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Technical Note

Oakley Green Lodge, Oakley Green

23-100-TNO-001 Rev A

Flood Risk and Drainage Statement

January 2024

Rev	Issue Purpose	Author	Checked	Reviewed	Approved	Date
-	Draft for comment	TSH	GAC	TSH	GAC	January 2024
A	Final	TSH	GAC	TSH	GAC	January 2024

1 Introduction

1.1 Overview

1.1.1 Charles & Associates Consulting Engineers Ltd (C&A) have been commissioned by Westbourne Homes (WH) to prepare a Flood Risk and Drainage Statement for a proposed redevelopment of land at Oakley Green Lodge, Oakley Green Road, Oakley Green, Berkshire.

1.1.2 Westbourne Homes will be submitting a detailed planning application to the Royal Borough of Windsor and Maidenhead (RBWM) for four residential units with associated access, vehicle parking and landscaping. Hereafter referred to as the Site. Refer to **Appendix A** for the Proposed Site Layout.

1.1.3 This Drainage Statement has been prepared to support a detailed planning application and as a means of demonstrating that flooding and surface and foul water drainage issues would not constrain the redevelopment of the Site. Nor would redevelopment have any adverse effects on existing public foul water drainage systems, watercourses, or ground water source protection zones.

1.1.4 The findings, recommendations and conclusions of this report are based on information obtained from a variety of external sources which are understood to be reputable. However, C&A Consulting Engineers cannot guarantee the authenticity or reliability of any data and/or records provided by third parties.

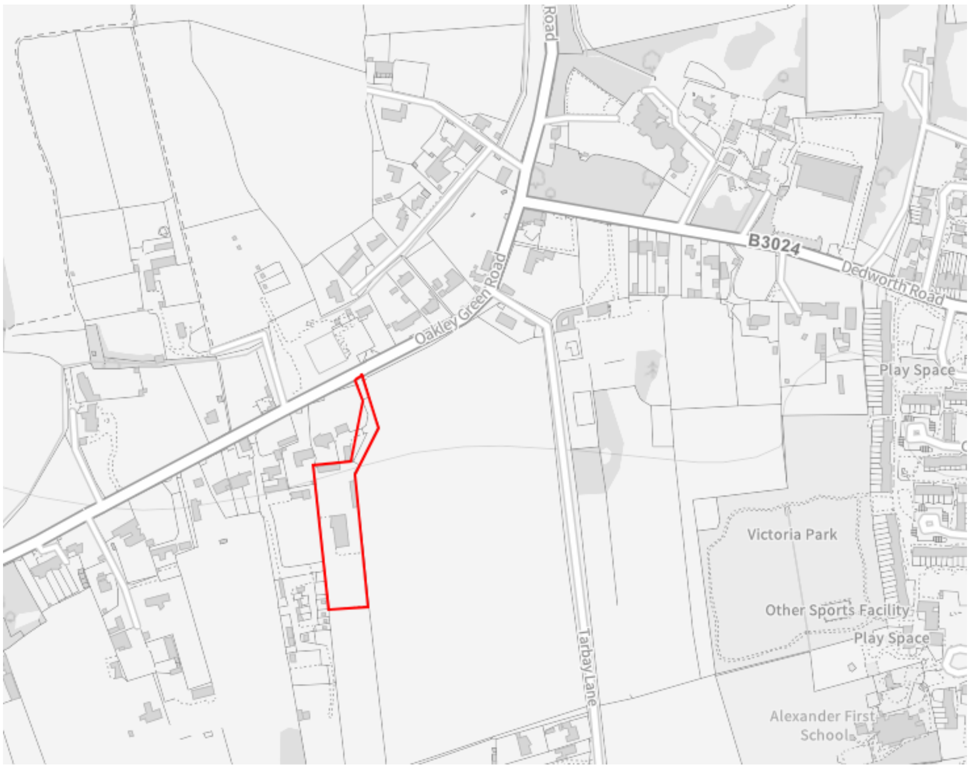
2 Existing Site

2.1 Site Location

2.1.1 The site is located to the south of Oakley Green Road, west of Oakley Green, Berkshire. The site is bound to the east and south by agricultural fields, to the west by existing residential dwellings and gardens and to the north by an existing property known as Oakley Green Lodge and beyond Oakley Green Road.

2.1.2 The entire site within the redline boundary is approximately 0.89 hectares and is currently used as a repair and refurbishment yard for heavy goods vehicles. It is therefore classified as a brownfield site. Refer to **Figure 2.1** below for a Site Location Plan.

Figure 2.1: Site Location Plan



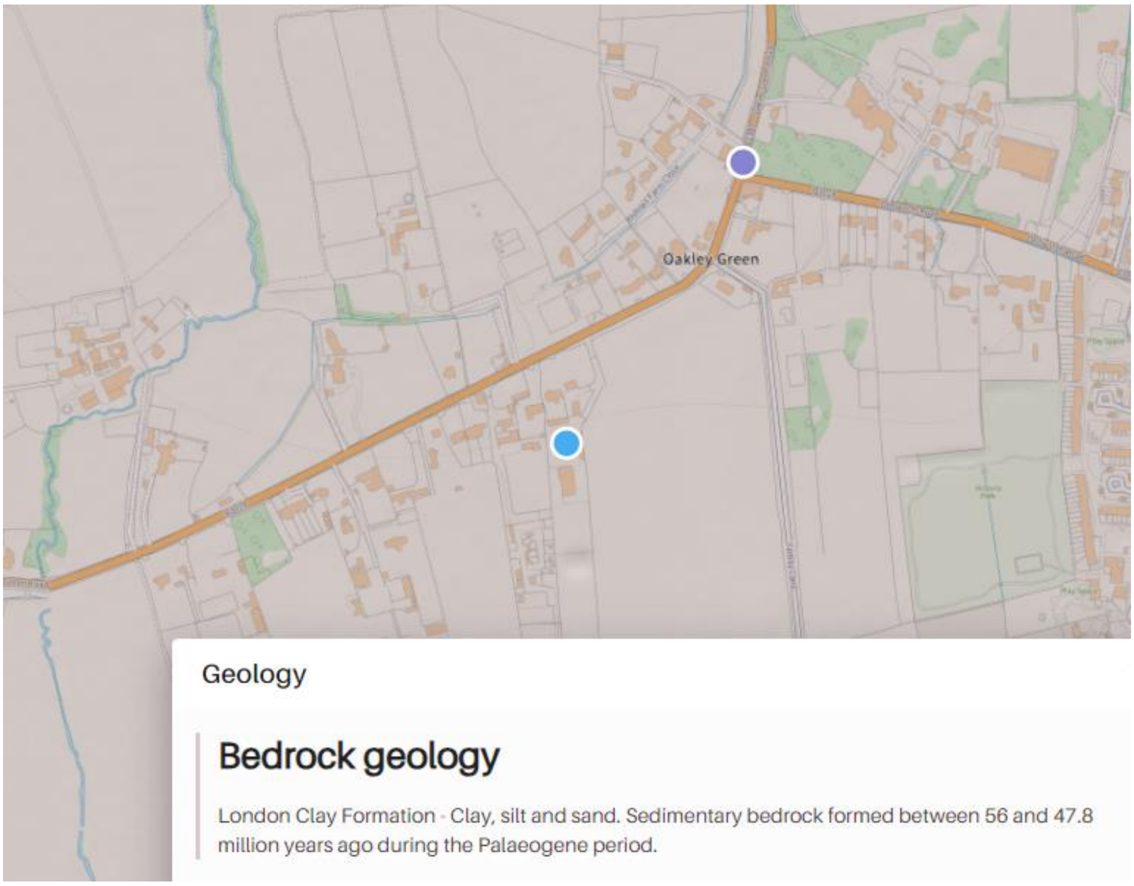
2.2 Topography

2.2.1 Topographical survey information has been obtained for the site. Refer to **Appendix B**. The highest recorded level is 80.22m AOD (metres above ordnance datum) and is located on the southern boundary. From here the site falls towards the north with the low point of the site being recorded on the northern boundary at 74.65m AOD. The site is brownfield in nature and consists of predominantly hardstanding, concrete with several buildings.

2.3 Geology and Hydrogeology

2.3.1 Published geological data from the British Geological Survey (BGS) indicates the site is underlain by a bedrock of London Clay which comprises clay, silt, and sand. There is no information available for superficial deposits. Refer to **Figure 2.2** below.

Figure 2.2: BGS Geology Map



Geology

Bedrock geology

London Clay Formation - Clay, silt and sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period.

2.3.2 A review of the Department for Environment, Food & Rural Affairs (Defra) “Magic Map” confirms that the site is not within a Groundwater Source Protection Zone or underlain by an aquifer nor is the site within a Nitrate Vulnerable Zone.

2.3.3 A Soil Infiltration Assessment was undertaken by Aviron Associates Limited (Aviron) in January 2024 (report reference – 24-131.01 Version 1). As part of this assessment soil logs were taken from the site. The soil logs demonstrate the presence of the Made Ground above London Clay up to 5m deep.

2.3.4 Due to the presence of London Clay and high groundwater levels infiltration testing was abandoned. Aviron have stated in the report that “conventional shallow soakaway drainage is not considered to be suitable…”. Deep bore soakaways are also stated to be unsuitable due to ground water levels. Refer to **Appendix C** for the full report.

3 Flood Risk Policy

3.1 National Policy

3.1.1 The National Planning Policy Framework (NPPF) provides national guidance to planning authorities, developers, the public, and the Environment Agency (EA), to ensure that flood risk is considered at all stages of the planning process.

3.1.2 The NPPF states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

3.1.3 NPPF sets out a robust approach to the Sequential Test and is intended to provide a rigorous understanding of flood risk. Its aim is to steer new development to areas at the lowest probability of flooding (i.e., Flood Zone 1). The Sequential Test would normally be completed by the Local Planning Authority (LPA) to inform the preparation of the Local Development Framework (LDF).

3.1.4 As the site is located within Flood Zone 1, is less than 1 hectare in area, not identified as having critical drainage problems (by the Environment Agency), not on land identified in RBWM's Strategic Flood Risk Assessment as being at increased flood risk in the future or on land subject to other sources of flooding the NPPF states a Flood Risk Assessment (FRA) is not required and the site has passed the sequential test.

3.1.5 However, a summary has been provided in Section 4 of this report to demonstrate that the site is not at risk from flooding, nor will it increase flood risk downstream post development thus further demonstrating the sites suitability for redevelopment in terms of flood risk.

3.2 Royal Borough of Windsor and Maidenhead Strategic Flood Risk Assessment

3.2.1 A Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) has been produced for RBWM in June 2017 and April 2018, respectively.

3.2.2 The aim of the Level 1 SFRA is to collate and present information to define flood risk within the borough and make recommendations for policies and guidance for the effective management of flood risk to property and life. The Level 2 SFRA provides detailed flood risk evidence on the sites identified by RBWM as being potential allocation sites.

3.2.3 The redevelopment site is not identified within the SFRAs as a site at risk of flooding now or in the future and therefore redevelopment is suitable for this site in accordance with the SFRAs.

3.3 Royal Borough of Windsor and Maidenhead Borough Local Plan

3.3.1 RBWM produced a Borough Local Plan (BLP) which was adopted in February 2022. The aim of the document is to guide the future development of the borough. It sets out a spatial strategy and policies for managing development and infrastructure to meet the environmental, social, and economic opportunities and challenges facing the area up to 2033. The BLP is used to make decisions on planning applications.

3.3.2 There are several policies relating to drainage and flood risk identified within the BLP. The following section demonstrates the compliance of the proposed development in relation to the BLP policies.

3.3.3 Policy SP2 of the BLP relates to Climate Change and states:

"All development will demonstrate how they have been designed to incorporate measures to adapt to and mitigate climate change. The following measures shall be incorporated into development:

a. Wherever possible, new buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements;

b. Proposals involving both new and existing building shall demonstrate how they have been designed to maximise resistance and resilience to climate change for example by including measures such as solar shading, thermal mass, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls etc;

c. Use of trees and other planting, where appropriate as part of green and blue infrastructure schemes, to provide shading of amenity areas, buildings, and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions; and

d. All development shall minimise the impact of surface water runoff from the development in the design of the drainage system and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change.

3.3.4 The strategy proposed for the redevelopment significantly reduces surface water runoff from the site from brownfield flows to greenfield flows. Refer to Section 5 for further details. Due to the reduction in runoff the redevelopment reduces flood risk to the site as well as downstream of the site. Therefore, compliant with Policy SP2 of the BLP.

3.3.5 Policy QP2 of the BLP relates to Green and Blue Infrastructure and states:

"1. In order to secure multiple biodiversity, recreational, health and well-being and environmental benefits, development proposals will be required to contribute to the maintenance, enhancement, and, where possible, enlargement, of the Borough's existing green and blue infrastructure network, in terms of both quantity and quality. The level of provision of green and blue infrastructure on individual development sites will be expected to conform to the standards set out in the Council's Green and Blue Infrastructure SPD, or a subsequent successor document.

2. Within intensifying urban areas, especially town centres, all forms of development will be expected to incorporate innovative, exemplar quality green and blue infrastructure at both ground floor and upper levels.

3. Development proposals will be expected to pay particular attention to the provision of blue infrastructure in their proposals. This could include (but is not limited to) improving and restoring the quality and quantity of existing natural water features, as well as introducing man-made features and Sustainable Drainage Systems (SuDS)."

3.3.6 The site, as it currently exists, does not have any blue and green corridors nor does it contain any natural water features. The proposals, as demonstrated in Section 5, do include the provision of blue and green corridors. Furthermore, the proposals will provide an improvement to water quality leaving the site therefore the proposal will comply with Policy QP2 of the BLP.

3.3.7 Policy NR1 of the BLP relates to Managing Flood Risk and Waterways and states:

"1. Flood zones are defined in the National Planning Practice Guidance and the Council's Strategic Flood Risk Assessment (Level 1). Within designated Flood Zones 2 and 3 (and also in Flood Zone 1 on sites of 1 hectare or more in size and in other circumstances as set out in the NPPF) development proposals will only be supported where an appropriate flood risk assessment has been carried out and it has been demonstrated that development is located and designed to ensure that flood risk from all sources of flooding is acceptable in planning terms.

2. The sequential test is required for all development in areas at risk of flooding, except for proposed developments on sites allocated in this plan or in a made Neighbourhood Plan which accord with the provisions of those Plans so far as material to the application. In applying this test development proposals should show how they have had regard to:

a. the availability of suitable alternative sites in areas of lower flood risk

b. the vulnerability of the proposed use and the Flood Zone designation

c. the present and future flood risk

d. the scale of potential consequences

e. site evacuation plan in the event of potential flooding.

Only water compatible uses and essential infrastructure development will be supported in the area defined as functional floodplain. The exception test will still apply.

3. The sequential approach should be followed by developers for all development so that the most vulnerable development is located in the lowest risk flood areas within a site, taking account of all sources of flood risk.

4. Development proposals should include an assessment of the impact of climate change using appropriate climate change allowances over the lifetime of the development so that future flood risk is taken into account.

5. In all cases, development should not itself, or cumulatively with other development, materially:

a. impede the flow of flood water

b. reduce the capacity of the floodplain to store water

c. increase the number of people, property or infrastructure at risk of flooding

d. cause new or exacerbate existing flooding problems, either on the proposal site or elsewhere.

e. reduce the waterway's viability as an ecological network or habitat for notable species of flora or fauna.

6. Development proposals should:

a. increase the storage capacity of the floodplain where possible

b. incorporate Sustainable Drainage Systems in order to restrict or reduce surface water runoff

c. reduce flood risk both within and beyond sites wherever practical

d. be constructed with adequate flood resilience and resistance measures suitable for the lifetime of the development

e. where appropriate, demonstrate safe access and egress and incorporate flood evacuation plans.

7. The exception test will need to be applied in accordance with national policy and guidance in the NPPF and PPG, including on sites allocated in the development plan. This should demonstrate how flood risk would be managed on the site, including that the sustainability benefits of the site outweigh the flood risk and that the development will be safe for its lifetime, taking into account the vulnerability of its users and that it will not increase flood risk elsewhere. Where possible, development will reduce flood risk overall.

8. Development proposals will be required to incorporate appropriate comprehensive flood risk management measures as agreed with the Environment Agency of the Council as Local Lead Flood Authority.

9. Development proposals near rivers (including culverted rivers) should retain or provide an undeveloped 8 metre buffer zone alongside main rivers and, where practicable and appropriate, ordinary watercourses. This buffer zone should be on both sides of the watercourse and be measured from the top of the river bank at the point at which the bank meets the level of the surrounding land.

10. Further development land associated with strategic flood relief measures will be safeguarded, including the proposed River Thames Scheme and the flood relief channel from Datchet to Wraysbury. Development should facilitate the improvement and integration of waterways in Maidenhead, including the completion of the Maidenhead Waterway Project."

3.3.8 The site, as previously stated, is in Flood Zone 1, is less than 1 hectare in area and is not at risk of flooding from any sources. The development proposals incorporate SuDS and reduce runoff from the development and is therefore compliant with Policy NR1 of the BLP.

4 Evaluation of Flood Risk

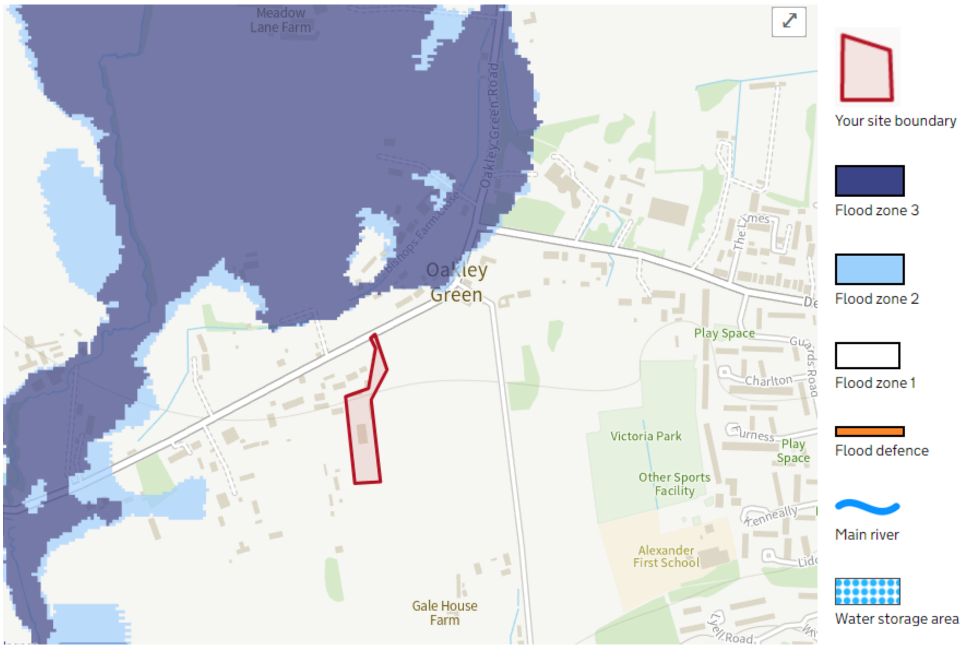
4.1.1 NPPF identifies potential sources of flooding that could affect sites.

- Flooding from the sea or tidal flooding.
- Flooding from rivers or fluvial flooding.
- Flooding from land or pluvial.
- Flooding from groundwater.
- Flooding from sewers.
- Flooding from reservoirs, canals, and other artificial sources.

4.2 Flooding from Rivers and The Sea (Fluvial and Tidal Flooding)

4.2.1 The site has been identified as being in Flood Zone 1. Therefore, the site is considered to be at very low risk of flooding from rivers or the sea. Refer to **Figure 4.1** below.

Figure 4.1: Government Flood Maps for Planning – Rivers and Sea

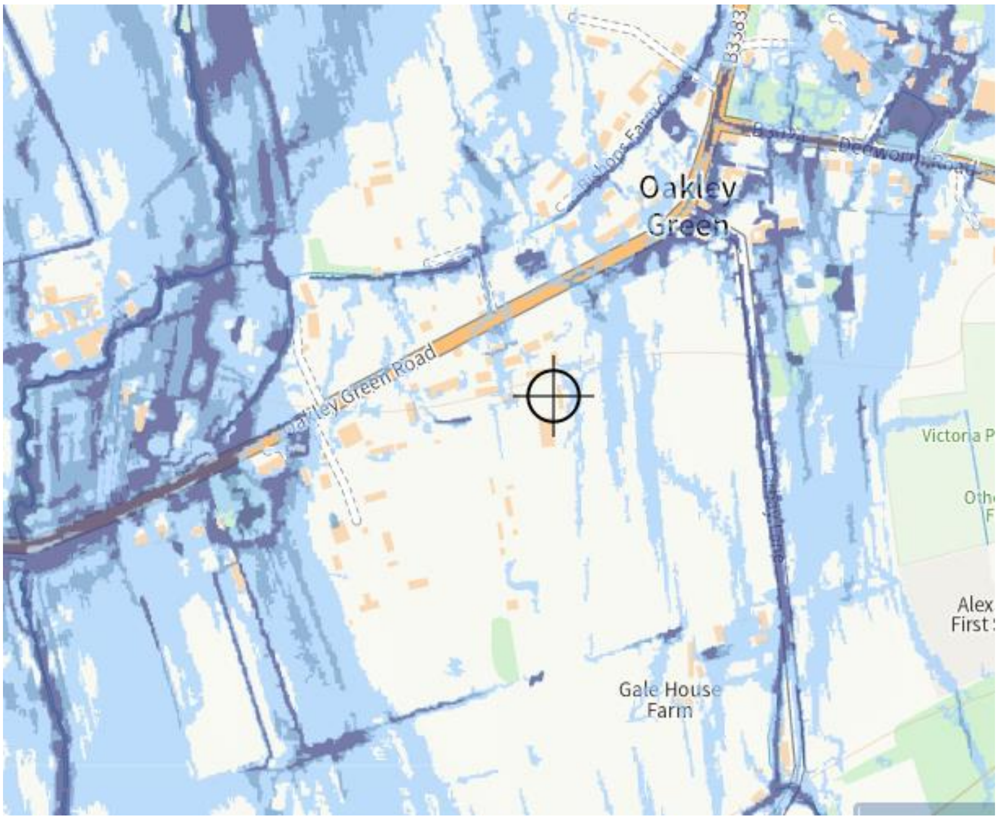


4.3 Flooding from Land (Pluvial Flooding)

4.3.1 Intense rainfall, often of short duration, which is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. Increased run-off from developed areas consisting of impermeable surfaces can increase overland flows. If the flow paths of these overland flows are not carefully considered during the detail design and planning stages, flooding from overland flows could occur.

4.3.2 The surface water flood maps show the site is has very small amounts of pluvial flooding, the majority of which is adjacent to the eastern boundary on the adjoining field. The pluvial flooding that is generated from this site is not an overland flow path emanating from upstream. Therefore, due to the introduction of the re-development and a new drainage regime for the site the surface water flooding will be reduced within the site, if not eradicated. Refer to **Figure 4.2** below.

Figure 4.2: Government Flood Maps for Planning – Surface Water Flooding



4.4 Flooding from Sewers

4.4.1 Local urban drainage should be considered, as every drainage system has a design capacity, which at some point can be exceeded. Sewer and surface water flooding generally results in localised short-term flooding caused by intense rainfall events which overload the capacity of sewers or runs off adjacent land as sheet flow. Flooding can also occur as a result of blockage, poor maintenance, or structural failure.

4.4.2 The existing sewers on the site are privately maintained. Following the redevelopment, the existing sewer system will be replaced with new independent foul and surface water networks constructed to the latest technical standards and specifications. Therefore, the risk of sewer flooding is considered to be very low.

4.5 Flooding from Groundwater

4.5.1 Groundwater flooding generally occurs when water levels in the ground rise above surface elevations. Severe storm events could cause groundwater levels to rise above ground level. Underlying geology is the principal factor that effects groundwater flooding. Groundwater flooding most commonly occurs in low lying areas which are underlain by permeable rocks or aquifers. The site is low lying and is underlain by aquifers so there is a medium to high risk of ground water flooding.

4.5.2 In reference to **Appendix C** the Soil Infiltration Assessment shows that groundwater was encountered at approximately 3m deep. The groundwater that was encountered was identified as perched in fissures of the clay strata / sandy partings. This is supported by the SFRA which does not highlight any groundwater flooding incidents in or around the site.

4.5.3 Groundwater monitoring wells were installed upto 5m deep, the monitoring showed ground water levels at 0.82m below ground level. However, this was expected to be resultant of surface water which has entered the well following recent heavy rainfall and is perched within the underlying and surrounding clay.

4.6 Flooding from Reservoirs, Canals, and other Artificial Sources

4.6.1 The main cause for flooding from a reservoir would be a structural failure in the walls of the reservoir or some form of accident-causing significant damage to the structure of the reservoir. This is highly unlikely.

4.6.2 Reservoir flood maps are available from the government website and in this case show the site is clear of the maximum extent of flooding from reservoirs. Therefore, the site is considered to be at very low risk from flooding from artificial sources.

5 Surface Water Management Proposals

5.1 Development Proposal

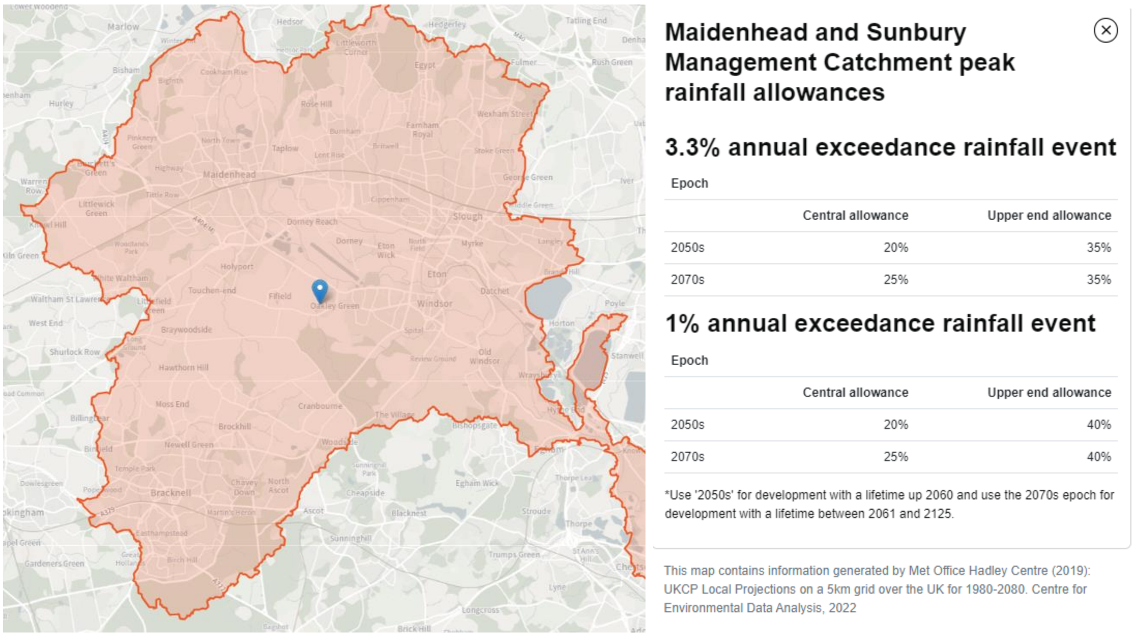
5.1.1 The proposed development is for four residential dwellings including, access from Oakley Green Road, sustainable drainage systems, landscaping, and all associated infrastructure. A site masterplan illustrating the layout of the development has been prepared by Ascot Design and is provided within **Appendix A**.

5.2 Climate Change

5.2.1 Based on the most recent advice on climate change reported in NPPG, peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future. It is recommended that considerations for future climate change are included in surface water drainage designs for proposed developments.

5.2.2 Having reviewed the Climate Change Allowance map the site lies within Maidenhead and Sunbury Management Catchment. **Figure 5.1** below summarises climate change allowances within this catchment.

Figure 5.1: DEFRA Climate Change Allowance Map



Maidenhead and Sunbury Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	20%	35%
2070s	25%	35%

1% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	20%	40%
2070s	25%	40%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

This map contains information generated by Met Office Hadley Centre (2019): UKCP Local Projections on a 5km grid over the UK for 1980-2080. Centre for Environmental Data Analysis, 2022

5.2.3 The proposed surface water drainage strategy will be designed to cater for the upper allowance for the 2070s epoch, thus providing a suitable surface water drainage solution for the lifetime of the development. All events up to and including the 100 year + 40% climate change event will be catered for within the proposed system. Further analysis will be undertaken to establish the effect on the system for the 1 in 30 year + 35% climate change event.

5.3 Proposed Surface Water Drainage Strategy

5.3.1 A comprehensive sustainable drainage system will be implemented to prevent runoff from this development increasing flood risk to other areas. Due the sites existing use as a heavy goods vehicle repair and refurbishment yard the redevelopment will provide significant betterment to the area in terms of water quality and flow.

5.3.2 This will be fully detailed at the detail drainage design stage of the proposed redevelopment, although an indicative strategy to demonstrate that SuDS can be delivered is described below.

5.3.3 There are several options available to impose surface water restrictions on proposed development plots such as attenuation ponds, oversized sewers, below ground storage tanks, pervious paving, infiltration systems etc. NPPG and Approved Document Part H sets out a hierarchy for surface water disposal, which encourages a sustainable approach.

- An adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable.
- A Watercourse, or where that is not reasonably practicable.
- to a surface water sewer, highway drain, or other drainage system.
- to a combined sewer.

5.3.4 As described in **Section 2** above, a site investigation has been undertaken. It has been determined that discharging to ground is not appropriate for this site due to the cohesive nature of the soils (London Clay). Surface water flows emanating from the development will discharge into an existing ditch located to the north of the site, east of the site access.

5.3.5 Refer to **Appendix D** for the Proposed Surface Water Drainage Strategy. The strategy is further explained below.

5.4 Surface Water Network and Proposed SuDS

5.4.1 The surface water network will collect all surface water run-off from the private drives, and roofs of the garages and houses. The surface water will initially be collected by a traditional piped system before flowing to a proposed swale and filter drain arrangement along the eastern edge of the access road. The access road itself it will be designed to fall and drain into the swale.

5.4.2 The swale and filter drain will treat, convey, and store surface water runoff from the redevelopment prior to discharging to the existing ditch, to the east of the access road, at restricted rates. An attenuation tank has been provided beneath the access road to provide additional storage of the treated water to enable the restricted discharge rate. The discharge will be controlled and restricted through the use of a vortex flow control (Hydrobrake or similar).

5.5 Existing Discharge Rates

5.5.1 Pre-development brownfield run-off rates have been calculated for the existing site. This is based on an existing impermeable area of 0.333 ha measured from the topographical survey. The brownfield rates are summarised in Table 5.5.1 below. The brownfield calculations are provided in **Appendix E**.

Table 5.5.1: Pre-Development Brownfield Run-off rates

Return Period	Run-Off Rate (l/s)
1 in 2 year	45.8
1 in 30 year	110.5
1 in 100 year	141.8

5.5.2 Greenfield run off rates have been established for the site. These have been included in **Appendix F** and summarised in Table 5.5.2 below.

Table 5.5.2: Greenfield Run-off rates

Return Period	Run-Off Rate (l/s)
1 in 1 year	3.3
QBAR	3.9
1 in 30 year	8.9
1 in 100 year	12.5

5.6 Proposed Discharge Rates

5.6.1 To provide a surface water strategy that complies with national and regional policy, as listed above, the surface water drainage strategy for the development proposes to restrict flows from the redevelopment to a maximum of 3.9l/s for all storm events up to and including the 100 year plus 40% CC with all runoff being attenuated on site prior to discharge to the existing ditch.

5.6.2 A check was undertaken for the 30 year + 35% CC event in accordance with the Maidenhead and Sunbury Management Catchment requirements, see 5.2 above. The full set of design calculations are included in **Appendix G** demonstrating the reduced discharge can be achieved and the proposed strategy is suitable for the redevelopment.

5.6.3 As has been demonstrated above the proposed discharge rates are significantly lower than the existing discharge rates providing significant betterment and reducing the potential for offsite flooding and reducing overall flood risk.

6 Foul Water Proposals

6.1.1 The sewerage undertaker for the site is Thames Water. The foul water drainage proposal intends to connect to the existing public sewer owned and maintained by Thames Water. Existing records of Thames Water's network within the area are included within **Appendix H** of this report.

6.1.2 As can be seen there is an existing foul water sewer running in Oakley Green Road to the north of the development.

6.1.3 A foul water drainage strategy for the site has been produced and has been included in **Appendix I** of this report. This shows that it is possible to drain the entire site to the connection point via gravity and that a foul water pumping station will not be required.

6.1.4 Due to the recently introduced Infrastructure Charges a fee will be payable to Thames Water for each property connecting into the public sewer (this is also applicable for water supply). The infrastructure charges paid to Thames Water will cover the costs of any upgrades required to serve the site.

7 Conclusion

7.1.1 C&A have prepared this Flood Risk and Drainage Statement, on behalf of Westbourne Homes, to demonstrate that flooding and surface and foul water drainage issues would not constrain the redevelopment of the Site. The site is a brownfield site located to the west of Oakley Green, Berkshire.

7.1.2 As has been demonstrated with this Technical Note and associated appendices the proposed redevelopment at Oakley Green Lodge, Oakley Green can be drained in a sustainable manner.

7.1.3 The proposals described above significantly reduce surface water runoff flows from the site, improve the quality of the surface water runoff, reduce flood risk to the site and downstream of the site and therefore complies with the relevant planning policy for the area.

7.1.4 The redevelopment provides significant betterment to the area in terms of flood risk and drainage and therefore, there is no reason for this site not to be granted planning permission in terms of flood risk and foul and surface water drainage.

Appendix A Masterplan

Rev.	Date	Detail

Status
PLANNING ISSUE

ASCOT DESIGN
Timeless architecture

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Client
WESTBOURNE HOMES

Project Title
OAKLEY GREEN LODGE, OAKLEY GREEN, WINDSOR

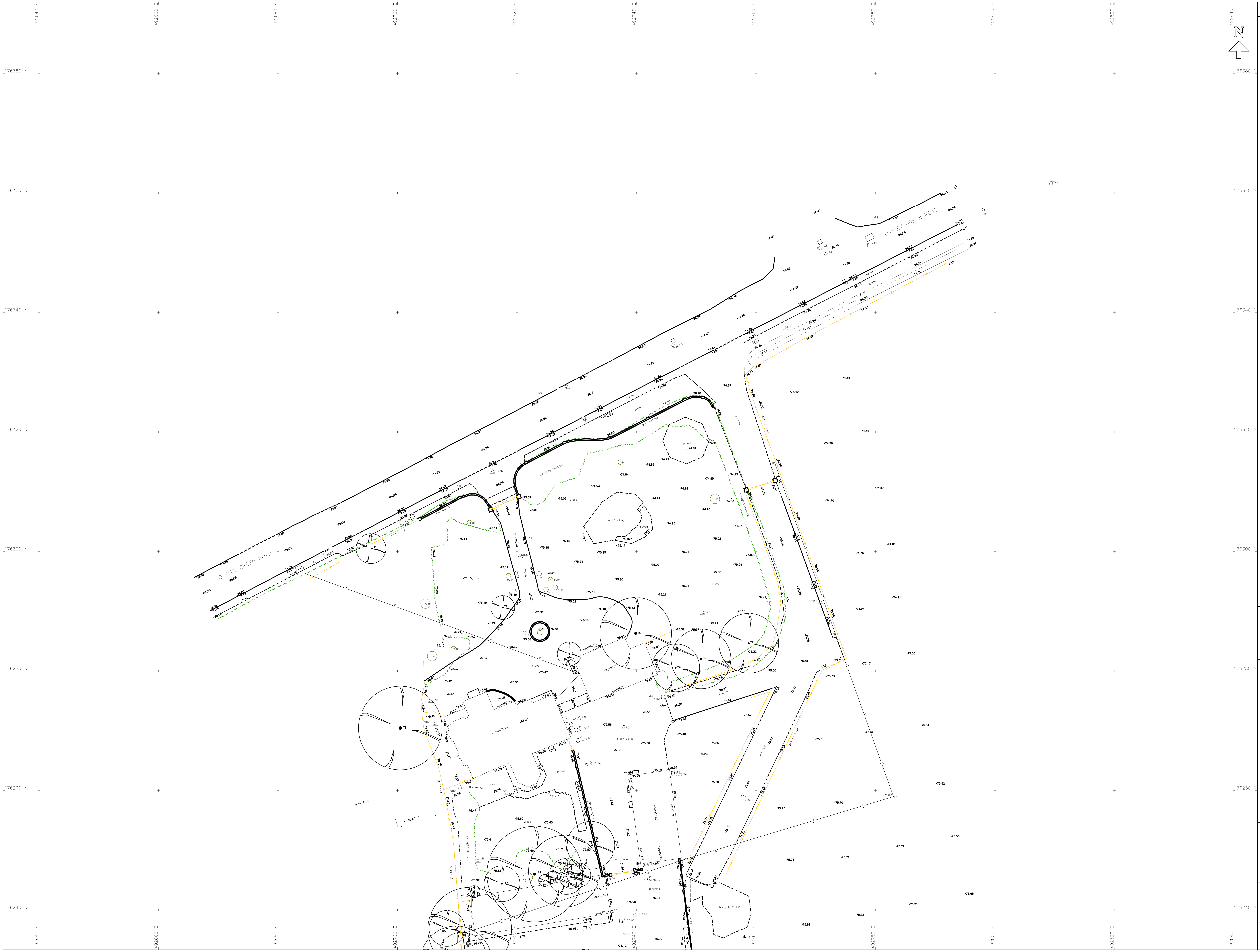
DRAWING Title
PROPOSED SITE LAYOUT

Scale.	Date	Drawn
1:500 @ A1	JAN '24	S.F

DRAWING No. 18 - J2560 - 501

Rev.

Appendix B Topographical Survey



LEGEND

FEATURE STYLES

SURVEY CONTROL
FENCE
HEDGE
FWS
SWS
WATER
POWER LINE (OVERHEAD)
TELECOM LINE (OVERHEAD)
ELECTRIC MAIN
GAS MAIN
EMBANKMENT

FENCE TYPES

BWR	Barbed Wire
CB	Close Board
CI	Corrugated Iron
CL	Chain Link
CPL	Conc Panel
CP	Chestnut Paling
CW	Chicken Wire
IW	Interwoven
IR	Iron Railing
OB	Openboard
PR	Post and rail
PW	Post and Wire

FEATURE ABREVIATIONS

AV	Air Valve
BS	Bus Stop
BT	British Telecom
BW	Brick Wall
CB	Conc Bollard
CL	Cover Level
CTO	cable TV outlet
EB	Electric Box
EC	Electric Cover
EP	Electricity Pole
FH	Fire Hydrant
FL	Floor level
G	Gully
GM	Gas Meter
GV	Gas Valve
IL	Invert Level
IC	Inspection Chamber
KLS	Keep Left Sign
KO	Kerb Offlet
LB	Letter Box
LP	Lamp Post
MKR	Marker
MP	Metal Post
MH	Manhole
MB	Metal Bollard
P	Post
PI	Petrol Interceptor
RG	Road Gully
RNB	Road Name Board
RS	Road Sign
RW	Retaining Wall
SA	Soakaway
SC	Stopcock
SV	Sluice Valve
TP	Telegraph Pole
TCB	Telephone Box
TJB	Tel.Junc.Box
TL	Traffic Light
V	Valve
VP	Vent Pipe
WL	Water Level
WM	Water Meter
WO	Water Outlet
WV	Water Valve

DATUM
GRID – ORDNANCE SURVEY NATIONAL GRID (OSTN02)
LEVELS – ORDNANCE SURVEY (OSGM02)

SURVEY CONTROL

STN	–E–	–N–	–Z–
1	492809.399	176361.583	74.625
2	492715.948	176313.302	74.934
3	492739.530	176212.600	76.291
4	492764.987	176337.300	74.858
5	492720.544	176299.195	75.143
6	492721.684	176286.048	75.345
7	492751.122	176289.674	75.149
8	492705.458	176274.959	75.348
9	492730.431	176271.992	75.588
10	492757.868	176259.187	75.643
11	492739.735	176239.171	75.971
12	492725.398	176259.292	75.568
13	492710.481	176260.474	75.549
14	492713.475	176248.174	75.591
15	492706.290	176271.095	75.528
16	492770.750	176291.554	75.307
17	492711.901	176234.472	76.217
18	492712.791	176223.915	76.357
19	492721.868	176225.923	76.397
20	492723.732	176212.680	76.409
21	492725.048	176205.927	76.417
22	492716.975	176211.694	78.000
23	492726.276	176198.412	76.437
24	492743.635	176198.959	76.521
25	492719.870	176187.607	76.805
26	492718.206	176199.961	76.393
27	492749.917	176179.667	76.762
28	492719.938	176180.234	76.816
29	492719.956	176176.651	76.900
30	492723.233	176165.923	77.043
31	492731.828	176149.784	77.222
32	492732.353	176155.810	77.041
33	492743.244	176144.527	77.145
34	492726.895	176173.469	76.934
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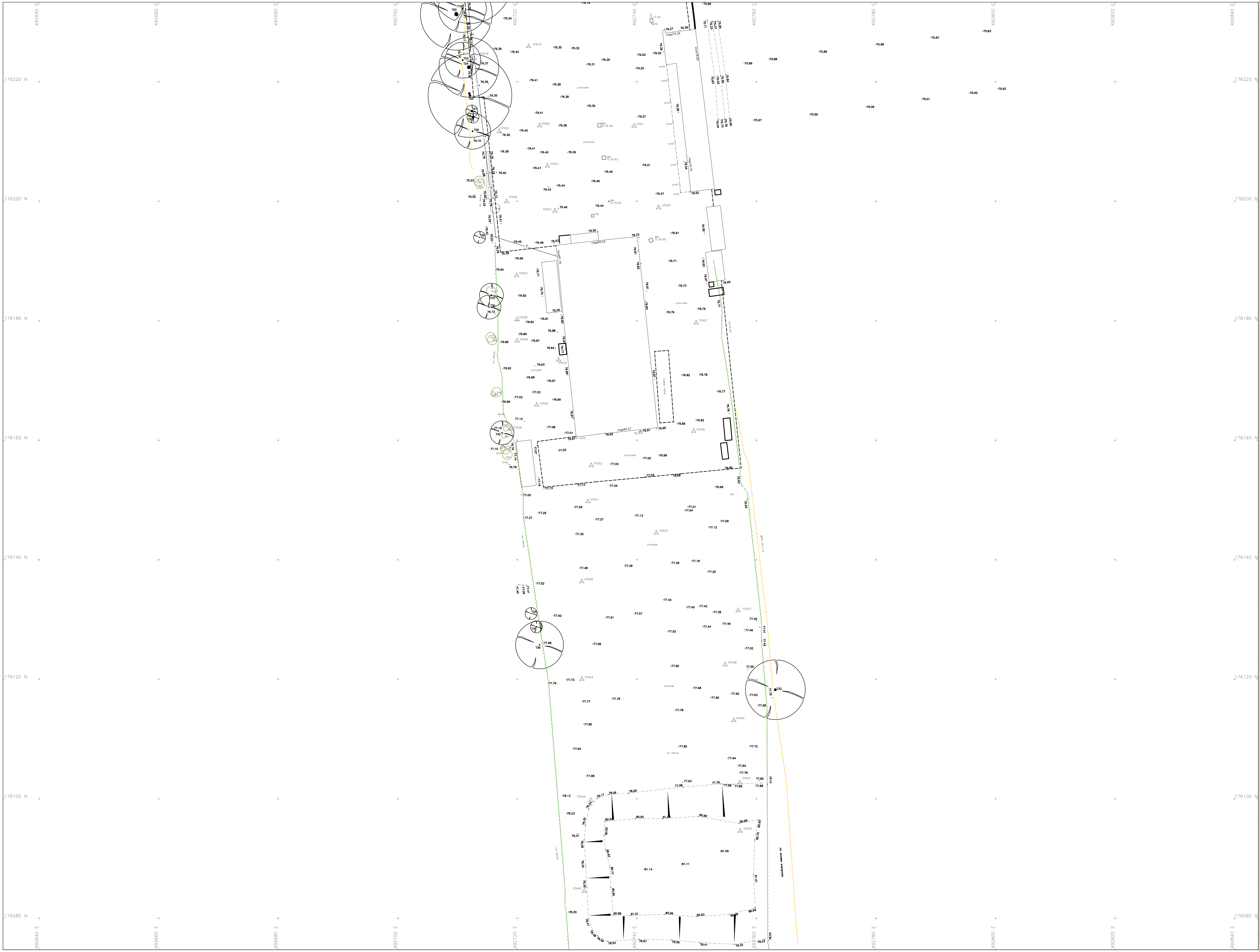
SCALE 1/200 (A0)	DATE AUG 2013
DRAWING No. 01	JOB No. 5387



LEGEND

FEATURE STYLES

- SURVEY CONTROL
- FENCE
- HEDGE
- FWS
- SWS
- WATER
- POWER LINE (OVERHEAD)
- TELECOM LINE (OVERHEAD)
- ELECTRIC MAIN
- GAS MAIN
- EMBANKMENT

FENCE TYPES

BWR	Barbed Wire
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FEATURE ABREVIATIONS

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BS	Bus Stop
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KO	Kerb Offlet
LB	Letter Box
LP	Lamp Post
MKR	Marker
MP	Metal Post
MH	Manhole
MB	Metal Bollard
P	Post
PI	Petrol Interceptor
RG	Road Gully
RNB	Road Name Board
RS	Road Sign
RW	Retaining Wall
SA	Soakaway
SC	Stopcock
SV	Sluice Valve
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LEVELS – ORDNANCE SURVEY (OSGM02)

SURVEY CONTROL

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1	492809.399	176361.583	74.625
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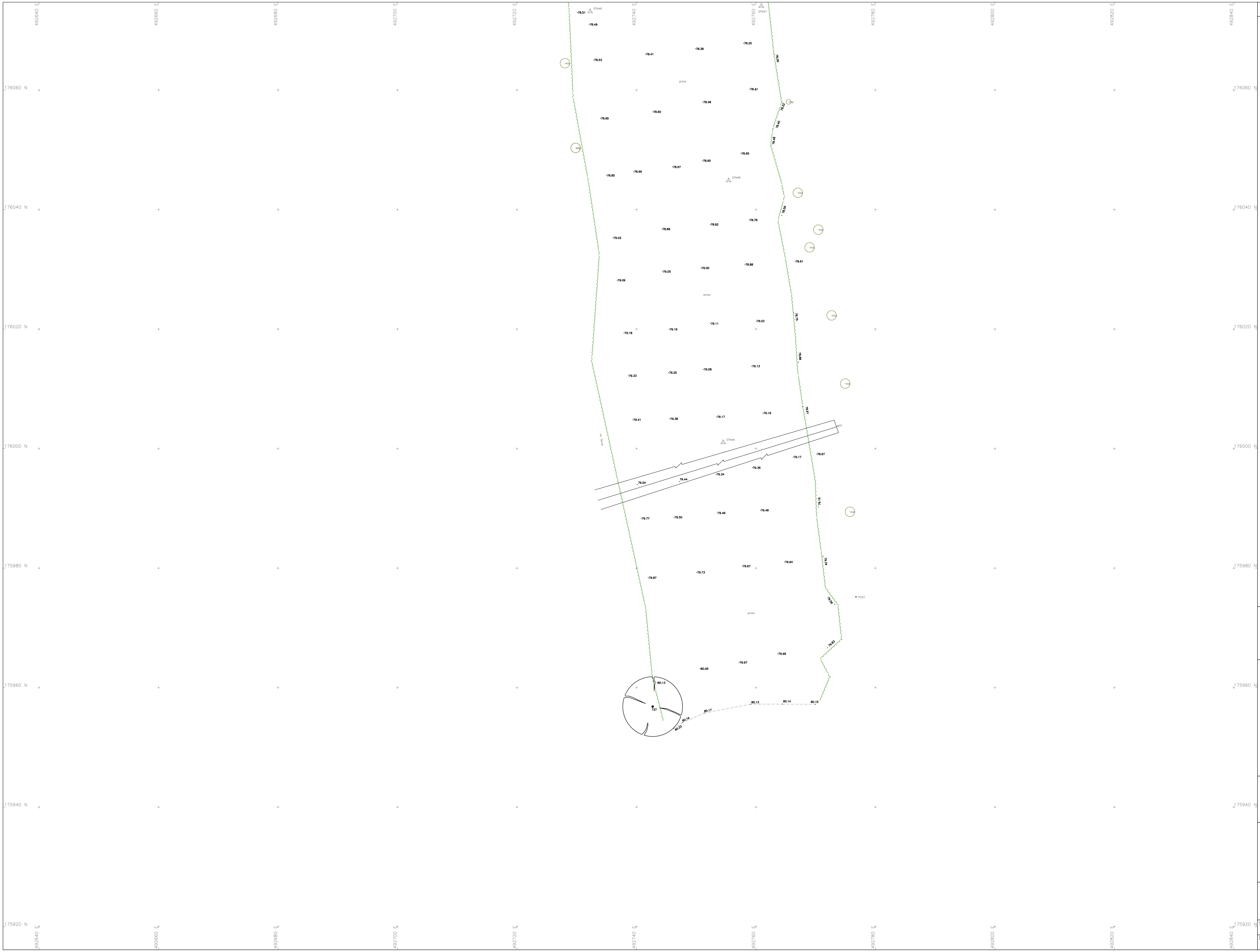
SCALE 1/200 (A0)	DATE AUG 2013
DRAWING No. 02	JOB No. 5387



LEGEND

FEATURE STYLES

SURVEY CONTROL	⚠
FENCE	—/—
HEDGE	
FWS	-·-·-
SWS	-··-··-
WATER	—w—
POWER LINE (OVERHEAD)	
TELECOM LINE (OVERHEAD)	—T—
ELECTRIC MAIN	—E—
GAS MAIN	—G—
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AS EXISTING

SCALE 1/200 (A0)	DATE AUG 2013
DRAWING No. 03	JOB No. 5387

Appendix C Soil Infiltration Assessment

SOIL INFILTRATION ASSESSMENT

Client	Westbourne Homes Limited
Site	Oakley Green Lodge, Oakley Green Road, Windsor, SL4 4PZ

Project	Version	Date
24-131.01	1	16 January 2024

1.0 INTRODUCTION

At the instruction of Westbourne Homes Limited (the Client), Aviron Associates Limited (Aviron) has undertaken a desk-based review and site investigation to appraise the viability of surface water drainage via infiltration devices.

Table 1: The Site	
Site Location	The site is located off Oakley Green Road, to the rear of Oakley Green Lodge, in Oakley Green, approximately 4 kilometres (km) to the west of Windsor town centre.
Current Land Use	The site comprised a commercial vehicle maintenance facility (Global Commercials Mechanics) with a large central workshop, smaller northern workshop and office and eastern stable block used as a store. Numerous vehicles, predominantly HGVs are stored across the site.
Surrounding Land Use	The site is bound by residential properties, located along Oakley Green Road, to the north and west of the site. A disused, overgrown field is situated to the south of the site and an agricultural field can be found to the east.
Proposed Land Use	It is proposed to residentially redevelop the site and enclosed within **Appendix I** is **Figure 1,** which provides a Proposed Development Plan.

2.0 DESK BASED RESEARCH

The British Geological Survey (BGS) GeoIndex has been used to determine the listed geology, which is reported within table 2.

Table 2: Anticipated Geology	
Superficial Geology	None reported
Solid Geology	**London Clay Formation (LCF)** Typically, brown, blue, grey Clay **Lambeth Group (LMB)** Typically multi-coloured Clay and Sand **Chalk Groups (CHK)** Typically, white Chalk with flint nodules.
Aquifer Status	LCF - Unproductive Strata (formerly non-aquifer)

A local borehole log has been accessed from the BGS website and is enclosed within **Appendix II**.

The borehole was drilled at Fifield House, Oakley Green Road, Windsor, SL4 4QF approximately 1,600m to the west of the site between December 2004 and January 2005 by HD Drilling Limited to a depth of 80m below ground level (bgl). The BGS ID is 15624791 and BGS Reference is SU97NW407. Enclosed within **Appendix I** is **Figure 2** which provides a BGS Borehole Location Plan.

A summary of ground conditions encountered within the ‘BGS’ borehole is presented in table 3.

Table 3: Summary of Local ‘BGS’ BH Log

Unit	Description	From (bgl)	To (bgl)
Topsoil	Topsoil	GL	0.2m
London Clay Formation	Soft blue and brown CLAY	0.2m	2.2m
	CLAYSTONE	2.2m	2.4m
	Firm blue and brown CLAY	2.4m	4.0m
	Stiff blue CLAY with layers of Claystone	4.0m	13.0m
	Blue silty CLAY with shells and pebbles	13.0m	15.0m
Lambeth Group	Stiff multi-coloured CLAY	15.0m	20.0m
	Grey ROCK	20.0m	20.1m
	Stiff multi-coloured CLAY with bands of Sand	20.1m	25.0m
	Brown Sand	25.0m	27.0m
	Very stiff blue brown CLAY	27.0m	34.7m
	Light grey SAND	34.7m	36.0m
	Green silty SAND	36.0m	38.0m
	Grey silty SAND	38.0m	39.0m
	Very hard grey silty CLAY with flint and pebbles	39.0m	40.0m
Chalk Formation	Chalk with lots of flints	40.0m	60.0m
	Very hard CHALK	60.0m	60.6m
	Firm white CHALK with lots of flints and some bands of hard Chalk	60.6m	80.0m
Groundwater	Water struck at 46.0m bgl Water resting at 9.45m bgl		

GL = Ground Level

3.0 GROUND INVESTIGATION

3.1 Drilling of Boreholes and installation of Monitoring Wells

Window sample boreholes WS1 to WS5 were drilled using a Dando Terrier drilling rig on 11 September 2018 with WS1 located in the north of the site, WS2 the centre and WS3-WS4 the south.

The locations of the window sample boreholes are illustrated in **Figure 3,** which is included as **Appendix I.**

The purpose of the window sampling was to evaluate ground conditions to depths of up to 5m bgl for the purpose of evaluating ground conditions and also determining groundwater levels.

The action of window sampling enables the installation of monitoring wells to undertake standing groundwater levels and falling head infiltration testing for which, a test following the general practices of the Building Research Establishment [BRE] Digest D365 - 2016, ‘Soakaway Design’ (BRE D365) can be completed.

Standard Penetration Tests (SPTs) were also undertaken at 1m intervals to depths of up to 5m bgl within the boreholes in accordance with BS EN SO 22476-3 “Standard Penetration Test 2005”. Disturbed soil samples were also collected from bored arisings for geotechnical material property laboratory tests to determine Volume Change Potential (VCP) of Clay.

3.2 Ground Conditions Encountered

The **exploratory hole logs** and **photographs** are presented in **Appendix III** and generally ground conditions are summarised in table 5.

Table 5: Summary of Ground Conditions Encountered

Unit	Description	From (bgl)	To (bgl)
Surfacing	Surfacing of CONCRETE at WS1 and WS2	GL	0.12m
Made Ground	All locations and generally a grey, black re-worked gravelly Clay with type 1	GL	0.3/0.45m
LCF	Brown, grey slightly sandy CLAY with occasional yellow Sand partings	0.3/0.45m	>5.0m
Groundwater	Encountered within WS2 at 3.0m, WS3 at 3.0m and WS5 at 3.0m and expected to be perched within Clay fissures/sandy partings.		
GL = Ground Level			

3.3 Monitoring Well Installation and Groundwater Standing Level Monitoring

Three window sample boreholes were converted to monitoring wells to enable standing level groundwater level and falling head infiltration tests. Wells were installed into 101mm diameter window sample boreholes using 63mm external diameter and 50mm internal diameter HDPE standpipe. Table 6 describes the construction of the wells.

Table 6: Monitoring Well Construction

Location	Depth of plain pipe and bentonite seal	Response zone; depths of slotted pipe with gravel screen	Purpose
WS1	GL-1.0m	1.0m – 5.0m	To enable falling head testing within the underlying Clay, and groundwater standing level monitoring.
WS2	GL-1.0m	1.0m – 5.0m	
WS3	GL-1.0m	1.0m – 5.0m	

An Aviron technician returned to site to complete groundwater standing level monitoring and falling head infiltration testing on 15 January 2024.

Table 7 provides standing level groundwater 'dips' during monitoring.

Table 7: Standing Groundwater Levels

Location	Depth bgl 15 January 2024
WS1	1.06m
WS2	0.82m
WS3	0.98m

Groundwater was encountered within monitoring wells is expected to be resultant of surface water which has entered the wells (following recent heavy rain) and is perched within the underlying and surrounding unit of Clay.

4.0 LABORATORY TESTING

Disturbed samples were collected where appropriate from the boreholes. A programme of geotechnical laboratory testing was undertaken at K4 Soils Laboratory. Testing was completed using the clay soils encountered.

The test procedures used were generally in accordance with the methods described in BS1377:1990. Details of geotechnical testing are provided in table 8.

Table 8: Soil Geotechnical Testing		
Test	**Standard**	**Number of Samples**
Atterberg Limits (and Moisture Content) *To determine the volume change potential of fine (clay and silt) soils and the influence of trees on the proposed development*	BS1377:1990:Part 2:Clause 4.3 & 5.3	12 (20)

Atterberg limits tests conducted on the soils beneath the site at depths of between 1.0m and 5.0m bgl indicate that the fine soils of the London Clay Formation comprise inorganic clays of high and very high plasticity (CH/CI), with a modified plasticity index of between 35% and 54%.

For the purposes of this assessment and in accordance with NHBC Standards Chapter 4.2, Building Near Trees, the CLAY strata anticipated at foundation formation of 1.5m bgl across the site are classified as being of high volume change potential.

The results of Atterberg limits testing results are enclosed within **Appendix V.**

5.0 INFILTRATION TESTING

Falling head infiltration tests were abandoned due to the high groundwater levels indicating negligible permeable Clay strata.

6.0 INFILTRATION SOAKAWAY DRAINAGE OPINION

6.1 Shallow Soakaway Drainage

Conventional shallow soakaway drainage is not considered to be suitable for any new development as the London Clay Formation is typically of negligible permeability and perched was levels of at a level which would not provide the necessary freeboard.

An alternative method of surface water disposal to conventional shallow soakaway drainage should be sought.

6.2 Deep Bore Soakaways

Deep bore soakaways are not considered suitable. The sub-crop of typically permeable Chalk strata is circa 40m bgl and rest water level is 9.45m bgl as thus surface water would be discharge into relatively shallow groundwater which has risen under artesian pressure from within the underlying Chalk aquifer, circa 40m deep.

An alternative method of surface water disposal to deep bore soakaway drainage should be sought.

7.0 CONCLUSIONS

The results of this assessment should be presented to the appointed drainage consultant to enable their drainage strategy to be prepared.

We trust that you find the above to be satisfactory, however should you require any further information please do not hesitate to contact the undersigned.

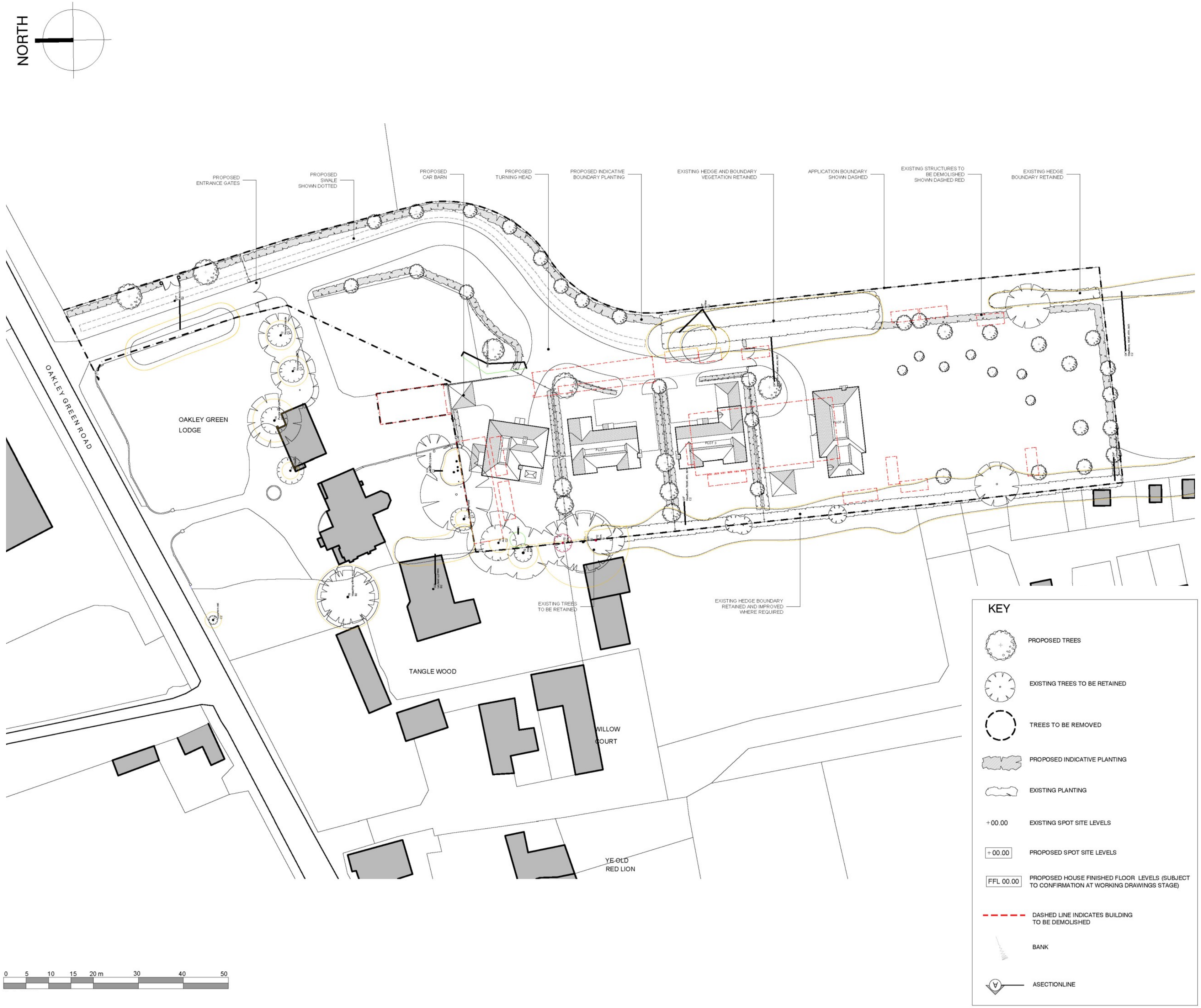
Prepared by **Orlando Blackwell** BEng (Hons) MSc (Eng) **Principal Engineer**	Approved by **James Burkitt** BEng (Hons) CEnv MRICS **Managing Director**

Appendix I

Figure 1 – Proposed Development Plan

Figure 2 – BGS Borehole Location Plan

Figure 3 – Exploratory Hole Location Plan



Legend

Notes

Figure 1

Drawing Title

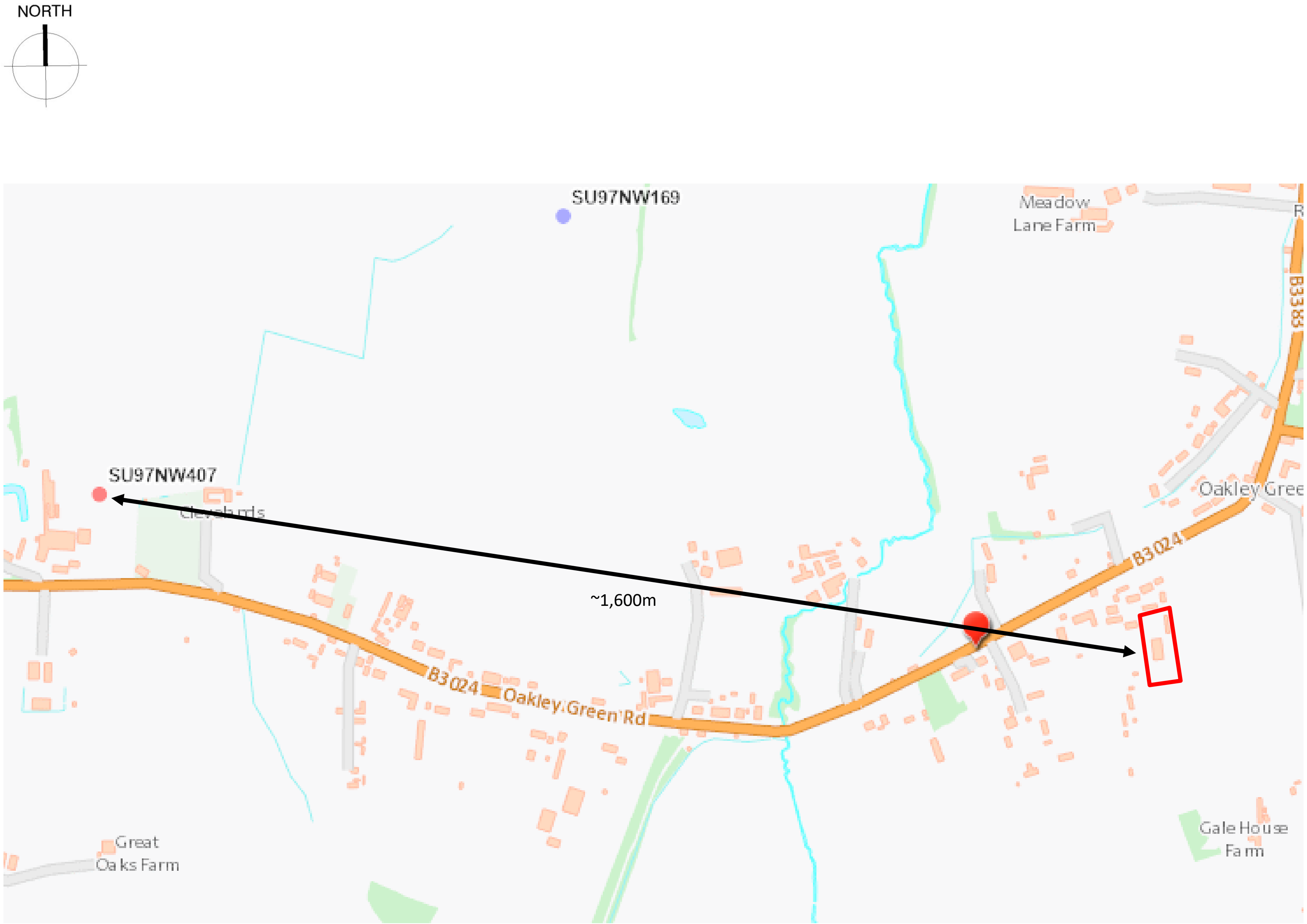
Proposed Development Plan

Project Number	24-131.01

Project Title

Oakley Green Lodge, Oakley Green,
Windsor, SL4 4PZ

Drawn by	GR
Checked by	JB
Scale	NTS



Legend

▯	Indicative Site Location
● SU97NW407	BGS Borehole Log Location

Notes

Figure 2

Drawing Title

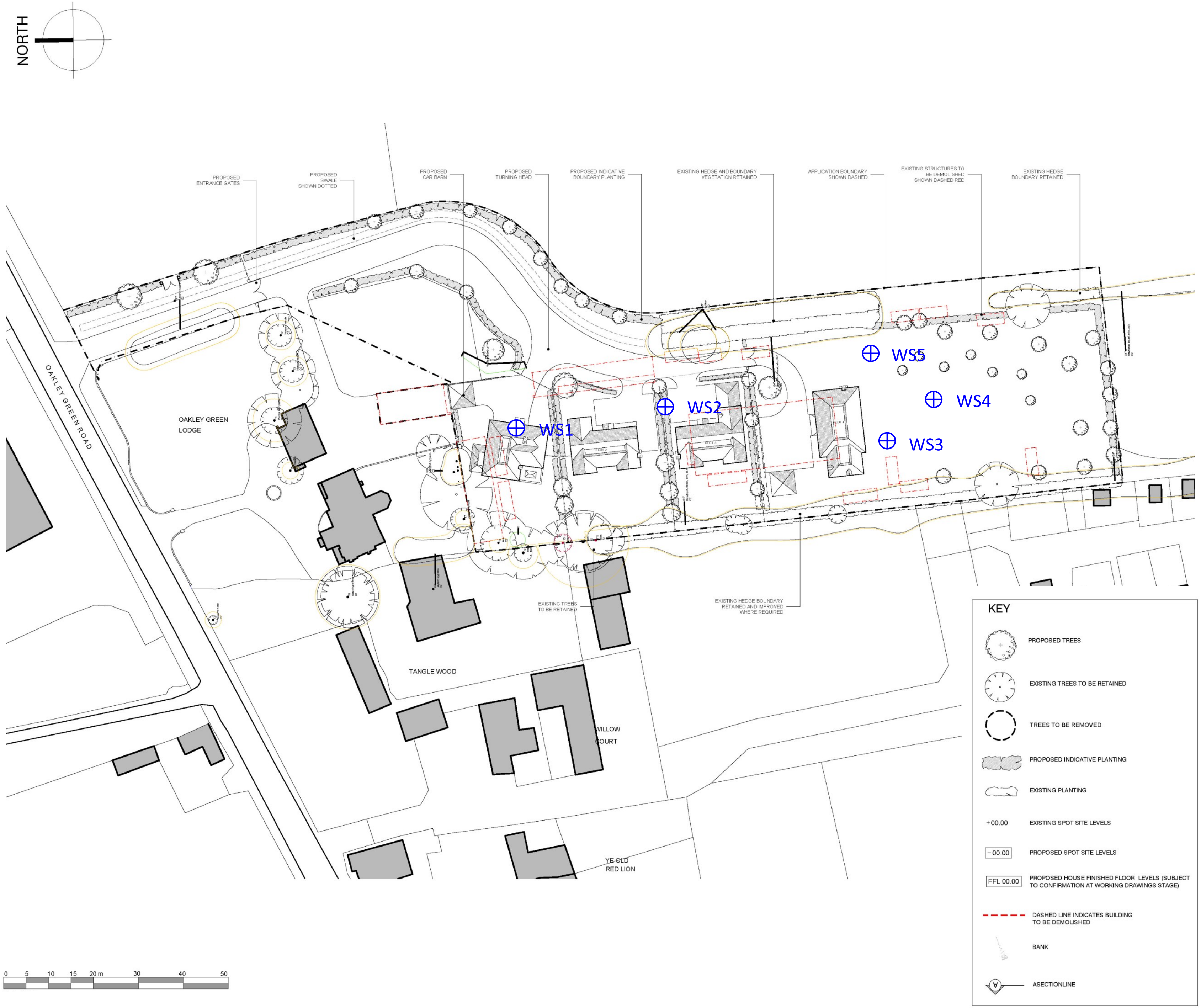
BGS Borehole Location Plan

Project Number	24-131.01

Project Title

Oakley Green Lodge, Oakley Green, Windsor, SL4 4PZ

Drawn by	GR
Checked by	JB
Scale	NTS



Legend

⊕ Window Sample Location

Hand Pit Location

Notes

Figure 3

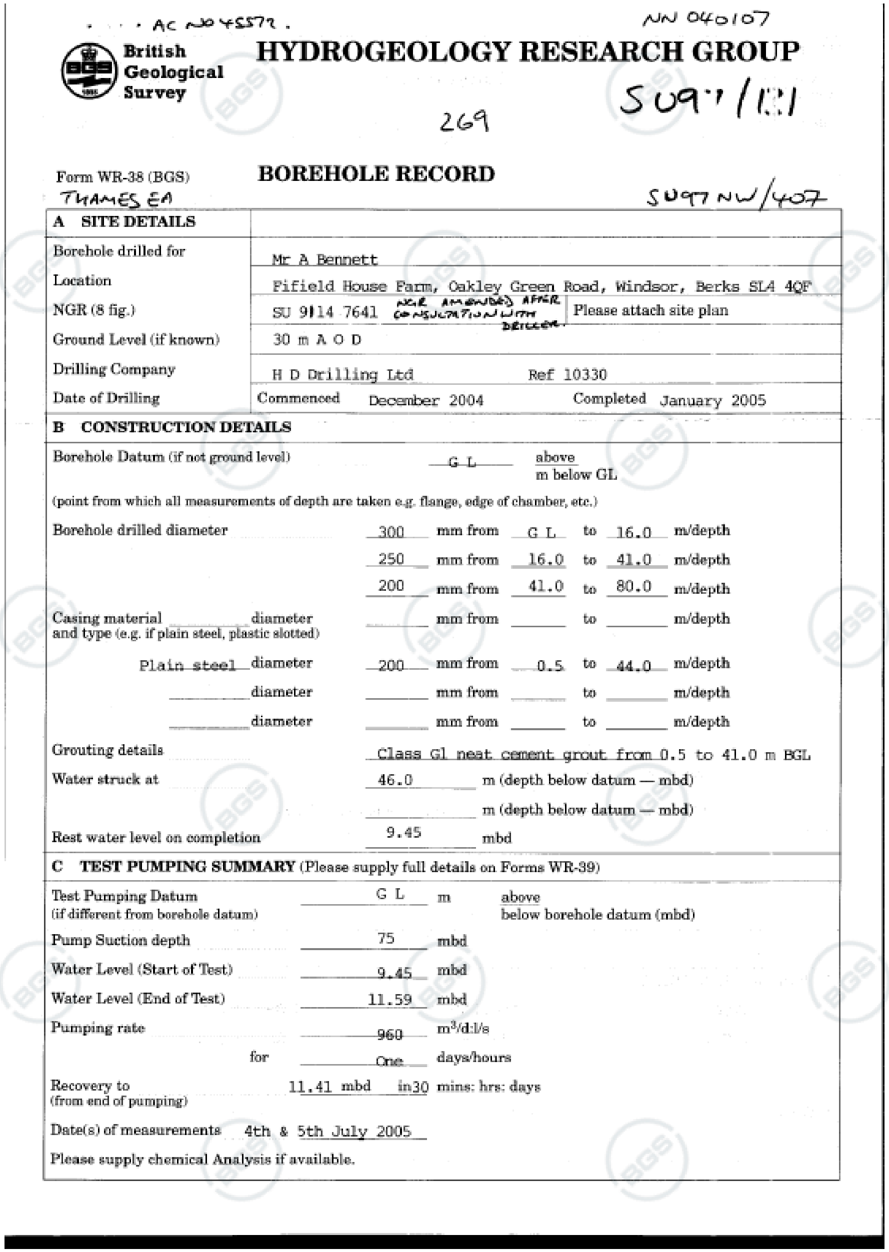
Drawing Title

Exploratory Hole Location Plan

Project Number	24-131.01
Project Title	Oakley Green Lodge, Oakley Green, Windsor, SL4 4PZ
Drawn by	GR
Checked by	JB
Scale	NTS

Appendix II

BGS Borehole Log



AC NO 45572 .   NN 040107

British Geological Survey

HYDROGEOLOGY RESEARCH GROUP

SU97/131

269

Form WR-38 (BGS)
THAMES EA

BOREHOLE RECORD

SU97NW/407

A SITE DETAILS	
Borehole drilled for	Mr A Bennett
Location	Fifield House Farm, Oakley Green Road, Windsor, Berks SL4 4QF
NGR (8 fig.)	SU 9114 7641 NGR AMENDED AFTER CONSULTATION WITH DRILLER. Please attach site plan
Ground Level (if known)	30 m A O D
Drilling Company	H D Drilling Ltd Ref 10330
Date of Drilling	Commenced December 2004 Completed January 2005

B CONSTRUCTION DETAILS

Borehole Datum (if not ground level) G L above / m below GL

(point from which all measurements of depth are taken e.g. flange, edge of chamber, etc.)

Borehole drilled diameter 300 mm from G L to 16.0 m/depth
250 mm from 16.0 to 41.0 m/depth
200 mm from 41.0 to 80.0 m/depth

Casing material and type (e.g. if plain steel, plastic slotted) diameter mm from to m/depth
Plain steel diameter 200 mm from 0.5 to 44.0 m/depth
diameter mm from to m/depth
diameter mm from to m/depth

Grouting details Class G1 neat cement grout from 0.5 to 41.0 m BGL

Water struck at 46.0 m (depth below datum — mbd)
m (depth below datum — mbd)

Rest water level on completion 9.45 mbd

C TEST PUMPING SUMMARY (Please supply full details on Forms WR-39)

Test Pumping Datum (if different from borehole datum) G L m above / below borehole datum (mbd)

Pump Suction depth 75 mbd

Water Level (Start of Test) 9.45 mbd

Water Level (End of Test) 11.59 mbd

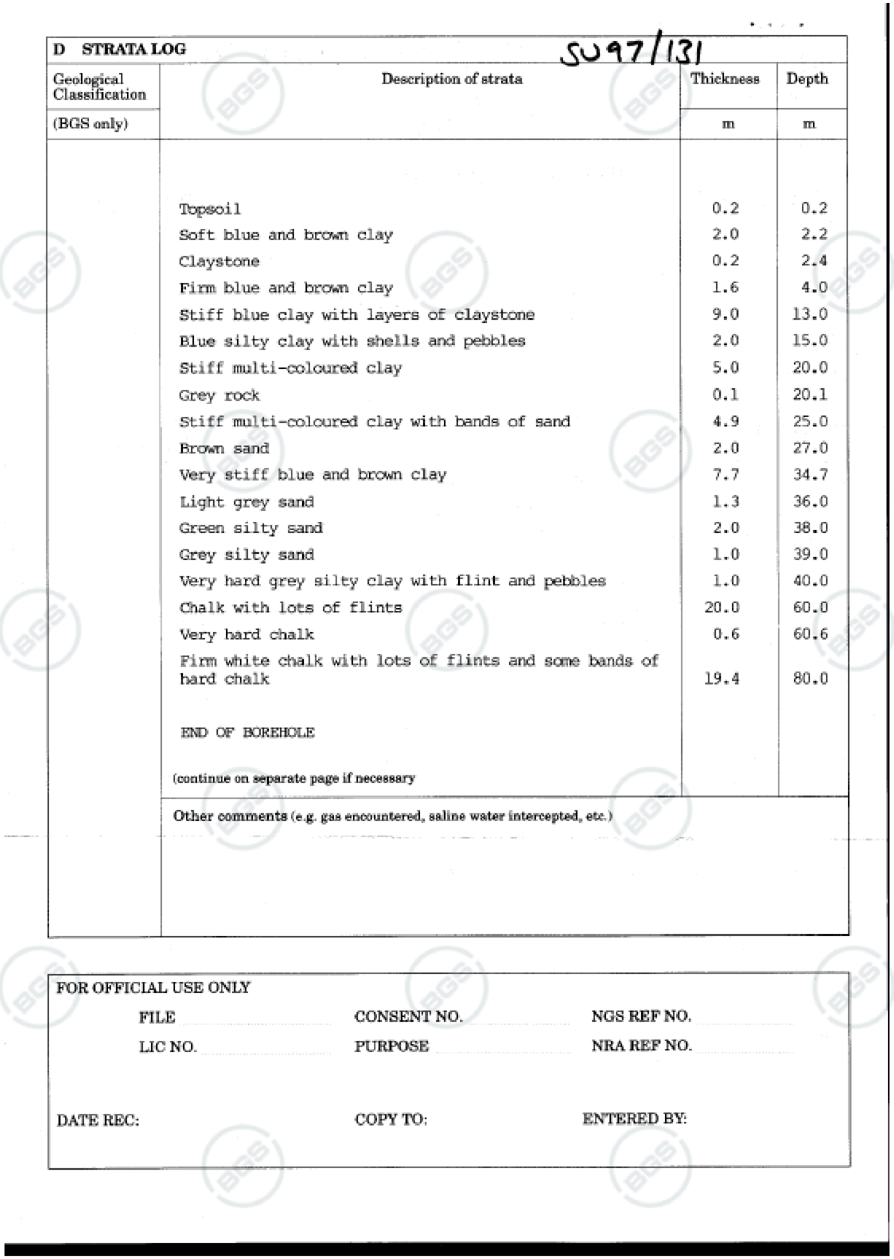
Pumping rate 960 m^3/d:l/s

for One days/hours

Recovery to (from end of pumping) 11.41 mbd in 30 mins: hrs: days

Date(s) of measurements 4th & 5th July 2005

Please supply chemical Analysis if available.



SU97/131

D STRATA LOG

Geological Classification (BGS only)	Description of strata	Thickness m	Depth m
	Topsoil	0.2	0.2
	Soft blue and brown clay	2.0	2.2
	Claystone	0.2	2.4
	Firm blue and brown clay	1.6	4.0
	Stiff blue clay with layers of claystone	9.0	13.0
	Blue silty clay with shells and pebbles	2.0	15.0
	Stiff multi-coloured clay	5.0	20.0
	Grey rock	0.1	20.1
	Stiff multi-coloured clay with bands of sand	4.9	25.0
	Brown sand	2.0	27.0
	Very stiff blue and brown clay	7.7	34.7
	Light grey sand	1.3	36.0
	Green silty sand	2.0	38.0
	Grey silty sand	1.0	39.0
	Very hard grey silty clay with flint and pebbles	1.0	40.0
	Chalk with lots of flints	20.0	60.0
	Very hard chalk	0.6	60.6
	Firm white chalk with lots of flints and some bands of hard chalk	19.4	80.0
	END OF BOREHOLE		
	(continue on separate page if necessary)		

Other comments (e.g. gas encountered, saline water intercepted, etc.)

FOR OFFICIAL USE ONLY

FILE	CONSENT NO.	NGS REF NO.
LIC NO.	PURPOSE	NRA REF NO.
DATE REC:	COPY TO:	ENTERED BY:

Appendix III

Exploratory Hole Logs and Photographs

Borehole Log

Borehole No.	**WS 1**	Sheet 1 of 1	
Project Name: Oakley Green Lodge	Project No. 18-240.01	Co-ords:	Hole Type WS
Location: Oakley Green, Windsor, SL4 4PZ		Level:	Scale 1:50
Client:		Dates: 11/09/2018	Logged By dn

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.12			Concrete
		0.20	ES		0.30			MADE GROUND black ashy sandy clay with brick fragments
		0.45	B					Firm brown and grey mottled slightly sandy CLAY with yellow sandy partings and rootlets
		0.50	ES					
		1.00	D					
		1.00	SPT	N=8 (1,1/2,2,2,2)	1.20			
								Firm to stiff, medium strength, becoming stiff locally fissured brown and grey mottled slightly sandy CLAY with yellow sandy partings
		1.50 - 1.95	U					
		2.00	D					
		2.00	SPT	N=13 (2,3/3,3,3,4)				
		2.50	D					
		3.00	D					
		3.00	SPT	N=17 (2,3/4,5,4,4)				
		3.50	D					
		4.00	D					
		4.00	SPT	N=19 (2,3/4,4,5,6)				
		5.00	D		5.00			End of Borehole at 5.00m
		5.00	SPT	N=20 (3,3/4,5,5,6)				

Remarks: No groundwater encountered

Borehole Log

Borehole No.	**WS 2**	Sheet 1 of 1	
Project Name:	Oakley Green Lodge	Project No.	18-240.01
Co-ords:		Hole Type	WS
Location:	Oakley Green, Windsor, SL4 4PZ		
Level:		Scale	1:50
Client:			
Dates:	11/09/2018	Logged By	dn

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results
		0.20	ES	
		0.70	ES	
		1.00	D	
		1.00	ES	
		1.00	SPT	N=9 (1,1/2,2,2,3)
		1.50 - 1.95	U	
		2.00	D	
		2.00	ES	
		2.00	SPT	N=14 (2,2/3,4,3,4)
		2.50	D	
	▼	3.00	D	
		3.00	SPT	N=16 (3,3/3,4,4,5)
		3.50	D	
		4.00	D	
		4.00	SPT	N=18 (3,2/4,4,5,5)
		5.00	D	
		5.00	SPT	N=19 (3,3/4,5,5,5)

Depth (m)	Level (m)	Legend	Stratum Description
0.12			Concrete
0.40			MADE GROUND soft grey stained sandy gravelly clay with brick fragments and black patches
0.70			Firm greenish grey and brown mottled slightly sandy CLAY with yellow sandy partings and rootlets
5.00			Firm, medium strength, becoming stiff locally fissured brown and grey mottled slightly sandy CLAY with yellow sandy partings *.... claystone at 2.90 m*

End of Borehole at 5.00m

Remarks: Groundwater encountered at 3.0m

Borehole Log

Project Name: Oakley Green Lodge	Project No. 18-240.01	Co-ords:	Borehole No. **WS 3** Sheet 1 of 1
Location: Oakley Green, Windsor, SL4 4PZ		Level:	Hole Type WS
			Scale 1:50
Client:		Dates: 11/09/2018	Logged By dn

Well	Water Strikes	**Sample and In Situ Testing**			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40	ES		0.45		▨	MADE GROUND Type 1 with brick and concrete cobbles
		1.00 1.00	D SPT	N=8 (1,1/1,2,2,3)			▤	Firm becoming stiff brown and grey mottled slightly sandy CLAY with yellow sandy partings and rootlets
		1.50 1.50 - 1.95	ES U		1.50		▤	Firm to stiff, medium strength, becoming stiff locally fissured brown and grey mottled slightly sandy CLAY with yellow sandy partings
		2.00 2.00	D SPT	N=13 (2,2/3,3,3,4)			▤	
		2.50	D				▤	
	▼	3.00 3.00	D SPT	N=15 (2,3/3,3,4,5)			▤	
		3.50	D				▤	
		4.00 4.00	D SPT	N=21 (25 for 80mm/9,4,4,4)			▤	*..... claystone at 4.30 m*
		5.00	SPT	N=21 (4,4/5,5,5,6)	5.00			End of Borehole at 5.00m

Remarks: No groundwater encountered at 3.0m

Borehole Log

Borehole No.	**WS 4**
	Sheet 1 of 1
Project Name:	Oakley Green Lodge
Project No.	18-240.01
Co-ords:	
Hole Type	WS
Location:	Oakley Green, Windsor, SL4 4PZ
Level:	
Scale	1:50
Client:	
Dates:	11/09/2018
Logged By	dn

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20		▩	MADE GROUND road planings with brick and concrete fragments
		0.30	ES		0.40		▩	MADE GROUND brick and concrete cobbles
							▤	Firm, medium strength, becoming stiff brown and grey mottled slightly sandy CLAY with yellow sandy partings and rootlets to 1.5m
		1.00	D				▤	
		1.00	SPT	N=10 (1,1/2,2,3,3)			▤	
		1.50 - 1.95	U				▤	
		2.00	D				▤	
		2.00	SPT	N=14 (2,3/3,3,4,4)	2.10		▤	
							▤	Stiff locally fissured brown and grey mottled slightly sandy CLAY with yellow sandy partings
		2.50	D				▤	
		2.50	ES				▤	
		3.00	D				▤	
		3.00	SPT	N=17 (3,3/4,4,4,5)			▤	
		3.50	D				▤	
		4.00	D				▤	
		4.00	SPT	N=22 (4,4/5,5,6,6)			▤	
							▤	*.... claystone at 4.70 m*
		5.00	D		5.00		▤	
		5.00	SPT	N=23 (4,5/5,6,6,6)				End of Borehole at 5.00m

Remarks: No groundwater encountered

Borehole Log

Borehole No.	**WS 5**	Sheet 1 of 1	
Project Name: Oakley Green Lodge	Project No. 18-240.01	Co-ords:	Hole Type WS
Location: Oakley Green, Windsor, SL4 4PZ		Level:	Scale 1:50
Client:		Dates: 11/09/2018	Logged By dn

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.20	ES		0.20		▨	MADE GROUND road planings with brick and concrete fragments	
					0.30		▨	MADE GROUND relic topsoil with brick cobbles	
		0.45	B					Firm becoming stiff and medium to high strength, brown and grey mottled slightly sandy CLAY with yellow sandy partings and rootlets to 1.4m	
		1.00	D						1
		1.00	ES						
		1.00	SPT	N=11 (1,1/2,3,3,3)					
		1.50 - 1.95	U						
		2.00	D		2.00			Stiff locally fissured brown and grey mottled slightly sandy CLAY with yellow sandy partings	2
		2.00	SPT	N=15 (2,2/3,4,4,4)					
		2.50	D						
	▼	3.00	D						3
		3.00	SPT	N=17 (3,3/3,4,5,5)					
		3.50	D					*.... claystone at 3.50 m*	
		4.00	D						4
		4.00	SPT	N=20 (3,4/4,5,5,6)					
		5.00	D		5.00			End of Borehole at 5.00m	5
									6
									7
									8
									9
									10

Remarks: No groundwater encountered at 3.0m

PHOTOGRAPHIC LOG

SITE Oakley Green Lodge **DATE** 11/09/2018

PROJECT 18-240.01 **TAKEN BY** DN

WS1

WS2

WS3

PHOTOGRAPHIC LOG

SITE Oakley Green Lodge **DATE** 11/09/2018

PROJECT 18-240.01 **TAKEN BY** DN

WS4

WS5

Appendix IV

Laboratory Test Results

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
25179	Oakley Green Lodge	Samples received	12/09/2018
		Schedule received	12/09/2018
Project No.	Client	Project started	13/09/2018
18-240.01	Aviron	Testing Started	24/09/2018

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
WS 1	-	1.00	-	D	Brown silty CLAY	31	100	73	28	45	
WS 1	-	2.00	-	D	Brown silty CLAY with orangish brown sandy patches	27	100	69	26	43	
WS 1	-	2.50	-	D	Brown silty CLAY	29					
WS 1	-	3.00	-	D	Brown silty CLAY with bluish grey and orangish brown veins, and scattered selenite crystals	28	100	70	28	42	
WS 1	-	3.50	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	31					
WS 1	-	4.00	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	32	100	76	28	48	
WS 1	-	5.00	-	D	Brown silty CLAY with orangish brown veins and scattered selenite crystals	30					
WS 2	-	1.00	-	D	Brown silty CLAY	35	100	79	28	51	
WS 2	-	2.00	-	D	Brown slty CLAY with bluish grey and orangish brown veins, and scattered selenite crystals	30	100	71	29	42	
WS 2	-	2.50	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	29					
WS 2	-	3.00	-	D	Brown silty CLAY with bluish grey and orangish brown veins	29	100	67	27	40	
WS 2	-	3.50	-	D	Brown silty CLAY with bluish grey veins, claystone fragments and scattered selenite crystals	32					

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials J.P

Date: 27/09/2018

UKAS TESTING
2519

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

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
25179	Oakley Green Lodge	Samples received	12/09/2018
		Schedule received	12/09/2018
Project No.	Client	Project started	13/09/2018
18-240.01	Aviron	Testing Started	24/09/2018

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
WS 2	-	4.00	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	32					
WS 2	-	5.00	-	D	Brown silty CLAY with scattered selenite crystals	33	100	73	30	43	
WS 3	-	1.00	-	D	Brown and orangish brown slightly sandy silty CLAY with rare fm sub-angular gravel	28	98	59	23	36	
WS 3	-	2.00	-	D	Brown silty CLAY with orangish brown veins	35	100	77	31	46	
WS 3	-	2.50	-	D	Brown silty CLAY with bluish grey veins and orangish brown and light grey sandy patches	30					
WS 3	-	3.00	-	D	Brown silty CLAY with bluish grey and orangish brown veins, and scattered selenite crystals	28	100	75	29	46	
WS 3	-	3.50	-	D	Brown silty CLAY with scattered selenite crystals	28					
WS 3	-	4.00	-	D	Brown CLAY with bluish grey veins and scattered selenite crystals	28	100	71	29	42	
WS 4	-	1.00	-	D	Brown silty CLAY with scattered fine claystone fragments	29	99	75	29	46	
WS 4	-	2.00	-	D	Brown silty CLAY with bluish grey and orangish brown veins	31	100	76	30	46	
WS 4	-	2.50	-	D	Brown silty CLAY with bluish grey veins	33					
WS 4	-	3.00	-	D	Brown silty CLAY with bluish grey veins and orangish brown sandy patches	31	100	70	28	42	

UKAS TESTING
2519

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved
Initials **J.P**
Date: 27/09/2018

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

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
25179	Oakley Green Lodge	Samples received	12/09/2018
		Schedule received	12/09/2018
Project No.	**Client**	Project started	13/09/2018
18-240.01	Aviron	Testing Started	24/09/2018

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
WS 4	-	4.00	-	D	Brown silty CLAY with bluish grey veins	31					
WS 4	-	5.00	-	D	Brown silty CLAY with orangish brown sandy patches	27	100	64	27	37	
WS 5	-	1.00	-	D	Brown silty CLAY	35	100	84	30	54	
WS 5	-	2.00	-	D	Brown silty CLAY with orangish brown veins	30	100	78	29	49	
WS 5	-	2.50	-	D	Brown silty CLAY with bluish grey veins	30					
WS 5	-	3.00	-	D	Brown silty CLAY with bluish grey veins	30	100	73	28	45	
WS 5	-	4.00	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	28	100	72	30	42	
WS 5	-	5.00	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	27					

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

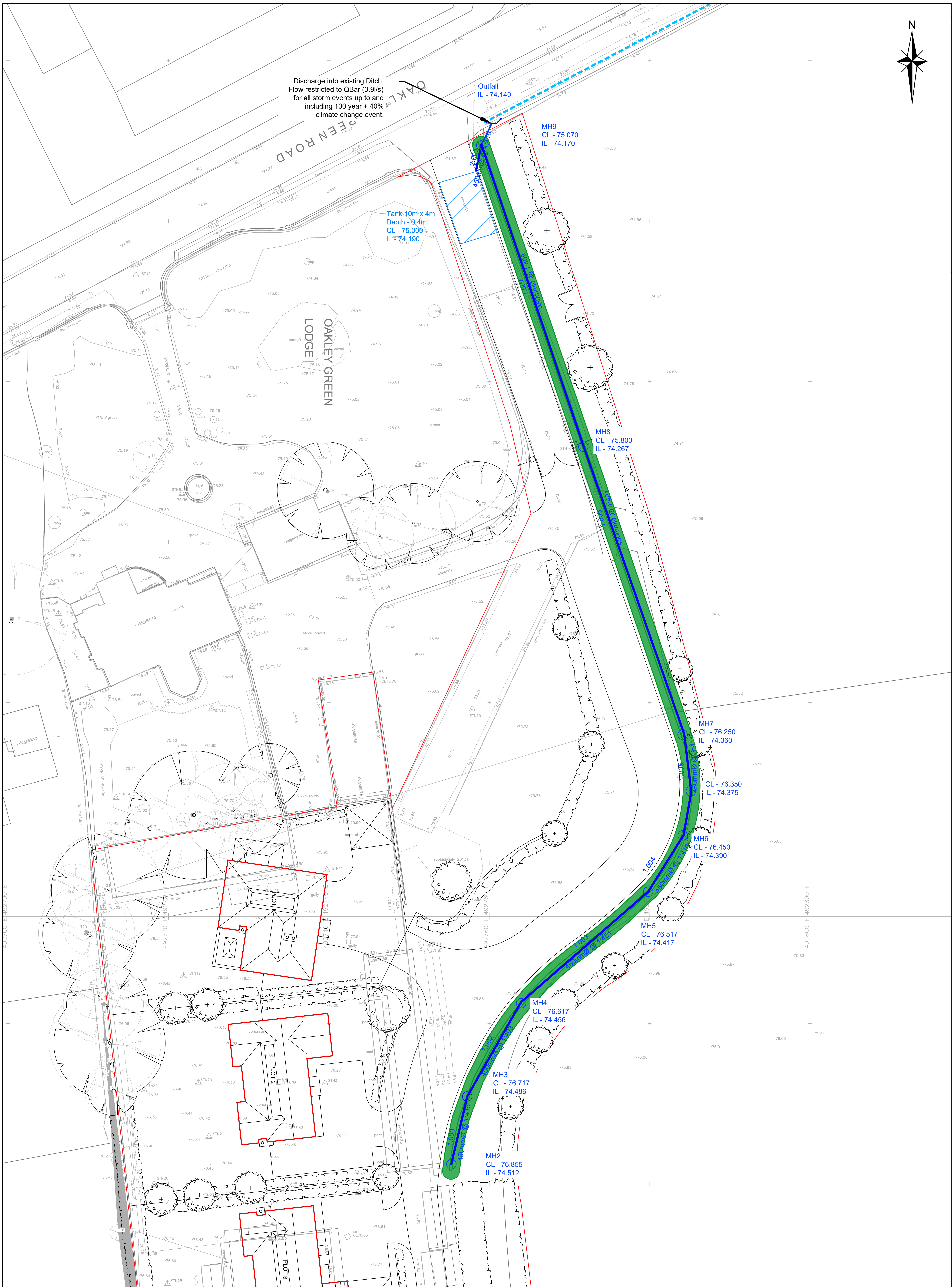
Initials J.P

Date: 27/09/2018

UKAS TESTING
2519

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

Appendix D Surface Water Drainage Strategy

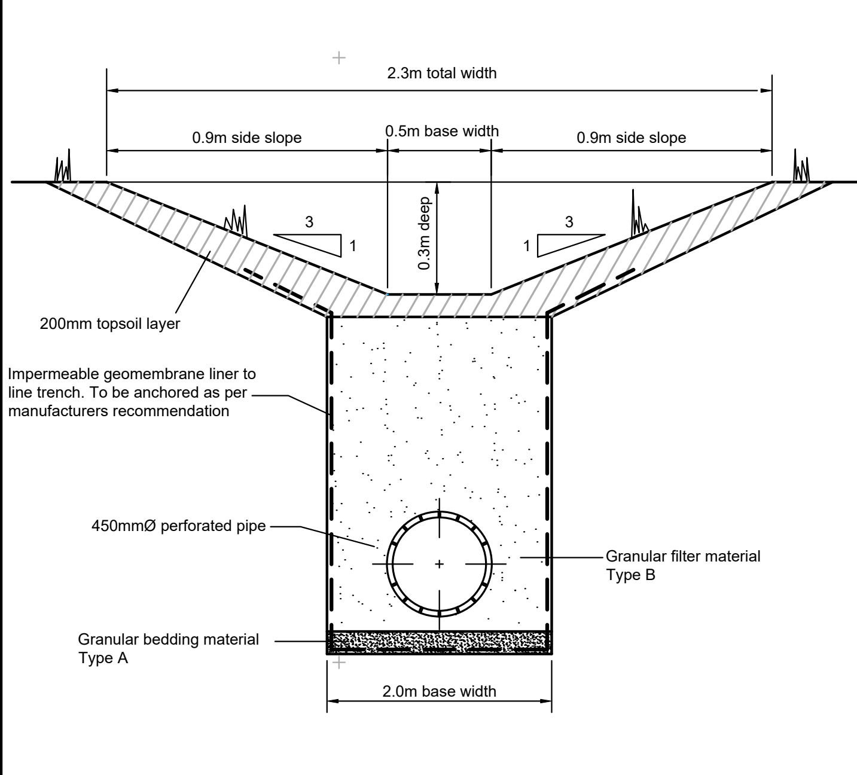


NOTES

1. Do not scale from this drawing.
2. All dimensions are in metres unless stated otherwise.

Key

—	Red Line Boundary
🟩	Swale
—	Surface Water Pipes
○	Surface Water Manholes
⌒	Headwall
▨	Proposed AttenuationTank
- - -	Existing Ditch



Typical Section Through Swale / Filter Drain
NTS

Rev	Amendments	Drn	Chk	App	Date
B	New Site layout	MT	TSH	GC	Jan 24
A	Updated to suit client comments	MT	TSH	GC	Dec 23

Charles & Associates

☒ Issued by ☐

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Park House
Park Farm
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Bradbourne Lane
Aylesford Kent
ME20 6SN
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Job Title
Oakley Green Lodge
Oakley Green

Drawing Title
Indicative Surface Water
Drainage Strategy

Client
Westbourne Homes

Scale 1:250 @ A1	Date Dec 23	Designed MT
Drawn MT	Checked TSH	Approved GAC
Job No 23-100	Drawing No 23-100-004	Rev B

Appendix E Existing Brownfield Runoff Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 492746 176236 SU 92746 76236
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	**Length (m)**	**Fall (m)**	**Slope (1:X)**	**I.Area (ha)**	**T.E. (mins)**	**Base Flow (l/s)**	**k (mm)**	**HYD SECT**	**DIA (mm)**	**Section Type**	**Auto Design**
S1.000	10.000	0.017	580.0	0.333	5.00	0.0	0.600	o	600	Pipe/Conduit	🔒
S1.001	102.000	0.175	582.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	🔓

Network Results Table

PN	**Rain (mm/hr)**	**T.C. (mins)**	**US/IL (m)**	**Σ I.Area (ha)**	**Σ Base Flow (l/s)**	**Foul (l/s)**	**Add Flow (l/s)**	**Vel (m/s)**	**Cap (l/s)**	**Flow (l/s)**
S1.000	50.00	5.17	74.000	0.333	0.0	0.0	0.0	1.00	283.9	45.1
S1.001	50.00	6.86	73.983	0.333	0.0	0.0	0.0	1.00	283.1	45.1

Free Flowing Outfall Details for Storm

Outfall Pipe Number	**Outfall Name**	**C. Level (m)**	**I. Level (m)**	**Min I. Level (m)**	**D,L (mm)**	**W (mm)**
S1.001	S	76.000	73.808	0.000	0	0

Simulation Criteria for Storm

```
          Volumetric Runoff Coeff 0.750   Additional Flow - % of Total Flow 0.000
           Areal Reduction Factor 1.000       MADD Factor * 10m³/ha Storage 2.000
                  Hot Start (mins)     0                Inlet Coeffiecient 0.800
             Hot Start Level (mm)     0 Flow per Person per Day (l/per/day) 0.000
 Manhole Headloss Coeff (Global) 0.500                      Run Time (mins)    60
     Foul Sewage per hectare (l/s) 0.000               Output Interval (mins)     1

            Number of Input Hydrographs 0 Number of Storage Structures 0
              Number of Online Controls 0 Number of Time/Area Diagrams 0
             Number of Offline Controls 0 Number of Real Time Controls 0
```

Synthetic Rainfall Details

```
           Rainfall Model                                FEH
    Return Period (years)                                  2
     FEH Rainfall Version                               2013
            Site Location GB 492746 176236 SU 92746 76236
                Data Type                              Point
            Summer Storms                                Yes
            Winter Storms                                Yes
              Cv (Summer)                              0.750
              Cv (Winter)                              0.840
     Storm Duration (mins)                                30
```

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

```
                              Simulation Criteria
          Areal Reduction Factor 1.000   Additional Flow - % of Total Flow 0.000
                Hot Start (mins)     0       MADD Factor * 10m³/ha Storage 2.000
            Hot Start Level (mm)     0                  Inlet Coeffiecient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
   Foul Sewage per hectare (l/s) 0.000

           Number of Input Hydrographs 0 Number of Storage Structures 0
             Number of Online Controls 0 Number of Time/Area Diagrams 0
            Number of Offline Controls 0 Number of Real Time Controls 0

                           Synthetic Rainfall Details
                     Rainfall Model                             FEH
                FEH Rainfall Version                           2013
                       Site Location GB 492746 176236 SU 92746 76236
                           Data Type                          Point
                         Cv (Summer)                          0.750
                         Cv (Winter)                          0.840

            Margin for Flood Risk Warning (mm) 300.0     DVD Status OFF
                             Analysis Timestep  Fine Inertia Status OFF
                                    DTS Status    ON


                    Profile(s)                           Summer and Winter
                 Duration(s) (mins)     15, 30, 60, 120, 180, 240, 360, 480, 600,
                                          720, 960, 1440, 2160, 2880, 4320, 5760,
                                                                7200, 8640, 10080
           Return Period(s) (years)                                   2, 30, 100
                 Climate Change (%)                                      0, 0, 0


                                                                            Water
        US/MH             Return Climate First (X) First (Y) First (Z) Overflow  Level
    PN   Name    Storm    Period  Change Surcharge   Flood   Overflow   Act.     (m)

  S1.000    S1  15 Winter      2     +0%                                       74.245
  S1.001    S2  15 Winter      2     +0%                                       74.163


              Surcharged Flooded                      Half Drain  Pipe
         US/MH   Depth   Volume  Flow / Overflow    Time     Flow          Level
    PN   Name     (m)     (m³)    Cap.    (l/s)     (mins)   (l/s)  Status Exceeded

  S1.000   S1     -0.355   0.000   0.34                       51.1     OK
  S1.001   S2     -0.420   0.000   0.17                       45.8     OK
```

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 492746 176236 SU 92746 76236
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	**US/MH Name**	**Storm**	**Return Period**	**Climate Change**	**First (X) Surcharge**	**First (Y) Flood**	**First (Z) Overflow**	**Overflow Act.**	**Water Level (m)**
S1.000	S1	15 Winter	30	+0%					74.417
S1.001	S2	15 Winter	30	+0%					74.274

PN	**US/MH Name**	**Surcharged Depth (m)**	**Flooded Volume (m³)**	**Flow / Cap.**	**Overflow (l/s)**	**Half Drain Time (mins)**	**Pipe Flow (l/s)**	**Status**	**Level Exceeded**
S1.000	S1	-0.183	0.000	0.83			123.5	OK	
S1.001	S2	-0.309	0.000	0.42			110.5	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

```
         Areal Reduction Factor 1.000   Additional Flow - % of Total Flow 0.000
               Hot Start (mins)     0        MADD Factor * 10m³/ha Storage 2.000
             Hot Start Level (mm)     0                 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
   Foul Sewage per hectare (l/s) 0.000

     Number of Input Hydrographs 0 Number of Storage Structures 0
      Number of Online Controls 0 Number of Time/Area Diagrams 0
     Number of Offline Controls 0 Number of Real Time Controls 0
```

Synthetic Rainfall Details

```
          Rainfall Model                         FEH
    FEH Rainfall Version                        2013
           Site Location GB 492746 176236 SU 92746 76236
               Data Type                       Point
             Cv (Summer)                       0.750
             Cv (Winter)                       0.840

   Margin for Flood Risk Warning (mm) 300.0     DVD Status OFF
                    Analysis Timestep  Fine Inertia Status OFF
                           DTS Status    ON


            Profile(s)                          Summer and Winter
      Duration(s) (mins)    15, 30, 60, 120, 180, 240, 360, 480, 600,
                              720, 960, 1440, 2160, 2880, 4320, 5760,
                                                   7200, 8640, 10080
    Return Period(s) (years)                               2, 30, 100
        Climate Change (%)                                   0, 0, 0
```

PN	**US/MH Name**	**Storm**	**Return Period**	**Climate Change**	**First (X) Surcharge**	**First (Y) Flood**	**First (Z) Overflow**	**Overflow Act.**	**Water Level (m)**
S1.000	S1	15 Winter	100	+0%					74.477
S1.001	S2	15 Winter	100	+0%					74.322

PN	**US/MH Name**	**Surcharged Depth (m)**	**Flooded Volume (m³)**	**Flow / Cap.**	**Overflow (l/s)**	**Half Drain Time (mins)**	**Pipe Flow (l/s)**	**Status**	**Level Exceeded**
S1.000	S1	-0.123	0.000	1.06			158.5	OK	
S1.001	S2	-0.261	0.000	0.54			141.8	OK	

Appendix F Existing Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

```
                              Input

Return Period (years)    100           Soil    0.450
            Area (ha)  0.890          Urban    0.000
            SAAR (mm)    700  Region Number Region 6

                          Results   l/s

                          QBAR Rural   3.9
                          QBAR Urban   3.9

                          Q100 years  12.5

                             Q1 year   3.3
                            Q30 years   8.9
                          Q100 years  12.5
```

Appendix G Surface Water Design Calculations

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
MH2	0.221	5.00		76.855	1200	35.630	14.530	2.343
MH3	0.000	5.00	0.0	76.717	1200	44.493	31.104	2.231
MH4	0.000	5.00	0.0	76.617	1200	49.175	43.144	2.161
MH5	0.137	5.00	0.0	76.517	1200	53.857	53.846	2.100
MH6	0.095	5.00		76.450	1200	61.884	66.388	2.060
MH7	0.000	5.00	0.0	76.250	1200	68.907	82.441	1.890
MH8	0.037	5.00	0.0	75.800	1200	67.402	98.662	1.533
MH9	0.023	5.00		75.070	1200	66.439	113.080	0.900
Outfall	0.000	5.00	0.0	75.140	1200	74.426	125.920	1.000
Tank	0.000	5.00	0.0	75.000		54.249	107.542	0.830

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	MH2	MH3	10.800	0.600	74.512	74.486	0.026	415.4	450	5.18	50.0
1.001	MH3	MH4	12.100	0.600	74.486	74.456	0.030	403.3	450	5.38	50.0
1.002	MH4	MH5	17.600	0.600	74.456	74.417	0.039	451.3	450	5.69	50.0
1.003	MH5	MH6	11.250	0.600	74.417	74.390	0.027	416.7	450	5.88	50.0
1.004	MH6	MH7	12.350	0.600	74.390	74.360	0.030	411.7	450	6.09	50.0
1.005	MH7	MH8	37.350	0.600	74.360	74.267	0.093	401.6	450	6.70	50.0
1.006	MH8	MH9	39.700	0.600	74.267	74.170	0.097	409.3	450	7.37	50.0
1.007	MH9	Outfall	3.360	0.600	74.170	74.140	0.030	112.0	300	7.41	50.0
2.000	MH9	Tank	8.200	0.600	74.190	74.170	0.020	410.0	450	5.14	50.0

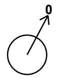
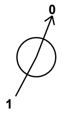
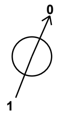
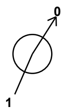
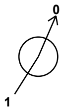
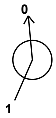
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.991	157.6	30.0	1.893	1.781	0.221	0.0	132	0.769
1.001	1.006	160.0	30.0	1.781	1.711	0.221	0.0	131	0.778
1.002	0.950	151.1	30.0	1.711	1.650	0.221	0.0	135	0.745
1.003	0.989	157.4	48.5	1.650	1.610	0.358	0.0	171	0.875
1.004	0.996	158.3	61.4	1.610	1.440	0.453	0.0	194	0.934
1.005	1.008	160.3	61.4	1.440	1.083	0.453	0.0	193	0.944
1.006	0.998	158.8	66.4	1.083	0.450	0.490	0.0	203	0.955
1.007	1.485	104.9	69.5	0.600	0.700	0.513	0.0	178	1.583
2.000	0.998	158.7	0.0	0.430	0.380	0.000	0.0	0	0.000

Pipeline Schedule

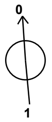
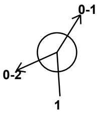
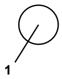
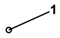
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	10.800	415.4	450	Circular	76.855	74.512	1.893	76.717	74.486	1.781
1.001	12.100	403.3	450	Circular	76.717	74.486	1.781	76.617	74.456	1.711
1.002	17.600	451.3	450	Circular	76.617	74.456	1.711	76.517	74.417	1.650
1.003	11.250	416.7	450	Circular	76.517	74.417	1.650	76.450	74.390	1.610
1.004	12.350	411.7	450	Circular	76.450	74.390	1.610	76.250	74.360	1.440
1.005	37.350	401.6	450	Circular	76.250	74.360	1.440	75.800	74.267	1.083
1.006	39.700	409.3	450	Circular	75.800	74.267	1.083	75.070	74.170	0.450
1.007	3.360	112.0	300	Circular	75.070	74.170	0.600	75.140	74.140	0.700
2.000	8.200	410.0	450	Circular	75.070	74.190	0.430	75.000	74.170	0.380

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	MH2	1200	Manhole	Adoptable	MH3	1200	Manhole	Adoptable
1.001	MH3	1200	Manhole	Adoptable	MH4	1200	Manhole	Adoptable
1.002	MH4	1200	Manhole	Adoptable	MH5	1200	Manhole	Adoptable
1.003	MH5	1200	Manhole	Adoptable	MH6	1200	Manhole	Adoptable
1.004	MH6	1200	Manhole	Adoptable	MH7	1200	Manhole	Adoptable
1.005	MH7	1200	Manhole	Adoptable	MH8	1200	Manhole	Adoptable
1.006	MH8	1200	Manhole	Adoptable	MH9	1200	Manhole	Adoptable
1.007	MH9	1200	Manhole	Adoptable	Outfall	1200	Manhole	Adoptable
2.000	MH9	1200	Manhole	Adoptable	Tank		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
MH2	35.630	14.530	76.855	2.343	1200		0	1.000	74.512	450
MH3	44.493	31.104	76.717	2.231	1200		1	1.000	74.486	450
							0	1.001	74.486	450
MH4	49.175	43.144	76.617	2.161	1200		1	1.001	74.456	450
							0	1.002	74.456	450
MH5	53.857	53.846	76.517	2.100	1200		1	1.002	74.417	450
							0	1.003	74.417	450
MH6	61.884	66.388	76.450	2.060	1200		1	1.003	74.390	450
							0	1.004	74.390	450
MH7	68.907	82.441	76.250	1.890	1200		1	1.004	74.360	450
							0	1.005	74.360	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
MH8	67.402	98.662	75.800	1.533	1200		1	1.005	74.267	450
							0	1.006	74.267	450
MH9	66.439	113.080	75.070	0.900	1200		1	1.006	74.170	450
							0-1	1.007	74.170	300
							0-2	2.000	74.190	450
Outfall	74.426	125.920	75.140	1.000	1200		1	1.007	74.140	300
Tank	54.249	107.542	75.000	0.830			1	2.000	74.170	450

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	35	0	0
100	40	0	0

Node MH9 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.007	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0094-3900-1000-3900
Invert Level (m)	74.170	Min Outlet Diameter (m)	0.150
Design Depth (m)	1.000	Min Node Diameter (mm)	1200
Design Flow (l/s)	3.9		

Node MH3 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.486	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	2	Diameter (mm)	500

Node MH3 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.486	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	2	Diameter (mm)	500

Node MH4 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.456	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	2	Diameter (mm)	500

Node MH5 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.002
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.417	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	2	Diameter (mm)	500

Node MH6 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.003
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.390	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	2	Diameter (mm)	500

Node MH7 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.004
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.360	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	2	Diameter (mm)	500

Node MH8 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.005
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.267	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	0	Diameter (mm)	500

Node MH9 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.006
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.170	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	0	Diameter (mm)	500

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	74.170
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	7

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	40.0	0.0	0.400	40.0	0.0	0.401	0.0	0.0

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MH2	12	75.217	0.705	117.5	2.1260	0.0000	SURCHARGED
15 minute winter	MH3	12	75.200	0.714	108.4	2.0485	0.0000	SURCHARGED
15 minute winter	MH4	12	75.180	0.724	101.5	1.5289	0.0000	SURCHARGED
15 minute winter	MH5	12	75.153	0.736	166.4	2.8452	0.0000	SURCHARGED
15 minute winter	MH6	12	75.099	0.709	208.1	2.0942	0.0000	SURCHARGED
15 minute winter	MH7	12	75.010	0.650	204.0	1.3217	0.0000	SURCHARGED
15 minute winter	MH8	12	74.819	0.552	219.5	1.9364	0.0000	SURCHARGED
15 minute winter	MH9	12	74.587	0.417	230.4	1.2437	0.0000	SURCHARGED
15 minute summer	Outfall	1	74.140	0.000	3.9	0.0000	0.0000	OK
15 minute winter	Tank	12	74.506	0.336	226.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MH2	1.000	MH3	108.4	0.738	0.688	1.7112	
15 minute winter	MH3	1.001	MH4	101.5	0.744	0.634	1.9172	
15 minute winter	MH4	1.002	MH5	100.1	0.632	0.663	2.7886	
15 minute winter	MH5	1.003	MH6	160.7	1.014	1.021	1.7825	
15 minute winter	MH6	1.004	MH7	204.0	1.288	1.289	1.9568	
15 minute winter	MH7	1.005	MH8	203.9	1.287	1.272	5.9179	
15 minute winter	MH8	1.006	MH9	220.9	1.394	1.391	6.1881	
15 minute winter	MH9	Hydro-Brake®	Outfall	3.9				5.3
15 minute winter	MH9	2.000	Tank	226.9	1.641	1.430	1.1279	120.3

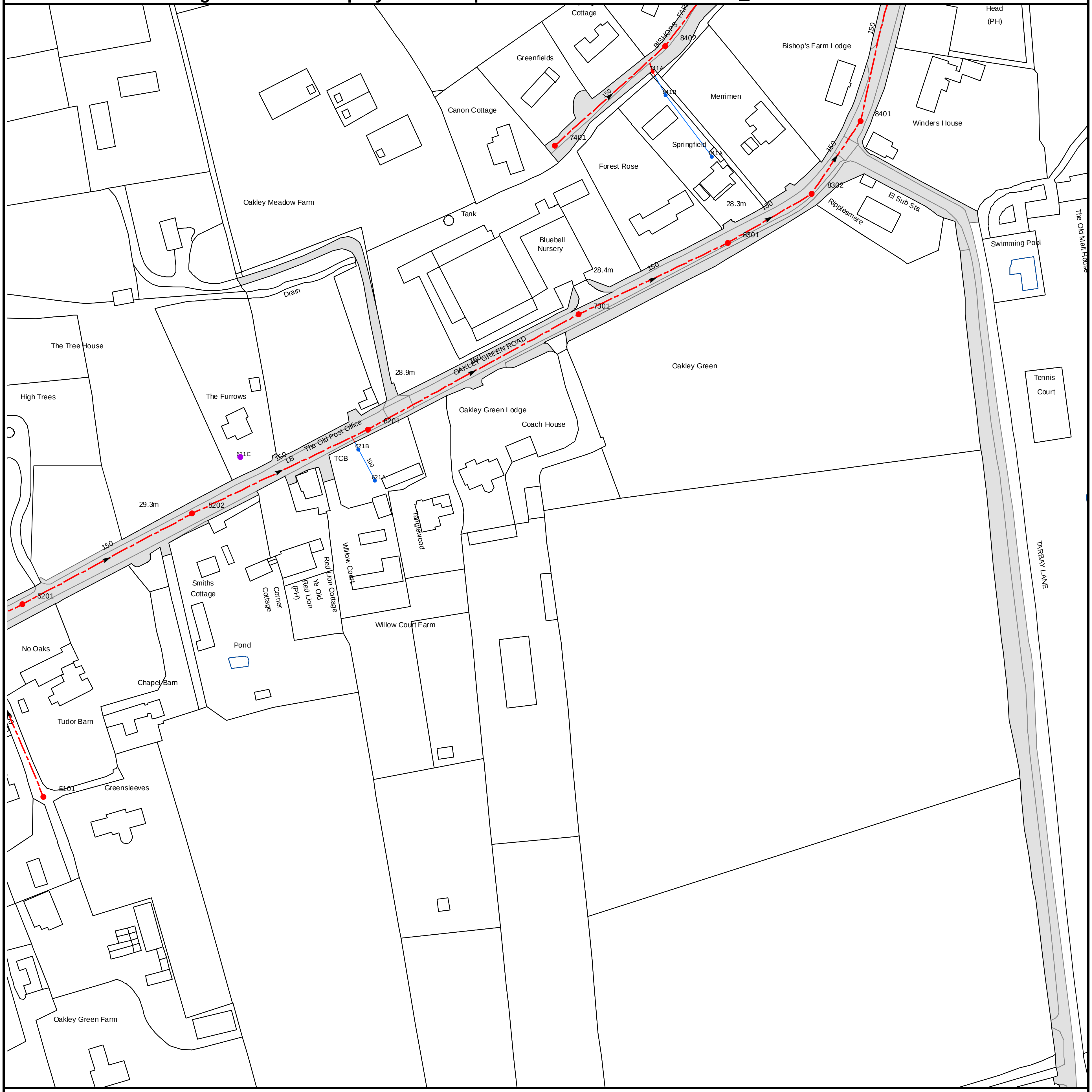
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MH2	12	75.721	1.209	155.7	3.6479	0.0000	SURCHARGED
15 minute winter	MH3	12	75.691	1.205	142.7	4.1960	0.0000	SURCHARGED
15 minute winter	MH4	12	75.657	1.201	130.6	2.9349	0.0000	SURCHARGED
15 minute winter	MH5	12	75.613	1.196	215.0	5.1772	0.0000	SURCHARGED
15 minute winter	MH6	12	75.524	1.134	267.4	3.6808	0.0000	SURCHARGED
15 minute winter	MH7	12	75.375	1.015	260.1	2.4105	0.0000	SURCHARGED
15 minute winter	MH8	12	75.060	0.793	281.1	3.6797	0.0000	SURCHARGED
15 minute winter	MH9	12	74.674	0.504	293.9	1.6904	0.0000	SURCHARGED
15 minute summer	Outfall	1	74.140	0.000	3.9	0.0000	0.0000	OK
15 minute winter	Tank	12	74.546	0.376	290.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MH2	1.000	MH3	142.7	0.901	0.906	1.7112	
15 minute winter	MH3	1.001	MH4	130.6	0.824	0.816	1.9172	
15 minute winter	MH4	1.002	MH5	128.2	0.809	0.849	2.7886	
15 minute winter	MH5	1.003	MH6	206.2	1.302	1.311	1.7825	
15 minute winter	MH6	1.004	MH7	260.1	1.642	1.643	1.9568	
15 minute winter	MH7	1.005	MH8	260.7	1.646	1.626	5.9179	
15 minute winter	MH8	1.006	MH9	281.2	1.775	1.771	6.2902	
15 minute winter	MH9	Hydro-Brake®	Outfall	3.9				5.5
15 minute winter	MH9	2.000	Tank	290.0	1.859	1.828	1.2303	161.2

Appendix H Thames Water Sewer Records

CommercialDW Drainage and Water Enquiry Sewer Map- CDWS/CDWS Standard/2018_3835989



The width of the displayed area is 500m

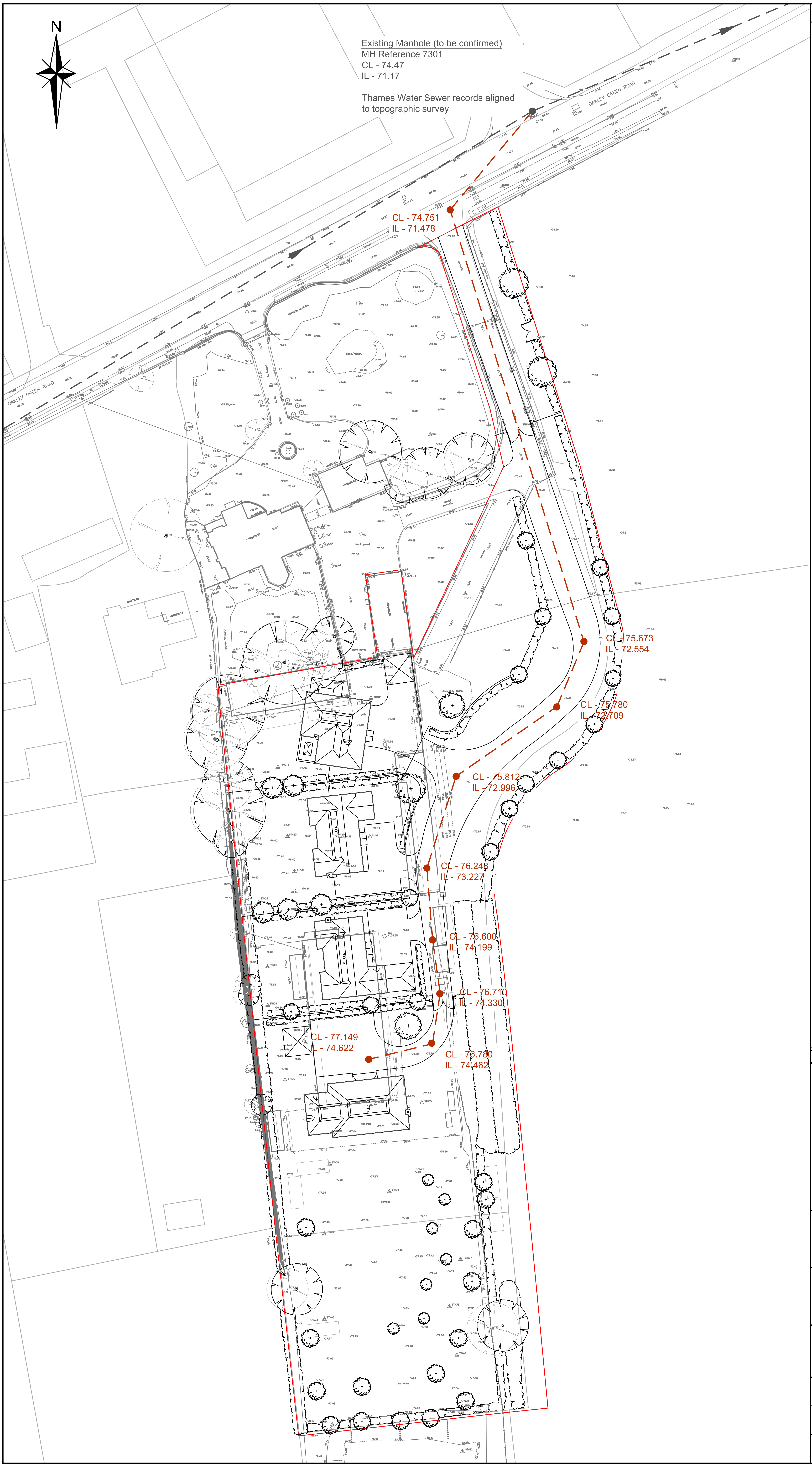
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual 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 no survey information is available.

Manhole Reference	Manhole Cover Level	Manhole Invert Level
621B	n/a	n/a
6201	28.84	25.6
621A	n/a	n/a
7301	28.42	25.12

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.

Appendix I Proposed Foul Water Drainage Strategy



Existing Manhole (to be confirmed)
MH Reference 7301
CL - 74.47
IL - 71.17

Thames Water Sewer records aligned to topographic survey

NOTES

1. Do not scale from this drawing.
2. All dimensions shown on this drawing are in metres unless stated otherwise.
3. Topographic survey provided by Ground Surveys Ltd.
4. Existing sewer records provided by Thames Water and drainage aligned to topographic survey.
5. All existing levels, gradients , depths etc to be checked on site prior to constrcution. Any discrepancies to be reported to the engineer immediately.
6. Proposed drainage has been designed in accordance to Sewerage Sector Guidance (SSG).

KEY

—	Site Boundary
- - ● - -	Existing Thames Water Foul Water Sewer & Manhole
- - ● - -	Foul Water Sewer & Manhole

Rev	Amendments	Drn	Chk	App	Date
A	New Site Layout	MT	TS	GC	Jan 24

Charles & Associates

☒ Issued by ☐

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Bradbourne Lane
Aylesford Kent
ME20 6SN
01732 448120

Job Title
Oakley Green Lodge
Oakley Green

Drawing Title
Indicative Foul Water
Drainage Strategy

Client
Westbourne Homes

Scale
1:500@A2

Date
Dec 23

Designed
CSG

Drawn
CSG

Checked
TSH

Approved
GAC

Job No
23-100

Drawing No
23-100-003

Rev
A