Infrastruct CS Ltd

Consulting Civil and Structural Engineers

Infrastruct CS Ltd
26A High Street,
Eynsham,
Oxford,
OX29 4HB
Tel: 01865 880909
Email: info@infrastructcs.co.uk
Web: www.infrastructcs.co.uk

Flood Risk Assessment and Drainage Statement

Site reference

Woodstock East,

Woodstock,

Oxfordshire

Client

Pye Homes Ltd and The Vanburgh Unit Trust

Date

November 2014

Report No.

13-1363.08.001 Rev A

Revision	Compiled by	Checked by	Issue date
Draft	T. S. TROTMAN M.Eng (Hons) C.Eng CWEM MCIWEM FIHE	D. JEFFERY I.Eng FIHE	November 2014
Initial	T. S. TROTMAN M.Eng (Hons) C.Eng CWEM MCIWEM FIHE	D. JEFFERY I.Eng FIHE	November 2014
A	T. S. TROTMAN M.Eng (Hons) C.Eng CWEM MCIWEM FIHE	D. JEFFERY I.Eng FIHE	November 2014

Registered Office: Jamesons House, Compton Way, Witney, OX28 3AB
Registered in England and Wales 07521130,

Table of Contents

Contents

1.0 Summary

A Flood Risk Assessment (FRA) and drainage strategy has been undertaken to accompany the planning application for the proposed Woodstock East development. This report has been prepared by Infrastruct CS Ltd on behalf of Pye Homes Limited and The Vanbrugh Unit Trust 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 at the southeast corner of the town of Woodstock, Oxfordshire with an approximate grid reference of E = 445759, N = 216245.*
Size and Current Land Usage	*The current site equates to approximately 74.7 ha in size and is agricultural fields with the main boundaries defined by woodland and hedgerows.*
Flood Zone	*The development site falls entirely within flood zone 1, which is classified as low probability.*
Fluvial Flood Risk	***Low*** *– Refer to Section 9.1.*
Overland Flood Risk	***Low*** *– Refer to Section 9.2.*
Groundwater Flood Risk	***Low*** *– Refer to Section 9.3.*
Sewerage Flood Risk	***Low*** *– Refer to Section 9.4.*
Artificial Flood Risk	**Low** – Refer to Section 9.5.
Historical Flood Risk	The WODC SFRA for Woodstock records flood events for the town but no flood events associated with the development site.
Proposed Development	New housing, school, employment and retail development. Refer to Section 4.0

Based on this assessment, it is concluded that in accordance with the flood risk vulnerability table within Section 8.5, the flood risk compatibility table in Section 8.4 and the Flood risk vulnerability and flood zone compatibility table in Section 8.6 from the Planning Practise Guidance document, the report considers the proposed development appropriate.

Furthermore the proposed surface water drainage design for the development site has been designed to cater for the 1 in 100yr storm plus 30% for climate change and as such for all storms up to and including this event, the proposed surface water drainage system will replicate the current greenfield conditions found on site and discharge all surface water into the underlying ground conditions and adjacent watercourses.

2.0 Introduction

2.1 Commission

The Client, Pye Homes Limited and The Vanburgh Unit Trust (acting on behalf of Blenheim Estates), has commissioned Infrastruct CS Ltd to prepare a Flood Risk Assessment (FRA) and drainage statement to support a planning application for a mixed use urban extension to Woodstock, which will include up to 1500 houses, a new primary school, employment and retail space, and public open space. The scheme also makes provision for a link and ride facility.

For the purposes of this report the development is referred to as Woodstock East.

2.2 Guidance

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

2.3 Aims and Objectives

The purpose of this flood risk assessment is to demonstrate that the site can be developed safely, without exposing the new development to an unacceptable degree of flood risk or increasing the risk of flooding to third parties.

This report will identify the flood risk zone, potential sources of flood risk, consider the proposed drainage, recommend appropriate flood risk mitigation measures and will be used to support the planning application proposals.

This report is based on information made available at the time of writing. Consequently, there is potential for additional information to be published which may lead to changes to the conclusions drawn in this report. As such Infrastruct CS Ltd cannot be held responsible for such changes.

3.0 Site Details

3.1 Location

The proposed Woodstock East development is located at the south-eastern tip of the town of Woodstock across a 70.4 ha site currently comprising of mainly agricultural land. The site is bounded by the A44 (Oxford Road), which runs along the south-western boundary to the site, the A4095 (Upper Campsfield Road) along the south-eastern boundary and the Shipton Road along the northern boundary to the site. The boundary meets with existing sports field associated with Marlborough School at the northern most tip of the site.

The boundary to the west joins the current residential dwellings associated with Flemings Road, Plane Tree Way, Hedge End and Churchill Gate.

Although the site is largely Greenfield, it does include an existing residential property (The Pest House) and associated hard standing and access road which is accessed off the Shipton Road to the northern side of the site.

The Woodstock East site comprises of three agricultural fields bounded from one another by existing hedgerows. There is an established tree belt separating the majority of the site along the Shipton and Upper Campsfield Roads.

There are two existing isolated properties, 'Littlecote' which is accessed off the A44 Oxford Road, along with No. 21 Upper Campfield Road at the southernmost tip of the site. Both of these dwellings do not fall within the development site.

Within the central part of the site there is an existing scheduled ancient monument and to the southeast, lies the grounds of Blenhiem Palace.

The extents of the Woodstock East development site have been highlighted in red below within figure 3.1.

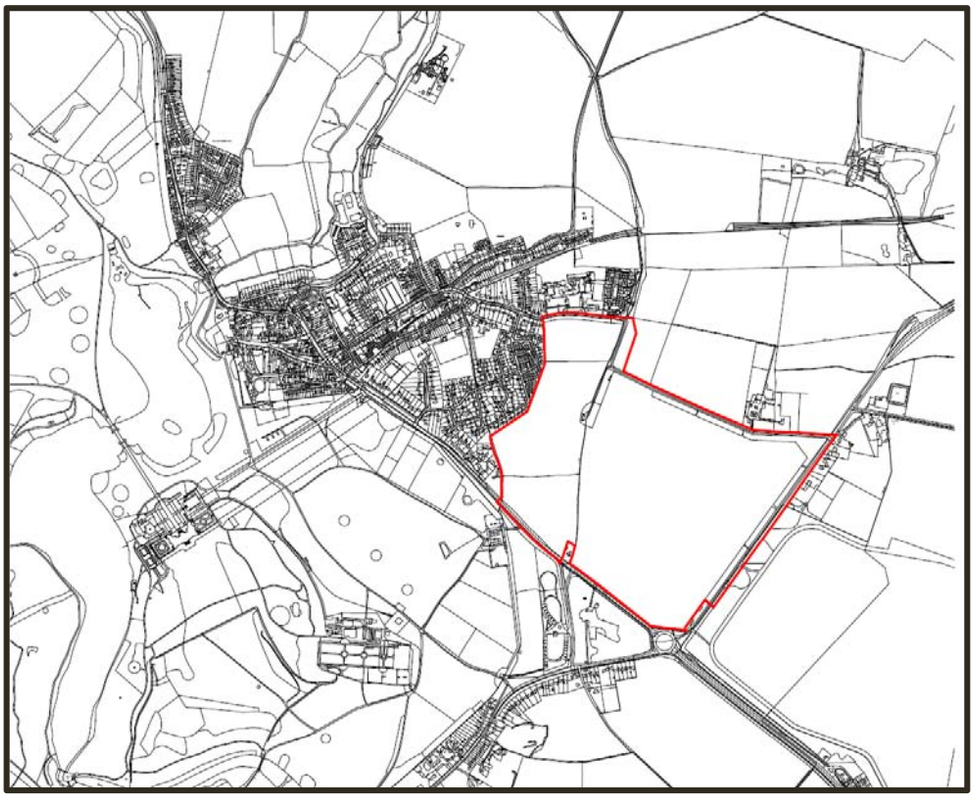


Fig 3.1 – Site Location Plan

3.2 Grid reference

The approximate ordnance survey national grid reference for the centre of the site;

E-445759, N-216245.

3.3 Topography of the Site

A detailed topographic survey for the Woodstock East development site has been undertaken by Ground Surveys Ltd in August 2014 and this can be found within Appendix A of this report.

The general fall of the site is in a easterly direction away from the town of Woodstock, with the lowest levels of the site corresponding with the boundary adjacent the A4095 Upper Campsfield Road.

The highest levels of site relate to northwest corner of the development adjacent to Plane Tree Way with an overall fall across the development site of approximately 10.2m.

Both Shipton Road and the A44 Oxford Road are slightly elevated above the levels of the site with a small embankment located off the back edge of the public highway.

At the easternmost point of the site there is a triangular portion of common land which is approximately 1m lower than the surrounding levels of the site and adjacent highways and is heavily wooded. This is being retained as part of the development proposals.

The general falls of the Woodstock East development site have been highlighted on figure 3.3 below.

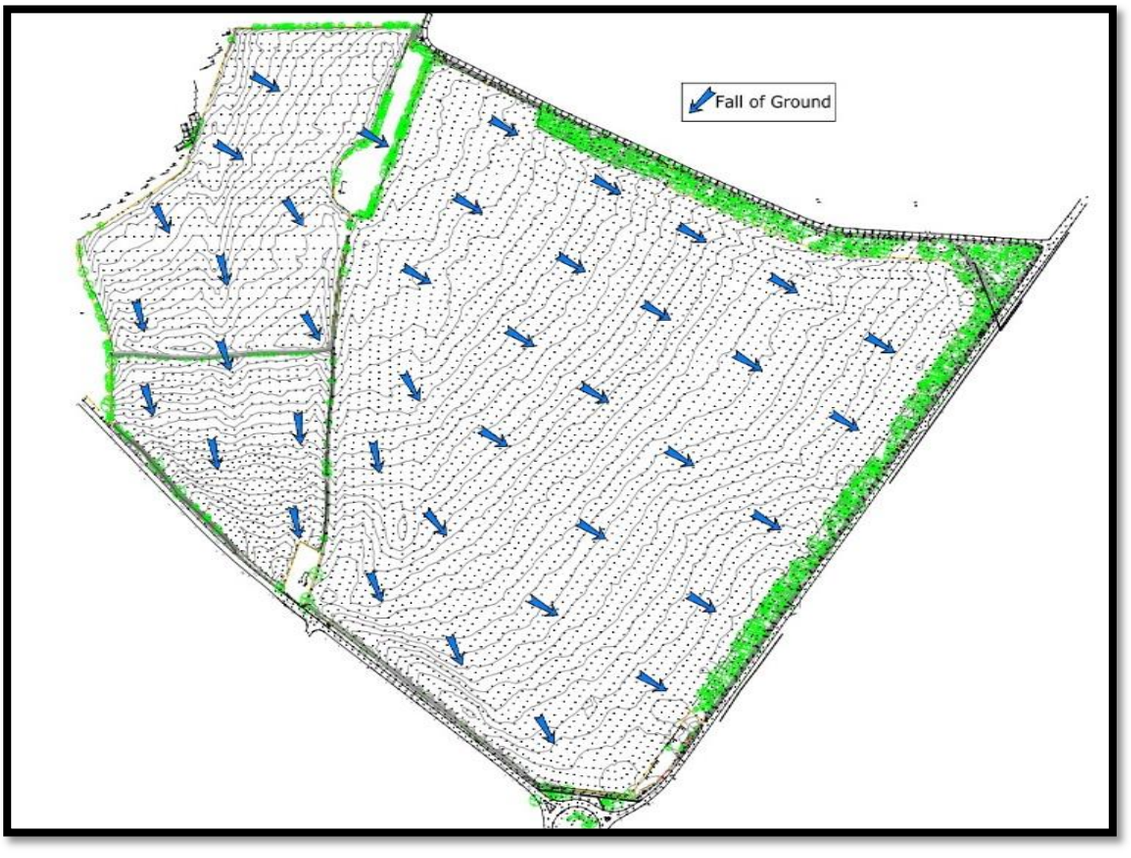


Fig 3.3 – Topographic falls of the site

3.4 Geotechnical Conditions

Ground conditions across the development site have been assessed by Lister Geotechnical Consultants Limited in September 2014.

These investigations concluded that the underlying ground conditions vary across the development site. To the east of the site the ground conditions consisted of a thin veneer of topsoil overlying degraded limestone gravels to a depth of 1.0m with the solid Cornbrash Formation below.

The ground conditions across the western half of the development site differs in that the Cornbrash Formation occurs within a thin band closer to the surface, with the Forest Marbles (clays) beneath.

The ability of the underlying ground to infiltrate surface water has been assessed in relation to the trial holes and detailed below in Figure 3.4.

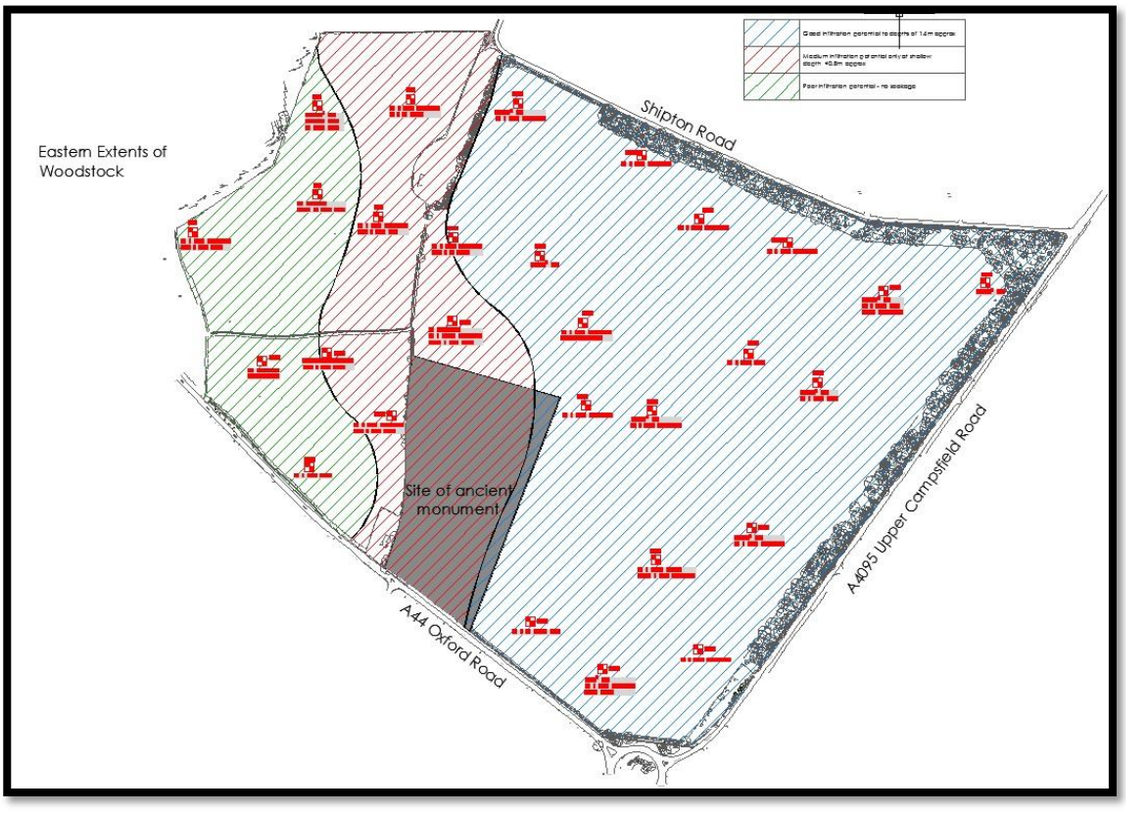


Fig 3.4 – Ground conditions across the site (Appendix B)

The green area to the west indicates ground with no infiltration potential, the red area with shallow infiltration potential associated with the band of brash with the blue area to the east providing good infiltration associated with the brash, gravels and sand deposits.

3.5 Existing Drainage description

3.5.1 A44 Oxford Road

The A44 running along the southwestern boundary to the site is served by a series of road gullies although the spacing and position of the road gullies is infrequent with the majority of the gullies, appearing on the opposite side of the road to the site.

Along the western section of the southwestern boundary there is an existing land drainage ditch running parallel to the main road. This drainage feature appears to be taking surface water flows from the public highway via kerb outlets with piped connections into the ditch system. This report also considers that it also is acting as land drainage for the less permeable western half of the development site.

Midway along the road this system becomes culverted via a headwall structure and a visual inspection suggests that from here the culvert continues along the A44 in a westerly direction before emerging as the Rowell Brook on the north side of the A44 adjacent the London Oxford Airport.

There are no Thames Water public sewers running within this highway.

3.5.2 A4095 Upper Campsfield Road

Unlike the A44, the A4095 predominantly doesn't have a kerbed edging and as such surface water from the public highway appears to discharge onto the adjacent land via the use of drainage grips. As such there is no positive piped surface water system serving the majority of this carriageway adjacent to the site.

There is an isolated section of kerb line on the opposite side of the road associated with the residential properties of Upper Campsfield and this section of the road is served by conventional gullies.

Along the site side of this road there is a land drainage ditch system into which the water would collect, however this ditch doesn't appear to have any associated outfalls and given the permeable nature of the ground in this location, this report surmises that these ditches act predominantly as infiltration ditches/swales, allowing surface water to collect prior to discharge into the underlying ground conditions.

3.5.3 Shipton Road

Although the Shipton Roady doesn't have a kerbed edging, it is served by gullies on either side of the road which in turn discharge surface water into the ditch systems which run on either side of the road. On the site side of the carriageway the ditch systems varies from a defined channel to a localised depression within the site adjacent the boundary. Again given the permeability of the underlying ground conditions it is understanding of this report that these ditches do not convey a flow of water and act as storage facilities to allow surface water to infiltrate into the underlying ground conditions.

3.5.4 Within the site

There are no visible signs of any piped drainage systems within the current site although there is a land drainage ditch system which follows and runs parallel to the hedge field boundaries. At the time of inspection (August 2014) these were dry.

The extent and location of the land drainage ditches has been highlighted on Fig 3.5 below.

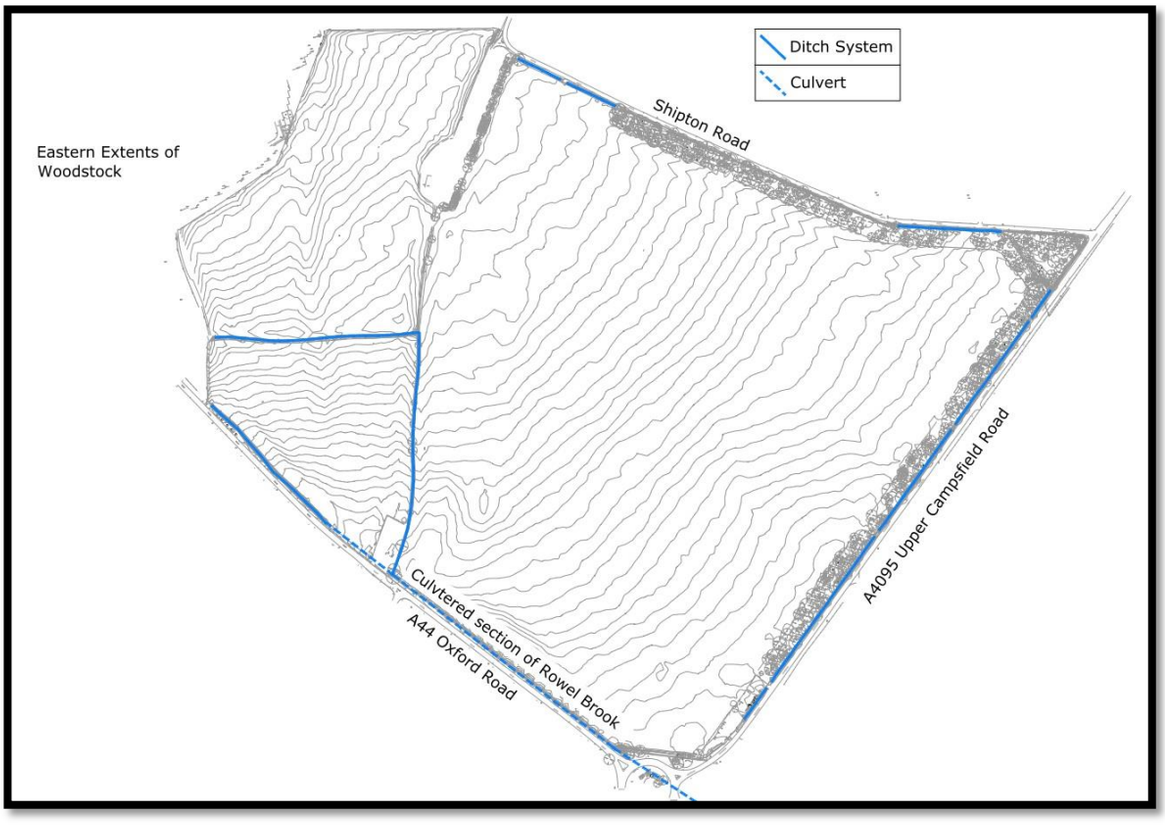


Fig 3.5 – Local Drainage Features

3.6 Local rivers and water courses

The nearest main watercourse to the development site is River Glyme which runs in an southerly direction 1000m to the northwest of the site. There is a smaller Rowell Brook which runs parallel to the A44 Oxford Road which following investigations on site and a subsequent conversation with the Drainage team at Oxford County Council, extends in a westerly direction via a culvert system to the ditch system running along the southern boundary to the site.

4.0 Proposed Development

A strategic master plan has been developed by West Waddy ADPLLP through consultation with various stakeholders. The current Woodstock East development proposals involve the following;

- erection of up to 1,500 dwellings including affordable housing
- Up to 150 unit care village with associated publicly accessible ancillary facilities
- site for new primary school
- up to 930 sqm of retail space
- up to 7,500 sqm of locally led employment (B1, B2, B8) space
- site for a Football Association step 5 football facility with publicly accessible ancillary facilities
- public open space
- provision of site for new link and ride facility

Proposed vehicular access points are to be provided from a new roundabout off the Upper Campsfield Road (A4095), Shipton Road and Oxford Road (A44)

A copy of the site master plan can be found within Appendix C of this report.

5.0 Environment Agency/LLFA Information

From a review of the site, in conjunction with the information provided by the Environment Agency, this report can confirm the following information.

Groundwater Source Protection Zones

The site does not lie within any areas associated with groundwater protection zones

Aquifer Designations

Superficial Deposits Designation

The site does not lie within Aquifer associated with the superficial deposits

Bedrock Designation

The site lies within a Secondary A aquifer. A Secondary A aquifer is defined as 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

6.0 On-Site Investigations

A buried site investigation has been undertaken across the development site to determine the underlying geology and provide the necessary information to substantiate the surface water drainage design. Section 3.4 above provides an overview of the findings, however the trial pit locations, trial pit logs and soakage tests are included within Appendix D.

7.0 Impact of the Development on the Ground Water Table

7.1 General Development

Development of any kind has the potential to introduce new sources of contamination into Greenfield areas which as a result may have a negative impact on the local hydrological regime, through impact on local watercourses and/or the underlying ground water table.

Potential sources of contamination can occur through industrial, commercial, residential and accidental incidents and the scale and impact of an incident can be dependent on the surrounding topographic and geological characteristics of the development site.

Section 3.0 of this report has identified that the Woodstock East development site lies partially over strata exhibiting varying degrees of infiltration potential, and as such the proposed drainage strategy for the site (refer to section 11.0) proposes the use of a split drainage system, with half the site positively drained into the existing ditch system and the other half utilizing a full surface water infiltration system.

As such all surface water from the proposed development site will be allowed to discharge into either the existing ditch systems or the permeable ground beneath the development site to mirror the current hydrological regime for the site.

Section 4.0 of this report confirms that the Woodstock East site doesn't lie over a groundwater source protection zone. These zones define key groundwater catchments which provide drinking water to local dwellings and maintain the flow in local rivers. As such these areas identify where the potential risk of contamination from any activities may have a detrimental impact on drinking water.

.

Section 4.0 also confirms that the Aquifer Designation of the ground beneath the Woodstock East development site does not lie over a Superficial Aquifer but does lie over a Secondary A bedrock Aquifer.

The Environment Agency protect groundwater by identifying different types of aquifer. An Aquifer is associated with underground layers of water-bearing permeable rock or drift deposits from which groundwater can be extracted.

The Environment Agencies Groundwater Protection Policy uses these aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems.

The aquifer designation data is based on geological mapping provided by the British Geological Survey and are split into the following designations;

Principal Aquifers - These are layers of rock or drift deposits that have high inter-granular and/or fracture permeability. As such 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.

Secondary Aquifers - These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:

Secondary A - 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;

Secondary B - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary Undifferentiated - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

Unproductive Strata - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

For the purposes of the Environment Agencies Groundwater Protection Policy the following default position applies, unless there is site specific information to the contrary:

- if no superficial (drift) aquifers are shown, the EA will use the bedrock designation;
- in areas where the bedrock designation shows unproductive strata (the uncoloured areas) the EA will use the superficial (drift) designation;
- in all other areas, EA will use the more sensitive of the two designations (e.g. if secondary drift overlies principal bedrock, we will adopt an overall designation of principal)

As such the whole of the Woodstock East development site will be classified as a Secondary A Aquifer which may support water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

7.2 Local Abstract Points local to the development site

Section 7.1 above has identified that the local geology of the development site may be able to support local water supplies. A search of the relevant databases has shown that there are the following water abstraction licenses.

Licence Point	Type of Abstraction	Purpose of	Being utilised for	Distance from site (Approx)
1	Catchpit and borehole	Agricultural	Reservoir top up and general farming	200m
2	Borehole	Industrial	Industrial process and steam raising	2km
3	River	Agricultural	General Estate use, agriculture and spray irrigation	2km
4	Borehole	Industrial	Drinking Water	3km

The location of the current water abstraction license has been indicated below on Fig 7.2

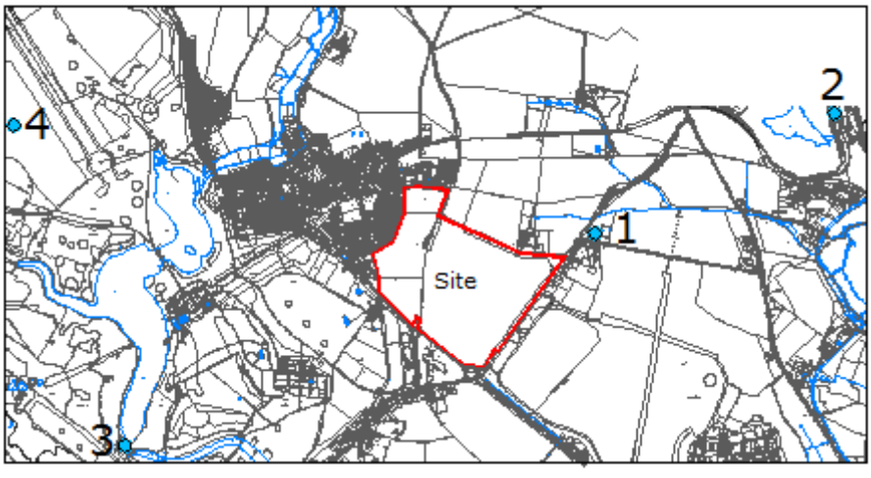


Fig 7.2 – Water Abstraction Licenses

7.3 Impact of the development on local abstract points

The classification of aquifer for the site relates to the bedrock strata and as such surface water abstracted from local sources relates to ground water found at depth as opposed to superficial deposits.

Of the current water abstraction points located, only location 1 is within close proximity of the development site and may be prone to a possible contamination event on the site.

All other locations are considered to be located a significant distance away from the development site and as such are not considered at risk.

The abstraction point 1, believed to be associated with Upper Campsfield Farm, relates to water secured from a borehole which is subsequently used to fill an adjacent surface reservoir which is used for agricultural purposes.

As such there does not appear to be a direct risk to drinking water associated with this abstraction.

As such there does not appear to be a direct risk to drinking water associated with this abstraction.

7.4 Possible risk of contamination from the development site

The proposed master plan for the development site proposes a mix of uses and as such these areas have been assessed below in terms of the potential risk and scale of a contamination incident impacting the ground water table.

Usage	Possible Sources of Contamination	Scale of the event	Likelihood of the event	Can the risk be addressed	How will the risk be addressed?
Up to1500 Dwellings	From residents	Low	Low	Yes	Surface water drainage systems serving the individual residence can be via sealed systems, which will limit potential for the introduction of contaminants
Up to 150 bed Care Village	From residents, operators and hard standing areas	Low	Low	Yes	Surface water drainage systems serving the care village can be discharged via a petrol interceptor.
Primary School	From operators	Low	Low	Yes	Surface water drainage systems serving the individual residence can be via sealed systems, which will limit potential for the introduction of contaminants
Up to 930sqm of Retail Space	From hard standing areas	Low	Low	Yes	Surface water drainage systems serving hard standing can be discharged via a petrol interceptor.
Infrastructure	Vehicle Spillages	Low	Medium	Yes	Proposed use of infiltration swales and permeable paving to drain the road network will provide biological and micro-bacterial treatment of the water.
Up to 7500sqm of employment Space	From operators	Low	Low	Yes	Appropriate surface water drainage systems for external areas to be defined within detailed design process.
Football Facility	From operators	Low	Low	No	No need to address the risk
Link and Ride Facility	Vehicle Spillages	Medium	Medium	Yes	Proposed areas to be drained via petrol interceptor following EA and PP3 guidelines

Fig 7.4 – Potential sources of contamination

Given the information above this report considers that the proposed mix of uses associated with the Woodstock East development site do not propose a significant risk to pollution of the underlying ground water table.

The greatest risk would be associated with the proposed link and ride facility, however the possible use of a petrol interceptor following Environment Agency guidelines will ensure that any oil/fuel spillages can be intercepted and prevented from entering the water table.

8.0 Flood Risk Policy

8.1 Environment Agency Flood Map

The Woodstock East development site is situated in the Environment Agency West Thames Region and their Flood Zone maps for the area indicate fluvial flooding extents.

The flood map for the development site, shown below in Fig 8.1, indicates that all of the site is located within flood zone 1, which is defined as land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any one year.

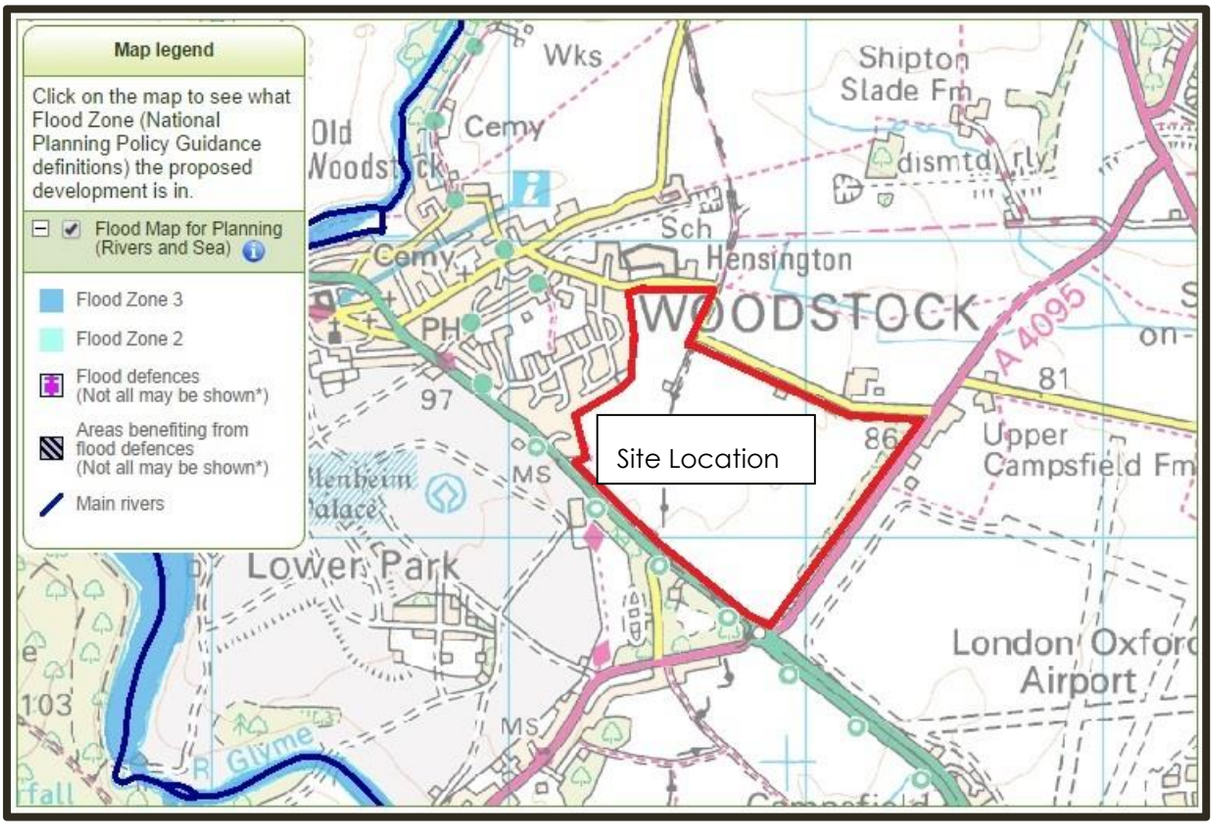


Fig 8.1 – Environment Agency Flood Zone map

8.2 The National Planning Policy Framework

The National Planning Policy Framework and the accompanying Planning Practice Guidance gives direction for development with respect to flooding. These documents promote a sequential approach in order to encourage development away from areas that may or are susceptible to flooding. In doing so it categorises flood zones in the context of their probability of flooding, as shown in the table within Section 8.3 below.

8.3 Flood zone definition

The National Planning Policy Framework Definition of Flood Zones

Flood zone	Fluvial	Tidal	Probability of flooding
1	< 1 in 1000 year (<0.1 %)	<1 in 1000 year (<0.1 %)	Low probability
2	Between < 1 in 1000 year (<0.1 %) and 1 in 100 year 1%	Between <1 in 1000 year (<0.1 %) and 1 in 200 year 0.5%	Medium Probability
3a	> 1 in 100 year 1% (>1.0%)	> 1 in 200 year (>0.5%)	High probability
3b	Either > 1 in 20 (5%) or as agreed between the EA and the LPA	Either > 1 in 20 (5%) or as agreed between the EA and the LPA	Functional flood plain

8.4 Flood Zones – Table 1 NPPF

(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.
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 systems.

8.5 Flood Risk Vulnerability Classification – Extract from Table 2 NPPF

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**.

Less Vulnerable

- Police, ambulance and fire stations which are ***not*** required to be operational during flooding.
- Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do **not** need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

8.6 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 NPPF (table 3), confirms that residential, commercial, employment and care developments within flood zones 1 is acceptable.

8.7 Local Strategic Flood Risk Assessment SFRA & Local Policy

A strategic flood risk assessment (SFRA) was undertaken for Cherwell and West Oxfordshire District Council by Scott Wilson in April 2009 and the report covers the Woodstock area.

Historically the town did suffer fluvial flooding in December 1907 when the River Glyme burst its banks and flooded adjacent properties.

Fluvial flooding occurred again in November 1909, when the River Glyme flooded and affected local businesses.

In November 1959, Woodstock suffered from surface water flooding when 45mm of rainfall was recorded over a 45 minute period.

More recently data for the town records only 1 property claiming flood grant aid following the July 2007 flood event.

Thames Water have 3 records of sewer flooding within the town centre of Woodstock over the last 10 years, however the exact location of these has not been substantiated.

As such there have been no recorded flood incidents associated with, to or from the Woodstock East development site.

8.8 Other Flooding Mechanisms

In addition to the potential for assessing flooding from fluvial and tidal sources, the National Planning Policy Framework 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 waste water 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.

9.0 Flood Risk To The Development

9.1 Flooding From Fluvial Sources

The proposed Woodstock East development site lies entirely within flood zone 1 which is classified as land assessed as having a less than 1 in 1000 annual probability of river or sea flooding and is appropriate to all uses of land. Although there are ditches around the perimeter of the sites, these are associated with land/highway drainage as opposed to natural watercourses.

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

9.2 Flooding From Overland Flows To The Site

The topographical survey and general topography of the area shows the development site has a general fall from the northwest to the southeast. Within the smallest of the three fields the ground falls in a more southerly direction towards the land drainage ditch mentioned within section 3.5.1. As the site is currently farmland, it is likely that the drainage ditches found on site do convey surface water flows during heavier storm intensities.

If the capacity of these ditches is exceeded then there is potential for localised flooding adjacent to these ditches and potentially through the site along these channels in a south-easterly direction. As these mainly relate to the extreme site boundaries associated with the existing hedge lines and tree belts, and away from the proposed development, this report doesn't consider this to present a significant risk to the development.

The land at a higher elevation which may also contribute to flooding via this mechanism is associated with both the current Marlborough sports fields and the residential dwellings to the west. Run off from these areas are unlikely to generate significant surface water flows.

The Woodstock East development site will incorporate surface water measures to ensure that the runoff rates across the site are maintained at the existing Greenfield rates. This will ensure that the flood risk from surface water run off to the site and surrounding land is maintained at the baseline level.

Details of the proposed surface water drainage strategy detailed within Section 11.0 of this report. As with any development, if appropriate SuDS measures are not incorporated within the development proposals, there is the potential for surface water flooding to develop due to the fact that areas of impermeable surfacing have increased.

Based on the existing surface water regime for the site and provided that the proposed drainage strategy incorporates suitable SuDS measures, this risk can be addressed.

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

9.3 Flooding From Rising Groundwater

The site investigations undertaken by Lister Geotechnics Ref: 14.08.005a, during September and October 2014, incorporated 40 trial holes across the development site. These recorded the ground conditions down to depths of 3m and across the whole site the ground water table was not encountered.

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

9.4 Flooding From The Local Sewerage Network

The closest sewers to the development site relate to the existing public foul sewer which serve the adjacent residential dwellings associated with Plane Tree Way, Hedge End and Churchill Gate to the west of the Woodstock East development site. All of these systems are located on the periphery of the sewerage network and drain in a westerly direction back towards Woodstock town centre.

As such should these systems surcharge then the resultant flows are likely to be retained within the adjacent development site given the low flows entering the systems.

Other than these sewers there are no other piped drainage systems within or close to the development site.

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

9.5 Flooding From Reservoirs, Canals & Other Artificial Sources

Review of location plans for the development site show there to be no signs of large manmade water sources within the local area. There is a small raised land irrigation reservoir to the west of the site but this would not pose a flood risk to the development site should there be a breach of the supporting walls.

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

10.0 Flood Risk As A Result Of The Development

10.1 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.

10.2 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.'

10.3 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. The NPPF recommends that developments that have a life expectancy beyond 2085, an additional factor of 30% is applied to the peak volume of runoff.

11.0 Proposed Drainage Strategy

11.1 Drainage Strategy & Design

The information contained below should be read in conjunction with the Infrastruct CS Ltd drainage strategy drawing No. 13-1363-100, 101 and 102 (Appendix E, J and K). Given the varied ground conditions reported within Section 3.4 of this report, the site needs a bespoke surface water drainage strategy.

As such the surface water drainage strategy for the Woodstock East development site aims to demonstrate that the site will not increase the risk of flooding to either the development site or areas outside the site by ensuring the post development surface water run off rates are maintained at the currently Greenfield rates.

11.2 Foul Water

Consultation with Thames Water has taken place with regards the development site, initially through the pre-development enquiry process. Early consultation has confirmed that the foul drainage system currently serving the town of Woodstock does suffer from capacity issues and as such the connection of the proposed development could not utilise this system without significant upgrading works.

In conjunction with the development of the overall master plan, Infrastruct CS Ltd have been working with Thames Water to identify local sewerage catchments in order to establish the most appropriate connection point(s) for the foul drainage. By working collaboratively with Thames Water it will help to ensure that flows from the new scheme will pose no detriment to local buildings connected to and located close to the existing sewerage network.

The natural topography of the development site falls away from the town of Woodstock and the Thames Water drainage systems serving it. As such all foul drainage from the Woodstock East development site will need to be pumped to a receiving network.

Discussions to date have established that foul flows from the development site should be directed straight to the Woodstock Sewerage Treatment Plant located to the north of the town.

As foul flows from the Woodstock East site will need to be pumped, it is envisaged that an on-site pumping station will pump the foul water from the site direct to this treatment facility and that Thames Water will be continuing their assessment of the sewerage treatment works to establish what upgrades will be required to accommodate the additional flows.

An indicative plan for the foul drainage system can be found within Appendix E of this report.

11.3 Surface Water

The intrusive ground investigations found varied ground conditions across the development site with less permeable ground conditions associated with the higher ground to the west, with the ground becoming more granular and permeable in a easterly direction.

In line with the recommendations of surface water hierarchy, the following approach to surface water disposal should be considered:

1 store rainwater for later use
2 use infiltration techniques, such as porous surfaces in non-clay areas

3 attenuate rainwater in ponds or open water features for gradual release
4 attenuate rainwater by storing in tanks or sealed water features for gradual release
5 discharge rainwater direct to a watercourse
6 discharge rainwater to a surface water sewer/drain
7 discharge rainwater to the combined sewer.

As the geology within the site varies, the surface water drainage strategy for the site needs to adapt and respond to the changes in the ground conditions. At present rainfall landing on the higher ground to the west would naturally migrate in both a southerly and easterly direction, following the natural topography of the site, towards both the existing ditch systems and the permeable strata associated with the western half of the site.

Following the surface water hierarchal drainage approach listed above, the development scheme should seek to infiltrate as much of the surface water generated into the underlying ground conditions to mimic the current surface water regime for the site.

As such it is the proposed intention to replicate this arrangement with the proposed drainage system for the site and incorporate an drainage system which utilizes the permeable ground conditions associated with the western half of the site.

The area associated with the less permeable western half will follow the current surface water regime and discharge at an attenuated rate into the open ditch system running along the A44 Oxford Road.

11.4 Surface Water Drainage Strategy for Western half of the development site

Figure 3.4 of this report (Appendix B) makes an assessment with regards the underlying strata's ability to accommodate infiltration techniques. The results of this exercise suggest land to the west of the existing hedgerow running north-south through the development site will shed surface water into the existing ditch systems both within and adjacent to the site.

In order to replicate the current green field drainage regime for this half of site the proposed drainage strategy will collect flows from this area of the site and direct them via piped systems and swales, down towards the existing ditch system running along the A44 Oxford Road.

To ensure the proposed drainage system mirrors that of the existing site the Greenfield run off rates for this element of the site have been established below.

11.5 Greenfield Run Off Rates (Western Half of the Site)

Utilising the ICP SUDS Mean Annual Flood element of Microdrainage the rate at which surface water sheds off this area of land has been calculated utilising the following design rationale;

Site Area: - 15.695 ha
SAAR (mm) - 663
Soil - 0.4
Urban - 0.00
Region - 6

The programme generated the Greenfield run off rates for various storm events and the results can be found within Appendix F, but have also been summarized below;

Event	1 in 1 yr	1 in 2yr	1 in 30yr	1 in 100yr	QBAR
Flow Rate	42.6 l/s	44.1 l/s	113.6 l/s	159.9 l/s	50.1 l/s

It is the intention to limit the surface water flows off the western half of the site at a rate of 50.1 l/s for all storm events up to and including the 1 in 100yr storm event plus 30% for climate change.

11.6 Calculation of Impermeable Areas

At present the western half of the development site consists of the following land uses as detailed within the master plan found within Appendix C of this report.

- Care Village
- School
- Phase 1 residential land parcel (detailed)
- Remaining residential land parcels (outline)
- Commercial units
- Associated road networks

In order to establish the required volume of storage required for the surface water drainage system an assessment of these areas has been made in terms of the area of drained hard standing being proposed.

For ease of calculation the road network has been absorbed into each individual land parcel with the commercial units included within the remaining residential land parcel.

The proposed areas associated with the school, care village and Phase 1 works has been calculated off the current master plan. The calculation for the remaining residential land parcels has been set to mirror that of the detailed phase 1 residential parcel.

The results are provided within table 11.6 below;

Land Use	Approximate Area (sqm)	% of hard standing and roof area	Approximate area of drained hard standing and roof areas (sqm)
Care Village	22,375	50%	11,187
School (Building and car parks)	2,580	100%	2,580
Phase 1 Residential land parcel (29 units)	15,700	30%	4,710
Remaining residential land parcels	77,790	Assumed at 30%	28,337
		Total Area	**46,814**

Table 11.6 – Impermeable Areas for Western Half of the site

11.7 Provision of Surface Water Storage (Western half of the site)

Following the SuD's hierarchal approach to surface water drainage within Section 11.3 within this report, the proposed method of dealing with the surface water is to collect water being shed off the areas detailed above within piped systems which can then route surface water into a storage facility prior to its gradual release into the adjacent ditch running parallel to the A44 Oxford Road.

This piped network has been modelled within Microdrainage for the western half of the development site to ensure there is sufficient fall across this portion of the site to achieve a gravity fed connection into the detention basin. This exercise has established that the current fall of the land from the north towards the south has sufficient fall (approximately 5.5m) to route flows into the proposed basin above the intended bed level of the feature which corresponds with the adjacent ditch system running parallel to the A44 Oxford Road. The results of this exercise can be found with Appendix G.

In promoting this approach, the scheme seeks to replicate the current surface water arrangement for this section of the site and retain the base flow into the ditch system.

Consultation with the London Oxford Airport has confirmed that the use of open water features cannot be used as the provision of open bodies of water could attract flocking waterfowl which may increase the likelihood of bird strikes to aircraft taking off.

As such the use of a dry detention basin is proposed. This feature will temporarily hold the water within an open storage feature before draining dry.

Assessment of the storage required has been undertaken below using the quick storage element of Microdrainage;

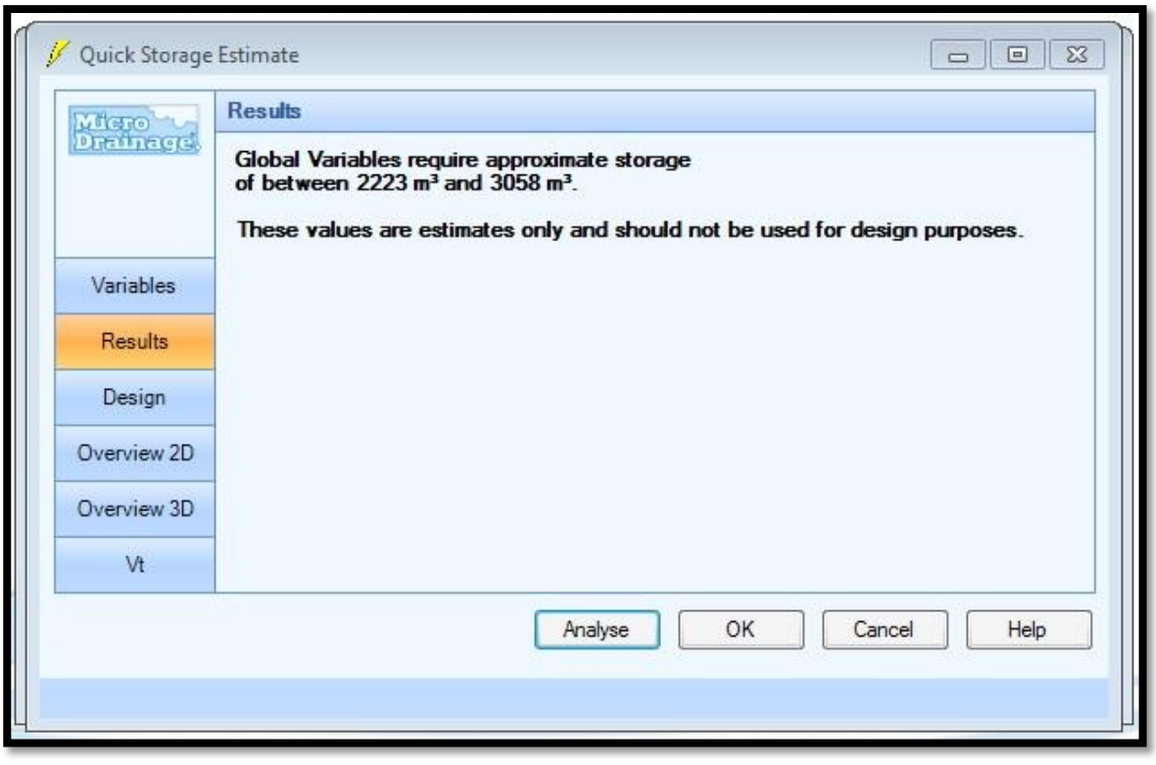


Fig 11.7 – Quick Storage Requirements for the western half of the site

11.7.1 Detention Basin

This report proposes that the majority of this storage is provided within the proposed detention basin located close to the southern boundary of the site, which also corresponds to the low point of the western half of the site.

The basin has been shown with a plan area of 1,800sqm with a maximum depth of 1.3m, which can accommodate a maximum volume of 2,187.5cum. The position of the basin is reflected on the plan within Appendix I.

11.7.2 Swales

To provide a level of biological treatment associated with the main road network, it is the intention to implement a swale drainage feature to one side of the road which will collect and convey the surface water down towards the detention basin. The current proposals are to utilise approximately 660 linear metres of swale, which at 2m wide, will provide up to 165cum of storage.

11.7.3 Further storage

There are additional elements of storage that can be utilised such as the volume found within the piped network serving this half of the site together with the potential to incorporate elements of permeable pavements. To ensure the surface water strategy provides a robust approach, the storage available from these additional elements has not been taken into account at this stage. In doing so the required storage provision has been specified within major drainage elements to ensure sufficient space has been allocated for these within the site master plan.

It would be the recommendation that during the detailed design of the infrastructure phase, that flow rates are set and defined on a drawing, together with the detailed design of the detention basin so that future development of the site sets the surface water flow restrictions off each land parcel.

11.8 Simulation of surface water storage

The combined effects of the detention basin and swales have been inputted into microdrainage programme to simulate the performance of the system associated with a 1 in 100year storm event with an additional allowance of 30% for climate change. This confirmed that the storage provision would accommodate the storm event based on the assumptions listed within this section of the report.

Importantly the system has been designed to drain down completely and with the current arrangement, the pond will have a half drain down time of 390 minutes or 6 ½ hours during an a 1 in 100yr event with full drain down time of twice that. Given that the water within the storage pond will only be retained for a 13 hour duration, it is unlikely to attract flocks of waterfowl.

The results of this exercise can be found within Appendix H of the report.

11.9 Designing for flood exceedance

The design and placement of the proposed surface water storage pond has been carefully selected to ensure it makes most use of the natural topographic falls of the site. As such this has been placed close to the southern boundary immediate due south of the care village. As the main body of storage has been placed at the low point of the system, should the storage be exceeded by an extreme storm event, flows can be safely diverted into the adjacent ditch by a high level swale between the storage pond and the existing ditch system. To provide an additional level of protection it is the recommendation of this report that a ground level bund is built between the pond and the adjacent existing residential property to ensure any extreme flows off the development site are channelled away from this property.

11.10 Surface Water Drainage Strategy (Phase 1)

A section of the development site has been detailed by the architects to provide an indication to the likely density and layout for the individual phases of development. This land parcel lies immediately to the northwest of the detention basin and so this area has been designed in more detail to establish the principles of how the drainage system will work. A detailed plan of the drainage layout for this phase can be found within Appendix I.

11.10 Surface Water Drainage Strategy for Eastern half of the development site

Figure 3.4 of this report (Appendix B) together with the site investigation results (Appendix D) confirm that land to the east of the north - south hedge line within the site has ground conditions that will support the use of infiltration.

In accordance with the SuD's hierarchal approach, this side of the development site will utilise a system of infiltration devices to disperse surface water from hard standing and roof areas into the underlying ground conditions.

These will follow three main measures which have been outlined below;

11.10.1 Infiltration Swales

The main elements of roads have been designed with sufficient space to one side to accommodate a swale feature to collect and disperse surface water from the adjacent road. This technique has the additional benefit of providing a level of biological treatment to the surface water prior to infiltration. The extent of these roads has been reflected on the site wide surface water drainage strategy within Appendix L of this report.

The average infiltration rate of the eastern half of the site equates to 1.095×10^{-4} m/s. The current master plan layout makes provision of a 2.5m wide swale to one the side of the 7m wide carriageway.

A 100m section of this swale has been modelled within microdrainage to ensure that there is sufficient capacity within the intended profile to allow surface water to collect and subsequently discharge into the ground conditions for a 1 in 100yr storm event plus 30% for climate change.

The results of this exercise can be found within Appendix J of this report.

11.10.2 Permeable Pavements

Off the main road network, it is the intention to utilise permeable pavements to allow surface water to infiltrate down into the underlying strata. This technique also has the potential to incorporate an element of microbial treatment to the surface water whilst passing through the stone sub base layers.

As with section 11.10.1 above, a 100m section of road has been modelled on an assumed width of 7m and the average infiltration rate of 1.095×10^{-4} m/s to ensure there is sufficient capacity to deal with a 1 in 100yr storm event plus 30% for climate change.

The results of this exercise can be found within Appendix K of this report.

11.10.3 Cellular Soakaways

The remaining impermeable areas associated with the development relate to the roof areas of the proposed buildings. As such it is the intention to discharge the surface water into the underlying ground conditions.

As the ground conditions associated with this half of the site have permeable strata to depths, this report recommends the use of cellular soakaways to discharge surface water from these areas.

Although the site investigation report concluded that the ground water table was at depth, the design of soakaways should be undertaken by increasing the footprint of the devices rather than providing the storage required through increasing the depth.

11.11 Site Wide Surface Water Drainage Strategy

The proposed site wide surface water drainage strategy has been shown on Infrastruct CS Ltd Drawing 13-1363-100, which can be found within Appendix L of this report.

12.0 Recommendations and Conclusion

12.1 Conclusion

The Environment Agency requires that for sites above 1 ha in size and within Flood Zone 1, that a pro-forma should be completed to demonstrate that the following surface water flood risk principles have been followed. Based on the strategy within this report all of the following have been met.

- That surface water runoff from the development will not increase flood risk to the development or third parties.
- That Sustainable Drainage Systems (SuDS) have been explored and used to attenuate to at least pre-development discharge rates and volumes.
- That an allowance for climate change has been incorporated, which means adding an extra amount to peak rainfall, which relates to the life time of the development.
- That the residual risk of flooding has been addressed should failure or exceedence of the drainage system occur. This could include measures to manage residual risk such as raising ground or floor levels where appropriate.

The completed Pro Forma can be found within Appendix M.

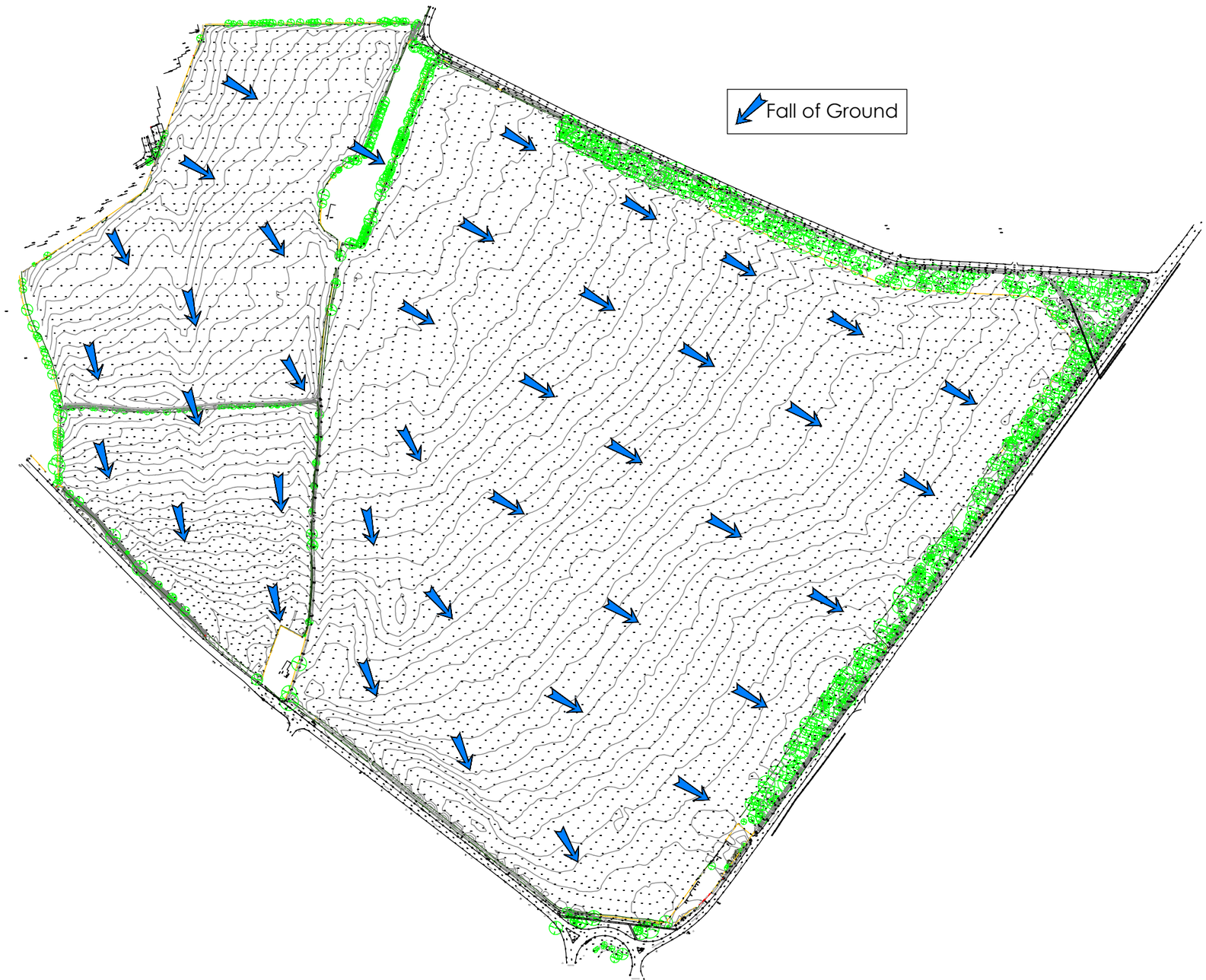
Therefore in line with the recommendations of the National Planning Policy Framework and the Planning Practise Guidance, the development site lies within land classified as flood zone 1, which is considered at a low risk of flooding, and therefore appropriate for a development of this nature. Having 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.

Furthermore the proposed surface water drainage design for the development site has been designed to cater for the 1 in 100yr storm plus 30% for climate change and as such for all storms up to and including this event, the proposed surface water drainage system will replicate the current greenfield conditions found on site and discharge all surface water into the underlying ground conditions and adjacent land drainage ditches.

References & Bibliography

- The National Planning Policy Framework March 2012
- Planning Practice Guidance.
- Code For Sustainable Homes - Department of Communities and Local Government. Revised February 2008.
- Environment Agency - Rainfall Runoff Management for Developments
- Environment Agency indicative flood maps http;//maps.environment- agency gov.uk
- Environment Agency indicative ground water source protection zone maps http;//maps.environment- agency gov.uk
- Environment Agency indicative Aquifer designation maps http;//maps.environment-agency gov.uk
- CIRIA 2007, The Sustainable drainage Systems (SUDS) Manual C697
- Sewers for adoption 6th Edition and interim guidance prior to the introduction of sewers for adoption 7th edition WRC
- WODC SFRA 2009and Flood Report 2007
- Flood Estimation Handbook

Appendix A – Topographic Survey



N
W E
S

SURVEY INFORMATION
Name of Survey Company
DRG NUMBER: **
DATE RECEIVED: DD/MM/YYYY

ARCHITECT SITE PLAN INFORMATION
Name of Architects
DRG NUMBER: **
DATE RECEIVED: DD/MM/YYYY

NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawings has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.

Rev	Drawn by	Chk'd by	Comments	Date
P01	NJ	DJ	Initial issue	03/11/14

DRAWING TITLE
Topographic Falls

PROJECT
Woodstock East
Woodstock
Oxon

DESIGNED BY	DRAFTED BY	APPROVED BY
TST	NJ	DJ

DATE 03/11/2014

STATUS **INFORMATION**

SCALE 1:2500 @ A1

0m 62.5m 125m
Scale bar @ 1:2500

CLIENT
PYE

Infrastruct CS Ltd

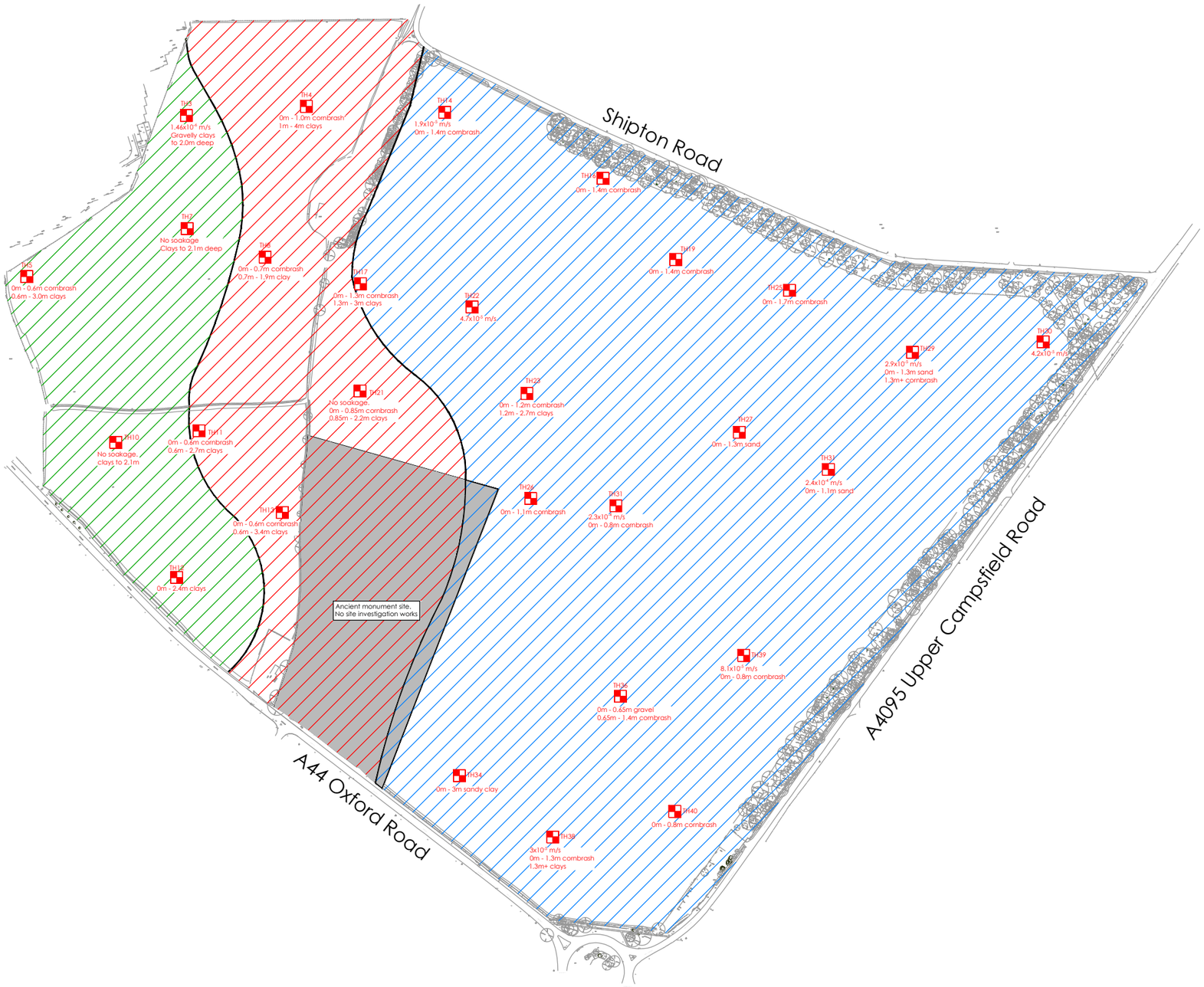
JOB NUMBER	DRAWING NUMBER	REVISION
13-1363	98	P01

Infrastruct CS Ltd, Cheltenham, Oxford, Cardiff, Tel: 01242 529690, info@infrastructcs.co.uk, www.infrastructcs.co.uk

X:\ICS Jobs\1300 Jobs\13-1363 Woodstock Phase 3\08 - Misc\FRA Report\site Falls.dwg

Appendix B – Summary of Ground Conditions

Eastern Extents of Woodstock



N
W E
S

SURVEY INFORMATION
Name of Survey Company
DRG NUMBER: **
DATE RECEIVED: DD/MM/YYYY

ARCHITECT SITE PLAN INFORMATION
Name of Architects
DRG NUMBER: **
DATE RECEIVED: DD/MM/YYYY

NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawings has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.

KEY

	Good infiltration potential to depths of 1.4m approx
	Medium infiltration potential only at shallow depth <0.8m approx
	Poor infiltration potential - no soakage

Rev	Drawn by	Chk'd by	Comments	Date
P01	NJ	DJ	Initial issue	02/10/14

DRAWING TITLE
Trial Hole Locations Plan

PROJECT
Woodstock East
Woodstock
Oxon

DESIGNED BY	DRAFTED BY	APPROVED BY
TST	NJ	DJ

DATE 02/10/2014
STATUS **INFORMATION**
SCALE 1:2500 @ A1
0m 62.5m 125m
Scale Bar @ 1:2500

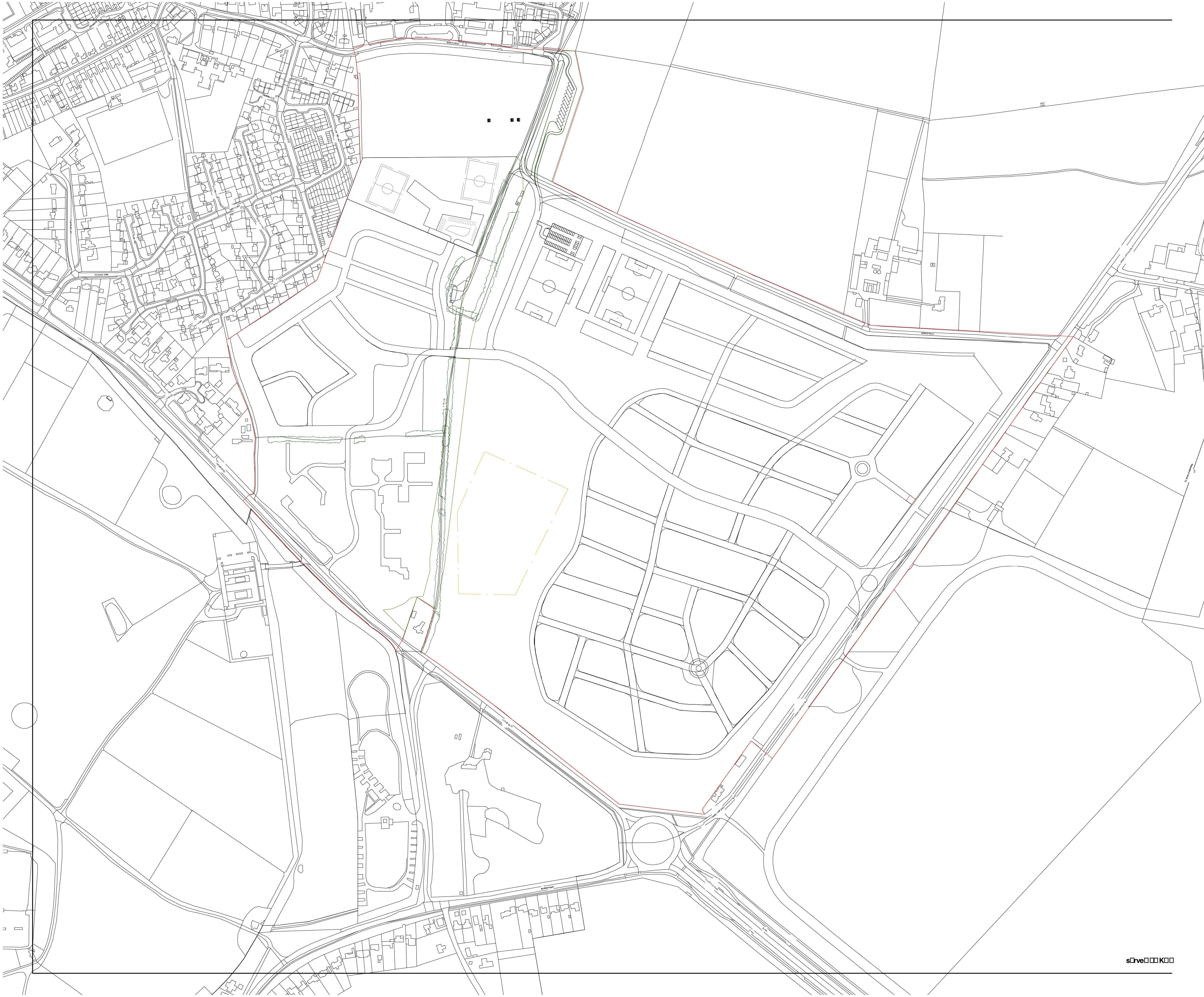
CLIENT
PYE

Infrastruct CS Ltd

JOB NUMBER	DRAWING NUMBER	REVISION
13-1363	99	P01

Infrastruct CS Ltd | 20A High Street, Eynsham, Oxford, OX29 4HB | Tel: 01865 880909 | info@infrastructcs.co.uk | www.infrastructcs.co.uk

Appendix C – Site Master Plan



T□is □rawin□ is t□e cop□ri□□t o□ □ est □ a□□□ □□□□ an□ ma□ not □e copie□ or repro□□ce□ wit□o□t written permission□ T□e Cop□ri□□t □r□er 1990 provi□es □or t□e □lannin□ □□t□orit□ to cop□ an□ □istri□□te □rawin□s □or p□□lic inspection in relation to a □lannin□ □pplication onl□□ T□ose copies are marke□ in t□e □ollowin□ manner□

□T□is cop□ □as □een ma□e wit□ t□e a□t□orit□ o□ □ est □ a□□□□□□□ p□rs□ant to Section □7 o□ t□e Cop□ri□□t □esi□ns an□ □atents □ct 19□□ an□ □or t□e p□rposes onl□ o□ p□□lic inspection□ T□is cop□ m□st not □e copie□ wit□o□t t□e prior written permission o□ t□e Cop□ri□□t owner□□

□o not scale □rom □rawin□s □nless □or plannin□ p□rposes onl□□ Use figured dimensions at all other times. In case of doubt contact □ est □ a□□□□□□□

□imensions to □e c□ecke□ on site □e□ore work commences an□ an□ □iscrepancies reporte□ to t□e □rc□itect□

T□e acc□rac□ o□ t□is □rawin□ ma□ □e reliant □pon s□rve□ in□ormation provi□e□ □□ t□ir□ parties□ □o lia□ilit□ will □e accepte□ □□ □ est □ a□□□□□□□ □or errors in or arisin□ □rom s□c□ t□ir□ part□ s□rve□ in□ormation□

- Site □o□n□ar□
- Sc□e□□le□ Mon□ment □esi□nate□ □rea
- □e□□erow
- □□□wa□s
- Bat Corridor (unspecified Landscaping)

Rev	□ate	Revisions	□nitials	c□ecke□
E	19□11□□	□mmen□mennts □□ncl□sion o□ t□e ro□n□a□o□t on Upper Campsfield Road w□ic□ went missin□ in Rev □ □ □mmen□ments to t□e Masterplan to miti□ate aro□n□ □r□oric□lt□re st□□ies	□□	□S
□	17□11□□	□eneral □p□ate	□□	□S
C	07□11□□	□p□ate to □ estern Site area□ Link and Ride, Employment & □ncl□sion o□ t□e □□mpin□ Station	□□	□S
□	27□10□□	□eneral □p□ate	□□	R□□
□	2□□09□□	□eneral □p□ate	□□	C□□

□ oo□stock East

Concept Masterplan Framework Rev E

T□e Malt□o□se
□0 East St□□elen Street
□□in□□on□□ □or□s□ire□□□1□5E□

Tel (01235) 523139
Fa□ (01235) 521□□2

e□mail□ en□□iries□ westwa□□□a□p□co□□k

ARCHITECTS AND TOWN PLANNERS
westwaddy ADP

□ate	19 □ovem□er 201□
Scale	1□2500 □ □1
□rawn	□□
c□ecke□	□S

□o□	□w□ □o□	Rev□
273	SK012	E

□oc□Re□□ □F 3□□1

Appendix D – Site Investigation Information

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP1

Date of Excavation: 10/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy TOPSOIL with limestone gravel.		0.00		0.10	D			
			(0.50)					
CORNBRASH Dense dark orange sandy clayey limestone GRAVEL			0.50	0.50	D			
			(0.50)					
CORNBRASH Strong orange-brown and buff horizontally bedded, extremely closely fractured, platey LIMESTONE with sandy clay in fractures.		1.00	1.00	1.00	D			
			(0.20)					
FOREST MARBLE Very stiff light grey fissured silty CLAY.			1.20	1.50	D	+140		
		2.00						
			(1.80)					
...with many lithorelicts from 2.30m				2.50	D			
Trial Pit terminated at 3.00 m		3.00	3.00					
		4.00						

Remarks

1. Method of Excavation: JCB
2. Backfill with Site Arisings
3. Groundwater: Dry
4. Stability: Stable
5. Logged by MB to +A2

NGR: 445444: 216655

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP2

Date of Excavation: 10/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy silty TOPSOIL with limestone gravel.		0.00	(0.40)	0.10	D			
			0.40	0.50	D			
CORNBRASH Strong horizontally bedded orange-brown extremely closely fractured platy LIMESTONE with sandy clay on fractures.		1.00	(1.00)	1.00	D			
			1.40	1.50	D	122		
FOREST MARBLE Stiff light grey fissured silty CLAY with occasional nodules.		2.00		2.00	D			
...becoming very stiff, horizontally bedded with mudstone lithorelicts from 2.20m.			(1.60)					
Trial Pit terminated at 3.00 m		3.00	3.00	3.00	D			
		4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Groundwater: Dry
4. Stability: Stable
5. Logged by MB to +A2

NGR: 445584: 216655

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP3

Date of Excavation: 09/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Dark brown sand silty gravelly clay TOPSOIL with abundant fine roots. Gravel is fine to coarse sub angular limestone.		0.00	(0.30) 0.30	0.20	D			
Silty gravelly CLAY Soft to firm friable brown sand slightly silty gravelly CLAY. Gravel is fine to coarse angular to sub angular limestone.			(0.20) 0.50 (0.40) 0.90	0.50	D			
Sandy silty gravelly CLAY Medium dense to dense dark brown sandy silty clay gravelly limestone COBBLES. Gravel is fine to coarse angular limestone.		1.00	(0.20) 1.10	1.00	D			
Clayey silty gravelly COBBLES Medium dense to light grey sand silty gravelly limestone COBBLES. Gravel is fine to coarse angular limestone.			(0.90)	1.40	D		238	
Silty sandy gravelly CLAY Stiff grey brown matt orange silty sandy gravelly CLAY. Gravel is fine to coarse angular to sub angular limestone.		2.00	2.00	2.00	D			
Trial Pit terminated at 2.00 m		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Trial Pit Dimensions: 0.6 x 3.5 2.0
4. Max Depth of Visable Roots: 0.4
5. Groundwater: Dry
6. Stability: Stable
7. Soakaway Test Performed

NGR: 445408: 216578

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP4

Date of Excavation: 10/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy clay TOPSOIL with limestone gravel.		0.00	(0.30) 0.30	0.10	D			
CORNBRASH Stiff, horizontally-bedded, platy closely fractured orange-brown and buff LIMESTONE with sandy clay on fractures.			(0.65)	0.50 0.50	CBR D			
FOREST MARBLE Stiff light grey closely fissured very silty CLAY with occasional mudstone lithorelicts and nodules.		1.00	0.95	1.00	D	132		Dry
		2.00	(3.05)					
		3.00						
Trial Pit terminated at 4.00 m		4.00	4.00					

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Groundwater: dry
4. Stability: Stable
5. Logged by MB to +A2

NGR: 44556: 216575

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP5

Date of Excavation: 10/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy silty TOPSOIL with limestone gravel.		0.00	(0.35)					
Medium dense orange brown sandy clayey limestone GRAVEL.			0.35 (0.25)	0.50	D			
CORNBRASH			0.60					
FOREST MARBLE Very stiff dessicated light grey fissured CLAY with occasional nodules.		1.00		1.00 1.00	D D	+140		
				1.50	D			
			(2.40)					
		2.00						
...becoming green-grey with horizontally aligned mudstone lithorelicts from 2.2m.				2.50	D			
Trial Pit terminated at 3.00 m		3.00	3.00					
		4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Groundwater: Dry
4. Stability: Stable
5. Logged by MB to +A2

NGR: 445247: 216404

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP6

Date of Excavation: 11/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy clay TOPSOIL with limestone gravel.		0.00	(0.35)	0.10	D			
			0.35	0.50	CBR			
CORNBRASH Dense dark orange-brown platy fine to coarse limestone GRAVEL with much orange brown very sandy clay in fractures.			(0.55)	0.50	D			
			0.90					
FOREST MARBLES Stiff fissured light grey and buff very silty CLAY with nodules.		1.00		1.00	D			
		2.00	(2.20)	2.00	D			Dry
		3.00		3.00	D			
Trial Pit terminated at 3.10 m			3.10					
		4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Groundwater: Dry
4. Stability: Stable
5. Logged by MB to +A2

NGR: 445323: 216449

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP7

Date of Excavation: 09/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Dark brown slightly sandy gravelly silty clay TOPSOIL with abundant fine roots. Gravel is fine to coarse angular to sub angular limestone.		0.00	(0.30) 0.30					
Sandy gravelly CLAY Medium dense orangey brown slightly clayey slightly sandy gravelly angular limestone COBBLES. Gravel is fine to coarse angular limestone.			(0.30) 0.60	0.50	D			
CLAY with silt Stiff grey , grey mottled orange silty CLAY. 1.4 becoming fragile.		1.00		1.00	D		179	
			(1.50)	1.50	D		171	
		2.00	2.10	2.00	D		179	
Trial Pit terminated at 2.10 m								
		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Trail Pit Dimensions: 0.6 x 3.8 x 2.10
3. Max Depth of Visable Roots: 0.4
4. Groundwater: Dry
5. Stability: Stable
6. Soakaway Test Performed
7. Logged by MJ to +A2

NGR: 445441: 216447

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date	**TRIAL PIT LOG**	**Report No.** 14.08.005a
September 2014		**Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP8

Date of Excavation: 09/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Dark brown gravelly silty clay TOPSOIL with abundant fine roots. Gravel is fine to medium angular limestone.		0.00	(0.30) 0.30	0.10	D			
Silty sandy gravelly CLAY Soft to firm brown friable sandy silty gravelly CLAY. Gravel is fine to coarse angular to sub angular limestone.			(0.20) 0.50 (0.20) 0.70	0.40	D			
Sandy clayey gravelly COBBLES Medium dense grey brown sandy clayey gravelly limestone COBBLES. Gravel is fine to coarse angular limestone.		1.00		1.00	D		300	
CLAY with silt gravelly Hard grey silty gravelly CLAY. Gravel is fine to coarse angular limestone.			(1.20)	1.30	D		234	
Trial Pit terminated at 3.50 m		2.00	1.90	2.00	D		150	
		3.00		3.00	D		158	
		4.00						

Remarks

1. Method of Excavation: JCB
2. Trial Pit Dimensions: 0.6 x 2.9 x 3.5
3. Max depth of Visable roots: 0.4
4. Groundwater: Dry
5. Stability: Stable
6. Logged by MJ to +A2

NGR: 445506: 216407

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP9

Date of Excavation: 10/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown silty sandy TOPSOIL with limestone gravel.		0.00	(0.30)	0.10	D			
CORNBRASH Strong horizontally-bedded extremely closely fractured, orange brown and buff platey LIMESTONE with sandy clay on fractures.			0.30 (0.65)	0.50	D			
FOREST MARBLE Very stiff light grey fissured silty CLAY with nodules.		1.00	0.95	1.00	D			
		2.00	(2.05)	2.00	D			
Trial Pit terminated at 3.00 m		3.00	3.00	3.00	D			
		4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Groundwater: Dry
4. Stability: Stable
5. Logged by MB to +A2

NGR: 445388: 216364

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP10

Date of Excavation: 09/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Dark brown slightly gravelly sandy silty clay TOPSOIL with abundant fine roots. Gravel is fine to coarse angular limestone.		0.00	(0.25) 0.25	0.30	D			
Sandy gravelly CLAY Stiff orange brown slightly gravelly slightly sandy CLAY. Gravel is firm to medium angular limestone.			(0.25) 0.50	0.80	D		250	
CLAY with silt Very stiff fissured light grey mottled orange silty CLAY.		1.00	(1.30)	1.20	D			
				1.60	D		242	
Silty sandy CLAY Stiff fissured light grey mottled orange brown slightly sandy silty CLAY.			1.80 (0.30)	2.00	D		155	
Trial Pit terminated at 2.10 m		2.00	2.10					
		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Trial Pit Dimensions: 0.6 x 3.4 x 2.1
3. Max Depth of Visable Roots: 0.3
4. Groundwater: Dry
5. Stability: Stable
6. Soakaway Test Performed
7. Logged by MJ to +A2

NGR: 445328: 216244

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date	**TRIAL PIT LOG**	**Report No.** 14.08.005a
September 2014		**Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP11

Date of Excavation: 11/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy clay TOPSOIL with limestone.		0.00	(0.40)	0.10	D			
CORNBRASH Stiff orange brown very sandy CLAY with many coarse angular platy limestone gravels			0.40 (0.20) 0.60	0.40 0.50	CBR D			
FOREST MARBLE Very stiff fissured light grey very desiccated silty CLAY with nodules		1.00	(0.80)	1.00	D			
FOREST MARBLE Stiff fissured light grey silty CLAY with nodules			1.40	1.50	D			
		2.00	(1.30)	2.00	D			Dry
FOREST MARBLE Very strong LIMESTONE			2.70 (0.05) 2.75					
Trial Pit terminated at 2.75 m		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Groundwater: Dry
3. Stability: Stable
4. Logged by MB to +A2

NGR: 445443: 216244

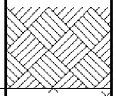
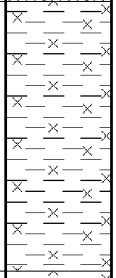
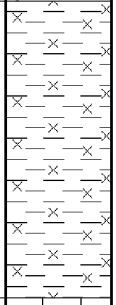
▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP12

Date of Excavation: 11/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy clay TOPSOIL with limestone gravel		0.00	(0.30) 0.30	0.10	D			
FOREST MARBLE Very stiff light grey and buff very fissured desiccated silty CLAY		1.00	(1.00)	0.40 0.50 1.00	CBR D D			
FOREST MARBLE Stiff fissured light grey and buff silty CLAY with nodules		2.00	1.30 (1.10)	1.50	D			Dry
FOREST MARBLE Very strong massive LIMESTONE *Trial Pit terminated at 2.45 m*		3.00 4.00	2.40 (0.05) 2.45	2.40	D			

Remarks

1. Method of Excavation: JCB
2. Groundwater: Dry
3. Stability: Stable
4. Logged by MB to +A2

NGR: 445407: 216112

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP13

Date of Excavation: 09/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Dark brown slightly sandy slightly gravelly silty clay TOPSOIL with abundant fine roots. Gravel is fine to coarse angular limestone.		0.00	(0.25) 0.25	0.20	D			
CORNBRASH Firm orange brown sandy gravelly CLAY with occasional angular limestone COBBLES. Gravel is fine to coarse angular limestone.			(0.30) 0.55	0.50	D			
FOREST MARBLE Very stiff light fissured light grey mottled orange brown sandy slightly gravelly silty CLAY.		1.00	(1.35)	1.00	D		250	
				1.50	D			
FOREST MARBLE Very stiff thinly bedded green-grey silty CLAY with many horizontally aligned lithorelicts or mudstone.		2.00	1.90 (1.50)	2.00	D			
Trial Pit terminated at 3.40 m		3.00	3.40	3.40	D			
		4.00						

Remarks

1. Method of Excavation: JCB
2. Logged by MJ to +A2

NGR: 445502: 216141

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date	TRIAL PIT LOG	Report No. 14.08.005a
September 2014		Client Ref:

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP14

Date of Excavation: 10/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Brown silty sandy TOPSOIL with limestone gravel.		0.00	(0.35) 0.35	0.30	D			
CORNBRASH Strong horizontally-bedded extremely closely fractured orange-brown and light grey platy LIMESTONE with orange-brown sandy clay in fractures.		1.00	(1.05)	0.50 1.00	D D			
No progress past 1.40m. Limestone too competent. *Trial Pit terminated at 1.40 m*		2.00 3.00 4.00	1.40	1.40	D			

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Trail Pit Dimensions: 0.7 x 1.40 x 3.40m
4. Groundwater: Slight seepage at 1.40m
5. Stability: Stable
6. Logged by MB to +A2
7. Soakaway Test Performed

NGR: 445704: 216599

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP15

Date of Excavation: 12/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy clay TOPSOIL with limestone		0.00	(0.30)	0.10	D			
CORNBRASH Dense orange brown very sandy platy angular limestone COBBLES			0.30 (0.25)	0.40	CBR			
CORNBRASH Medium dense orange brown very sandy slightly clayey angular fine to coarse limestone GRAVEL		1.00	0.55 (0.55)	0.50 1.00	D D			
CORNBRASH Strong closely fractured, horizontaly bedded platy orange brown LIMESTONE No progress past 1.20m			1.10 (0.10)	1.20	D			
Trial Pit terminated at 1.20 m		2.00	1.20					Dry
		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Groundwater: Dry
3. Stability: Stable
4. Logged by MB to +A2

NGR: 445648: 216533

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP16

Date of Excavation: 10/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Brown sandy TOPSOIL with limestone gravel.		0.00	(0.30) 0.30	0.10	D			
CORNBRASH Dense dark orange-brown platy limestone GRAVEL.			(0.50) 0.80	0.50	D			
CORNBRASH Very dense light orange-brown very sandy clayey limestone GRAVEL.		1.00	(0.30) 1.10	1.00	D			
LIMESTONE Strong extremely closely fractured horizontally bedded platy orange-brown LIMESTONE. No progress past 1.4m			(0.30) 1.40	1.40	D			
Trial Pit terminated at 1.40 m		2.00 3.00 4.00						

Remarks

1. Method of Excavation: JCB
2. Groundwater: Dry
3. Stability: Stable
4. Logged by MB to +A2

NGR: 445790: 216534

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date	TRIAL PIT LOG	Report No. 14.08.005a
September 2014		Client Ref:

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP17

Date of Excavation: 10/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy TOPSOIL with limestone gravel.		0.00		0.10	D			
			(0.50)					
			0.50	0.50	D			
CORNBRASH Strong horizontally bedded, extremely closely fractured, platy orange-brown LIMESTONE with sandy clay in fractures.			(0.80)					
		1.00		1.00	D			
			1.30					
FOREST MARBLE Very stiff fissured light grey silty CLAY with nodules.				1.50	D	+140		
		2.00						
			(1.70)					
				2.50	D			
Trial Pit terminated at 3.00 m		3.00	3.00					
		4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Groundwater: Dry
4. Stability: Stable
5. Logged by MB to +A2

NGR: 445603: 216416

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP18

Date of Excavation: 10/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Dark brown very gravelly sandy clayey silty TOPSOIL. Gravel is fine to coarse angular limestone.		0.00	(0.25) 0.25					
LIMESTONE Medium dense brown sandy gravelly angular limestone COBBLES. Gravel is fine to coarse angular limestone.			(0.25) 0.50 (0.60)	0.50	D			
LIMESTONE Strong horizontally-bedded orange-brown and light grey extremely closely fractured platy LIMESTONE. No progress past 1.10.		1.00	1.10	1.00	D			
Trial Pit terminated at 1.10 m		2.00 3.00 4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Groundwater: Dry
4. Stability: Stable
5. Logged by MJ to +A2

NGR: 445761: 216458

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP19

Date of Excavation: 12/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Brown sandy clay TOPSOIL with limestone gravel		0.00	(0.25) 0.25	0.10	D			
CORNBRASH Dense orange brown very sandy angular platy fine to coarse limestone GRAVEL AND COBBLES			(0.55) 0.80	0.50	D			
CORNBRASH Dense light orange very sandy angular fine to coarse limestone GRAVEL		1.00	(0.50) 1.30	1.00	D			
CORNBRASH Strong closely fractured, horizontaly bedded platy orange brown LIMESTONE No progress past 1.40m			(0.10) 1.40					
Trial Pit terminated at 1.40 m		2.00						Dry
		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Groundwater: Dry
3. Stability: Stable
4. Logged by MB to +A2

NGR: 445862: 216425

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date	TRIAL PIT LOG	Report No. 14.08.005a
September 2014		Client Ref:

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP20

Date of Excavation: 10/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Brown silty sandy TOPSOIL with limestone gravel.		0.00	(0.35) 0.35	0.10	D			
CORNBRASH Dense orange-brown very sandy clayey limestone GRAVEL.		1.00	(1.05)	0.50 1.10	D D			
CORNBRASH Strong extremely closely fractured orange-brown horizontally bedded, platy LIMESTONE with sandy clay on fractures. No progress past 1.60m.		2.00	1.40 (0.20) 1.60	1.50	D			
Trial Pit terminated at 1.60 m		3.00 4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Groundwater: Dry
4. Stability: Stable
5. Logged by MB to +A2

NGR: 445895: 216489

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date	**TRIAL PIT LOG**	**Report No.** 14.08.005a
September 2014		**Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP21

Date of Excavation: 10/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown silty sandy TOPSOIL with many platy limestone gravels.		0.00	(0.40)	0.10	D			
CORNBRASH Strong platy orange-brown and grey extremely closely fractured horizontally bedded LIMESTONE with ornage-brown sandy clay in fractures.			0.40 (0.45)	0.50	D			
FOREST MARBLE Stiff to very stiff fissured light grey and buff mottled very silty CLAY with occasional nodules.		1.00	0.85	1.00	D		7000	
			(1.35)	1.50	D			
		2.00		2.00	D		7000	
Trial Pit terminated at 2.20 m			2.20					
		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Backfilled with Site Arisings
3. Trial Pit Dimensions: 0.70 x 2.30 x 2.20m
4. Groundwater: Dry
5. Stability: Stable
6. Logged by MB to +A2
7. Soakaway Test Performed

NGR: 445593: 216319

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP23

Date of Excavation: 12/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy clay TOPSOIL with limestone fragments		0.00	(0.30)	0.10	D			
			0.30	0.30	CBR			
CORNBRASH Dense orange brown very sandy angular platy fine to coarse limestone GRAVEL AND COBBLES			(0.40)	0.50	D			
			0.70					
CORNBRASH Strong extremely closely fractured, horizontaly bedded platy orange brown LIMESTONE		1.00	(0.50)	1.00	D			
			1.20					
FOREST MARBLE Stiff light grey and buff fissured silty CLAY with nodules				1.50	D	132		
		2.00	(1.50)	2.00	D			Dry
Trial Pit terminated at 2.70 m			2.70					
		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Groundwater: Dry
3. Stability: Stable
4. Logged by MB to +A2

NGR: 445775: 216323

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP24

Date of Excavation: 12/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy clay TOPSOIL with limestone gravel		0.00	(0.30)	0.10	D			
CORNBRASH Dense dark orange brown platy coarse limestone GRAVEL			0.30 (0.30)	0.40 0.50	CBR D			
CORNBRASH Very dense light orange brown very sandy clay platy limestone GRAVEL		1.00	0.60 (1.00)	1.00	D			
				1.50	D			
CORNBRASH Very strong closely fractured, orange brown LIMESTONE No progress past 1.70m			1.60 (0.10) 1.70					Dry
Trial Pit terminated at 1.70 m		2.00 3.00 4.00						

Remarks

1. Method of Excavation: JCB
2. Groundwater: Dry
3. Stability: Stable
4. Logged by MB to +A2

NGR: 445946: 216375

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP25

Date of Excavation: 12/09/2014

Description of Strata	Strata Change: Legend	Strata Change: Depth -m Scale	Strata Change: Depth -m Strata	Samples: Depth -m	Samples: Type	Shear Strength (kPa) (Cu): HV	Shear Strength (kPa) (Cu): PP	Water Level -m
TOPSOIL Brown sandy clay TOPSOIL with limestone gravel		0.00	(0.30)	0.10	D			
			0.30					
CORNBRASH Strong horizontally bedded extremely closely fractured platy orange brown LIMESTONE with orange sandy clay in fractures			(0.40)	0.50	D			
			0.70					
CORNBRASH Dense light orange brown very sandy clay limestone GRAVEL		1.00	(0.60)	1.00	D			
			1.30					
CORNBRASH Very strong horizontally bedded closely fractured, platy orange brown LIMESTONE			(0.40)	1.50	D			
No progress past 1.70m			1.70					
Trial Pit terminated at 1.70 m		2.00						Dry
		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB
2. Groundwater: Dry
3. Stability: Stable
4. Logged by MB to +A2

NGR: 446043: 216422

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**

LOCATION: Land East of Woodstock, Oxon

TRIAL PIT: TP26

Date of Excavation: 09/09/2014

Description of Strata	Strata Change			Samples		Shear Strength (kPa) (Cu)		Water Level -m
	Legend	Depth -m		Depth -m	Type	HV	PP	
		Scale	Strata					
TOPSOIL Dark brown slightly gravelly silty slightly sandy clayey TOPSOIL with abundant fine to coarse angular limestone.		0.00	(0.25) 0.25					
Sandy gravelly CLAY Medium dense brown slightly clayey sandy gravelly angular limestone COBBLES. Gravel is fine to coarse angular limestone.			(0.35) 0.60	0.50	D			
LIMESTONE Strong horizontally bedded extremely closely fractured platy orange-brown and buff LIMESTONE with orange-brown sandy clay in fractures.		1.00	(0.50) 1.10	1.00	D			
Trial Pit terminated at 1.10 m		2.00						
		3.00						
		4.00						

Remarks

1. Method of Excavation: JCB/360
2. Backfilled with Site Arisings
3. Max depth of Visible Roots: 0.3m
4. Groundwater: Dry
5. Stability: Stable
6. Logged by MJ to +A2

NGR: 445756: 216217

▽	Water Strike
▼	Water (Standing Level)
W	Water Sample
B	Bulk Sample
D	Small Disturbed Sample
V	Vane Test
P	Penetrometer Test
M	Mexe Penetrometer
CBR	CBR Sample
UF	Under Foundations

Date September 2014	**TRIAL PIT LOG**	**Report No.** 14.08.005a **Client Ref:**