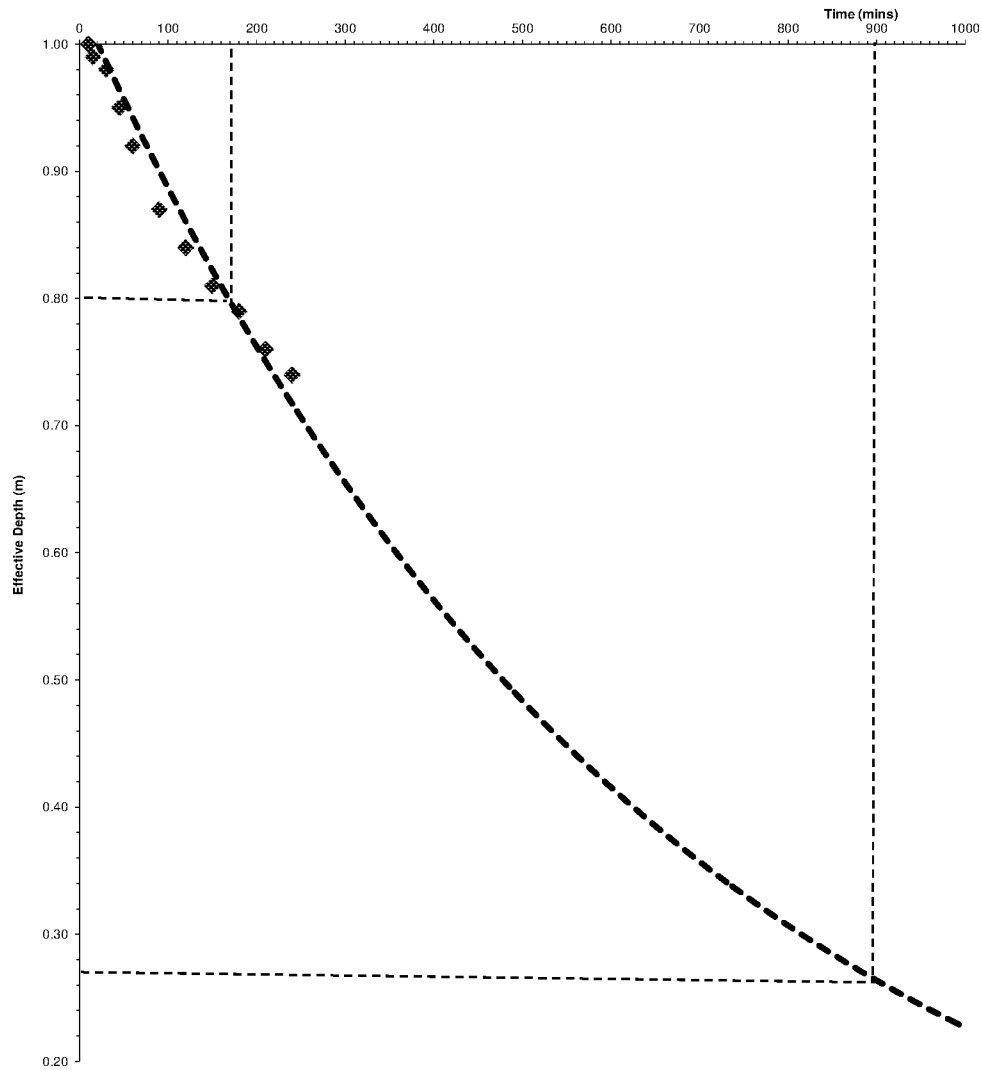
Date: 28/04/2017

Test by: TW

Checked by: *JH*

Trial Pit 1

Infiltration Rate



In Situ Percolation Test

Hole Ref. **TP2**

Project: East Street/Fitzalan Road, Littlehampton

Sheet 1 of 2

Job No. CCL02814

Date: 28/04/2017

Test by: TW

Checked by: *TH*

Trial Pit 2

Depth 2.00 m
Length 1.90 m
Width 0.40 m

Depth to water at start of test 0.94 m
Max Effective Depth 1.06 m
75% Effective Depth 0.80 m
25% Effective Depth 0.27 m

Water Level Measurements

Time (Minutes)	Depth to Water (metres)	Effective Depth (m)
0.5	0.94	1.06
1	0.94	1.06
1.5	0.94	1.06
2	0.94	1.06
5	0.94	1.06
10	0.96	1.04
15	0.96	1.04
30	0.97	1.03
45	0.98	1.02
60	0.99	1.01
90	1.01	0.99
120	1.03	0.97
150	1.04	0.96
180	1.07	0.93
210	1.09	0.91
240	1.12	0.88

75% Effective Depth - 400 - 0.80
25% Effective Depth - >24 hrs - 0.27

Outflow Volume

Volume outflowing between 75% & 25% effective depth:

$$V_{p75} = 0.40 \text{ m}^3$$

The mean surface area through which the outflow occurs, taken to be the pit sides to 50% effective depth and the base.

$$a_{p50} = 3.20 \text{ m}^2$$

Time for outflow

$$t_p = 1500 \text{ mins}$$

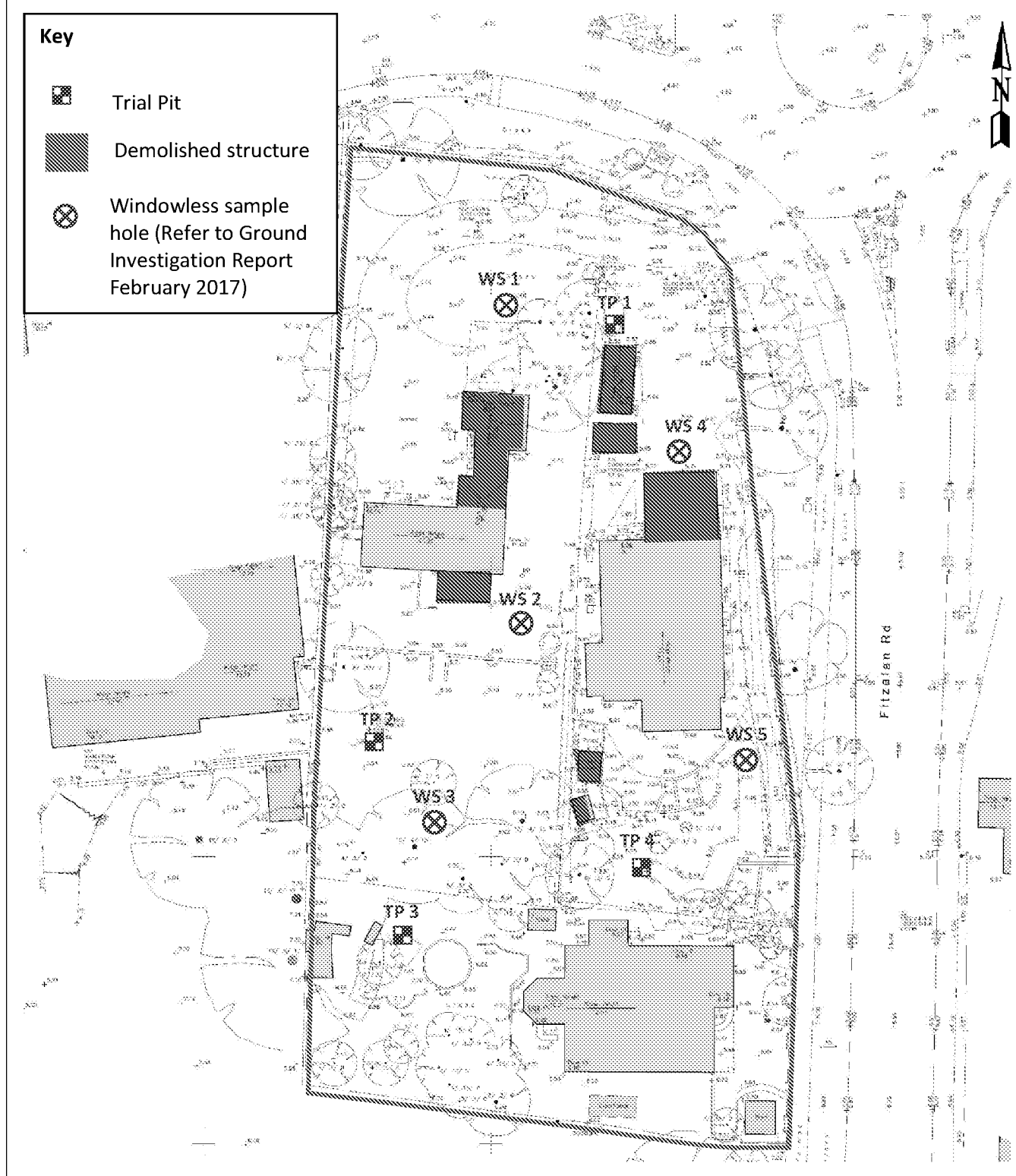
$$\text{Soil Infiltration Rate } f = V_{p75} / a_{p50} * t_p$$

as defined in

$$\text{BRE Digest 365 (1991)} \quad f = < 1 \times 10^{-6} \text{ m/sec}$$

Infiltration period exceeds 24 hrs and small test volume precludes an accurate infiltration rate value.

FIGURE I-1



EXPLORATORY HOLE LOCATION PLAN

Scale 1:500

Reproduced from the January 2016 1:200 scale Drawing No. SU-01 produced by D&H Surveys