clarkebond

MULTIDISCIPLINARY ENGINEERING CONSULTANTS

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WB03671	**NOVEMBER 2014**

Project:

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

LAND TO THE WEST OF CHILGROVE DRIVE, NORTH OF CAMP ROAD AND ADJOINING FORMER RAF UPPER HEYFORD, UPPER HEYFORD, INCORPORATING FORMER MOD GYMNASIUM

Client:

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Report status: **DRAFT**

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1.0 INTRODUCTION

1.1 Background

Clarkebond (UK) Ltd (CB) was commissioned in October 2014 by EP Barrus to produce a Flood Risk Assessment to support a proposed industrial/commercial development on land to the west of Chilgrove Drive, north of Camp Road and adjoining former RAF Upper Heyford, Upper Heyford incorporating former MOD gymnasium.

The site is situated within the urban boundary of Upper Heyford in Oxfordshire to the north west of the junction of Camp Road and Chilgrove Drive, with the approximate Ordnance Survey Grid Reference of SP5215725867 (WGS84 Geoid Lat/Long: 51.928885,-1.242885). The nearest post code is OX25 5LU.

This FRA report has been prepared in support of a hybrid planning application comprising:

1) Application for full planning permission for Phase One works comprising erection of 9,837 sq. m warehouse with associated service yard and access; and
2) Outline application for Phase Two works comprising office and training school and manufacturing, storage and distribution buildings with associated parking and landscaping.

It is intended to provide the Planning Authority and Environment Agency (EA) information on flooding in order to determine the planning application.

1.2 Proposed Development

Refer to proposed site layout plan in Figure 1 and **Appendix A**.

The following are the key activities envisaged during the proposed development:

- The construction of main services to the entire site; water, foul and storm sewers, power
- The construction of the access roads, car parking and landscaping;
- Phased construction of the warehousing, other structural units and supporting infrastructure.

The proposed land use is classified as ‘Less Vulnerable’ development, as described in Table 2 of the National Planning Policy Framework (NPPF) Technical Guidance.

Table 3 of the NPPF Technical guidance, shows that ‘Less Vulnerable’ development is suitable in Flood Zones 1, 2 and 3a but not Flood Zone 3b.

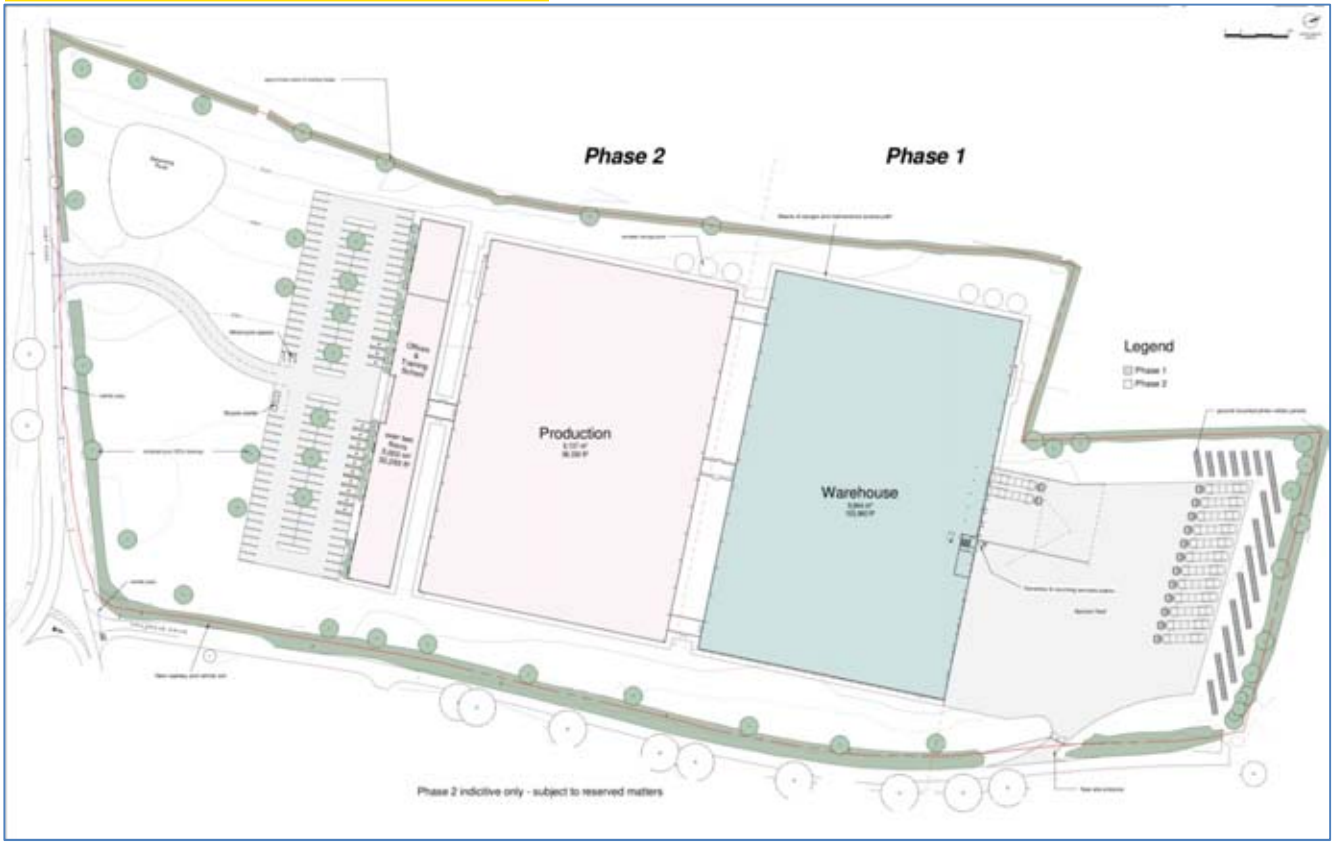

Figure 1: Proposed Site Plan (Phases 1 and 2)

1.3 Objectives

The main objectives of this FRA are to demonstrate that the national policy test in the National Planning Policy Framework (NPPF) paragraphs 103 and 104 are met and thus:

- To identify the probability or otherwise of flooding at the proposed development site.
- To assess the need to develop at this site in relation to the Sequential Test.
- To identify the consequence of flooding and any possible flood protection measures.
- To assess the overall impacts of the development on flood risk elsewhere.

1.4 Limitations

The information, views and conclusions drawn concerning the site are based, in part, on information supplied to Clarkebond by other parties. Clarkebond has proceeded in good faith on the assumption that this information is accurate. Clarkebond accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to Clarkebond from others.

2.0 THE STUDY AREA

2.1 Location

The proposed site is located approximately 3.2km northeast of Lower Heyford, approximately 3.5km south east of Somerton and approximately 600m north-northeast of Caulcott. The site, which has previously housed a gymnasium associated with the RAF and USAF operations at the former Upper Heyford airbase, has a total area of approximately 5.7ha and is bounded:

- To the north and north west by the former RAF Upper Heyford airbase;
- To the east by Chilgrove Drive and agricultural land;
- To the south by Camp Road, with a mobile home site 90m to the south west; and
- To the west by a field and residential properties some 150m from the site boundary

The site location is shown in Figure 2.

Figure 2: Aerial Photograph Showing Site

2.2 Site Topography

Review of the survey information confirms that the site slopes moderately towards the south and south western boundary, with the highest site levels on the 122m AOD contour toward the north east of the site and lowest site levels on the 116m AOD contour toward the south west site boundary.

Refer to plan showing site topography and levels in **Appendix B**.

2.3 Geology

The geology of the site is shown on maps obtained from the Groundsure report which are extracted from the British Geological Survey (BGS) Digital Geological Map of Great Britain at 1:50,000 scale.

This indicates that the Great Oolite of Jurassic age, underlies the site. The BGS Lexicon describes the Great Oolite as 'Calcareous (rarely oolitic) and argillaceous formations.'

The maps do not show any superficial deposits.

Historical exploratory hole records available on the BGS website show that the closest recorded boreholes to the site are located on the east and south edges of the site. The borehole on the east of the site encountered Made Ground comprising brick, limestone and concrete rubble over firm brown sandy clay with brick fragments. This was underlain by a dark brown clayey, sandy silt with limestone fragments, and some coarse rubble. This was further underlain by buff yellow, moderately strong limestone.

The boreholes to the south of the site encountered topsoil to 0.60m, over interbedded limestone and blue clay to 20m depth, with water bearing clay strata at 18.60m.

2.4 Hydrology and Drainage

The main watercourse which provides natural drainage for the site is a minor headwater secondary tributary of the River Ray. This unnamed watercourse flows in a generally southern direction to join the Gallos Brook, which joins the River Ray near Islip. The River ray then flows westerly before joining with the River Cherwell.

The unnamed watercourse has a small catchment area of approximately 1.1km^2 at NGR SP 52050 25900 (near the site) and at its closest is approximately 32m from the western site boundary. Refer to Figures 3 and 4a & 4b which show the sub-catchment of the unnamed watercourse and the local hydrological setting respectively.

The River Ray

The River Ray is a river in Buckinghamshire and Oxfordshire, England. It rises at Quainton Hill and flows west through a flat countryside for around 25 km or 15 miles. It passes the village of Ambrosden and then flows through Otmoor. It is a major tributary to the Cherwell and joins the River Cherwell near Islip which then flows into the Thames.

In 1815 a new channel was cut between Charlton-on-Otmoor and Oddington, known as the New River Ray, to divert much of the water flow around the northern and southern edge of Otmoor.

River Cherwell

This is a major tributary of the River Thames in central England. It rises near Hellidon in Northamptonshire and flows south through Oxfordshire for 40 miles (64 km) to meet the Thames at Oxford.

Its general course is flowing from north to south through the centre of Cherwell District Council area passing through Banbury, Upper Heyford, and Kidlington before flowing to Oxford where the Cherwell meets the River Thames. The river drains a total catchment area of 906 km^2 with a mean annual rainfall of 682 mm. (Acreman 2003).

Tributaries that flow to the River Cherwell include the Hanwell Brook, the Sor Brook, the Bloxham Brook and the River Swere all flowing from the West and the River Ray flowing from the East. The confluence of the River Cherwell with the River Thames is located about 5km beyond the Cherwell District southern boundary.

Land use across the river catchment is predominately rural (less than 2% of the catchment is classified as 'urban') and includes the two main urban centres of Banbury and Bicester.

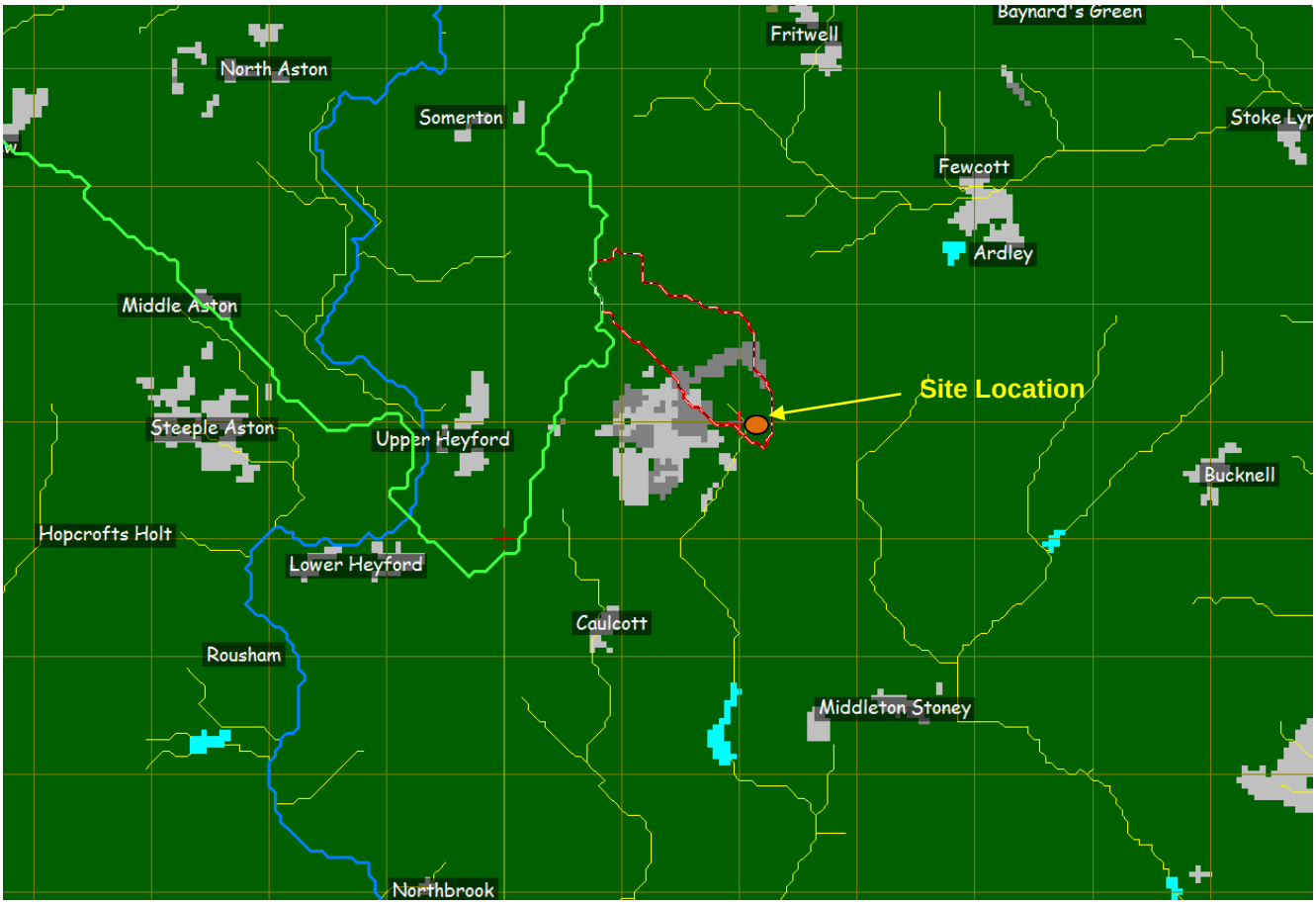

Figure 3: Local Catchment & Hydrological Setting (FEH CdROM)

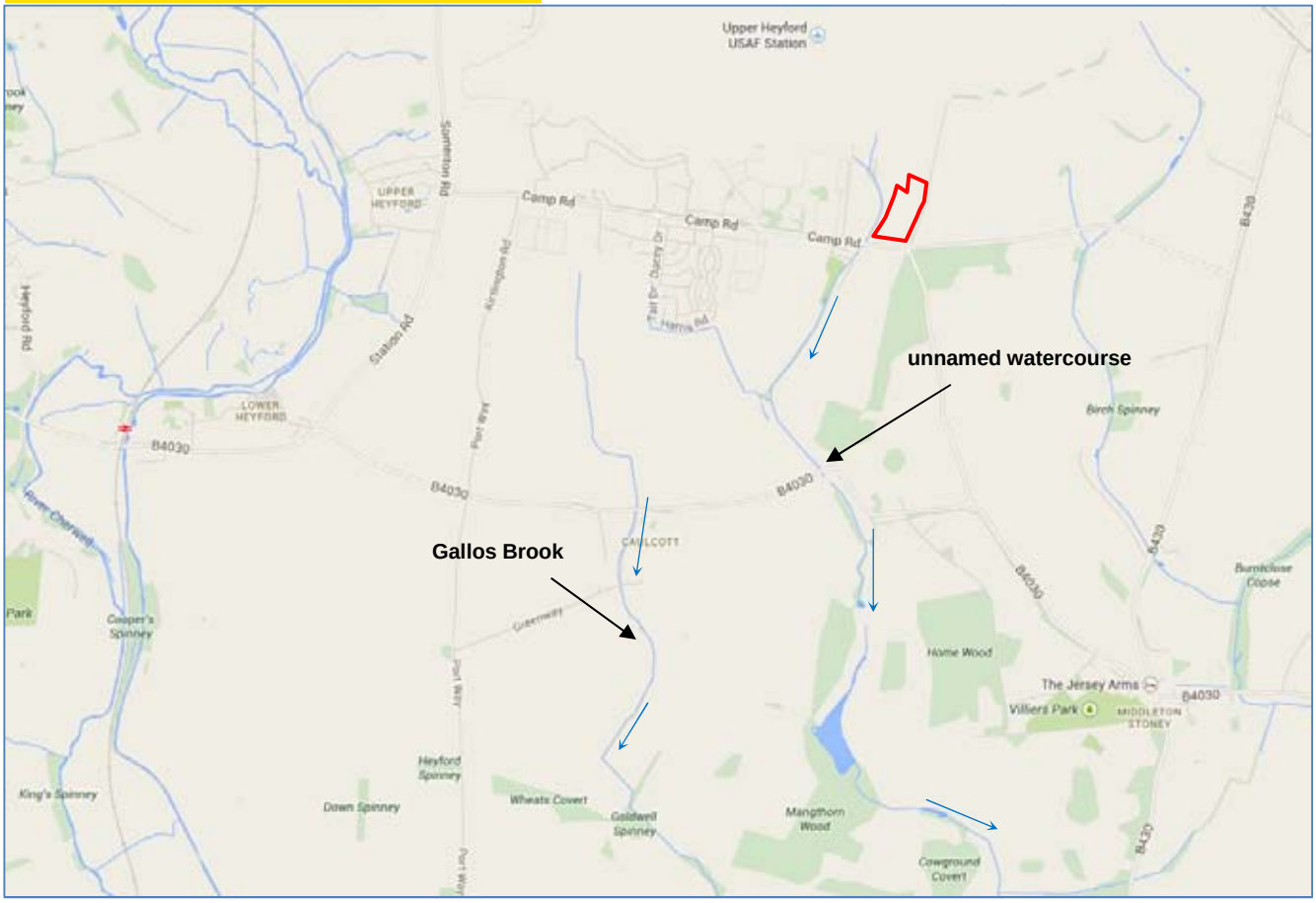

Figure 4a: Showing the Local Hydrological Setting

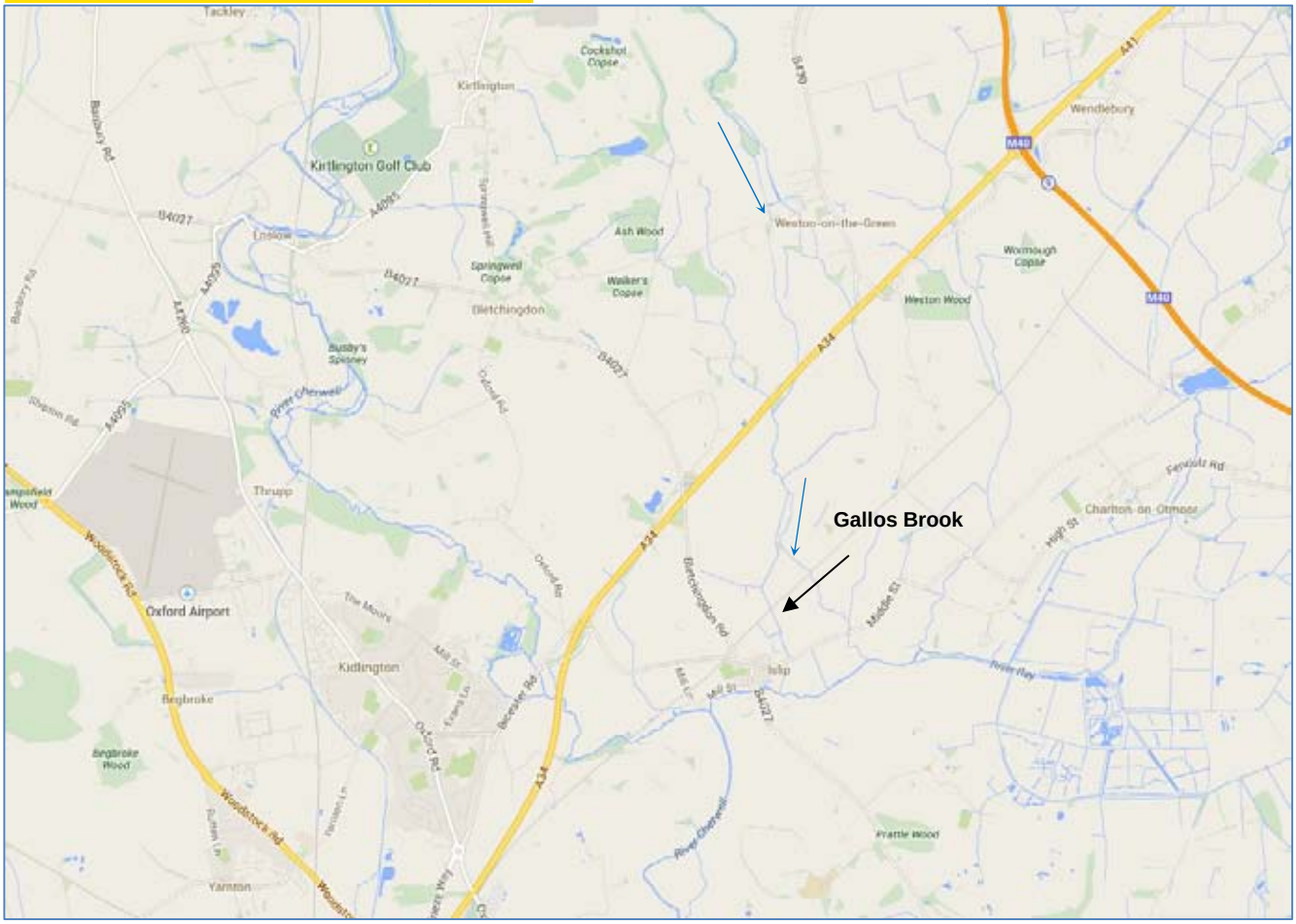

Figure 4b: Showing the Local Hydrological Setting

2.5 Site Drainage

There are no formal drains or ditches evident within the boundary of the proposed site. Natural infiltration to the soil and surface runoff to the minor watercourse (west of the site boundary) are the most likely mechanisms for the existing surface water drainage.

Thames Water is the statutory sewerage undertaker for the public sewer network, including foul, surface and combined sewers. In addition, private individuals may also be responsible for drainage systems that discharge to watercourses or the public sewer.

3.0 FLOOD RISK ASSESSMENT

3.1 Sources of Flood Hazards identified

The main source of flood risk identified for the proposed site is flooding from pluvial sources. The Cherwell and West Oxfordshire Strategic Flood Risk Assessment (SFRA) also concluded that the primary source of flood risk to this part of the SFRA area is not from fluvial or tidal flooding but from overland flow flooding from intense rainfall.

3.2 Predicted Flood Extents

Fluvial flood risks at the site were assessed using results from the Environment Agency (EA) Flood maps.

The EA flood map provides a broad scale assessment of flood risk for that geographical area. It evaluates risk as the product of the probability and the consequence of particular events. Probability is defined as the frequency and magnitude of floods that are generated by fluvial or tidal flows and intense rainfall activity. The consequence is defined as the impact of floodwater on receptors (people, property, land, etc).

The Environment Agency Indicative Flood Zone Maps indicate that the site lies within Flood Zone (FZ) 1, comprising land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (less than 0.1%). The flood zones of the watercourses relative to the site are shown on the Environment Agency Flood Map included as Figures 5a and 5b.

It is possible that the unnamed minor watercourse and other minor headwater tributaries of the River Ray were not specifically modelled in the broad scale assessment undertaken by the EA. The EA does not have any data on flood depth and velocity for the site. There was no information available on flooding history at the specific site.

NPPF allows the scale of site specific flood risk assessments to reflect the scale of development and the flood Zone it is located within.

The area of the site where the planned development will occur is outside of the 1 in 100 year (1%) and the 1 in 1000 (0.1%) fluvial events therefore the consequence of flooding from rivers is limited.

Flood risk from fluvial sources is therefore considered low.

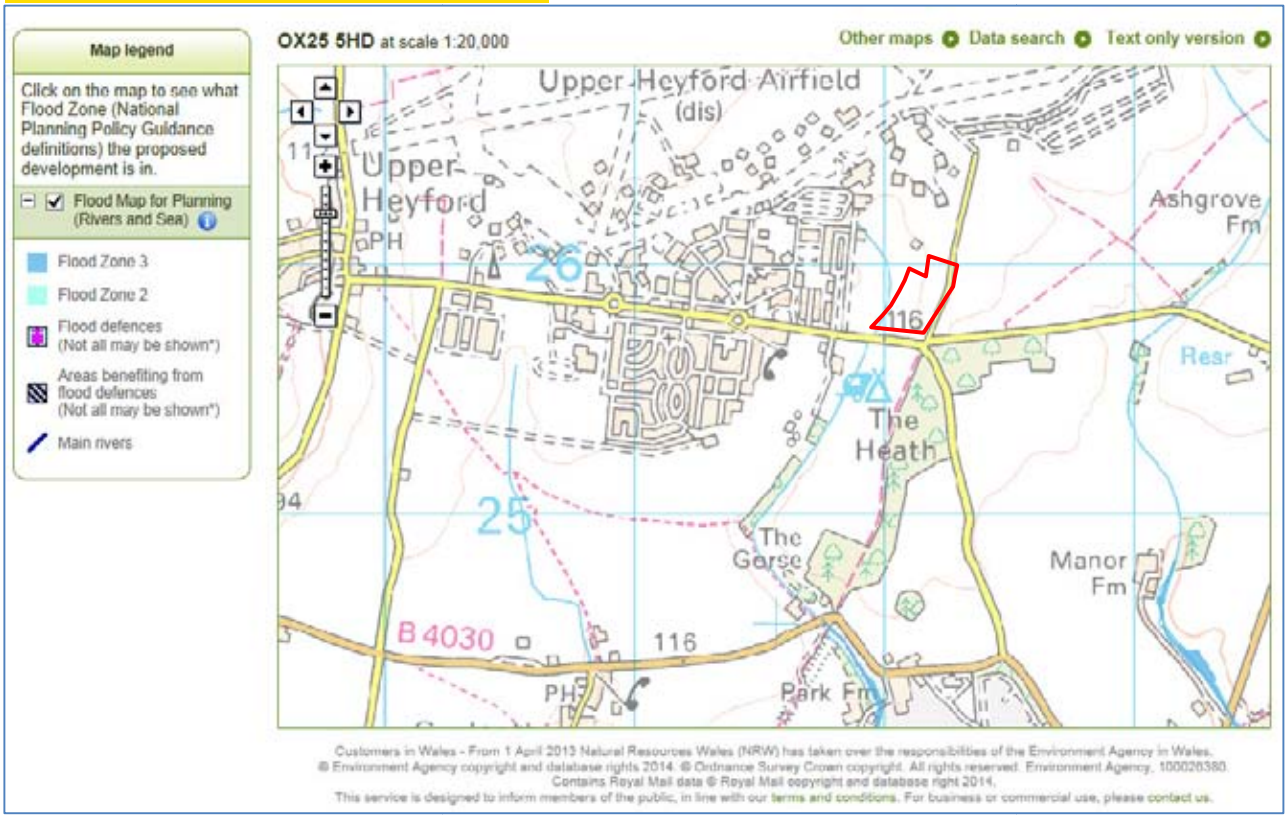

Figure 5a: EA Indicative Flood Map of Study Area (source EA website)

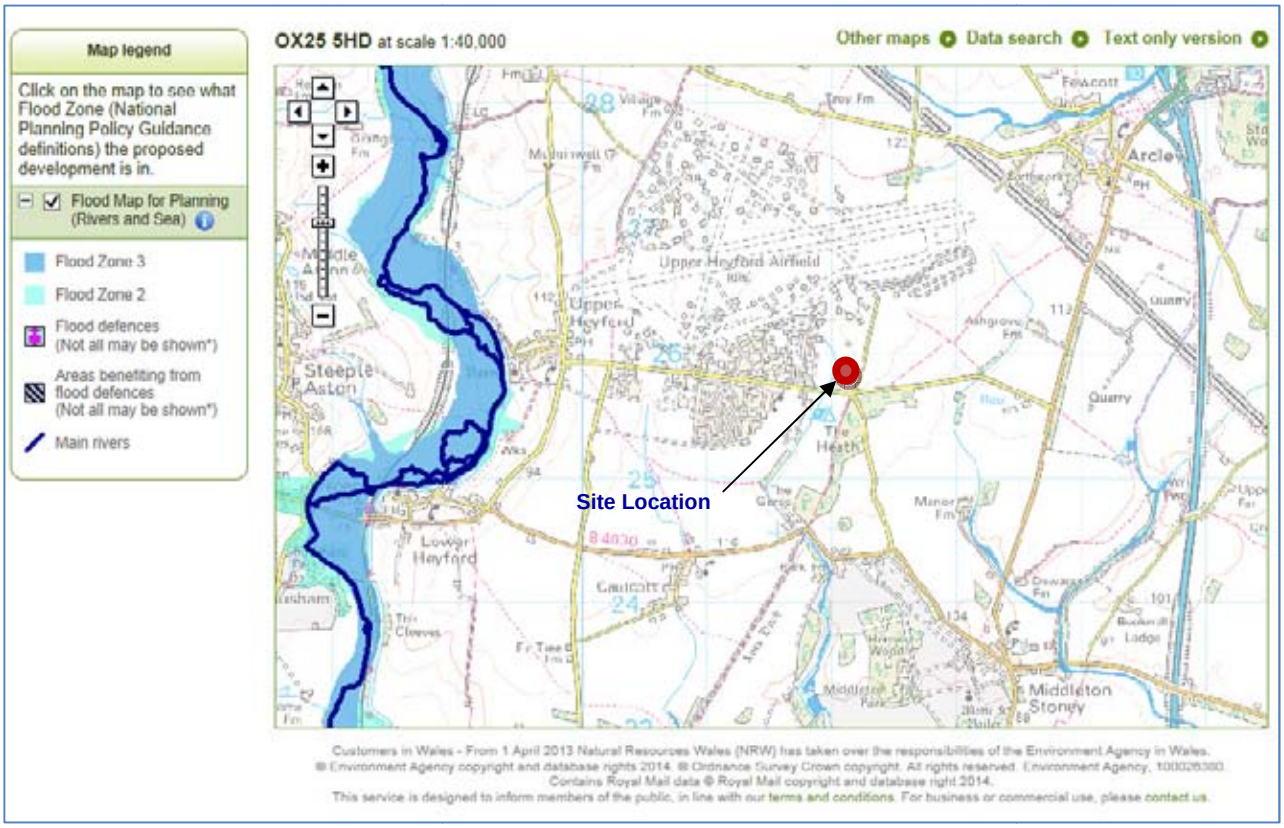

Figure 5b: EA Indicative Flood Map of Study Area (source EA website)

Surface Water Flood Risk

The EA flood map showing the risk of flooding from surface water (refer to Figure 6) shows the risk of flooding from surface water at the proposed development site to be very low. Very low means that each year, this area has a chance of flooding of less than 1 in 1000 (0.1%).

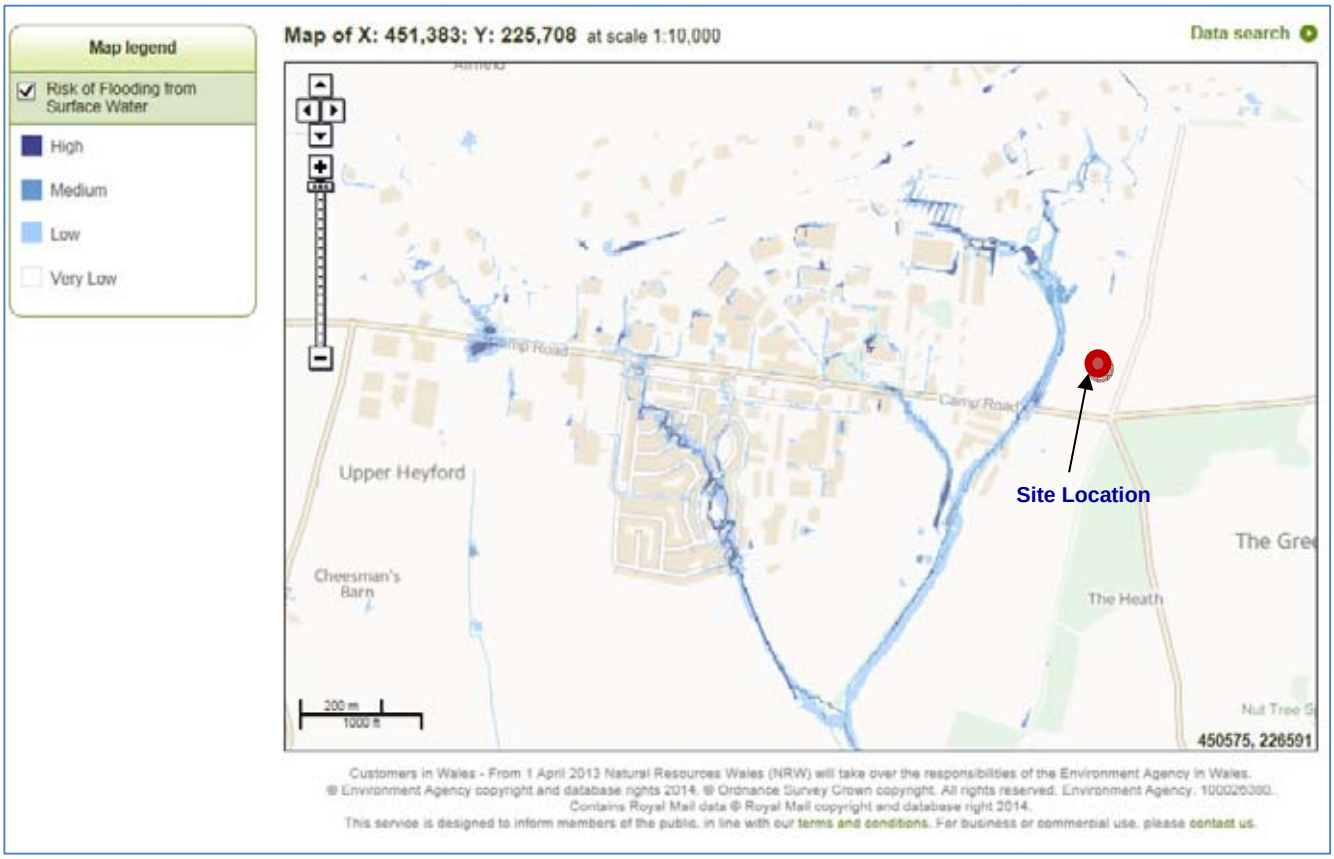

Figure 6: EA Flood Map Showing Risk of Flooding from Surface Water (source EA website)

3.3 Findings from the Strategic Flood risk Assessment (SFRA)

Review of the Level 1 SFRA has been undertaken to support the proposed development of the proposed site in Upper Heyford, Oxfordshire.

The SFRA indicates that the proposed site is flood-free for the 1 in 100 and 1 in 1000 fluvial events for all the relevant watercourses.

Historical Flooding

There have been numerous historical flood events in the Cherwell SFRA study area. According to the SFRA, the most severe flood event recorded in Cherwell District, in terms of danger to life and property occurred in April 1998 when flood levels reached what were at the time considered to have a return period of greater than 1 in 100 years. However, other events approaching the same level have occurred on several occasions over the last 25 years indicating that severe flooding (in terms of danger to life and property) could be becoming more frequent.

A gauging station at Banbury was installed in December 1966 and the largest flood event on record was in 1998 with a level of 2.75m (91.45m AOD). Records from July 2007 show that the maximum water level occurred on

the 21st July and was 2.39m (91.09m AOD). Therefore the April 1998 remains the largest flood on record at Banbury.

It is difficult to make an assessment of the magnitudes of these floods especially when the Cherwell Valley would historically have been far less developed making it likely that historical flood levels were lower than for the same rainfall event today.

However, the proposed site was not specifically identified by the SFRA to have been flooded in the past.

Flooding from Land (Pluvial/Surface Water Flooding and Overland Flow)

During periods of prolonged rainfall events and sudden intense downpours, overland flow from adjacent higher ground may 'pond' in low-lying areas of land without draining into watercourses, surface water drainage systems or the ground. According to the SFRA, the settlements of Kidlington, Launton, Ambrosden, Arncott, Blackthorn, Charlton-on-Otmoor, Fencott, Mercott, Wendlebury, Westonon- the-Green, Caulcot, Noke and Oddington are all located on low lying impervious ground where there may be limited surface water drainage and therefore may be at increased risk of flooding from overland flow.

Known areas of surface water flooding, caused mainly by local drainage problems have been identified within the SFRA.

Review of the SFRA maps does not identify any flooding incidents either within the proposed site boundary or within close vicinity of the proposed development. It is noted however that the information provided within the SFRA is based on historical data and is not exhaustive.

The EA flood map showing the risk of flooding from surface water (refer to Figure 6) shows the risk of flooding from surface water at proposed development site to be very low.

Flooding from Groundwater

The underlying superficial geology of the SFRA area is predominantly Clay, particularly in the north. This results in flashy runoff and rapid responses of fluvial systems to rainfall events. In the locality of Bicester there are outcrops of shale which are more permeable. There are locations within the Cherwell District that are affected by high water tables and are susceptible to seasonal spring fed activity such as Mollington. This may result in standing water on low lying ground that is unable to reach a ditch or watercourse and is unable to percolate through the ground due to seasonally high water perched groundwater levels.

Settlements at most risk of groundwater flooding are those that lie at the base of steep sided valleys such as Bodicote, Hook Norton and Steeple Aston where the potential for receiving and passing on ground water likely to cause flooding is the greatest.

The SFRA does not specifically identify groundwater flooding as a significant flood source at the proposed site.

Flooding from Sewers

It should be noted that much of the sewer network dates back to Victorian times, some of which is of unknown capacity and condition. More recent sewers are likely to have been designed to the guidelines in 'Sewers for Adoption' (WRC, 2006). These sewers tend to have a design standard of up to the 1 in 30 year storm event (equating to approximately a 1 in 5 year flood flow), although in many cases, it is thought that this design standard is not achieved, especially in privately owned systems.

It is therefore likely that parts of the sewer system will surcharge during large, high intensity rainstorm events resulting in frequent flooding, particularly if the systems are combined and if climate change forecasts are correct. Due to the limited capacities and design standards, the level of risk posed by and probability of sewer flooding is therefore greater than that of fluvial flooding, where the SFRA examines the 1 in 100 and 1 in 1000 year return periods.

Developments within Cherwell have historically been piped to watercourses due to the local geology. Discharges from older (generally preceding 1970) development are often unattenuated exacerbating the flashy responsiveness of the Districts fluvial systems to rainfall.

The SFRA has not specifically identified the proposed site or adjacent areas to be at risk to sewer flooding. Therefore taking this information into account with the site topography, flooding from sewer sources at this site is assessed to be low.

Flooding from Reservoirs, Canals and Other Artificial Sources

Artificial sources include reservoirs, canals and lakes where water is retained above natural ground level.

Oxford Canal

The Oxford Canal runs parallel to the River Cherwell and merges with it at two points within the District, sharing the same channel for 1.5km within the middle reach. A series of locks control water levels along the Oxford Canal with a series of overflow weirs ensuring any excess flows in the canals are diverted to the River Cherwell. During flood conditions the River Cherwell and the Oxford Canal are largely co-joined and therefore comments regarding the surcharging of the canal and the scope for flood protection and compensation are as for main rivers.

British Waterways have provided locations of points along the Oxford Canal where breaching occurred during the Summer 2007 flood event. Should any proposed development be located near the canal or one of the breach points, a detailed site specific FRA should be undertaken to determine residual risks from breaching or overtopping. If the development proposals are of a significant scale, then a Level 2 SFRA should be considered for the area that will also address the residual risks of breaching or overtopping.

Redundant Industrial Processes

Operational and redundant industrial processes such as mining, quarrying and sand and gravel extraction can pose a flood risk when pumping ceases and groundwater returns to its natural level.

Reservoirs

Cherwell District has two main reservoirs being Clattercote reservoir (which used to feed the Oxford Canal) and Grimsbury Reservoir. There is currently no flood risk data available for the reservoirs. However, the residual risks of overtopping or failure of the reservoirs needs to be taken into account when specifying development downstream.

Infrastructure Failure

Flooding may result from the failure of engineering installations such as flood defence, land drainage pumps, sluice gates and floodgates. Hard defences may fail through the slow deterioration of structural components such as the rusting of sheet piling, erosion of concrete reinforcement and toe protection or the failure of ground

anchors. Such deterioration is often difficult to detect, so that failure, when it occurs, is often sudden and unexpected. Failure is more likely when the structure is under maximum stress, such as extreme fluvial events when pressures on the structure are at its most extreme.

In Cherwell District, the EA have major flood defence assets at Grimsbury (in Banbury) and Kidlington. The council presume as a principal that they are maintained effectively but will consider for each of them the effect of a catastrophic structural failure resulting in rapid inundation of protected areas. It is considered that overtopping of such structures during conditions more severe than for which they have been designed would not itself lead to rapid inundation.

The Environment Agency Flood Risk maps do not show any flood risk extents as a result of reservoir flooding in the vicinity of the site. Therefore a detailed breach and overtopping assessment does not need to be undertaken as the proposed development is not considered to be immediately downstream or within the direct flow path or floodplain of any watercourses which are downstream of EA defined reservoir catchment areas.

The proposed development is not considered to be immediately downstream or within the direct flow path or floodplain of these artificial influences and hydrological features.

On the basis of the above information the potential risk of flooding from artificial sources at this site is assessed to be low.

3.4 Existing Flood Defences in the Study Area

The National Flood and Coastal Defence Database (NFCDD) identifies a significant number of flood defences throughout the study area, which are classified as fluvial defences. These include major defence assets at Grimsbury in Banbury, which is built to a 1:200 year protection and Kidlington, which is built to a 1:100 year protection.

According to the SFRA, the defences in the Cherwell District use a range of methods of protection including embankments, walls, culverts and gabions with the standard of protection of these defences varying from 2 to 200 years. Many of the fluvial defences have a design standard less than 5 years (excluding some major defences) therefore a flood event of a larger magnitude would be expected to result in flooding despite the presence of a flood defence.

With this in mind the efficient operation of channels and culverts is paramount if the existing standard of flood defence is to be maintained for the SFCA Study Area. This requires maintenance by the defence owners which include Local Authorities and private owners or by the responsible drainage authority where appropriate remedial action does not take place.

There are no formal flood defences owned or maintained by the Environment Agency within the proposed development area. The site does not appear to currently benefit directly from formal flood defences.

3.5 Focussed Settlement Assessments

The Non-Statutory Cherwell Local Plan (NSCLP) 2011 seeks to focus the majority of development in the urban areas of Banbury and Bicester, together with a proposed new settlement at the former RAF Upper Heyford. With the exception of Green Belt Villages, rural settlements are divided into three categories classified according to their size, location and range of services and facilities:

- Category 1 Villages (12 villages) where the most significant development is likely to be permitted in a rural setting;
- Category 2 Villages (51 villages) where limited development comprising infilling and conversion is likely to be acceptable;
- Category 3 Villages where there is little potential for development other than conversions or dwellings essential for agriculture.

Villages have been provisionally divided into three broad categories;

- Type A Villages (high level of sustainability),
- Type B Villages (medium level of sustainability),
- Type C Villages (low level of sustainability).

The proposed site (Upper Heyford) is categorised as a Category 2 Type C area.

3.6 Impact of Climate Change

Flood risk management measures to improve the resilience of existing assets should take climate change into account over the anticipated lifetime of the asset. These measures to take account of climate change can follow two generic approaches;

1. precautionary approach; incorporating mitigation measures for potential climate change now.
2. managed adaptive approach; making provision for mitigation measures to be undertaken at a future date when it is likely that there will be greater certainty on the effects of climate change on parameters such as river flow and rainfall.

In the UK precautionary allowances for net sea level rise and other parameters such as wind speed, wave height, river flow and rainfall intensity are provided by the UK Climate Impacts Programme (UKCIP, 2009). The EA recommends that unless a site is particularly vulnerable, simple uplift ratios (defined by Defra within Flood and Coastal Defence Appraisal Guidance FCDPAG3 and given in Table 1 below) can be used to make a baseline assessment of the potential impact of climate change on an asset. UKCP09 predictions can be used for sites with particular vulnerability and the EA are currently working with Defra to translate these more recent figures for FRA use and application.

Where sites are at risk of flooding from fluvial, surface water or other modelled flood data as identified by the Environment Agency a site specific FRA will assess the impact of climate change notably increased sea level, rainfall intensity and peak river flow in more detail to determine potential impacts during the design life of assets identified as being vulnerable to flood risk.

Table 1: Predicted climate change variables

	1990-2025	2025-2055	2055-2085	2085-2115
Net sea level rise (mm/yr)	4.0	8.5	12	15
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%	+20%	+20%
Offshore wind speed	+5%	+5%	+10%	+10%
Extreme wave height	+5%	+5%	+10%	+10%

In addition to this, NPPF requires that the effects of climate change should be taken into account to ensure sustainable development now and in the future.

As the site is within Flood Zone 1, assessment does not need to be made for peak river flows. However allowances have been made for a potential increase in peak rainfall intensity in the development of the outline drainage strategy for this site. Refer to Section 5.

4.0 FLOOD MITIGATION & WATERCOURSE MANAGEMENT

4.1 Sequential Test

'More Vulnerable' developments should, according to the Sequential Test, only be permitted in Flood Zone 3a if the Exception Test is passed (see Table 3-1, NPPF). The Exception Test should only be applied once the Sequential Test has been applied to the site and passed. To pass the Exception Test, the development must fulfil the following requirements:

a) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared. If the DPD has reached the 'submission' stage – see Figure 4 of PPS12: Local Development Frameworks – the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal;

b) The development should be on developable, previously-developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable previously-developed land; and

c) A FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The Exception Test should only be applied in partnership with the Local Planning Authority. For successful application it is important that the argument presented for justification through the Exception Test is in line with policies set out in Local Plans and Local Development Frameworks and supported by reference to other national policies such as the development of Brownfield (previously developed) sites.

More vulnerable developments are compatible with Flood Zones 2 and 1 and less vulnerable developments are compatible with Flood Zones 1, 2, and 3a but not Flood Zone 3b. See Table 3- 1.

The Sequential and Exception Tests should be carried out by the Local Planning Authority, in line with NPPF. This Flood Risk Assessment supports part c of the Exception Test.

Table 3-1 Copy of Table 3, Technical Guidance to the NPPF: Flood Risk Vulnerability 'compatibility'

Flood Risk Vulnerability Classification (see Table D2 of NPPF)		**Essential Infrastructure**	**Water Compatible**	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**
Flood Zone (see Table 1 NPPF)	**Zone 1**	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	***X***	Exception Test required	✓
	Zone 3b 'Functional Floodplain'	Exception Test required	✓	***X***	***X***	***X***

*Where ✓ means the development is appropriate and **X** means the development should not be permitted*

Outcome for the Proposed Development

The site previously housed a gymnasium as part of the RAF and USAF operations at the adjacent air base. The site specific Flood Risk Assessment has confirmed that the site is located within Flood Zone 1, being land assessed as having less than a 1 in 1000 year average annual probability of flooding (<0.1%). In accordance with NPPF the proposed development is classified as being 'less vulnerable' which is appropriate in Flood Zone 1.

In accordance with the requirements of the NPPF Technical Guidance the site passes the Sequential Test and is appropriate for development.

4.2 Site Access and Egress

A review of the flood zone maps confirms that the site will have safe, dry access / egress from Camp Road.

4.3 Predicted Flood Impacts Elsewhere

Loss of Floodplain Storage

The proposed development site is located in Flood Zone 1 – outside of the flood plain of the 1 in 100year (1%) and 1 in 1000year (0.1%) flood events. Consequently there will be no loss of storage and/or attenuating capacity of the functional floodplain as a result of the changes from the proposed development.

Afflux

Afflux is considered to be the rise in water level (above normal) on the upstream of a particular structure due to obstruction caused when the effective flow area at the obstruction is less than the natural width of the stream immediately upstream of the obstruction.

All construction works including temporary works will be undertaken in accordance with method statements agreed with the Local Authority/Environment Agency.

It is therefore envisaged that the risk that construction debris and materials from the proposal could enter the local drainage ditch and reduce the conveyance to be negligible.

Increased Surface Runoff

Any post development runoff that exceeds the predevelopment runoff rate will be stored on-site (at source). All runoff from the site will be limited by hydraulic control devices such as a hydro brake to the pre-development runoff rate.

It is envisaged that the proposed drainage strategy outlined in Section 5 of this report will adequately manage the surface runoff produced resulting in no net change in surface runoff from the site.

Exceedence

The main residual risk considered to apply to the proposed surface water scheme is that arising from exceedence of the new drainage system's capacity in weather conditions above the design standard. In such circumstances there is a high risk of excess run-off being unable to be accommodated within proposed the drainage system and instead flowing overland. In addition, even unpaved areas are likely to generate excess run-off in prolonged wet weather as the ground reaches saturation.

The development layout and detailed design of individual buildings will account for likely flowpaths of such water and ensure that appropriate corridors are provided to give a continuous but controlled route through the development for overland flow.

A site levels scheme has not currently been prepared for the site. When determining site levels consideration will be given to the impact of events which exceed the proposed sewer network.

5.0 DRAINAGE STRATEGY

The Environment Agency Indicative Flood Zone Map of the area illustrates that the site lies within Flood Zone 1. The surface water strategy is therefore bound by good practice, the requirements of NPPF and the guidance as set out in the SFRA. These requirements will ensure that the proposed development does not pose a flood risk to third parties.

The following constitutes an outline drainage strategy, which will form the basis of the detailed design work.

The objectives of the drainage strategy are to:

- Manage surface water runoff on site to minimise flood risk;
- Manage surface water discharge from the site so that it does not pose a threat to third parties flood risk;
- To ensure ongoing operation and maintenance through appropriate management / adoption.

Predevelopment Runoff Rates

Runoff rates have been calculated for the site catchment area of 5.97 ha using the IoH124 methodology using the Windes suite of software and are shown below. The results show the runoff over the whole site (5.97ha).

- QBAR Rural 26.1l/s
- Q1 year 22.2/s
- Q30 years 59.2/s
- Q100 years 83.3l/s

Sustainable Drainage Systems (SUDS)

Although the site has previously housed a gymnasium, the development will result in an increase in impermeable area and consequently implementing SuDS drainage features throughout the site is required so that the surface water run-off from the site is mitigated in a sustainable manner.

The surface water drainage strategy has been built upon sustainable principles and has been a major influence in the production of the current Masterplan for the site. This Development, although phased, is for a single user and as such the approach has been to control the surface water runoff within the site boundary (i.e. at source) with sufficient capacity for the later phases

The palette of materials used will be critical in achieving a sustainable development in accordance with SuDS best practice. Where possible the following can be considered;

Permeable Pavement	Reduces surface water run-off by absorption, evaporation and infiltration where possible
Rainwater Harvesting	Allows reuse of surface water run-off from roofs for grey water uses
Green Roofs	Where appropriate can significantly reduce surface water run-off and volumes
Clay tiles	Allows absorption and evaporation of water
Attenuation	Attenuation at individual property level will reduce the run-off rates entering into the drainage networks.

Swales	Can be provided along the edge of the roads – allows infiltration where possible, but has limited capacity and on a steep site will need to be carefully designed, so as to not cause residual flooding from overtopping and seepage
Box Culverts (should be considered only if conventional SuDS solutions are not appropriate)	Can be constructed underneath the highway and controlled using a flow control. Will not reduce the volume of surface water.
Cellular / Granular Tanks	Can be provided under public open space, with the possibility of an open base to allow potential infiltration, this will need to be carefully engineered to prevent seepage. Can be fully lined, and controlled with an outlet flow control.
Filter Strips	These are areas of gently sloping grass or other dense vegetation that treat runoff from adjacent impermeable areas.
Filter drains and perforated pipes	Filter drains are trenches that are filled with permeable material. Surface water from the edge of paved areas flows into the trenches, is filtered and conveyed into the drainage network, usually by a perforated pipe built into the base of the trench.
Pervious surfaces	As the at source detail, these allow absorption and infiltration through the surface, where if possible can be infiltrated to the ground or attenuated within a permeable sub-base.

In considering these available option, due cognisance is taken of Approved Document H of the Building Regulations which provides a hierarchy of how surface water runoff should be managed. Where practicable the following hierarchy should be followed:

- Discharge by infiltration to ground water
- Discharge to watercourses
- Discharge to public sewers

Clearly infiltration to the ground is the preferable form of drainage, it has the advantages of not imposing any additional flows on the downstream infrastructure and also assists in replenishing the local aquifers.

The desk study undertaken alongside this work has indicated that the prevailing geology is:

Topsoil/Subsoil:	Unknown type and depth
Superficial:	None
Solid:	Weathered Great Oolite Group (Clay)
	Great Oolite Group (Limestone) – extending to depth

The upper clay layers are unlikely to support percolation or soakaway drainage, however the lower limestone layers may support this form of drainage and it is expected that as part of the detailed design process an intrusive Ground Investigation will be undertaken including percolation tests in accordance with BRE Digest 365.

Should this show that the limestone layer is capable of supporting percolation and that it is encountered at suitable depth this form of drainage will be adopted.

However, the presence of an established watercourse close to the site boundary indicates that the limestone may be at significant depth or generally unfissured. As a consequence of this the current drainage strategy has to view percolation drainage as a possibility rather than a probability.

Consequently discharge to watercourse is the next available method in the hierarchy along with suitable on site attenuation to limit the flows reaching the receiving watercourse. The attenuated flows are stored in an open pond that is normally dry but fills in times of excess rainfall. The depth of this pond may allow some infiltration into the limestone layer depending on the actual levels of the various strata, however no allowance has been made at this time for and benefits of infiltration.

Considering the various measures outlined above the following systems have been adopted within the drainage strategy:

Permeable Paving:	Other than the car park area these materials are unlikely to be durable enough for the majority of the external paving;
Rainwater Harvesting:	Has been included, but assessments of the required attenuation volume have assumed that the harvesting tanks are full at the time of the critical storm to ensure a worst case assessment;
Green Roofs:	These are incompatible with efficient rainwater harvesting;
Clay Tiles:	The roof area and pitch is not suitable for this material;
Attenuation:	Is provided in the form of an open dry pond. The area will be grassed and used to store surface water in events where the runoff exceeds the limiting discharge;
Swales:	Filter drains have been employed along the internal circulation road;
Box Culverts:	Have not been employed, preference has been given to an open pond for attenuation;
Cellular or Granular Tanks:	Have not been employed, preference has been given to an open pond for attenuation;
Filter Strips:	The filter drain alongside the internal circulation road incorporates a filter strip;
Filter Drains and Perforated Pipes:	Filter drains have been employed along the internal circulation road; and
Pervious Surfaces:	Other than the car park area these materials are unlikely to be durable enough for the majority of the external paving;

5.1 Flood and Water Management Bill

The Flood and Water Management Act 2010 sets out new legislation which gives the role of SUDs approval and adoption to a SUDs approving body (SAB). The Act requires SAB approval for drainage in new developments before construction can commence.

This drainage strategy is put forward on the basis of current best practice, with consideration given to:

- Implementation of a SUDs hierarchy
- Location of proposed SUDs features within areas of public open space with appropriate access for maintenance.
- Effective outfall – to ground or watercourse
- Effective exceedence design

All private drainage will be constructed in accordance with Building Regulations and relevant British Standards.

5.2 Surface Water Strategy

Surface water runoff is generated by roofs and paved areas, these will be designed to fall to collection components such as gutters (in the case of roofs), gullies, surface drainage channels and filter drains depending on the location.

The outlets from this will be connected to below ground surface water drains. The following different methods of treatment will be incorporated:

Roofs will be collected and diverted to rainwater harvesting tanks located adjacent to the building. Only when these tanks are full will overflow roofwater be allowed to enter the surface water sewer network.

Paved areas such as the service yard and car park will be passed through a class 1 petrol interceptor prior to discharge. This interceptor will be a full retention type at the service yard and a bypass type in the car park where lower risks of spills and pollution are present.

Outfall will be made to the watercourse adjacent to the western boundary. The outflow from the site will be controlled to pre-development runoff rates. A complex flow control is envisaged with low return period storms being limited to Qbar using a Hydrobrake and a second stage high level Orifice Plate allowing additional discharge limiting the total outflow to the 1/100year pre-development runoff figure.

An attenuation pond has been sized to accommodate the maximum storage associated with the 1/100year plus 30% climate change event for the full phase 2 development based on attenuation to the 1/100 year pre-development runoff.

The drainage strategy for both phases is shown in Appendix C

5.3 Foul Water Strategy

The nearest sewers are located in Camp Road to the west of the site. It is proposed to collect foul sewage from the units by gravity and deliver this to a private pumping station within the boundary of the site.

From here the foul flows will be pumped west along Camp Road to make outfall to the Thames Water Foul sewer at manhole 6703 or 6704.

This proposal is subject to there being sufficient capacity in the receiving system, approval from Thames Water and an agreement with the highway authority to place private apparatus within the highway.

In the event that this is not possible there is precedent from the caravan park across the road from the site for the construction of an onsite treatment facility with discharge to the watercourse adjacent to the western boundary of the site. In this event it is likely that an underground package treatment plant would be utilised.

5.4 Ownership and Maintenance

The storm and foul system will be wholly contained (other than outfall pipes) within the boundary of land controlled by E P Barrus and will be solely for their own use.

As such both foul and stormwater systems will remain private and will be maintained and managed by E P Barrus and their appointed contractors.

6.0 SUMMARY and CONCLUSION

6.1 Key Points

The proposed development site is located within Flood Zone 1.

The development site previously housed a gymnasium building associated with the operations at the adjoining RAF/USAF air base.

The Flood Risk Assessment demonstrates that the site is not at risk of flooding and is appropriate for development.

It is demonstrated that surface water runoff from the site can be managed in a sustainable way, in accordance with NPPF and best practice.

The Flood Risk Assessment therefore demonstrates that flood risk on site can be managed without either risk on site or increasing flood risk elsewhere within the catchment.

It also demonstrates that the site can be developed without adversely impacting existing surface water runoff.

Overall strategies exist to drain the site without increasing risk to downstream developments and as such there should be no objection to the development on drainage grounds.

APPENDIX A – PROPOSED DEVELOPMENT LAYOUT

A1

13087 / P-10

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Index	Revision	Date	Int	Ch'kd

CAMP ROAD

CHILGROVE DRIVE

116.50

Balancing Pond

approximate extent of existing hedge

117.50

118.0

118.0

120.0

Access to site in abeyance; required input from highways engineer.

120.00

Warehouse
9,837 m²
105,880 ft²

FFL
119.50

Loading docks

Entrance

Loading shutters

Service Yard

Staff parking

Bicycle shelter

120.64

New site entrance with fence and gates

N

0 5 20m
1:500

LYONS+SLEEMAN+HOARE | **Architects**

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PROJECT WINGS

Job N	Drg N	Rev	Scale	Status	Job
13087	P-10	-	1 : 500	WORK IN PROGRESS	PROJECT WINGS

Date	Director	Author	Check	Drawing
09/10/14	SA	AH	-	PROPOSED SITE PLAN - PHASE 1

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A1

13087 / P-11

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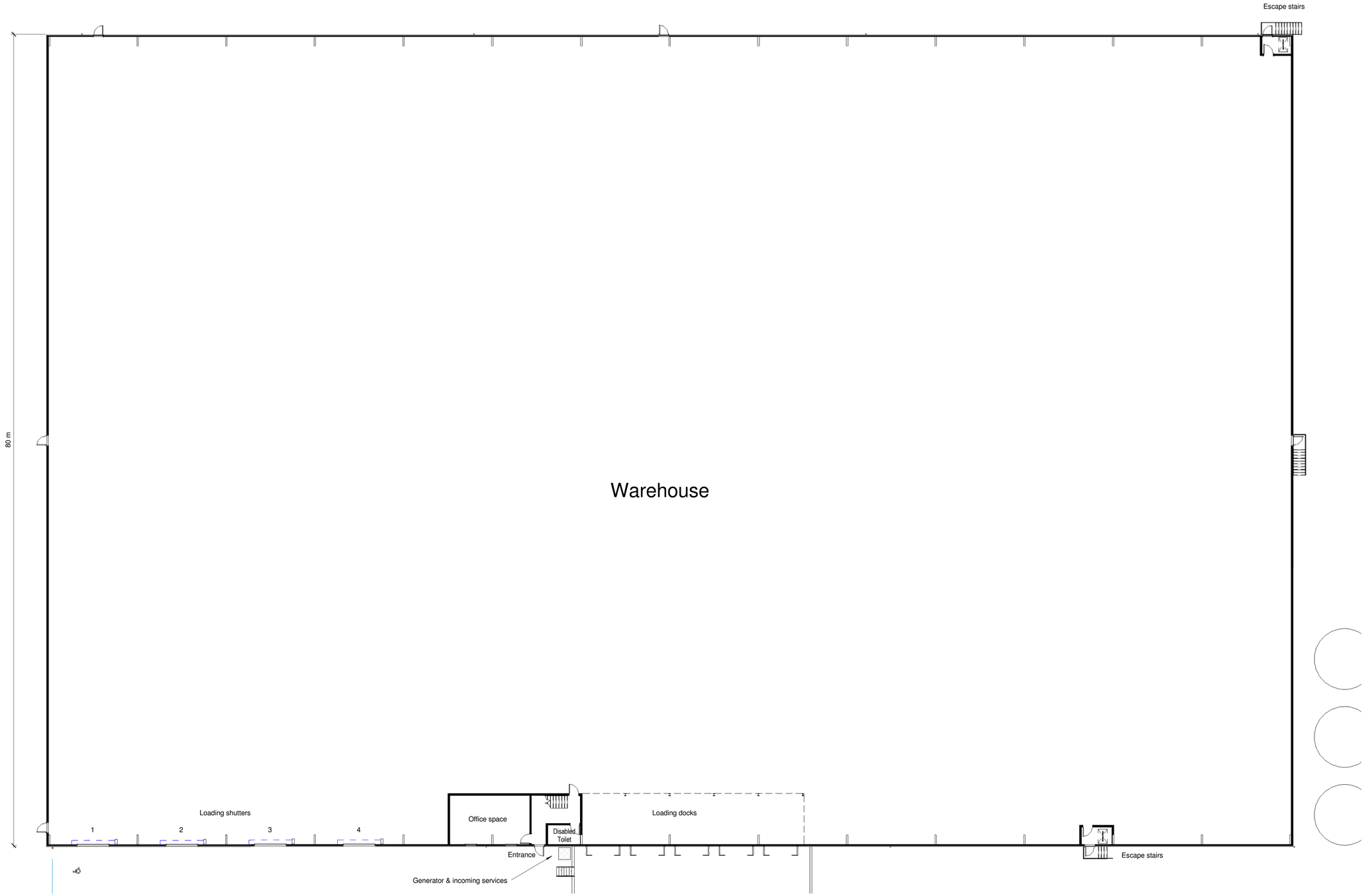
Index	Revision	Date	Int	Ch'k'd



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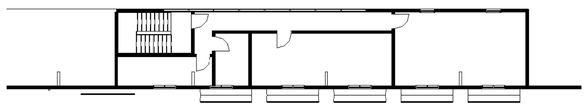

2 | P-11 - Proposed Building Plan - Mezzanine
1 : 200

0 2 8m
1:200

APPROXIMATE NORTH

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Job N° Drg N	Rev	Scale	Status	Job
13087 / P-11		1 : 200	WORK IN PROGRESS	PROJECT WINGS
Date	**Director**	**Author**	**Check**	**Drawing**
09/12/14	SA	AH	SA	PROPOSED BUILDING PLAN - PHASE 1

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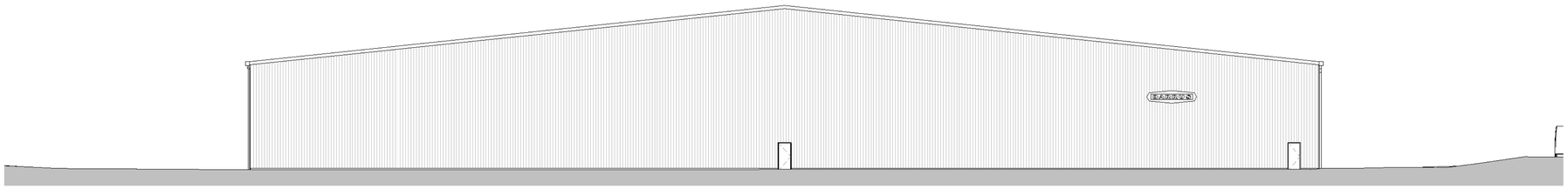

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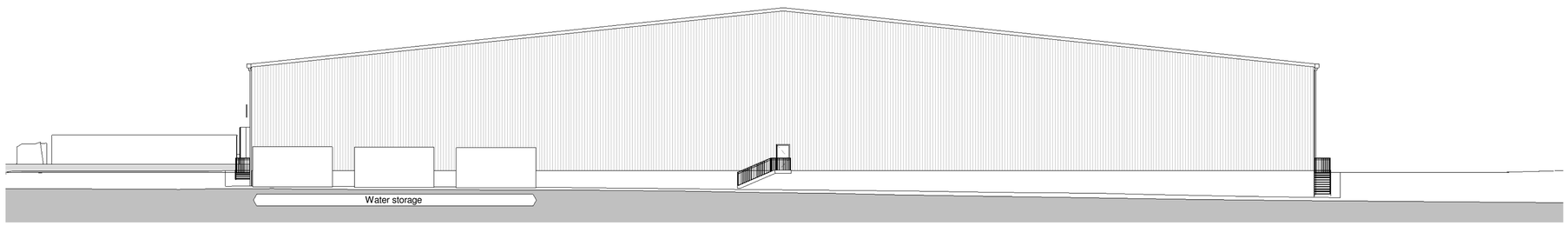
1 : 200



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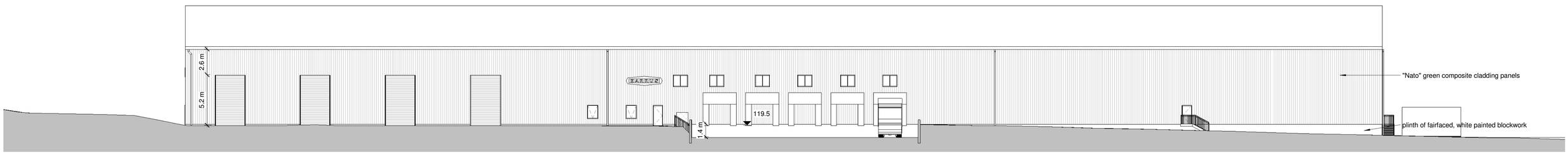
1 : 200



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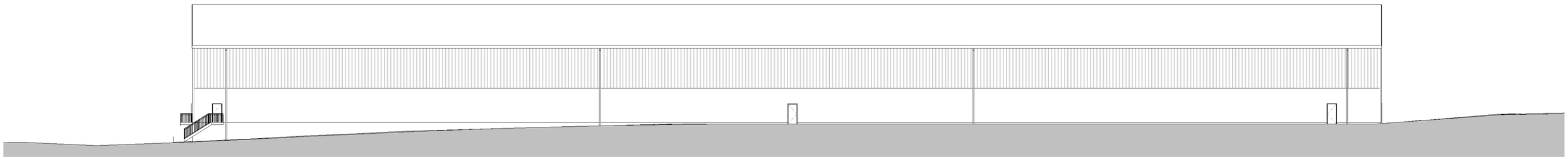
1 : 200



4 P-12 South Elevation
1 : 200

0 2 8m
1:200

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Job N° Drg N	Rev	Scale	Status	Job
13087 / P-12		1 : 200	STATUS	PROJECT WINGS
Date	**Director**	**Author**	**Check**	**Drawing**
09/10/14	SA	Designer	Checker	PROPOSED BUILDING ELEVATIONS - PHASE 1

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A1

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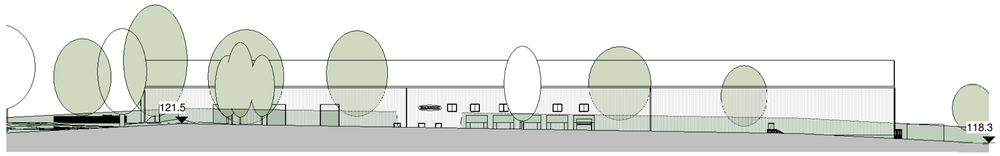
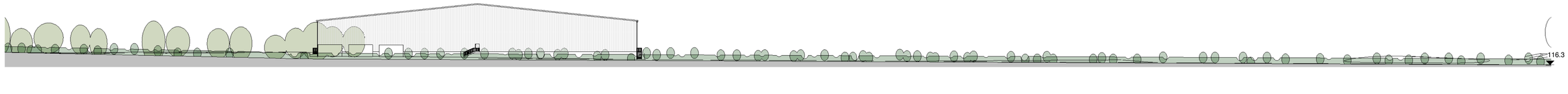


1 | P-05 North Boundary Elevation
1 : 500

4 | P-05 South Boundary Elevation
1 : 500



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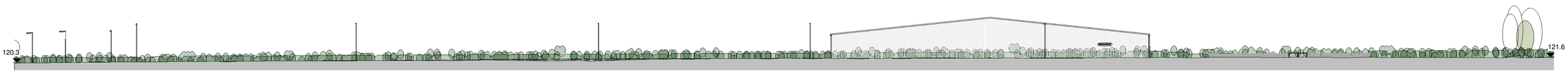

2 | P-05 East Boundary Elevation
1 : 500

0 1 4m
1:100

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13087	P-13	-	1 : 500	STATUS	PROJECT WINGS
Date		**Director**	**Author**	**Check**	**Drawing**
09/10/14		SA	AH	-	PROPOSED SITE ELEVATIONS - PHASE 1

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A3

13087 / P-14 / -

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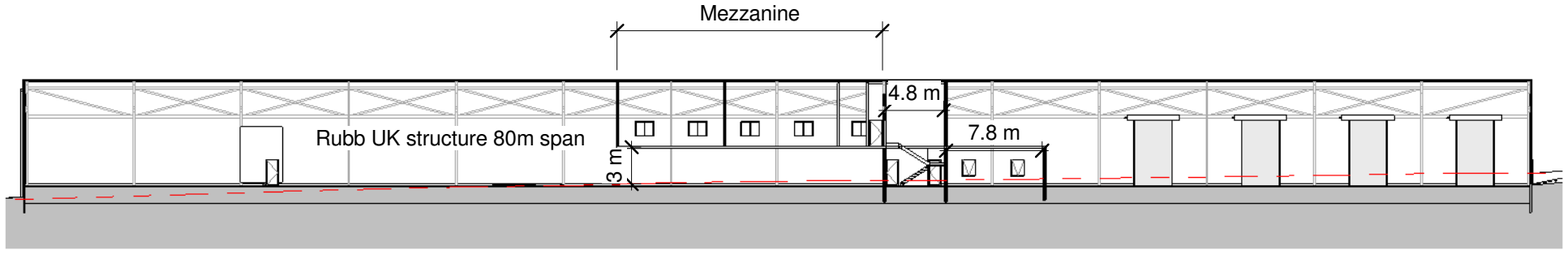

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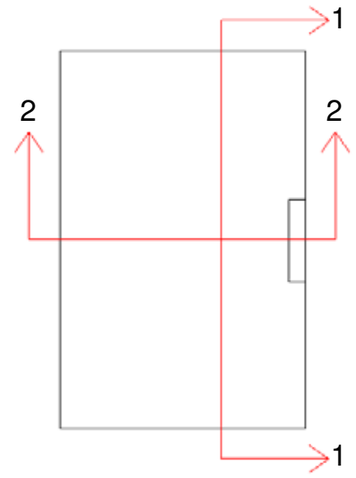

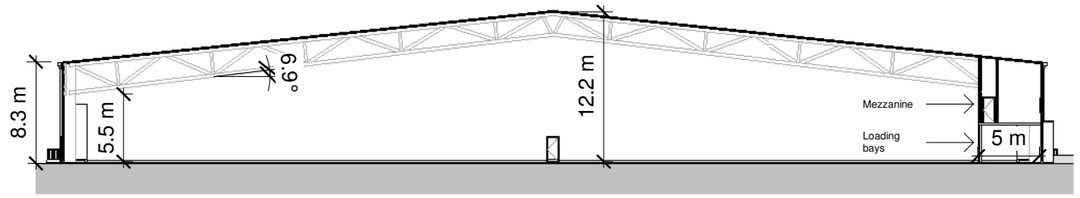

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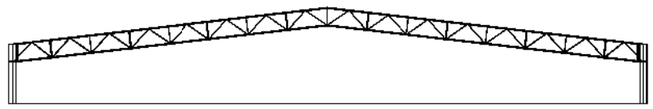

Typical Section as supplied by Rubb - NTS

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13087 / P-14	-	As indicated	WORK IN PROGRESS	PROJECT WINGS
Date	**Director**	**Author**	**Check**	**Drawing**
09/19/14	SA	LF	SA	PROPOSED SECTIONAL VIEWS - PHASE 1

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A1

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Index	Revision	Date	Int	Ch'kd

approximate extent of existing hedge

Balancing Pond

117.0

118.0

119.0

CAMP ROAD

Motorcycle spaces

visibility splay

Bicycle shelter

landscaping as HED's drawings

Offices & Training School

over two floors
3,000 m²
32,293 ft²

Phase 2

Phase 1

Means of escape and maintenance access path

rainwater storage tanks

Production
9,137 m²
98,350 ft²

Warehouse
9,844 m²
105,960 ft²

DN

ground mounted photo-voltaic panels

Generator & incoming services station

Service Yard

visibility splay

CHILGROVE DRIVE

New roadway and vehicle exit

New site entrance

Phase 2 indicitive only - subject to reserved matters

Legend

- Phase 1
- Phase 2

0 5 20m
1:500

APPROXIMATE NORTH

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Land to the West of Chilgrove Drive & North of Camp Road, Upper Heyford

Job N	Drg N	Rev	Scale	Status	Job
13087	P-20	B	1 : 500	PLANNING	Land to the West of Chilgrove Drive & North of Camp Road, Upper Heyford
Date		Director	Author	Check	Drawing
09/12/14		SA	LF	AH	PROPOSED SITE PLAN - PHASES 1 AND 2

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A1

13087 / P-23 - B

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BARRUS Est. 1947

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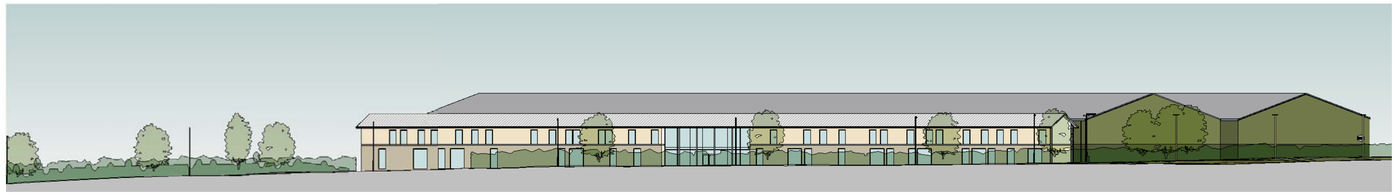
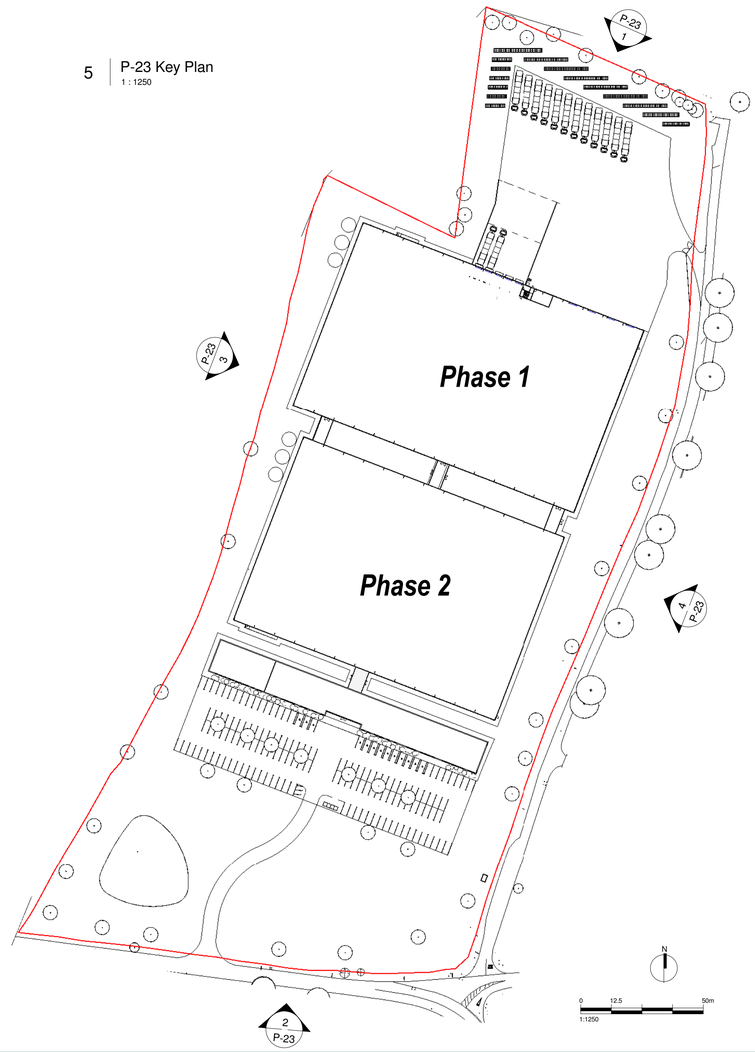


2 | P-23 South Boundary Elevation
1 : 500

3 | P-23 West Boundary Elevation
1 : 500

4 | P-23 East Boundary Elevation
1 : 500

5 | P-23 Key Plan
1 : 1250



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1:500

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Nero Brewery, Cricket Green, Hartley Wintney, Hants RG27 8QA
Tel: 01252 844144 Fax: 01252 844800 Web: www.lsharch.co.uk

Land to the West of Chilgrove Drive & North of Camp Road, Upper Heyford

Job N°	Drg N	Rev	Scale	Status	Job
13087	P-23	B	As indicated	PLANNING	Land to the West of Chilgrove Drive & North of Camp Road, Upper Heyford
Date		Director	Author	Check	Drawing
27/10/14		SA	AH	-	PROPOSED SITE ELEVATIONS - PHASE 2

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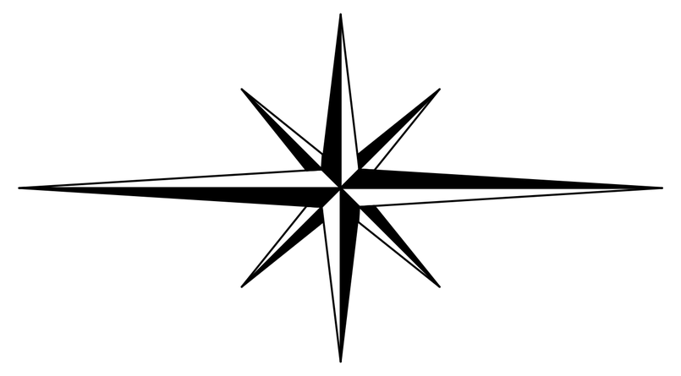
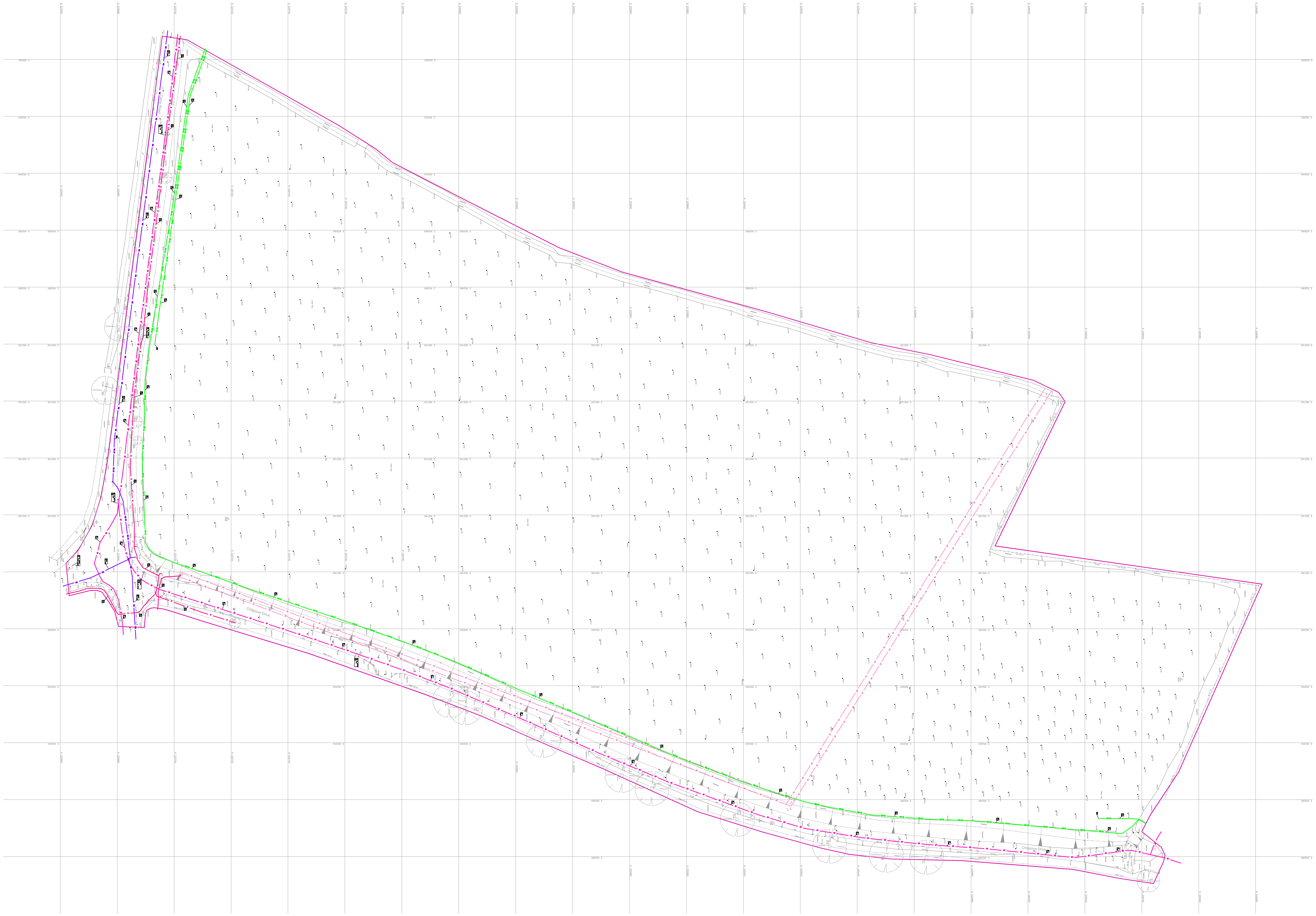
APPENDIX B – TOPOGRAPHICAL SURVEY



APPROX NORTH



0 50 METRES

CAD REFERENCE
\\2013Projects\R-M8748\R-M8748_101to105_Issue01

CTB REFERENCE
\\CTB-files\TS-Utils-v01.ctb

A0

NOTES

1. BACKGROUND PLAN INFORMATION IS BASED ON TOPOGRAPHIC SURVEY DATA CREATED BY OTHERS AND SUPPLIED TO US FOR THE PURPOSES OF PRESENTING OUR SURVEY OUTPUT. WE CANNOT BE HELD RESPONSIBLE FOR THE CONTENT, COMPLETENESS AND ACCURACY OF DATA CREATED BY OTHERS.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH All OTHER RELEVANT DRAWINGS/DOCUMENTATION.
PLEASE REFER TO TOPOGRAPHIC SURVEY DRAWING R-M8748_201-205_Issue01

3. DO NOT SCALE FROM THIS DRAWING.

4. IF IN DOUBT ASK.

5. OS COPYRIGHT
REPRODUCED FROM THE ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE, CROWN COPYRIGHT, TOWER SURVEYS, VIVIAN HSE, VIVIAN AVENUE, NOTTINGHAM. NG5 1AF. LICENCE No WL1005152.

SERVICES LEGEND

BT	UNDERGROUND BT CABLE(S)
COM	UNDERGROUND COMMUNICATIONS CABLE(S)
CTV	UNDERGROUND CABLE TV CABLE(S)
E	UNDERGROUND ELECTRIC CABLE(S)
FO	FIBREOPTIC CABLE(S)
GAS	GAS MAIN
HW	HOT WATER PIPE
OBT	OVERHEAD BT CABLE(S)
OE	OVERHEAD ELECTRIC CABLE(S)
OHC	UNIDENTIFIED OVERHEAD CABLE(S)
P	UNIDENTIFIED PIPE
SEC	SECURITY CABLING
S/L	LIGHTING CIRCUIT (WHERE IDENTIFIED)
TS	TRAFFIC SIGNAL CABLE(S)
UID-EL	UNIDENTIFIED ELECTRO LOCATION TRACE
UID-GPR	UNIDENTIFIED GPR TRACE
W	WATER SERVICE
WM	WATER MAIN
	FOUL SEWER
	SURFACE WATER SEWER
	COMBINED SEWER
	RISING MAIN
GAS AR	ASSUMED ROUTES
GAS TFR	SERVICES TAKEN FROM RECORDS
	SERVICES SURVEY AREA
MH CL 48.93	UTILITIES COMMENT BOX
elec 0.60d	DEPTH TO SERVICE (m)

INFORMATION SHOWN AS TFR HAS NOT BEEN PROVEN ON SITE

UTILITIES ABBREVIATIONS

1D 5C	1 DUCT 5 CABLES	DTS	DEPTH TO SOFFIT
AR	ASSUMED ROUTE	EBD	EXTERNAL BACKDROP
ACP	ASSUMED CONNECTION POINT	EOT	END OF TRACE
CB	CONCRETE BENCHING	FW	FOUL WATER SEWER
CBC	CIRCULAR BRICK CHAMBER	IBD	INTERNAL BACKDROP
CDP	CABLE DRAW PIT	IL	INVERT LEVEL
CL	COVER LEVEL	PCC	PRECAST CONCRETE CHAMBER
CPC	CIRCULAR PLASTIC CHAMBER	RBC	RECTANGULAR BRICK CHAMBER
CrL	CROWN LEVEL	SL	SOFFIT LEVEL
DCr	DEPTH TO CROWN	SW	SURFACE WATER SEWER
dia	DIAMETER	TFR	TAKEN FROM RECORDS
DTB	DEPTH TO BASE	UTL	UNABLE TO LIFT
DTI	DEPTH TO INVERT	UTS	UNABLE TO SURVEY
		UTT	UNABLE TO TRACE

AVAILABILITY OF STATUTORY UNDERTAKERS RECORDS DRAWINGS

TYPE	COMMENTS	TYPE	COMMENTS
SEWER	NO	CABLE TV	NO
WATER MAIN	NO	ELECTRICITY	NO
GAS MAIN	NO	OIL PIPELINES	NO
BT	NO	OTHER	NO

SERVICE LOCATION

ELECTRODETECTION AND/OR GROUND PROBING RADAR (GPR) TECHNIQUES HAVE BEEN USED TO LOCATE UNDERGROUND SERVICES SHOWN ON THIS PLAN. THESE ARE INTERPRETIVE METHODS AND IT IS THEREFORE RECOMMENDED THAT TRIAL EXCAVATIONS OR SIMILAR ARE CARRIED OUT TO CONFIRM IDENTIFICATION, LOCATION AND DEPTH OF SERVICES. ALL REASONABLE CARE HAS BEEN TAKEN AND EFFORT MADE IN SEARCHING AVAILABLE SERVICES RECORD INFORMATION. HOWEVER, THE COMPLETENESS OF INFORMATION SUPPLIED TO AND BY TOWER SURVEYS LTD CANNOT BE GUARANTEED.

IT SHOULD BE NOTED THAT CERTAIN TYPES OF SERVICES, SUCH AS PLASTIC OR CONCRETE PIPES OR CONDUITS WHERE THERE IS NO DIRECT ACCESS TO THE PIPE, ARE NOT TRACEABLE BY CONVENTIONAL ELECTRODETECTION METHODS; FOR THE LOCATION OF THESE SERVICES, EITHER RECORDS DRAWINGS SHOULD BE SOUGHT OR AN ALTERNATIVE MEANS OF OBTAINING THE INFORMATION USED.

DEPTHS OBTAINED USING GEOPHYSICAL TECHNIQUES SUCH AS GROUND PROBING RADAR ARE AFFECTED BY GROUND CONDITIONS THEREFORE MUST BE VIEWED AS INDICATIVE ONLY.

NUMBERS OF CABLES IN RUNS ARE NOT DETERMINED UNLESS SPECIFICALLY SHOWN. CABLE RUNS BETWEEN DRAWPITS ARE ASSUMED STRAIGHT UNLESS OTHERWISE SHOWN.

DEPTHS TO TRACED METALLIC PIPEWORK REFER TO PIPE CENTRE.

PIPE RUNS ARE ASSUMED STRAIGHT BETWEEN CHAMBERS UNLESS OTHERWISE INDICATED.

ALL SERVICES ARE UNDERGROUND EXCEPT WHERE INDICATED.

PLEASE NOTE THAT TOWER SURVEYS LTD ARE NOT PERMITTED TO INVESTIGATE ANY TELECOMMUNICATIONS APPARATUS, OTHER THAN EXISTING EXPOSED FEATURES. THEREFORE THIS INFORMATION MAY NOT APPEAR ON SURVEY DRAWINGS.

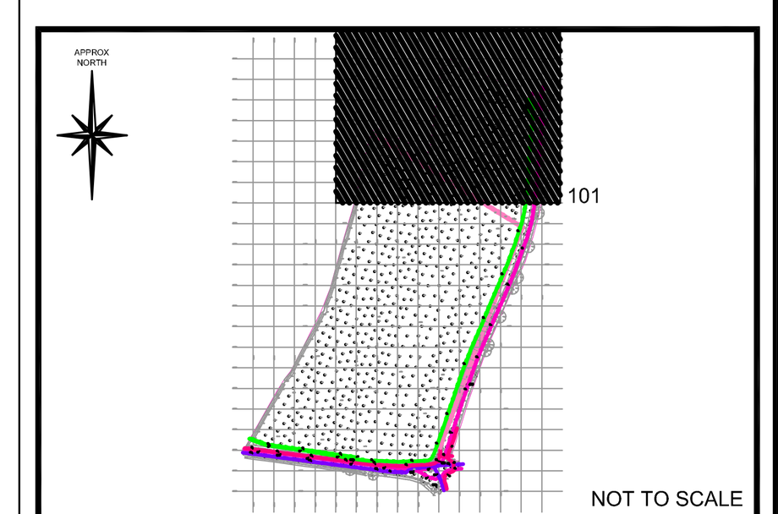
A FULL SET OF TOWER SURVEYS TERMS AND LIMITATIONS IS AVAILABLE ON REQUEST.

PLEASE REFER TO TOPOGRAPHIC SURVEY DRAWING R-M8748_201-205_Issue01

INFORMATION SHOWN AS TFR HAS NOT BEEN PROVEN ON SITE.

PLEASE NOTE OUR CAD LAYERING CONVENTION CONTAINS FURTHER INFORMATION.

IT IS INTENDED THAT THIS DRAWING BE REPRODUCED IN COLOUR.



NOT TO SCALE

GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR

DRAWING STATUS

INFORMATION

Tower Surveys
Chartered Surveyors
Geomatics-Land, Engineering & Building
RICS

1 SOUTH HOUSE
BOND AVENUE
BLETCHLEY
MILTON KEYNES
MK1 1SW
TEL:+44 (0)1908 399780
FAX:+44 (0)1908 201587
info@towersurveys.co.uk
www.towersurveys.co.uk

CLIENT
LSH ARCHITECTS

PROJECT TITLE
UPPER HEYFORD
PROJECT WINGS

DRAWING DETAIL
BURIED SERVICES SURVEY AS OF 10/12/13

DRAWN	SH	DATE	DECEMBER 2013
PROJECT ENGINEER	SH		
CHECKED	NJD	SCALE	1:500 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER R-M8748/100

REVISION

APPENDIX C – DRAINAGE STRATEGY PLAN

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 698 Urban 0.000
Area (ha) 5.966 Soil 0.450 Region Number Region 6

Results l/s

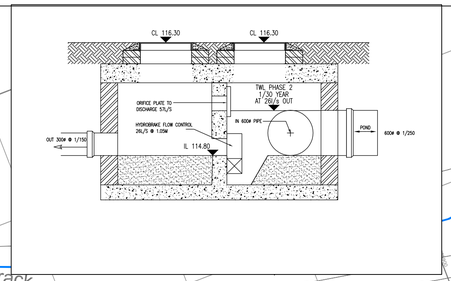
QBAR Rural 26.1
QBAR Urban 26.1

Q100 years 83.3

Q1 year 22.2
Q30 years 59.2
Q100 years 83.3

DO NOT SCALE THIS DRAWING FOR CONSTRUCTION PURPOSES.

CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ENGINEER



115.8m

Ponds

Track

CONTROLLED DISCHARGE TO WATERCOURSE

COMPLEX CONTROL CHAMBER COMBINED HYDROBRAKE AND ORIFICE TO LIMIT RUNOFF TO 1/100 YEAR GREENFIELD (83/ls). HYROBRAKE ONLY TO LIMIT FLOW TO Q BAR(26L/S). ORIFICE PLATE INVERT TO BE SET AT 1/30 YEAR TOP WATER LEVEL FOR PHASE 2.

PUMP TO PUBLIC SEWER

300Ø @ 1/150

S23
CL=116.30
IL=114.80

600Ø @ 1/250

600Ø @ 1/189

S14
CL=116.75
IL=115.25

600Ø @ 1/216

S13
CL=117.00
IL=115.50

600Ø @ 1/161

S12
CL=117.30
IL=115.88(525Ø)
IL=115.81(600Ø)

525Ø @ 1/132

450Ø @ 1/250

S11
CL=118.10
IL=116.78(300Ø)
IL=116.63(450Ø)
IL=116.56(525Ø)

300Ø @ 1/150

S10
CL=118.20
IL=117.00

450Ø @ 1/100 OVERFLOW FROM RA RAINWATER HARVESTING TANKS TO SURFACE WATER SEWER

PS1:
PUMPING CHAMBER TO TAKE ROOF WATER TO ABOVE GROUND HARVESTING TANKS
CL:118.35
INCOMING IL:116.678 (375Ø)
IL:115.607(450Ø)

1:4 SIDE SLOPE

1/149

1/100

1/128

115.33

POND TO PROVIDE STORAGE FOR 1/100+CC STORM LIMITED TO 1/100 YEAR GREENFIELD RUNOFF 83l/s. BASE AREA ≈1600m² SIDE SLOPES AT 1/4

1/115

115.21

GABION RETAINING WALL

1/128

1/100

115.65

3M MAINTENANCE STRIP AROUND POND

ABOVE GROUND RAINWATER HARVESTING TANKS

S4
CL=117.30
IL=116.03(375Ø)
IL=115.96(450Ø)

ROOFWATER RUNOFF TO BE COLLECTED IN ABOVE GROUND RAINWATER HARVESTING TANKS WITH OVERFLOW DISCHARGE TO STORM SEWER SYSTEM

ROOF AREA 9840m² GIVES RUNOFF @ 75mm/hr OF CIRCA 200l/s

375Ø @ 1/150

375Ø @ 1/250

300Ø @ 1/75

S9
CL=119.50
IL=117.72

300Ø @ 1/150

PETROL INCEPTOR

CLASS 1 FULL RETENTION

S8
CL=119.45
IL=118.12

S3
CL=119.50
IL=116.96(300Ø)
IL=116.89(375Ø)

Warehouse
FFL 119.50
9,844 m²
105,960 ft²

S5
CL=119.35
IL=116.66(225Ø)
IL=116.51(375Ø)

300Ø @ 1/250

F1
CL=119.50
IL=118.50

SURFACE WATER DRAINAGE TO SERVICE YARD TO BE BY GULLIES/CHANNELS DISCHARGED VIA PETROL INTERCEPTOR

300Ø @ 1/150

S2
CL=119.50
IL=117.18(225Ø)
IL=117.10(300Ø)

Service Yard
Concrete

S7
CL=119.62
IL=118.42

100Ø @ 1/80

225Ø @ 1/37

"ACO" DRAINAGE CHANNEL

225Ø @ 1/33

S6
CL=119.35
IL=118.23

S1
CL=119.50
IL=118.38

100Ø @ 1/80

F2
CL=119.50
IL=117.85

F3
CL=119.35
IL=116.66(100Ø)
IL=116.61(150Ø)

RISING MAIN

PRIVATE PUMPING STATION WITH 24 HOUR STORAGE OF 1 DWF TO COMPLY WITH BUILDING REGULATIONS

PS3
CL=118.63
IL=115.66

150Ø @ 1/150

150Ø @ 1/150

150Ø @ 1/150

F8
CL=119.35
IL=115.98(100Ø)
IL=115.88(150Ø)

F5
CL=119.35
IL=116.06(100Ø)
IL=116.01(150Ø)

Chilgrove Drive

Guide Post

120.3m

1.22m RH

Def

CHILGROVE DRIVE

1.22m RH

226

DWG INFO: M:\CLARKEBOND UK LIMITED\BRISTOL PROJECTS\WB03671 - PROJECT WINGS UPPER HEYFORD\DRAWINGS\CURRENT\WB03671-C-SK01-SK02-SK03-SK04 DRAINAGE STRATEGY

Client	
E P BARRUS LIMITED	
Project	
PROJECT WINGS UPPER HEYFORD	
Drawing Status	
PRELIMINARY INFORMATION	

Rev	Detail	By	Chk	Date
Revisions				

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web www.clarkebond.com
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Drawing Title			
DRAINAGE STRATEGY PHASE 1			
Project No.	Discipline	Drawing No.	
WB03671	C	SK01	
Scale	Date	Revision	
1:500 @ A1	24.10.14	A	
Drawn	Checked	Sheet Size	
SAP	AJ	A1	

DO NOT SCALE THIS DRAWING FOR CONSTRUCTION PURPOSES.

CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ENGINEER

N

226100m

226000m

225900m

225800m

225700m

Letchmere Farm Cottage

TRENCHARD CIRCLE

Play Area

Ponds

SODEN ROAD

LARSEN ROAD

Tennis Courts

Tennis Court

6704

6703

118.7m

119.1m

115.8m

Ponds

EXISTING TREATMENT PLANT

Track

Guide Post

Def

NOTES:
1. FOR DETAILS OF ONSITE DRAINAGE WORK REFER TO DRAWINGS WB03671_SK01–SK02.
2. LEVELS AND POSITION OF ALL OUTFALLLS TO BE CHECKED AND CONFIRMED PRIOR TO CONSTRUCTION.

Rev	Detail	By	Chk	Date
Revisions				

Client: E P BARRUS LIMITED

Project: PROJECT WINGS UPPER HEYFORD

Drawing Status: PRELIMINARY INFORMATION

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Bristol Exeter London Abu Dhabi

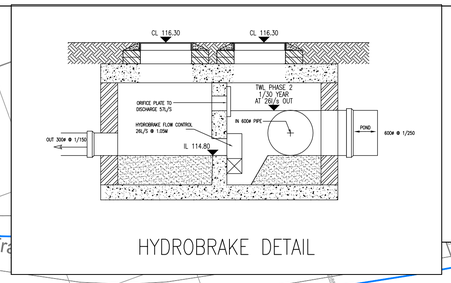
Drawing Title: DRAINAGE STRATEGY PHASE 1 OVERVIEW

Project No.	Discipline	Drawing No.
WB03671	C	SK03

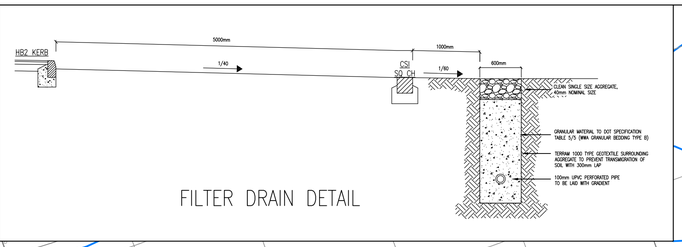
Scale	Date	Revision
1:1000 @ A1	27.10.14	A

Drawn	Checked	Sheet Size
SAP	AJ	A1

DWG INFO: M:\CLARKEBOND UK LIMITED\BRISTOL PROJECTS\WB03671 - PROJECT WINGS, UPPER HEYFORD\DRAWINGS\CURRENT\WB03671_C_SK01_SK02_SK03_SK04_DRAINAGE STRATEGY



HYDROBRAKE DETAIL



FILTER DRAIN DETAIL

DO NOT SCALE THIS DRAWING FOR CONSTRUCTION PURPOSES.

CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ENGINEER

N

CONTROLLED DISCHARGE TO WATERCOURSE

COMPLEX CONTROL CHAMBER COMBINED HYDROBRAKE AND ORIFICE TO LIMIT RUNOFF TO 1/100 YEAR GREENFIELD (83/s). HYROBRAKE ONLY TO LIMIT FLOW TO Q BAR(26L/S). ORIFICE PLATE INVERT TO BE SET AT 1/30 YEAR TOP WATER LEVEL FOR PHASE 2.

PUMP TO PUBLIC SEWER

300Ø @ 1/150

S23 CL=116.30 IL=114.80

600Ø @ 1/250

600Ø @ 1/189

S14 CL=116.75 IL=115.25

1:4 SIDE SLOPE

114.9

1/100

1/128

1/115

POND TO PROVIDE STORAGE FOR 1/100+CC STORM LIMITED TO 1/100 YEAR GREENFIELD RUNOFF 83l/s. BASE AREA =1600m² SIDE SLOPES AT 1/4

115.33

115.21

115.65

GABION RETAINING WALL

3M MAINTENANCE STRIP AROUND POND

IL=117.143

FILTER DRAIN 225Ø @ 1/250

IL=117.023

FILTER DRAIN 225Ø @ 1/250

IL=116.929

S15 CL=118.63 IL=116.311

CLASS 1 BYPASS INTERCEPTOR

600Ø @ 1/216

150Ø @ 1/15

S13 CL=117.00 IL=115.50

600Ø @ 1/161

375Ø @ 1/250

S12 CL=117.30 IL=115.88(525Ø) IL=115.81(600Ø)

375MMØ @ 1/250 OVERFLOW FROM RAINWATER HARVESTING TANKS TO SURFACE WATER SEWER

525Ø @ 1/132

450Ø @ 1/250

S11 CL=118.10 IL=116.78(300Ø) IL=116.63(450Ø) IL=116.56(525Ø)

300Ø @ 1/150

450Ø @ 1/100 OVERFLOW FROM RA RAINWATER HARVESTING TANKS TO SURFACE WATER SEWER

S10 CL=118.20 IL=117.00

PS1: PUMPING CHAMBER TO TAKE ROOF WATER TO ABOVE GROUND HARVESTING TANKS CL:118.35 INCOMING IL:116.678 (375Ø) IL:115.607(450Ø)

S19 CL=119.35 IL=117.53

F7 CL=119.35 IL=118.35

S20 CL=117.20 IL=116.16(150Ø) IL=116.01(300Ø) IL=115.93(375Ø)

PS2: PUMPING CHAMBER TO TAKE ROOF WATER TO ABOVE GROUND HARVESTING TANKS CL=117.40 IL=115.69(375Ø)

ABOVE GROUND RAINWATER HARVESTING TANKS

ROOFWATER RUNOFF TO BE CONNECTED IN ABOVE GROUND RAINWATER HARVESTING TANKS WITH OVERFLOW DISCHARGE TO STORM SEWER SYSTEM.

ROOF AREA 9140M² GIVES RUNOFF @ 75mm/hr OF CIRCA 190l/s

S4 CL=117.30 IL=116.03(375Ø) IL=115.96(450Ø)

ABOVE GROUND RAINWATER HARVESTING TANKS

ROOFWATER RUNOFF TO BE COLLECTED IN ABOVE GROUND RAINWATER HARVESTING TANKS WITH OVERFLOW DISCHARGE TO STORM SEWER SYSTEM

ROOF AREA 9840m² GIVES RUNOFF @ 75mm/hr OF CIRCA 200l/s

375Ø @ 1/250

375Ø @ 1/150

300Ø @ 1/75

S9 CL=119.50 IL=117.72

300Ø @ 1/150

PETROL INCEPTOR

S8 CL=119.45 IL=118.12

S3 CL=119.50 IL=116.96(300Ø) IL=116.89(375Ø)

CLASS 1 FULL RETENTION

S24 CL=118.63 IL=116.875

ACO DRAINAGE CHANNEL

225Ø @ 1/100

S16 CL=118.63 IL=117.205

S17 CL=118.63 IL=118.30

PRIVATE PUMPING STATION WITH 24 HOUR STORAGE OF 1 DWF TO COMPLY WITH BUILDING REGULATIONS

PS3 CL=118.63 IL=115.66

150Ø @ 1/150

F10 CL=119.23 IL=118.23

S25 CL=118.63 IL=116.610

F9 CL=119.23 IL=117.03

S18 CL=119.35 IL=117.87

F6 CL=119.35 IL=117.35

100Ø @ 1/50

150Ø @ 1/150

Offices & Training School

over two floors 3,000 m² 32,293 ft²

ROOF WATER RUNOFF TO BE COLLECTED IN ABOVE GROUND RAIN WATER HARVESTING TANKS WITH OVERFLOW

DISCHARGED TO STORM SEWAGE SYSTEM

ROOF AREA 1500m² GIVES RUNOFF 75mm/hr OF CIRCA 30l/s

100Ø @ 1/50

300Ø @ 1/36

Production 9,137 m² 98,350 ft²

S21 CL=119.35 IL=117.93(225Ø) IL=117.86(300Ø)

225Ø @ 1/167

S22 CL=119.35 IL=118.23

150Ø @ 1/150

F8 CL=119.35 IL=115.98(100Ø) IL=115.88(150Ø)

F5 CL=119.35 IL=116.06(100Ø) IL=116.01(150Ø)

F4 CL=119.35 IL=118.35

S5 CL=119.35 IL=116.66(225Ø) IL=116.51(375Ø)

100Ø @ 1/20

225Ø @ 1/33

S6 CL=119.35 IL=118.23

F3 CL=119.35 IL=116.66(100Ø) IL=116.61(150Ø)

150Ø @ 1/150

Warehouse FFL 119.50 9,844 m² 105,960 ft²

100Ø @ 1/80

S2 CL=119.50 IL=117.18(225Ø) IL=117.10(300Ø)

F1 CL=119.50 IL=118.50

SURFACE WATER DRAINAGE TO SERVICE YARD TO BE BY GULLIES/CHANNELS DISCHARGED VIA PETROL INTERCEPTOR

Service Yard Concrete

S7 CL=119.62 IL=118.42

"ACO" DRAINAGE CHANNEL

S1 CL=119.50 IL=118.38

F2 CL=119.50 IL=117.85

"ACO" DRAINAGE CHANNEL

Guide Post

120.3m

1.22m RH

Def

CHILGROVE DRIVE

1.22m RH

Chilgrove Drive

226

Rev	Detail	By	Chk	Date

Revisions

Client: E P BARRUS LIMITED

Project: PROJECT WINGS UPPER HEYFORD

Drawing Status: PRELIMINARY INFORMATION

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web www.clarkebond.com

Bristol Exeter London Abu Dhabi

Drawing Title: DRAINAGE STRATEGY PHASE 2

Project No.	Discipline	Drawing No.
WB03671	C	SK02

Scale	Date	Revision
1:500 @ A1	23.10.14	A

Drawn	Checked	Sheet Size
SAP	AJ	A1

DO NOT SCALE THIS DRAWING FOR CONSTRUCTION PURPOSES.

CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ENGINEER

N

226100m

226000m

225900m

225800m

225700m

Letchmere Farm Cottage

TRENCHARD CIRCLE

Play Area

SODEN ROAD

LARSEN ROAD

Tennis Courts

Tennis Court

Ponds

Stack

Production

Guide Post

6704

6703

118.7m

119.1m

115.8m

114.3m

EXISTING TREATMENT PLANT

NOTES:
1. FOR DETAILS OF ONSITE DRAINAGE WORK REFER TO DRAWINGS WB03671 SK01–SK02.
2. LEVELS AND POSITION OF ALL OUTFALLLS TO BE CHECKED AND CONFIRMED PRIOR TO CONSTRUCTION.

Rev	Detail	By	Chk	Date
	Revisions			

Client
E P BARRUS LIMITED

Project
PROJECT WINGS
UPPER HEYFORD

Drawing Status
PRELIMINARY INFORMATION

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Bristol Exeter London Abu Dhabi

Drawing Title
DRAINAGE STRATEGY
PHASE 2
OVERVIEW

Project No.	Discipline	Drawing No.
WB03671	C	SK04

Scale	Date	Revision
1:500 @ A1	27.10.14	A

Drawn	Checked	Sheet Size
SAP	AJ	A1

APPENDIX D – THAMES WATER SEWER RECORDS

Asset Location Search

Clarkebond UK Limited
129

BRISTOL
BS1 6UY

Search address supplied

Project Wings
Warehouse
1
Larsen Road
Camp Road
Upper Heyford
Bicester
OX25 5TA

Your reference WB03671

Our reference ALS/ALS Standard/2014_2879590

Search date 6 October 2014

You are now able to order your Asset Location Search requests online by visiting
www.thameswater-propertysearches.co.uk

Asset Location Search

Search address supplied: Project Wings, Warehouse, 1, Larsen Road, Camp Road, Upper Heyford, Bicester, OX25 5TA

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset Location Search

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

SP5125NE
SP5226SW

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

The following quartiles have not been printed as they contain no assets:

SP5225NW

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Asset Location Search

The following quartiles have been printed as they fall within Thames' water area:

SP5225NW
SP5125NE

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

The following quartiles have not been printed as they contain no assets:

SP5226SW

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Asset Location Search

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

Clean Water queries

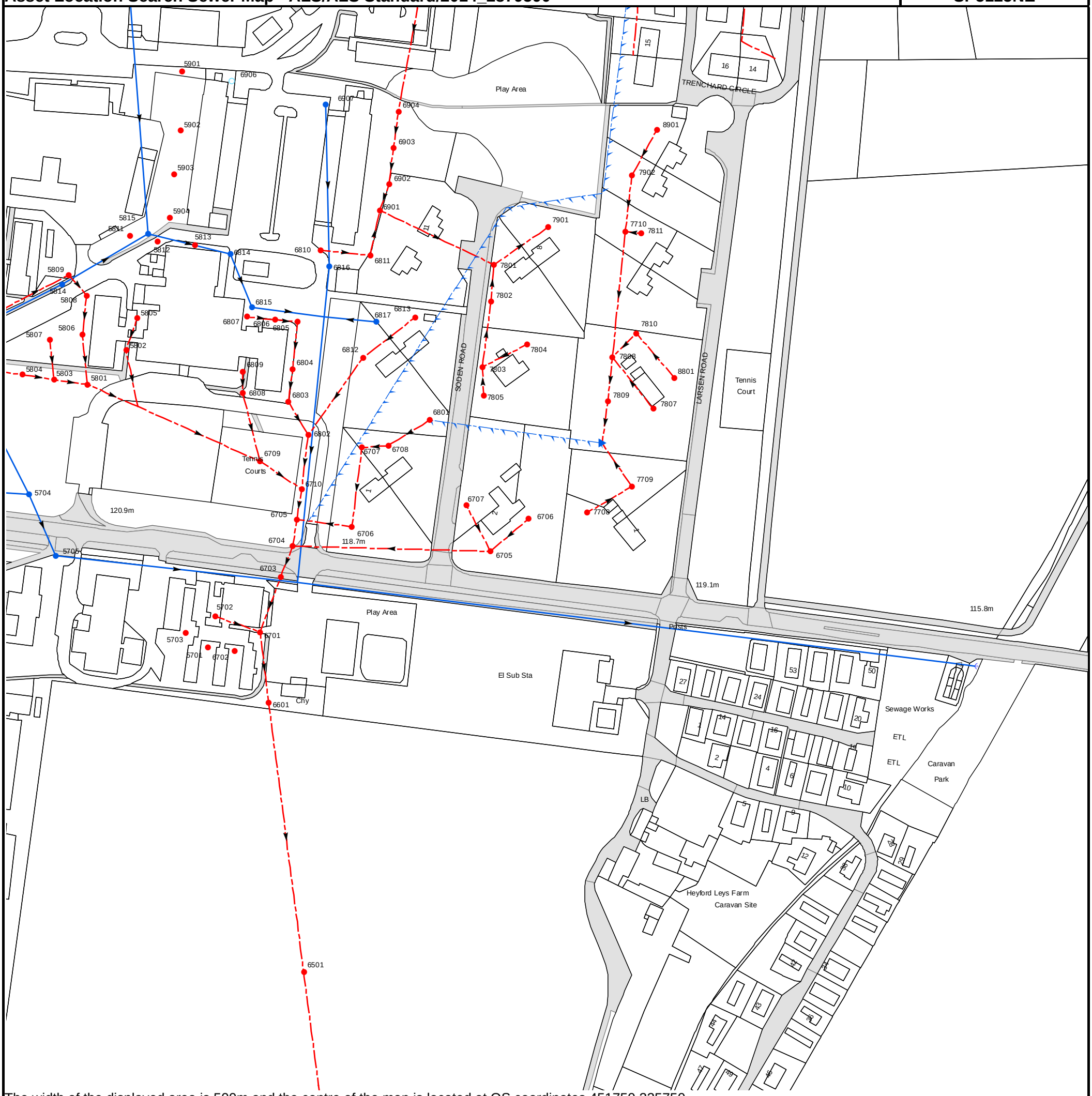
Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2014_2879590

SP5125NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 451750,225750

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5814	n/a	n/a
5809	n/a	n/a
5808	n/a	n/a
5811	n/a	n/a
5815	n/a	n/a
5812	n/a	n/a
5904	n/a	n/a
5903	n/a	n/a
5902	n/a	n/a
5901	n/a	n/a
5813	n/a	n/a
6814	n/a	n/a
6906	n/a	n/a
6807	n/a	n/a
6815	n/a	n/a
6810	n/a	n/a
6907	n/a	n/a
6816	n/a	n/a
6811	n/a	n/a
6901	n/a	n/a
6902	n/a	n/a
6903	n/a	n/a
6904	n/a	n/a
6813	n/a	n/a
7802	n/a	n/a
7801	n/a	n/a
6706	n/a	n/a
7708	n/a	n/a
7709	n/a	n/a
7807	n/a	n/a
7809	n/a	n/a
8801	n/a	n/a
7808	n/a	n/a
7804	n/a	n/a
7810	n/a	n/a
7811	n/a	n/a
7710	n/a	n/a
7901	n/a	n/a
7902	n/a	n/a
8901	n/a	n/a
5701	n/a	n/a
5702	n/a	n/a
6702	n/a	n/a
6809	n/a	n/a
6808	n/a	n/a
6709	n/a	n/a
6701	n/a	n/a
6601	n/a	n/a
6806	n/a	n/a
6703	n/a	n/a
6803	n/a	n/a
6704	n/a	n/a
6804	n/a	n/a
6705	n/a	n/a
6805	n/a	n/a
6710	n/a	n/a
6802	n/a	n/a
6706	n/a	n/a
6707	n/a	n/a
6812	n/a	n/a
6817	n/a	n/a
6708	n/a	n/a
6801	n/a	n/a
6707	n/a	n/a
7803	n/a	n/a
7805	n/a	n/a
6705	n/a	n/a
5804	n/a	n/a
5704	n/a	n/a
5807	n/a	n/a
5803	n/a	n/a
5705	n/a	n/a
5806	n/a	n/a
5801	n/a	n/a
5802	n/a	n/a
5805	n/a	n/a
5703	n/a	n/a
6501	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Asset Location Search Sewer Map - ALS/ALS Standard/2014_2879590 | SP5226SW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 452250,226250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
4401	n/a	n/a
5404	n/a	n/a
1201	n/a	n/a
1301	n/a	n/a
0401	n/a	n/a
0402	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2014_2879590	SP5225NW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 452250,225750

Asset Location Search Water Map - ALS/ALS Standard/2014_2879590

SP5125NE

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 451750,225750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to him at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS.	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE