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FLOOD RISK ASSESSMENT AND DRAINAGE STATEMENT

Scheme name:

Helmsley House, Bartons Road, Havant, Hants, PO9 5NB.

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Foreword

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Some of the information presented within this report is based on third party information which is believed to be correct; no liability will be accepted for any discrepancies in accuracy, mistakes or omissions in such information. The report also assesses the flood risk in relation to the requirements of the Environment Agency and as such assesses the site for a specific flood event and not all flood events. The contents of this document must not be copied or reproduced in whole or in part without the written consent of Infrastruct CS Ltd

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1.0 Summary

A Flood Risk Assessment (FRA) and drainage strategy has been undertaken to accompany the planning application for the proposed development at Helmsley House, Bartons Road, Havant, Hants, PO9 5NB. This report has been prepared by Infrastruct CS Ltd on behalf of Brackley Investments Ltd. in accordance with the guidelines set out in the National Planning Policy Framework.

The following table is an overview of the flood risk and drainage strategy for the proposed development of the site, based upon currently available information and finds the following –

ITEM	RESPONSE
Site Location	The site is located in the town of Havant Hampshire on Bartons Road, which bounds the site to the north. The site is located to the east of Helmsley House, with open/agricultural land to the east and a Bellway Residential development currently being constructed to the south of site. The approximate grid reference 473256 E, 107945 N.
Size and Current Land Usage	The current site is approximately 0.63ha in plan and is currently open/agricultural land.
Flood Zone	The development site falls entirely within Flood Zone 1, which is classified as low probability of flooding.
Fluvial Flood Risk	**Low** – Refer to Section 6.1
Overland Flood Risk	**Low** – Refer to Section 6.2
Groundwater Flood Risk	**Low** – Refer to Section 6.3
Sewerage Flood Risk	**Low** – Refer to Section 6.4
Artificial Flood Risk	**Low** – Refer to Section 6.5
Proposed Development	The proposals are for the development of land are construction of a 64 bed Residential Care Home, plus Parking & Hardstanding areas, with Landscaped Communal Gardens and associated amenities.
SuDS Features proposed for this scheme	The surface water drainage strategy connects into a system provided within the adjacent Bellway site however flows off site are reduced to 5l/s and excess surface water stored within a cellular tank located along the southern boundary of the site.

Based on this assessment, it is concluded that in accordance with the Flood risk vulnerability and flood zone compatibility table in Section 5.6 from the Planning Practice Guidance document, the report considers the proposed development appropriate.

2.0 Introduction

2.1 Commission

Brackley Investments Ltd. has commissioned Infrastruct CS Ltd, to prepare a Flood Risk Assessment (FRA) and drainage statement to support a planning application for the development at Helmsley House, Bartons Road, Havant, Hants, PO9 5NB.

2.2 Guidance

This flood risk assessment has been compiled in accordance with the recommendations of the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG).

2.3 Aims and Objectives

The purpose of this flood risk assessment is to assess the potential flood risks by and to the proposed development. It will identify the flood risk zone, potential sources of flood risk, consider the proposed drainage and will be used to support the proposed planning application.

3.0 Site Details

3.1 Location

The site is in Helmsley House, Bartons Road, Havant, Hants, PO9 5NB, bound by Bartons Road to the North, with Helmsley House to the west, with open/agricultural land to the east and a Bellway residential construction site to the south of site.

Figure 3.1.1 - Site Context

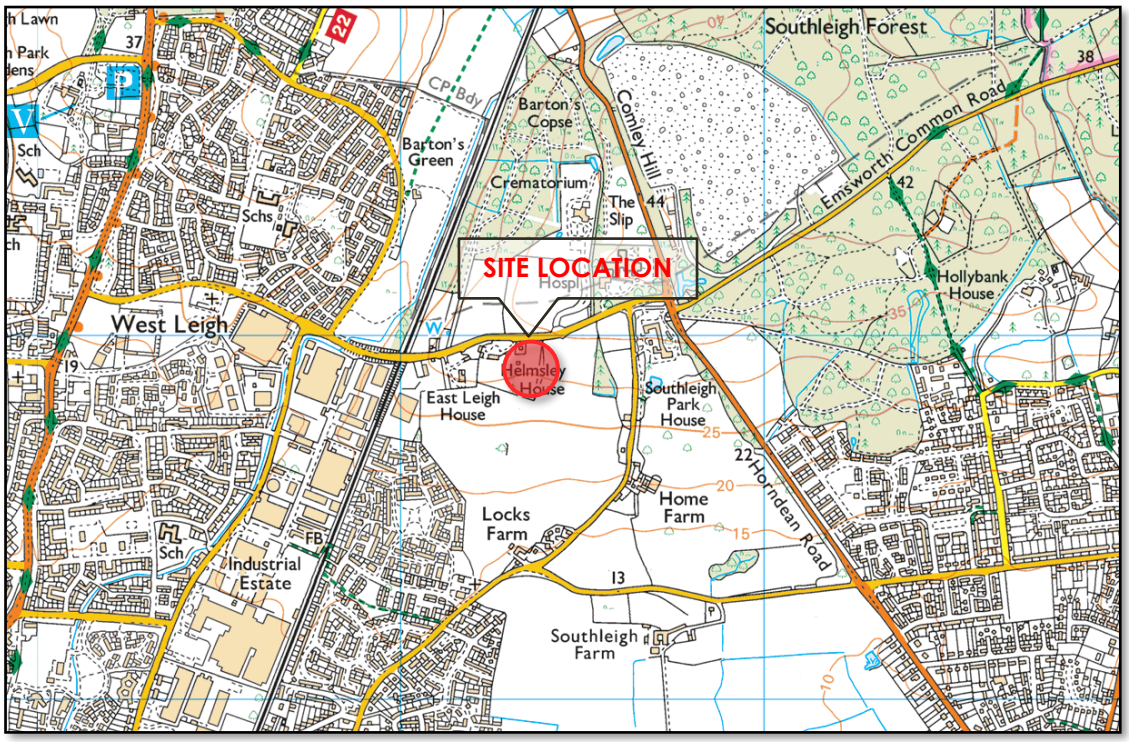


Figure 3.1.2 - Site location

3.2 Grid Reference

The Ordnance Survey National grid reference for the centre of the site is:

473256 E, 107945 N (Nat Grid SU 73256 07945)

3.3 Topography and Site Description

The site covers an approximate greenfield area of 0.63ha, and is located on the Southern side of Bartons Road, adjacent to Helmsley House, to the northeast of the town of Havant, Hampshire**.** The site is approximately square on plan.

Levels vary within the site between 35.04mAOD to the northern boundary (at the access road location) and 26.44mAOD to the southern boundary. The maximum fall across the site is 8.6m over 195m, giving a gradient of 1 in 23.

Refer to Appendix A for a copy of the topographic survey.

3.4 Ground Conditions

A Site Investigation Report (Ref: 18-08-05, Dated 29/08/2018) has been undertaken on site by GEO Integrity and found the following with regards to the underlying ground conditions.

Strata: MADE GROUND/Topsoil to a depth of 0.2mbgl, MADE GROUND/Dense brown sand to 0.6mbgl, HEAD/Stiff orange sandy clay to 1.1mbgl, With LONDON CLAY to the end of excavation

Infiltration: TP2 – Unable to Calculate Average Soil Infiltration Rate

TP3 – Unable to Calculate Average Soil Infiltration Rate

A copy of the report can be found within Appendix B of this report.

3.5 Ground Water

The site investigation report did not confirm the level of the water table, as none of the Trial Pits (from the GEO Integrity report: 18-08-05) encountered Standing/Groundwater.

Boreholes carried out in the vicinity of the site, encountered ground water/standing water at approx. 7.00mbgl**.** Further substantiation of the ground water table will be undertaken as part of a wider scope of site investigation works once planning consent has been secured.

A review of the maps within the local SFRA indicate that the site is at a low risk flooding.

3.6 Existing Site Drainage

The Southern Water wastewater plans for the local area show both foul and surface water sewers within the immediate vicinity of the site.

The development site will however be serviced be dedicated drainage laterals provided as part of the Bellway Residential site to the south. These systems connect into the Southern Water systems located further to the south.

Please refer to Appendix C for a copy of the drainage proposals for the Bellway site to the south with the laterals provided to cater for this development site.

3.7 Existing Watercourses

The nearest main river watercourse to the site is the River Lavant, which is located 435m to the West of the site.

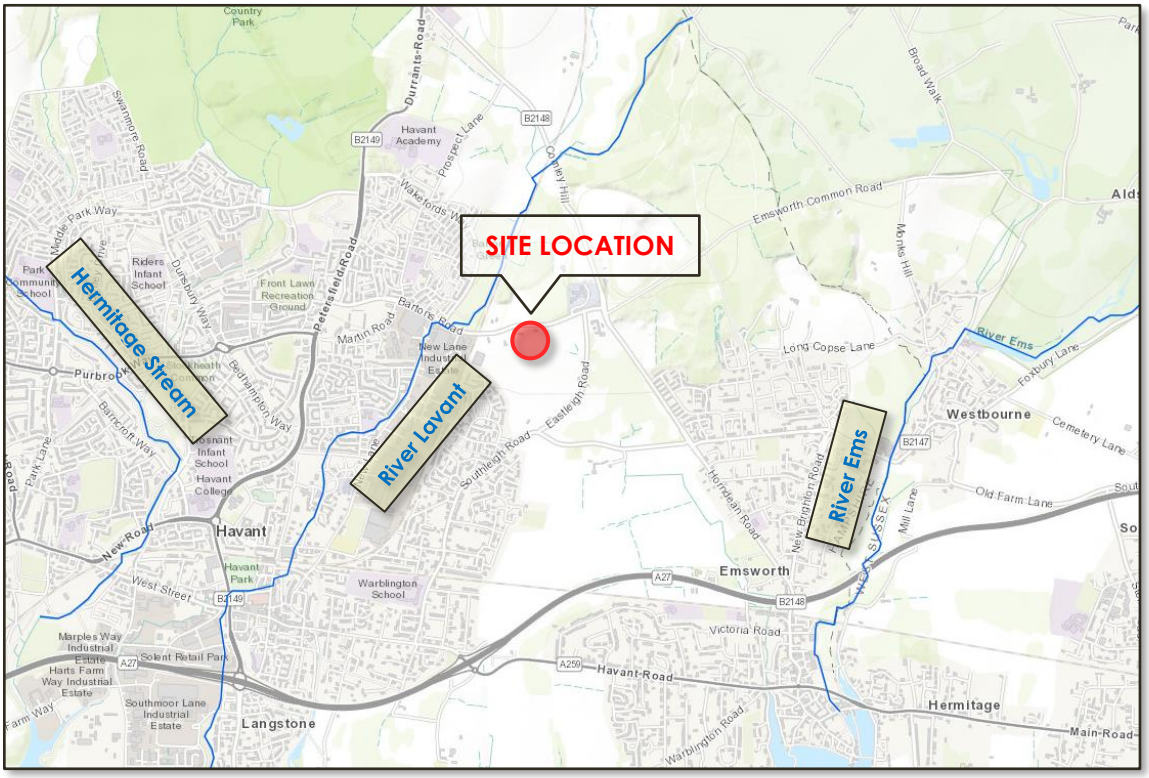


Figure 3.7.1 – Local Rivers

3.8 Environment Agency Groundwater and Aquifer Protection

Reference to the Environment Agency Groundwater protection zone map shows the area is sited within a Low to Unproductive groundwater protection zone(s). The Environment Agency have defined Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes, and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk.

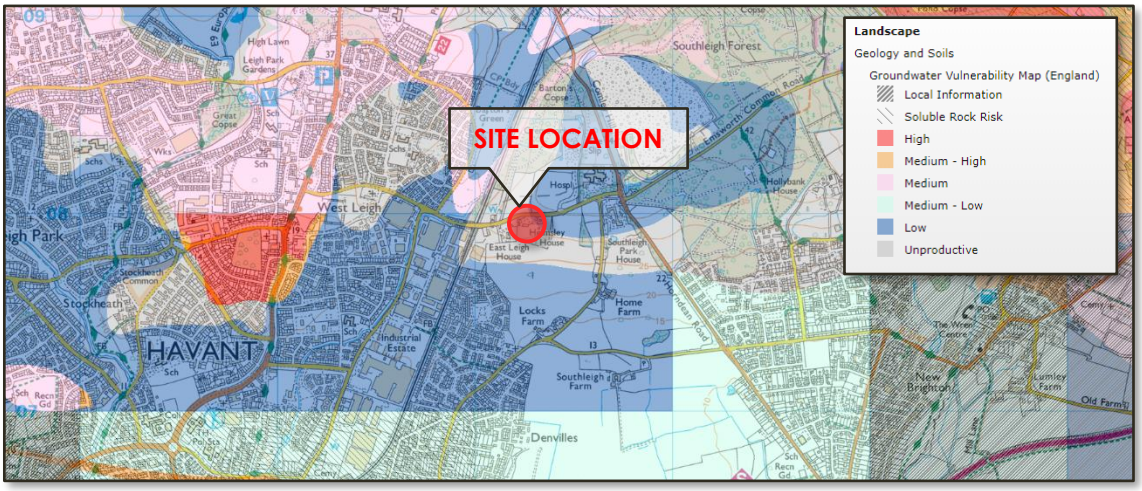


Figure 3.8.1 – Groundwater Protection Zones

The Environment Agency use the zones to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.

4.0 Proposed Development

The current architectural proposals involve the construction of a 64 bed Residential Care facility, parking for 29 vehicles with landscaped communal gardens and associated amenities.

The proposed development plans can be found in Appendix D.

5.0 Flood Risk Policy

5.1 Environment Agency Flood Map

The flood map for the development site shown below suggests that the site wholly falls within flood zone 1, which is defined as land assessed as having a less than 1 in 1000 annual probability of river flooding in any one year. `

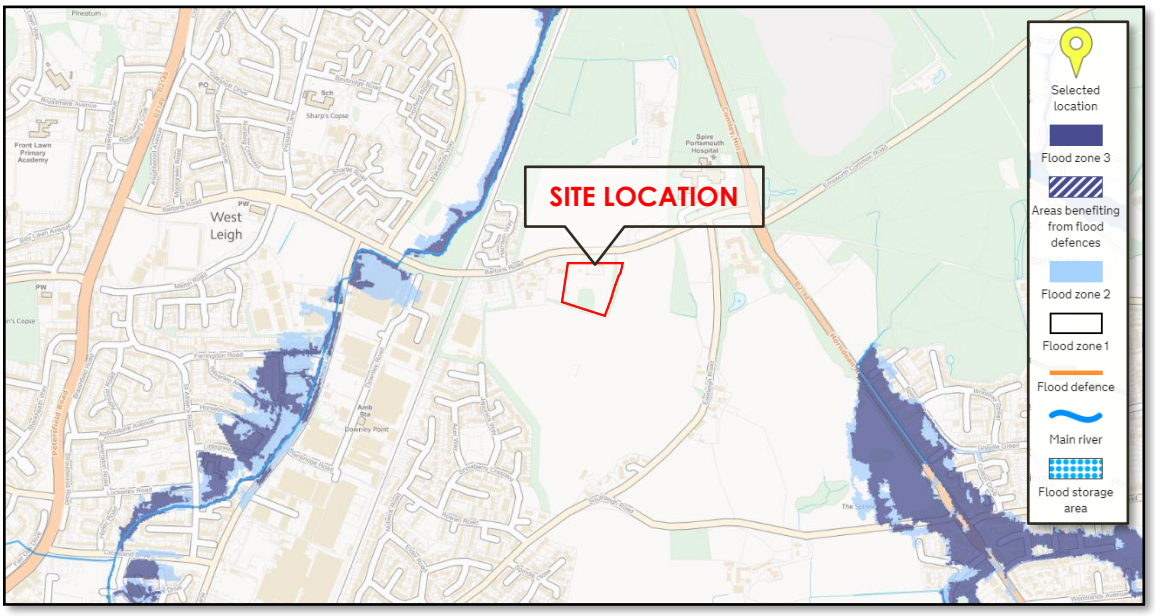


Figure 5.1 - Environment Agency Flood Zone map

5.2 The National Planning Policy Framework

The National Planning Policy Framework (NPPF) and the accompanying Planning Practice Guidance (PPG) gives direction for development with respect to flooding. These documents promote a sequential approach to encourage development away from areas that may be or are susceptible to flooding. In doing so it categorizes flood zones in the context of their probability of flooding, as shown in the table within Section 5.3 below.

5.3 Flood Zone Definition

The National Planning Policy Framework Definition of Flood Zones

Flood zone	Fluvial	Tidal	Probability of flooding
1	< 1 in 1000 year	<1 in 1000 year	Low probability
2	Between < 1 in 1000 year and 1 in 100 year	Between <1 in 1000 year and 1 in 200 year	Medium Probability
3a	> 1 in 100 year	> 1 in 200 year	High probability
3b	Either > 1 in 20 or as agreed between the EA and the LPA	Either > 1 in 20 or as agreed between the EA and the LPA	Functional flood plain

5.4 Flood Zones – Table 1 PPG

(Note: These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 - Low Probability
Definition
This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Appropriate uses
All uses of land are appropriate in this zone.
FRA requirements
For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E for minimum requirements.
Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

5.5 Flood Risk Vulnerability Classification - Extract from Table 2 PPG

More Vulnerable

- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels.
- Non–residential uses for health services, nurseries, and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

5.6 Flood Risk Vulnerability & Flood Zone Compatibility Table

Vulnerability classification flood zone	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
1	√	√	√	√	√
2	√	√	Exception test required	√	√
3a	Exception test required	√	x	Exception test required	√
3b	Exception test required	√	x	x	x

√ Development is appropriate x development is not appropriate

The above table, taken from PPG (Table 3), confirms that residential properties within flood zones 1 is appropriate development.

It is, therefore, the consideration of this FRA that the site has a low risk of flooding from fluvial sources.

5.7 Other Flooding Mechanisms

In addition to the potential for assessing flooding from fluvial and tidal sources NPPF also requires that consideration is given to other mechanisms for flooding:

- Flooding from land – intense rainfall, often in short duration, that is unable to soak into the ground or enter drainage systems, can run rapidly off land and result in local flooding.
- Flooding from groundwater – occurs when water levels in the ground rise above the surface elevations.
- Flooding from sewers – In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and wastewater sewers known as combined sewers. Flooding can result causing surcharging when the sewer is overwhelmed by heavy rainfall.
- Flooding from reservoirs, canals and other artificial sources – Non-natural or artificial sources of flooding can result from sources such as reservoirs, canals lakes etc, where water is held above natural ground levels.

6.0 Other Sources of Flood Risk to The Development

6.1 Flooding from Overland Flows

The risk of flooding due to overland flood flows is considered very low by the Environment Agency. The surface water flood data for the site, shown below, indicates that there is no risk in the local area or within the site.

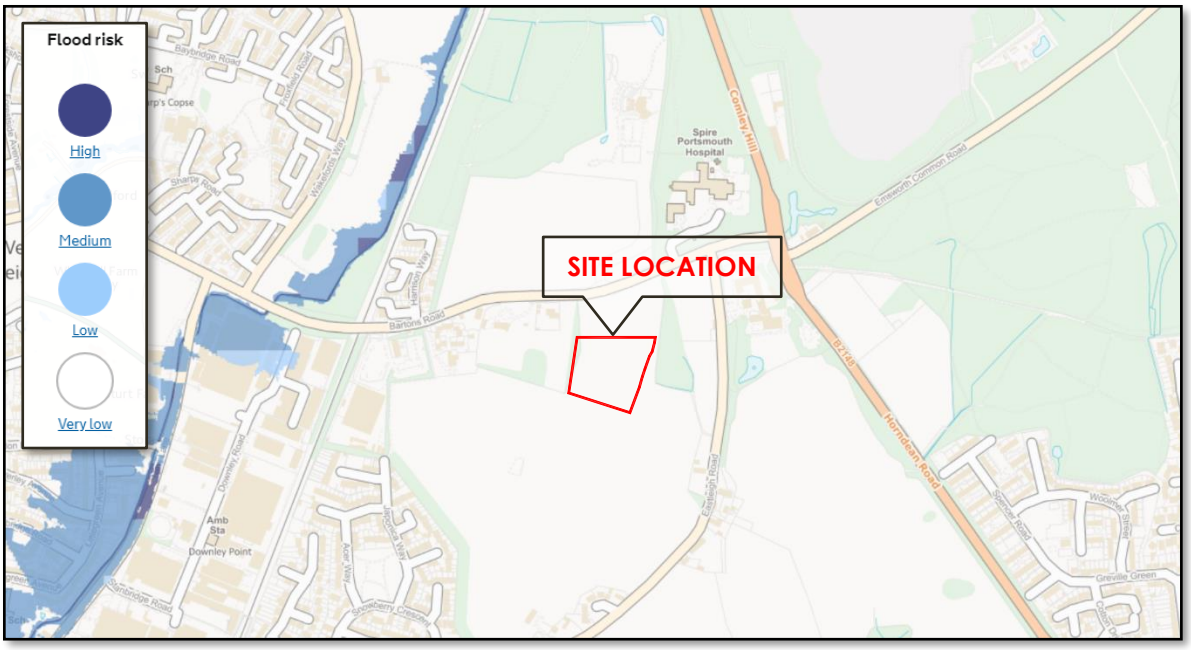


Fig 6.2 – Environment Agency Flood Risk from Surface Water map

It is, therefore, the consideration of this FRA that the site has a very low risk of flooding from overland flow.

6.2 Flooding from Rising Groundwater

Section 3.5 of this report confirms that boreholes carried out in the vicinity of the site, found ground water at approximate depths of approx. 7.0mbgl.

A review of the maps within the Havant Borough Council SFRA also indicate the site has a low risk of flooding from Groundwater.

It is, therefore, the consideration of this FRA that the site has a low risk of flooding from rising groundwater levels.

6.3 Flooding from the Local Sewerage Network

Sewer flooding generally results in localised short-term flooding caused by intense rainfall events overloading the capacity of sewers. Flooding from sewers can also occur as a result of blockage, poor maintenance or structural failure.

As the site is at a higher elevation than the receiving drainage networks, it is likely that any sewer flooding would occur below the level of the site and flow away from the site with the natural topographic falls of the area.

It is, therefore, the consideration of this FRA that the site has a low risk of flooding by surcharging of the local sewer network.

6.4 Flooding from Reservoirs, Canals & Other Artificial Sources

There are no known reservoirs, canals or other artificial sources in the vicinity of the site.

It is, therefore, the consideration of this FRA that the site has a low risk of flooding by reservoirs, canals or other artificial sources.

7.0 Flood Risk As A Result Of The Development

7.1 Effect of The Development Generally

Development by its nature usually has the potential to increase the impermeable area with a resultant increased risk of causing rapid surface water runoff to watercourses and sewers, thereby causing surcharging and potential flooding. There is also the potential for pollutants to be mobilised and consequently flushed into the receiving surface water system.

Increases in both the peak runoff rate (usually measured in litres per second l/s) and runoff volume (cubic metres m^3) can result.

7.2 Surface Water Drainage & Sustainable Drainage Systems

Sustainable Drainage techniques (SuDS) covers a range of approaches to manage surface water runoff so that-

'Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account. This should be demonstrated as part of the flood risk assessment.'

7.3 Peak Storm Design Criteria

The proposed sustainable drainage techniques for the development should accommodate the peak rainfall event for a 1 in 100 year storm event with an additional allowance for climate change. Table 5 of NPPG recommends for developments that have a life expectancy beyond 2085, that an additional factor of 40% is applied to the peak volume of runoff.

7.4 Infiltration Testing

Infiltration testing undertaken by Geo-Integrity in August 2018 (Appendix B) confirmed that the underlying strata would not support the use of infiltration devices. As such a positive outfall for surface water will be required.

7.5 Sustainable Drainage Hierarchy

A hierarchical approach has been undertaken in consideration of the application of SuDS in relation to the development. This is in order to meet the design philosophy of ensuring that surface water run-off is managed as close to its source as possible and the existing situation is replicated as closely as possible.

The following drainage hierarchy has been undertaken with reference to the procedures set out in the SuDS Manual (CIRIA C753, 2015) to assess the viability of the application of SuDS techniques to this scheme:

- store rainwater for later use
- use infiltration techniques, such as porous surfaces in permeable strata areas

- Attenuate rainwater in ponds or open water features for gradual release to a watercourse.
- attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse,
- discharge rainwater direct to a watercourse
- discharge rainwater to a surface water drain
- discharge rainwater to the combined sewer.

The sustainable drainage hierarchy shown above is intended to ensure that all practical and reasonable measures are taken to manage surface water higher up the hierarchy (1 being the highest) and that the amount of surface water managed at the bottom of the hierarchy is minimised.

The site-specific drainage hierarchy checklist considered for the drainage design for this development is detailed in Table 7.6.

SUDS OPTIONS	Comments	Potential for flow rate control	Volume reduction	Maintenance requirement	Space requirement	Cost	Included in final detailed design
Rainwater harvesting	Rainwater from roof runoff collected for re-use. Cost-benefit considerations	L	M	H	L	H	Pos
Water butts	Rainwater collection from roof runoff. Included in final design	L	L	L	L	L	Pos
Living roofs	Vegetated roofs that reduce runoff volume and rate	M	L	M	L	H	Y
Bio-retention	Shallow vegetated areas to retain and treat runoff.	L	L	M	M	L	N
Constructed wetlands	Waterlogged areas that can support aquatic vegetation. Replicates existing conditions and provides ecological benefit.	M	L	H	H/M	M	N
Swales	Shallow grassed drainage channels. Replicates existing conditions	H	M	L	M/H	L	N
Soakaways	Subsurface structures that dispose of water via infiltration.	H	H	L	L	M	N
Permeable pavements	Surface that infiltrate through surface. Retains pollutants.	H	H	M	L	M	Y
Tanked storage systems	Oversized pipes or cellular storage.	H	L	L	M	M/H	Y
Infiltration basins	Depressions in the ground to store and release water through infiltration	H	H	H/M	H	M/L	N
Detention basins	Temporary retention of runoff with controlled discharge	H	L	M	H	M/L	N

Table 7.6 Drainage design hierarchy (SuDS techniques considered for use in this scheme)

It should be noted that where the SuDS techniques are noted as feasible or possible it does not necessarily follow that they will all be used.

7.6 SUDS Techniques Employed

The proposed development relies on the drainage laterals provided by the Bellway scheme to the south of the site and a 'Collaboration Agreement' between the landowners and Bellway has been signed to secure these outfalls. Please refer to Appendix H of this report.

This agreement confirms that surface water flows off the development site must not exceed a rate of 5l/s. This rate is to cover the application site and a further site to the north of the application site.

As such overall flows off the site will be restricted to 5l/s but flows off the application site will be restricted to a rate of 2.5l/s.

This is to be achieved through the use of a hydrobrake flow control chamber with the storage required to cater for a 1 in 100yr plus 40% climate change event, contained within a cellular storage tank located along the southern boundary of the site.

The use of open storage features has been discounted due to the topographical falls of the site and the intended user group for the care facility.

The scheme also incorporates an element of biodiverse roofing to the proposed building and tanked permeable paving to the parking bays.

The proposed drainage arrangement and associated calculations can be found within Appendix E and F of this report.

7.7 Urban Creep

Following pre-application consultation with Hampshire County Council, the revised drainage strategy takes into account a 10% increase in impermeable area due to urban creep.

7.8 Residual Flood Risk & Exceedance

Should the site be impacted by an extreme storm event, the system has been designed to fail safe and surface water flows will follow the route of the drainage system and exit the site at the south east corner and then run along the adjacent access road.

7.9 Flood Risk Management

Unlike conventional drainage systems, SuDS features are visible, and their function should be easily understood by those responsible for maintenance. When problems occur, they are generally obvious and can be remedied simply, using standard landscaping practice. During the first year of operation of all types of SuDS, inspections should usually be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident. A full SuDS maintenance guidance can be found in Appendix G.

7.10 Water Quality

According to the CIRIA SUDS Manual, see below, the pollution hazard level for car parks and low traffic roads is low, and the simple index approach should be used. Residential roofs have a very low hazard level and periodic sediment removal is sufficient.

TABLE 4.3 Minimum water quality management requirements for discharges to receiving surface waters and groundwater

Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries[2]	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]*	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]*	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]* In England and Wales, Risk Screening[4] must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA (2009)	
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit[3]. Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required[5].	

Table 4.3 of the SUDS Manual CIRIA C753. Page 63.

The method is guided by the land use and SuDS performance evidence. The steps to be followed are outlined below.

BOX 26.2 Steps of the simple index approach

Step 1 – Allocate suitable pollution hazard indices for the proposed land use

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected[1] surface waters or groundwater, consider the need for a more precautionary approach

Note:

1 Designated as those protected for the supply of drinking water (Table 4.3).

Box 26.2 of the SUDS Manual CIRIA C753. Page 567.

Step 1: Pollution hazard indices are presented in table 26.2 below. These indices range from 0 (no pollution hazard for this contaminant) to 1 (high pollution hazard for this contaminant type).

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Table 26.2 of the SUDS Manual CIRIA C753. Page 568.

Step 2: To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index. In this case the principal destination of the runoff is the sewerage system, so table 26.3 should be used.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Notes

1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.

2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.

3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.

4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.

5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: **http://tinyurl.com/qf7yuj7**

6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

Table 26.3 of the SUDS Manual CIRIA C753. Page 569.

In this case, the mitigation indices are above the hazard indices which means the water quality treatment is adequate.

8.0 Recommendations and Conclusion

The development proposals together with the site layout have been assessed in relation to the provision of SuDS drainage associated with the works.

The report has assessed the feasibility of implementing the SuDS hierarchal approach and has confirmed that this development is likely to be able to install suitable drainage measures into the design proposals.

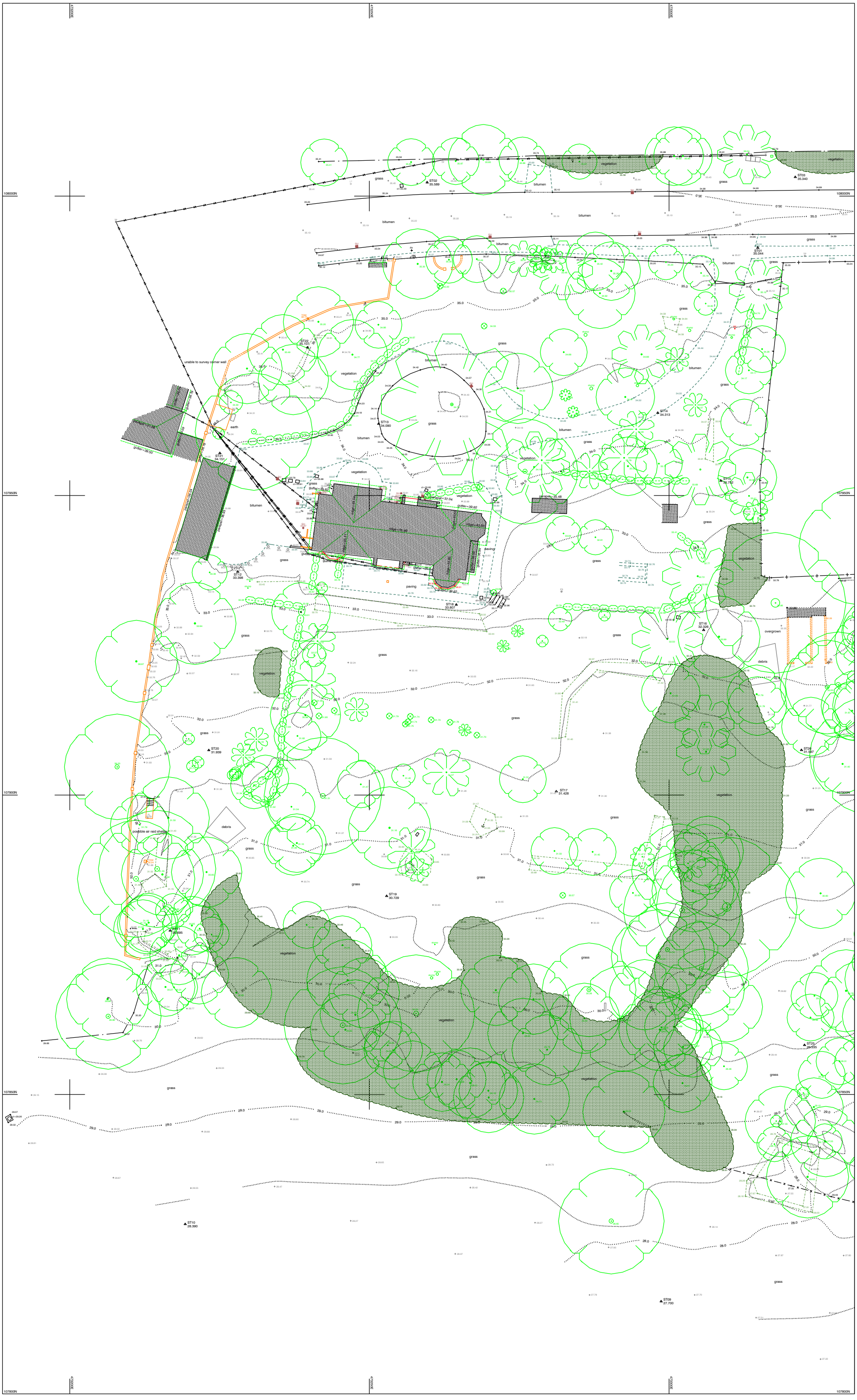
Flood risk to the site has been assessed, and where risks have been deemed above low, mitigation measures have been proposed to reduce the risk to the site.

Therefore, in line with the recommendations of the National Planning Policy Framework, the development site lies within land classified as flood zone 1, which is considered at a low risk of flooding, and therefore appropriate for a development of this nature. Having assessed the other forms of flood risk to and from the development site, this report finds that the site is not considered at high risk from any other sources of flooding.

9.0 References & Bibliography

- The National Planning Policy Framework July 2018
- Planning Practice Guidance.
- Environment Agency - Rainfall-Runoff Management for Developments
- Environment Agency indicative flood maps https://flood-map-for-planning.service.gov.uk/
- Environment Agency indicative groundwater source protection zone maps http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx
- Environment Agency indicative Aquifer designation maps http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx
- CIRIA 2007, The Sustainable Drainage Systems (SUDS) Manual C753
- Sewers for adoption 7th edition
- Havant Borough Council SFRA
- Flood Estimation Handbook
- Environment Agency - Adapting to Climate Change: Advice for the Flood and Coastal Erosion Management Authorities March 2016

Appendix A - Topographic Survey



Symbol & Abbreviation Key.

- BARBED WIRE FENCE
- POST & RAIL FENCE
- CLOSE BOARD FENCE
- RAILINGS
- CHAIN LINK FENCE
- OTHER FENCE
- KERB
- DROPPED KERB
- GULLY CHANNEL
- TOP / BOTTOM OF BANK
- FOLIAGE
- DITCH
- VERGE
- OVERHEAD CABLES
- GATE
- HEDGE
- TREE - BROAD LEAVED
- TREE - CONIFEROUS
- BUSH
- BUILDING
- BOREHOLE
- SURVEY STATION
- ORDNANCE SURVEY BENCH MARK

A/C	AIR CONDITIONING UNIT	KO	KERB OFFLET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BOREHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	RODDING POINT
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STOP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
ER	EARTH ROD	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TOF	TOP OF FENCE
EM	ELECTRICITY MARKER	TOH	TOP OF HEDGE
FB	FUSE BOX	TOR	TOP OF RAILINGS
FH	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
IL	INVERT LEVEL	WO	WASH OUT

General.

This survey has been prepared with a scaling accuracy for a plot at a scale of 1:200.

All tree heights and spreads are approximate. We have tried to identify tree types, however if tree species are critical specialist advice should be gained.

Drainage pipe sizes have been measured from the surface. Chamber access has not been gained for safety reasons, therefore sizes should be regarded as approximate.

Some detail may have been omitted due to parked vehicles.

Notes.

Coordinates related to OS National Grid from ST08 – by GPS (No scale factor added).
Levels related to GPS.

Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
BO	MS	19/09/17	RGT	20/09/17	RGT	20/09/17

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Client.

BRACKLEY INVESTMENTS
UNIT 6 LOWER FARM BARNS
BAINTON ROAD, BUCKNELL
BICESTER, OXON
OX27 7LT

Title.

TOPOGRAPHICAL SURVEY

HELMSLEY HOUSE
BARTONS ROAD
HAVANT, HAMPSHIRE
PO9 5NB

Dwg No. **170652** Sheet **1 of 3**

Scale 1:200 A0 Sheet Rev. -

Appendix B - Site Investigation Report

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murraybateman@geo-integrity.co.uk
www.geo-integrity.co.uk

Our Ref: MB/18-08-05

Brackley Investments Ltd
Unit 6 Lower Farm Barns
Bainton Road
Bucknell
Bicester
OX27 7LT

16th October 2018

For the attention of David Brill

Dear David

BRE365 Soakaway Testing – Land to east of Helmsley House, South of Bartons Road, Havant, PO9 5NB.

Following receipt of the acceptance email and consultants order BPM 00074/1059 dated 15th August 2018, we have pleasure in providing you with our interpretative soakaway letter report for the site at Helmsley House, South of Bartons Road, Havant, PO9 5NB, centred at National Grid Reference SU 73315 07899.

1 Sitework Information

On the 29th August 2018, we attended site and undertook five soakaway tests in general accordance with BRE Digest 365. This consisted of putting down five trial pits with an excavator to depths of between 0.95m to 1.52m bgl, the pits were then filled to 0.30m and 0.70m bgl, with water using a 700 litre mobile bowser, the infiltration of the water was then monitored over the course of the test. The location of the exploratory holes can be seen on the Exploratory Hole Location Plan attached.

2 Ground Conditions and Geotechnical Testing

Made Ground/Topsoil was encountered in all exploratory holes from ground level to depths ranging from 055m below ground level to 1.00m bgl. In the majority of holes it consisted of topsoil with brick and gravel overlying a dense dark brown gravelly sand with flint and brick fragments.

Head Deposits were encountered beneath the Made Ground in TP's 1 and 2. They consisted of stiff orange and grey very sandy gravelly clay.

London Clay was encountered in TPs 2 to 4 from beneath the Made Ground or Head Deposits to the full depth of the trial holes in each location (maximum depth of 1.50m bgl. It consisted of a stiff light grey and light brown thinly laminated silty clay with silt partings, and reworked in places with some flint gravel.

No geotechnical testing was requested as part of this investigation.

Groundwater was encountered in TP 1 at the base (1.01m bgl). It rose to a level of 0.97m bgl after ½ hr of observation before the BRE365 test.

3 Soil Infiltration Comments

One BRE365 soakaway test was run in each trial pit over a period of one day. None of the tests were completed (i.e. none recorded a soakage level of less than 75% of the original water volume). In three cases (TPs 2, 3 and 4), infiltration was so low over the whole day that we were unable to calculate an average soil infiltration rate. In TPs 1 and 5, a certain amount of infiltration took place (in both cases within the more granular Made Ground deposits near ground level) and therefore results were extrapolated to give an indication of the infiltration rate. These extrapolated rates ranged between 1.0 $x10^{-6}$m/s and 3.25 $x10^{-6}$m/s. However, caution should be exercised if using these results.

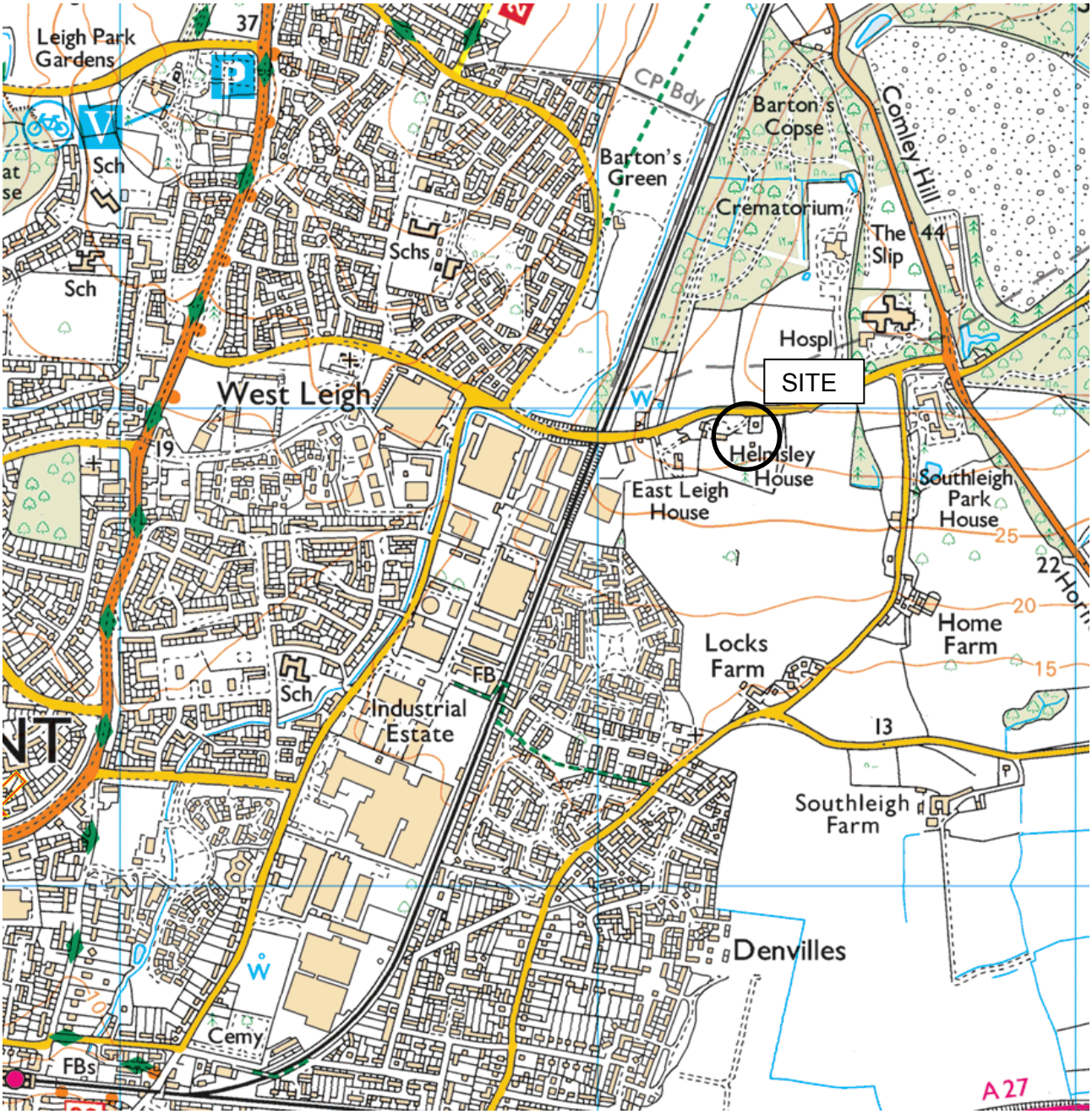
Therefore it is considered that the underlying Head and London Clay Deposits at the site were technically impermeable and that conventional deep soakaway would not work at the site. However, given the apparently fairly uniform thickness of granular Made Ground a relatively low infiltration rate of 1.0 $x10^{-6}$m/s may be possible if low level permeable paving were employed as part of the development.

We trust this information is satisfactory to you. In the event of any queries please contact us.

Yours sincerely

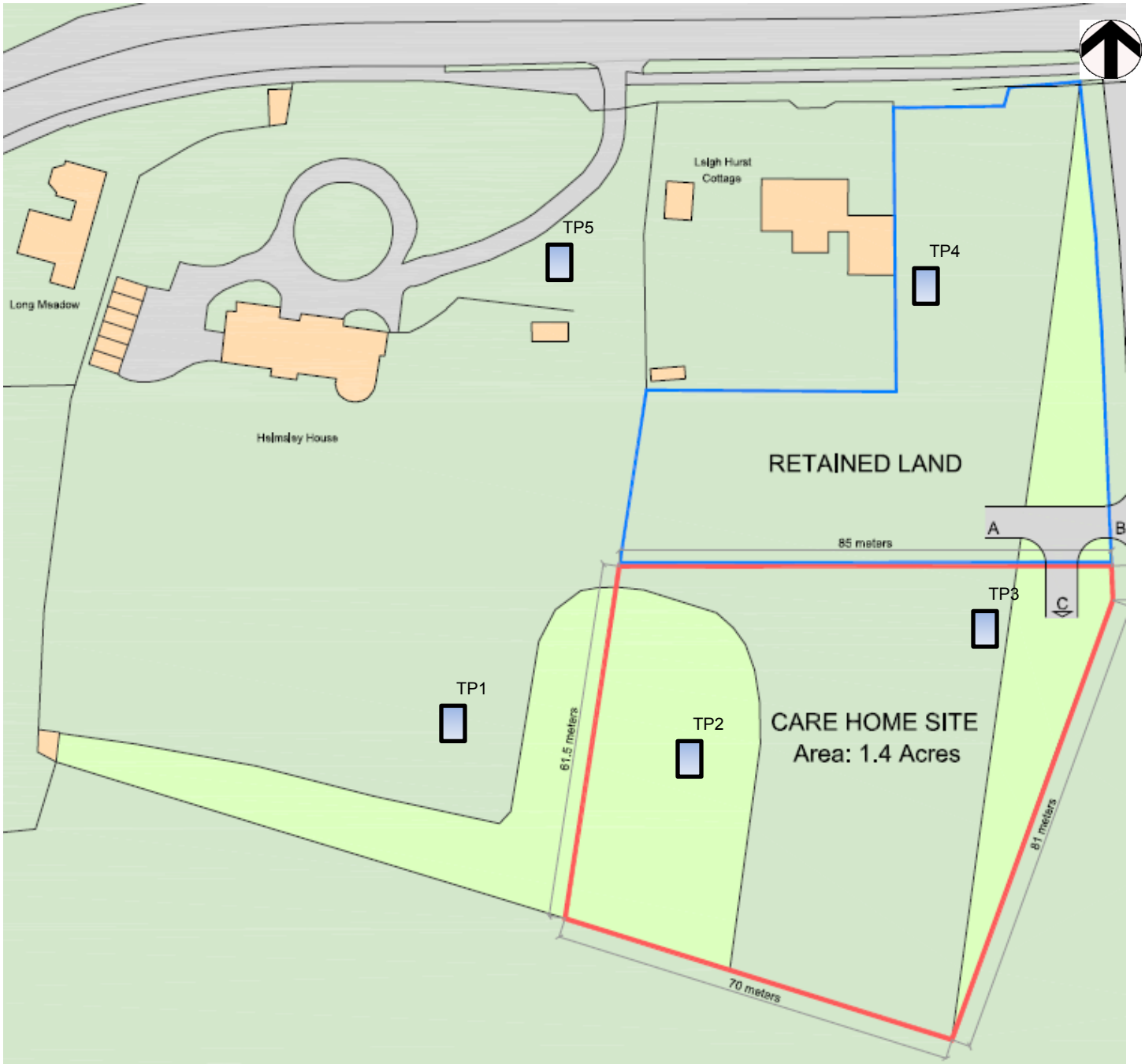
Murray Bateman
Director

Geo-Integrity Ltd.



Sept. 2018 **SITE LOCATION PLAN** Report No.:- 18-08-05

Geo-Integrity, - 07858 367 125 Email:- murraybateman@geo-integrity.co.uk



Key

Trial Pit

GEO INTEGRITY

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Maids Moreton
MK18 1QE

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Mob:- 07858 367 125
www. geo-integrity.co.uk

Exploratory Hole Location Plan

SITE:- Barton Road, Havant

JOB NO.:- 18-08-05

CLIENT:- Brackley Investments

Drawn	Checked
MB	DL

Scale: Not To Scale, for indicative purposes only

TRIAL PIT LOG TP 1

PROJECT NUMBER 18-08-05	**EXCAVATION DATE** 29/8/18	**EASTINGS**
PROJECT NAME BARTON ROAD, HAVANT	**TOTAL DEPTH** 1.01m	**NORTHINGS**
CLIENT BRACKLEY INVESTMENTS	**EXCAVATION METHOD** 360 TRACKED	
	GROUNDWATER DRY	**SURFACE ELEVATION**
	DIMENSIONS (W X L) 0.3m X 1.0m X 1.01m	

COMMENTS Logged to BS14688:2013

LOGGED BY MB
CHECKED BY SB

Hand Vane (kN/m2)	Samples	Groundwater	Depth (m)	Graphic Log	Material Description	Elevation (m)
			0.2		TOPSOIL Dark brown silty sandy TOPSOIL with large flint gravel	45
			0.4 0.6		MADE GROUND Dense brown very gravelly clayey SAND. Gravel is coarse sub-angular flint.	44.8 44.6 44.4
			0.8 1		HEAD Stiff orange and grey very sandy gravelly CLAY	44.2
			1.2 1.4 1.6 1.8			44 43.8 43.6 43.4 43.2
			2 2.2 2.4 2.6 2.8		Termination Depth at: 1.01m	43 42.8 42.6 42.4 42.2

produced by ESlog.ESdat.net on 07 Sep 2018

TRIAL PIT LOG TP 2

PROJECT NUMBER 18-08-05	**EXCAVATION DATE** 29/8/18	**EASTINGS**
PROJECT NAME BARTON ROAD, HAVANT	**TOTAL DEPTH** 1.52m	**NORTHINGS**
CLIENT BRACKLEY INVESTMENTS	**EXCAVATION METHOD** 360 TRACKED	
	GROUNDWATER DRY	**SURFACE ELEVATION**
	DIMENSIONS (W X L) 0.3m X 1.2m X 1.52m	

COMMENTS Logged to BS14688:2013

LOGGED BY MB
CHECKED BY SB

Hand Vane (kN/m2)	Samples	Groundwater	Depth (m)	Graphic Log	Material Description	Elevation (m)
					MADE GROUND Dark brown silty sandy gravelly TOPSOIL. Gravel is brick and flint	45
			0.2		MADE GROUND Dense brown very gravelly SAND. Gravel is flint and brick	44.8
			0.4			44.6
			0.6		HEAD Stiff orange and grey sandy gravelly CLAY. Gravel is flint.	44.4
			0.8			44.2
			1			44
			1.2		LONDON CLAY/HEAD??? Stiff light grey and light brown thinly laminated silty CLAY with orange silty partings.	43.8
			1.4			
			1.6		Termination Depth at: 1.52m	43.6
			1.8			43.4
			2			43.2
			2.2			43
			2.4			42.8
			2.6			42.6
			2.8			42.4
						42.2

produced by ESlog.ESdat.net on 07 Sep 2018

TRIAL PIT LOG TP 3

PROJECT NUMBER 18-08-05	**EXCAVATION DATE** 29/8/18	**EASTINGS**
PROJECT NAME BARTON ROAD, HAVANT	**TOTAL DEPTH** 0.95m	**NORTHINGS**
CLIENT BRACKLEY INVESTMENTS	**EXCAVATION METHOD** 360 TRACKED	
	GROUNDWATER DRY	**SURFACE ELEVATION**
	DIMENSIONS (W X L) 0.3m X 1.2m X 0.95m	

COMMENTS Logged to BS14688:2013

LOGGED BY MB
CHECKED BY SB

Hand Vane (kN/m2)	Samples	Groundwater	Depth (m)	Graphic Log	Material Description	Elevation (m)
			0.1, 0.2, 0.3, 0.4, 0.5		MADE GROUND Dense brown very sandy gravelly CLAY. Gravel is brick with old land drain at 0.2m and flints.	45.1, 45, 44.9, 44.8, 44.7, 44.6
			0.6, 0.7, 0.8, 0.9		REWORKED LONDON CLAY Stiff brown silty CLAY with pockets of sandy flint gravel.	44.5, 44.4, 44.3, 44.2
			1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9		Termination Depth at: 0.95m	44.1, 44, 43.9, 43.8, 43.7, 43.6, 43.5, 43.4, 43.3, 43.2

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TRIAL PIT LOG TP 4

PROJECT NUMBER 18-08-05	**EXCAVATION DATE** 29/8/18	**EASTINGS**
PROJECT NAME BARTON ROAD, HAVANT	**TOTAL DEPTH** 1.48m	**NORTHINGS**
CLIENT BRACKLEY INVESTMENTS	**EXCAVATION METHOD** 360 TRACKED	
	GROUNDWATER DRY	**SURFACE ELEVATION**
	DIMENSIONS (W X L) 0.3m X 1.1m X 1.48m	

COMMENTS Logged to BS14688:2013

LOGGED BY MB
CHECKED BY SB

Hand Vane (kN/m2)	Samples	Groundwater	Depth (m)	Graphic Log	Material Description	Elevation (m)
			0.1, 0.2, 0.3		MADE GROUND Dark brown sandy gravelly TOPSOIL. Gravel is flint.	45.1, 45, 44.9
			0.4, 0.5, 0.6, 0.7		MADE GROUND Dense brown very gravelly SAND. Gravel is flint and occasional ceramic	44.8, 44.7, 44.6, 44.5
			0.8, 0.9, 1, 1.1, 1.2, 1.3, 1.4		LONDON CLAY Stiff to very stiff grey and light brown very silty CLAY with many orange silty partings	44.4, 44.3, 44.2, 44.1, 44, 43.9, 43.8, 43.7
			1.5, 1.6, 1.7, 1.8, 1.9		Termination Depth at: 1.48m	43.6, 43.5, 43.4, 43.3, 43.2

produced by ESlog.ESdat.net on 07 Sep 2018

TRIAL PIT LOG TP 5

PROJECT NUMBER 18-08-05	**EXCAVATION DATE** 29/8/18	**EASTINGS**
PROJECT NAME BARTON ROAD, HAVANT	**TOTAL DEPTH** 1.0m	**NORTHINGS**
CLIENT BRACKLEY INVESTMENTS	**EXCAVATION METHOD** 360 TRACKED	
	GROUNDWATER DRY	**SURFACE ELEVATION**
	DIMENSIONS (W X L) 0.3m X 1.1m X 1.0m	

COMMENTS Logged to BS14688:2013

LOGGED BY MB
CHECKED BY SB

Hand Vane (kN/m2)	Samples	Groundwater	Depth (m)	Graphic Log	Material Description	Elevation (m)
			0.1		MADE GROUND/HEAD Dark brown very gravelly SAND. Gravel is coarse sub angular flint with occasional brick.	45.1
			0.2			45
			0.3			44.9
			0.4			44.8
			0.5			44.7
			0.6			44.6
			0.7			44.5
			0.8			44.4
			0.9			44.3
			1			44.2
			1.1		Termination Depth at: 1.0m	44.1
			1.2			44
			1.3			43.9
			1.4			43.8
			1.5			43.7
			1.6			43.6
			1.7			43.5
			1.8			43.4
			1.9			43.3
						43.2

produced by ESlog.ESdat.net on 07 Sep 2018

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Trial Pit Infiltration Testing to BRE Digest 365

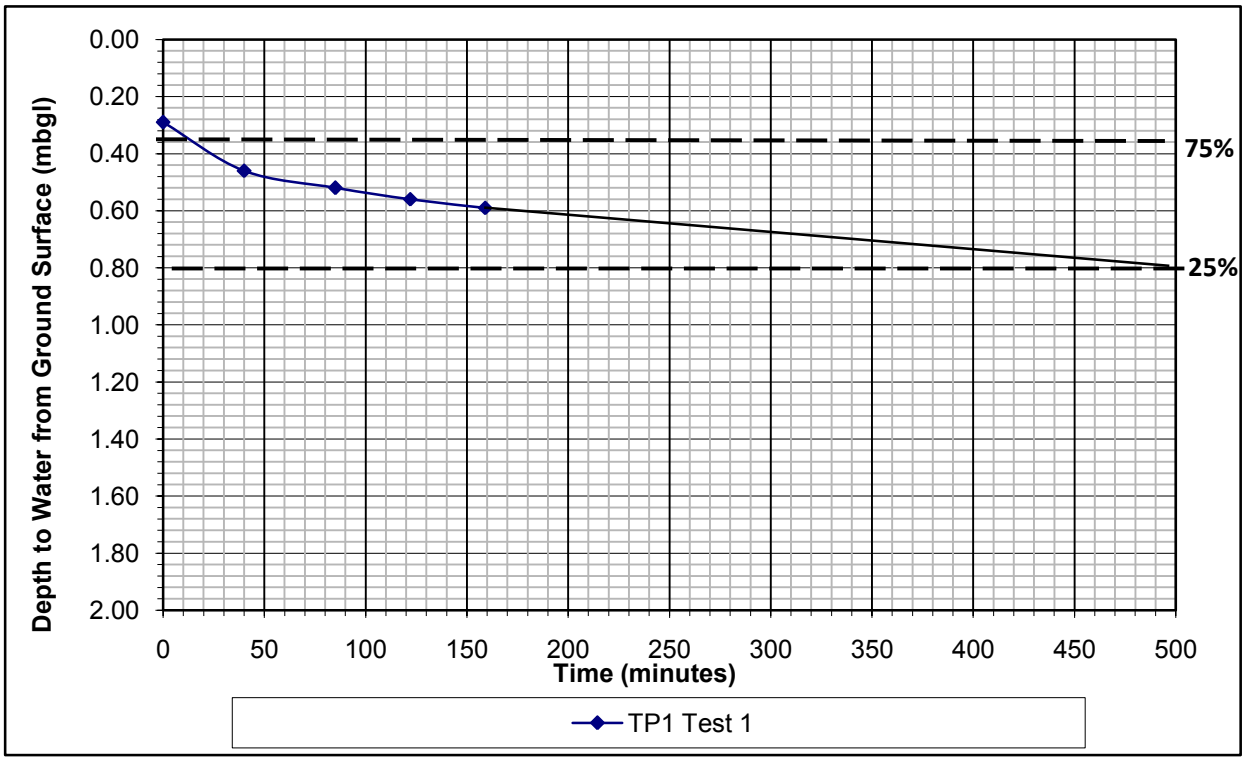
Client: Brackley Investments
Site: Havant, Barton Road
Dimensions: 0.3m x 1.10m x 1.01m (GW at 0.97) (width x length x depth)

Report No: 18-08-05
Date Tested: 29/08/2018
Test Location: TP1

Test Response Zone Description - : Glacial Till (Cohesive)

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.29				
40	0.46				
85	0.52				
122	0.56				
159	0.59				

Soil Infiltration Rate = 3.25 x 10^{-6} m/s
Comments : CAUTION - RESULTS EXTRAPOLATED



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Trial Pit Infiltration Testing to BRE Digest 365

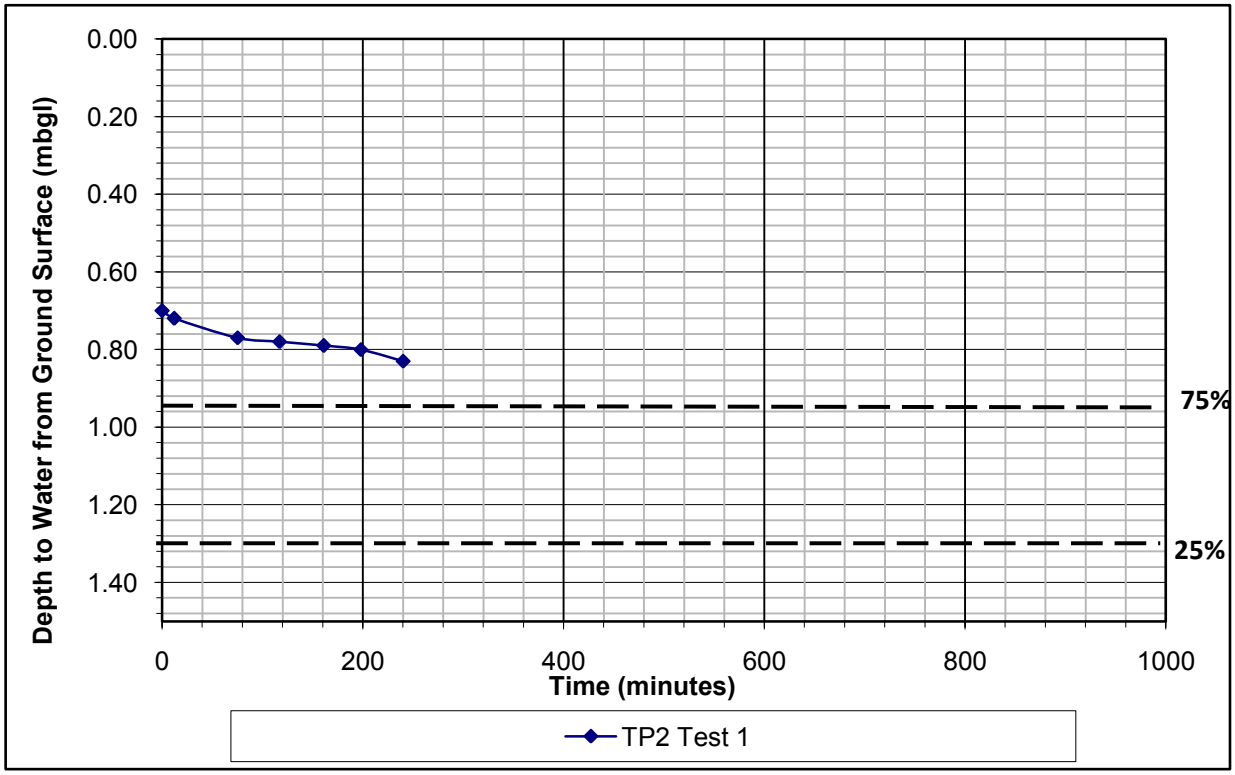
Client: **Brackley Investments**
Site: **Havant, Barton Road**
Dimensions: **0.30m x 1.20m x 1.52m**
(width x length x depth)

Report No: 18-08-05
Date Tested: 29/09/18
Test Location: TP2

Test Response Zone Description - : Glacial Till Deposits

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.70				
12	0.72				
75	0.77				
117	0.78				
161	0.79				
198	0.80				
240	0.83				

Unable to Calculate Average Soil Infiltration Rate



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Trial Pit Infiltration Testing to BRE Digest 365

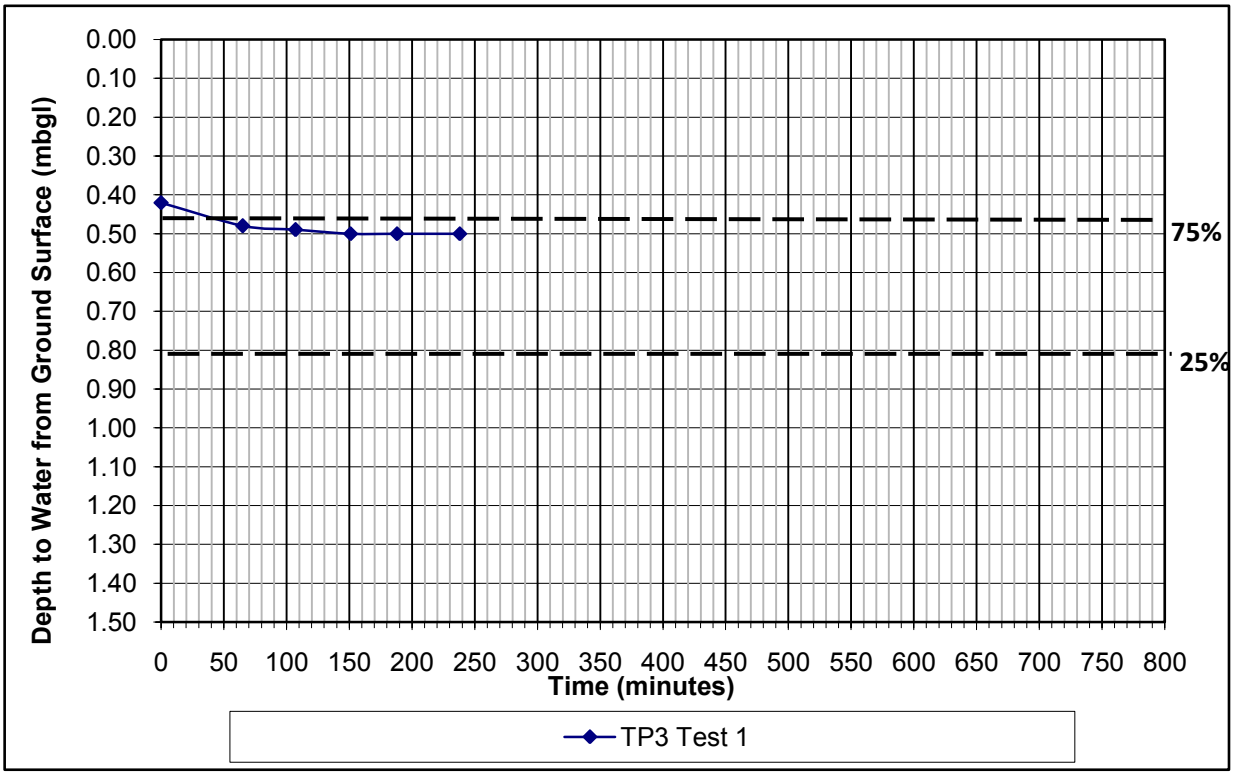
Client: Brackley Investments
Site: Havant, Barton Road
Dimensions: 0.30m x 1.20m X 0.95m
(width x length x depth)

Report No: 118-08-05
Date Tested 29/8/18
Test Location: TP3

Test Response Zone Description - : Glaciofluvial Deposits

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.42				
65	0.48				
107	0.49				
151	0.50				
188	0.50				
238	0.50				

Unable to Calculate Average Soil Infiltration Rate



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Trial Pit Infiltration Testing to BRE Digest 365

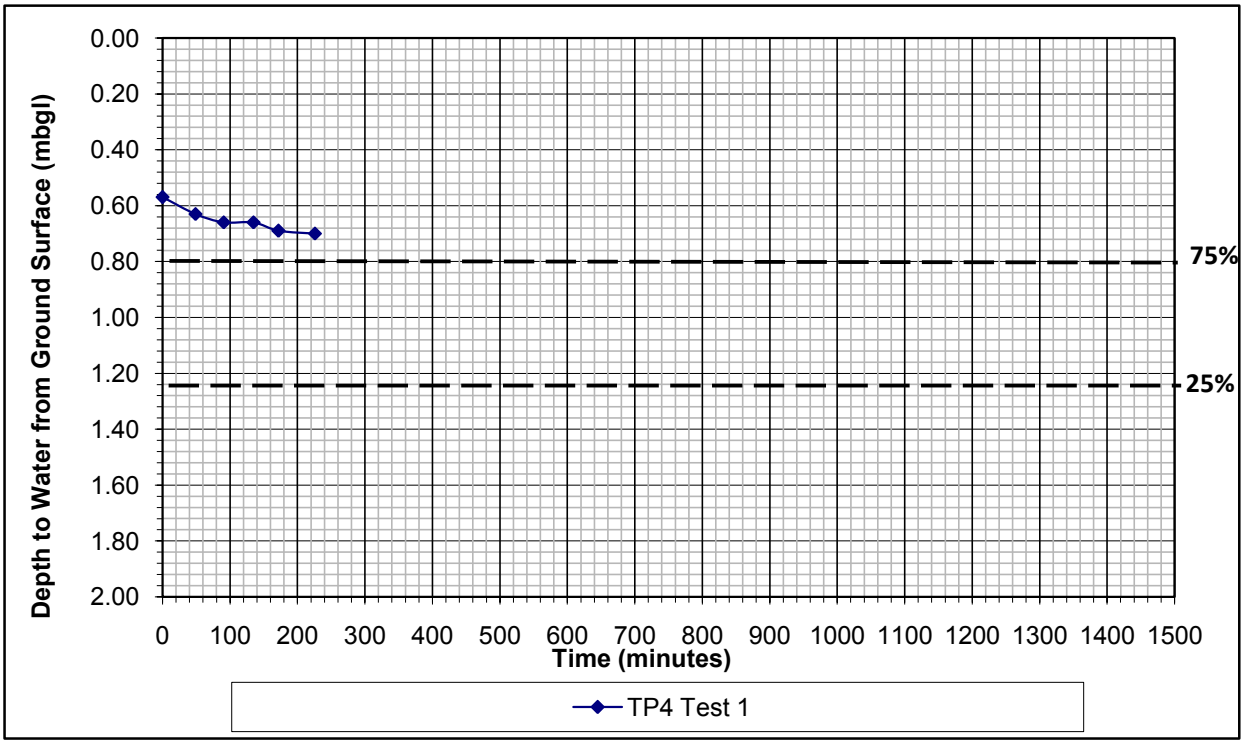
Client: **Brackley Investments**
Site: **Havant, Barton Road**
Dimensions: **0.30m x 1.10m x 1.48m** (width x length x depth)

Report No: 18-08-05
Date Tested: 29/8/18
Test Location: TP4

Test Response Zone Description - : Glacial Till (Cohesive)

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.57				
49	0.63				
91	0.66				
135	0.66				
172	0.69				
226	0.70				

Unable to Calculate Average Soil Infiltration Rate



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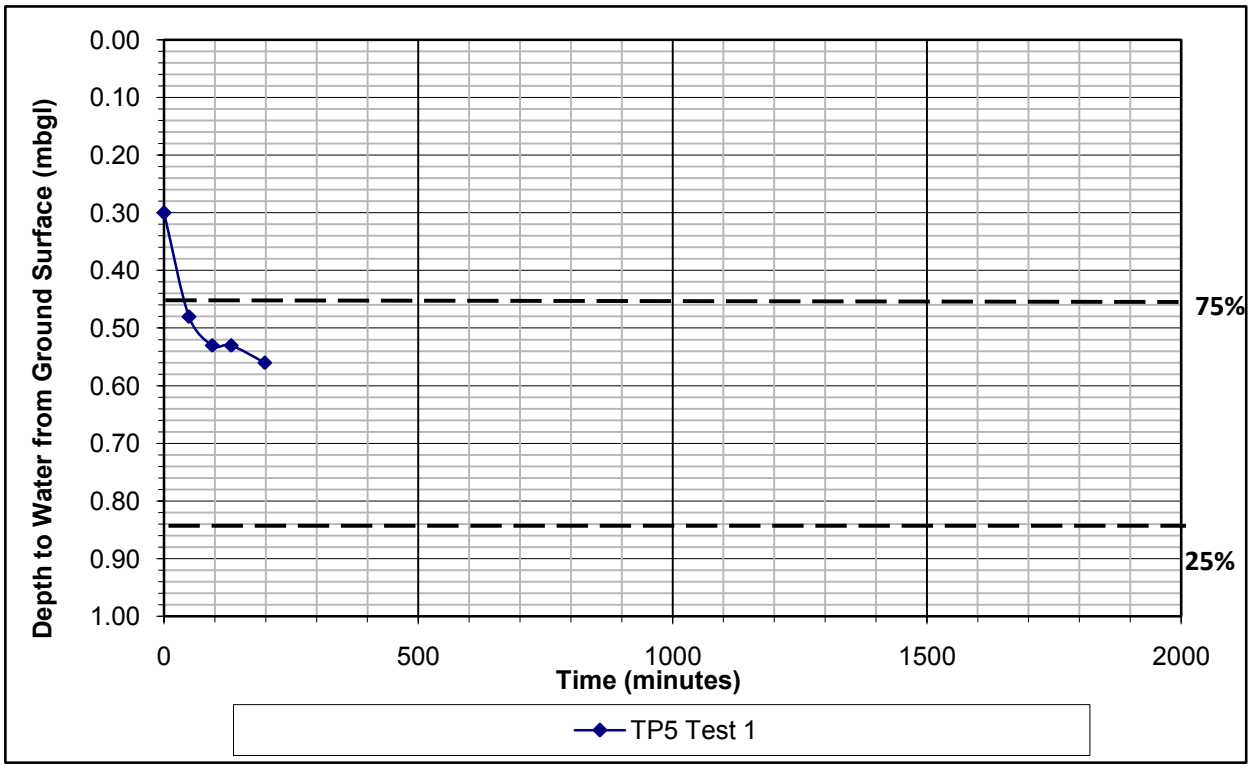
Trial Pit Infiltration Testing to BRE Digest 365

Client: Brackley Investments
Site: Havant, Barton Road
Dimensions: 0.30m x 1.10m x 1.00m
(width x length x depth)

Report No: 18-08-05
Date Tested: 29/08/18
Test Location: TP5

Test Response Zone Description - : Glacial Till Deposits

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.30				
49	0.48				
95	0.53				
132	0.53				
198	0.56				

Soil Infiltration Rate = 1 X 10^{-6} m/s

Comments:- CAUTION - Extrapolated assuming Tp25 =1500mins