ARDENT CONSULTING ENGINEERS

REAL8 GROUP

PROPOSED RESIDENTIAL DEVELOPMENT: LAND AT KEERES GREEN, AYTHORPE RODING

FLOOD RISK & SURFACE WATER MANAGEMENT STATEMENT (INCLUDING SuDS STRATEGY)

Report Ref. 190771-01
Project No. 190771
FEBRUARY 2021

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(INCLUDING SuDS STRATEEGY)

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REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	Draft for review.	SJB		(Draft only)	22/02/2021
-	Final for submission	SJB	PSA	SJB	23/02/2021

DISTRIBUTION

1.0 INTRODUCTION

1.1 Ardent Consulting Engineers has been appointed by Real8 Group to advise on flood risk and surface water management matters associated with the proposed development of land at Keeres Green, Aythorpe Roding.

1.2 This Flood Risk & Surface Water Management Statement has been prepared to support a full planning application to develop the vacant land and provide a residential scheme comprising three-dwellings, with associated access roads, car parking provision and supporting infrastructure/landscaping.

1.3 The site is situated within a Flood Zone 1 area and the developable area is less than one hectare. As such, a formal site-specific Flood Risk Assessment is not required, although the principles outlined within the National Planning Policy Framework and accompanying web-based Planning Practice Guidance, have continued to be adopted.

1.4 The NPPF was originally published in March 2012 (updated in February 2019) by the Department for Communities & Local Government (now known as the Ministry of Housing, Communities & Local Government), and is now the acknowledged standard for conducting FRAs/SuDS Statements.

1.5 This report aims to demonstrate to the Local Planning Authority and Statutory Consultees that the site can be suitably redeveloped whilst complying with the requirements of the NPPF.

1.6 On the basis of this report, supporting evidence is provided to enable the planning application to be determined in terms of flood risk and SuDS/surface water disposal. If additional and/or detailed information is required, it is anticipated that appropriate conditions will be recommended for future consideration.

2.0 BASELINE PARAMETERS

Existing Site

2.1 The application site is located in Keeres Green, on land on the eastern side, off the B184 Dunmow Road. Keeres Green is a small hamlet, located between the villages of Leaden Roding and Aythorpe Roding, as illustrated in **Figure 1** below:

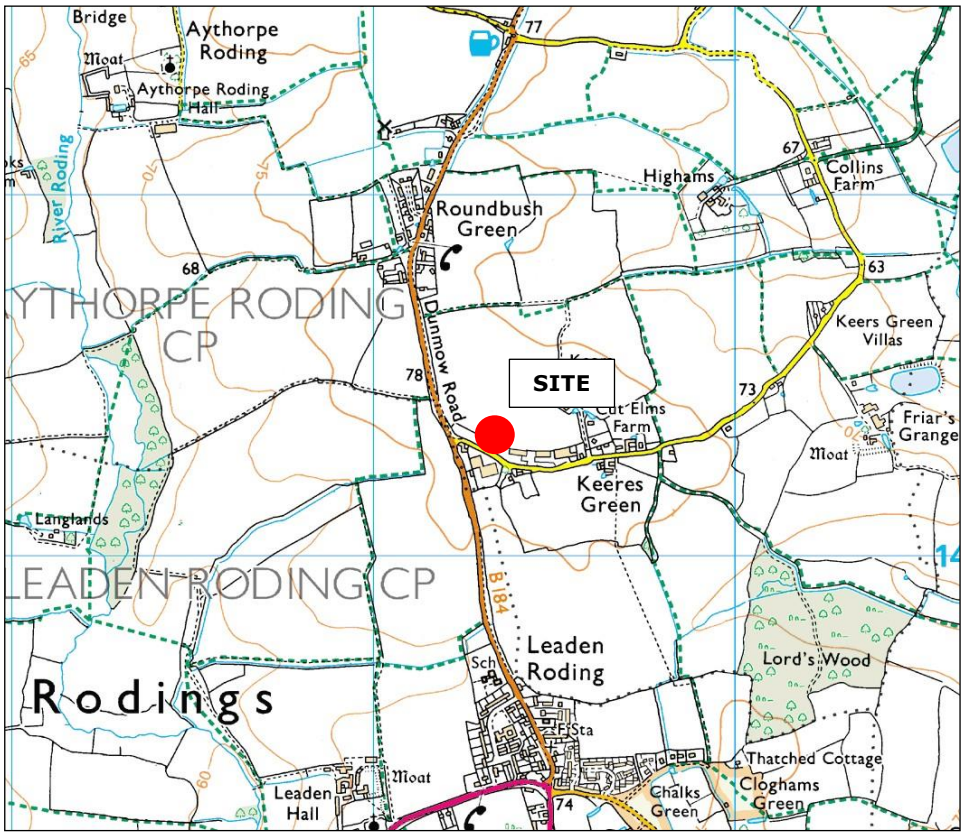


Figure 1: Site's Location

2.2 The site is bounded to the north by open agricultural land; to the east by residential properties; to the south by an unnamed country lane; and to the west by the B184 highway (and associated verge).

2.3 The application site is situated on an Ordnance Survey grid reference of 559290mE, 214314mN.

2.4 The application boundary comprises an area of circa 0.229 hectares, as illustrated in **Figure 2** below:

Figure 2: Aerial Record

2.5 A detailed topographical survey of the site was prepared by Survey Solutions in February 2019 and all finished ground levels relate to an Ordnance Survey datum. A detailed version of the survey has been provided in **Appendix A** of this report for further reference.

2.6 The topographical survey confirms that the site is an undeveloped greenfield, as illustrated in **Figure 3** on the following page. The survey also indicates that there is an existing open channel watercourse present adjacent to the site's southern boundary which conveys flows in an easterly direction. Discussions have been held with ECC Highways recently which confirmed that the ditch was in private ownership and were "*satisfied that the ditch is not within Highway".*

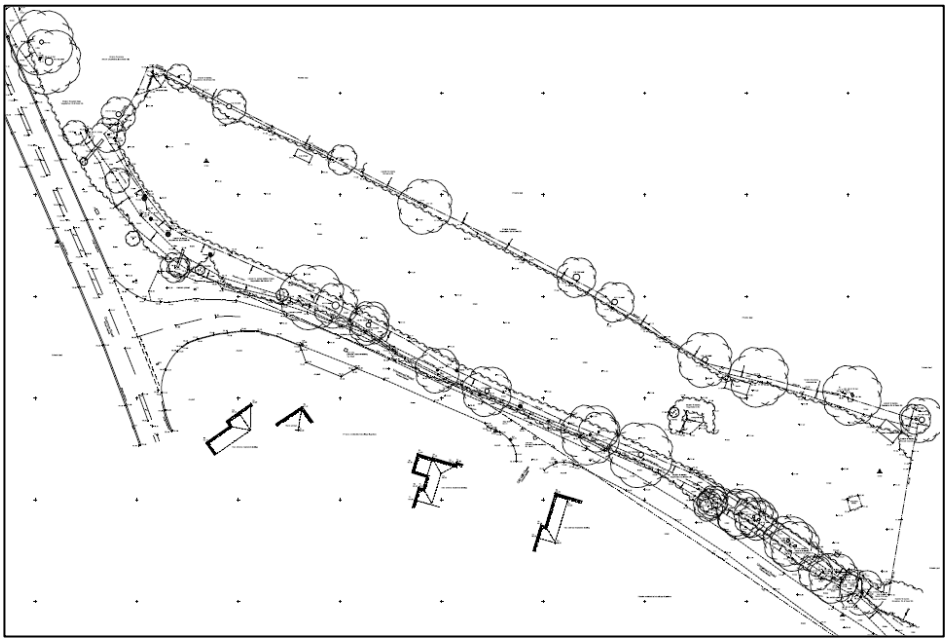


Figure 3: Extract of Topographical Survey

2.7 The public sewer asset record plan for the local area has been obtained from the Sewerage Undertaker for the region, Thames Water, confirms that there are no strategic foul or surface water public sewers which traverse the site, as illustrated in **Figure 4** below:

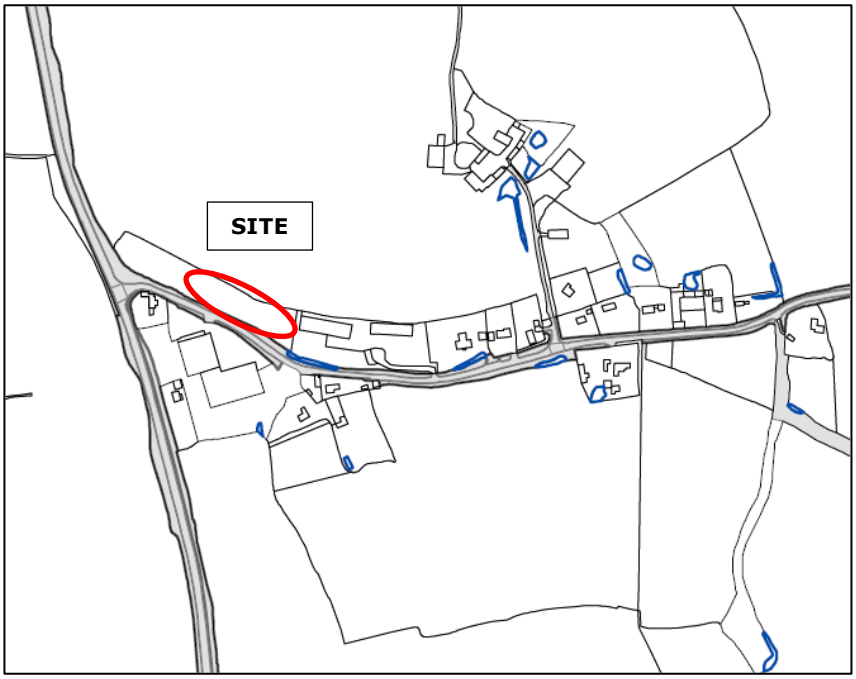


Figure 4: Public Sewer Asset Record Plan

2.8 In this respect, no protection or diversion works to strategic sewerage infrastructure is anticipated to accommodate the development scheme. A copy of the public sewer asset record plans has been provided within **Appendix B** of this report for further reference.

Development Proposals

2.9 A planning application is submitted to the local planning authority at Uttlesford District Council, which seeks permission to develop the vacant land to provide a residential scheme comprising three dwellings with vehicular access being secured from the unnamed country lane.

2.10 A layout of the proposed site has been prepared by the scheme's Architect (L Jones Architects) which outlines the proposals, as illustrated in **Figure 5** below:

Figure 5: Development Masterplan Layout

2.11 A detailed version of the layout plan has been provided in **Appendix C** of this report for further reference.

Urban Creep

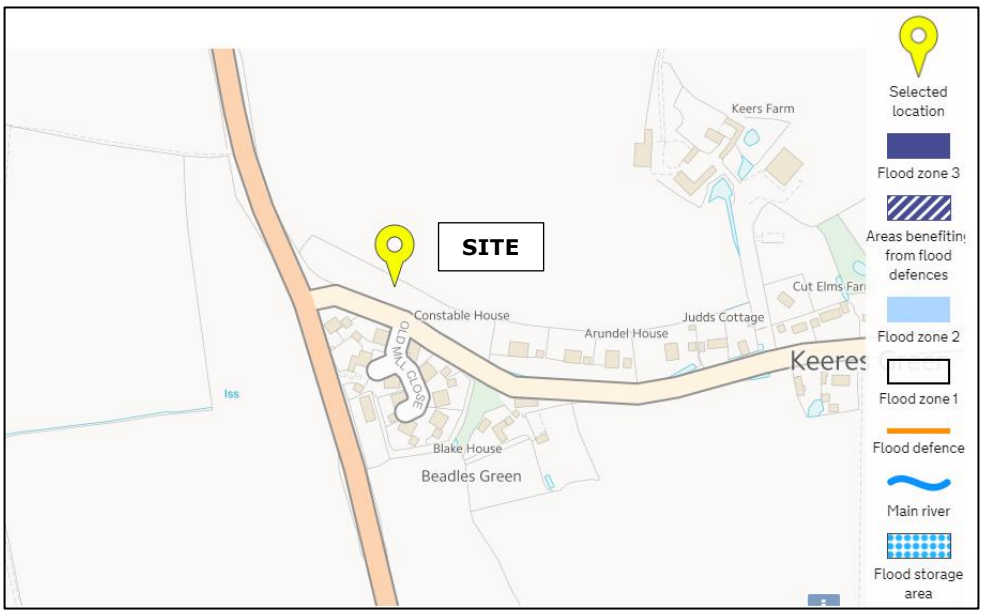
2.12 The impermeable area associated with the proposed development scheme (roof area of 347m^2, roads, driveways, paving etc.) is calculated to be circa 784m^2 with the remainder being soft landscaping.

2.13 However, for the purposes of this assessment, an additional 10% factor of safety has been applied to the roof footprint area of 347m^2 as an allowance for any future urban creep i.e. construction of domestic extensions. Therefore, the hydraulic modelling has been based on an impermeable area of 0.082 hectares.

3.0 FLOOD RISK/SURFACE WATER MANAGEMENT

Flood Risk Assessment

3.1 According to the Environment Agency's indicative floodplain mapping, the development site is not deemed to be situated within the indicative undefended floodplain of any nearby designated main river/watercourse and/or tidal estuary, as illustrated in **Figure 6** below:



Your selected location is in flood zone 1, an area with a low probability of flooding.

Figure 6: Indicative Fluvial/Tidal Floodplain Extent

3.2 The site is therefore classified as a Flood Zone 1 site, at a low probability of fluvial and/or tidal flooding. As the site is situated within a Flood Zone 1 area and the developable area is less than one hectare, a formal site-specific Flood Risk Assessment is not required, although the principles outlined within the National Planning Policy Framework and accompanying web-based Planning Practice Guidance, have continued to be adopted.

3.3 'Planning Policy Statement 25: Development and Flood Risk' (PPS25) was first published in December 2006 by the Department for Communities & Local Government (now known as the Ministry for Housing, Communities & Local Government) but has since been replaced by the National Planning Policy Framework (NPPF) which was originally published in March 2012 and subsequently revised in February 2019. This study is therefore based on the latest guidance stated within the NPPF and the accompanying web-based Planning Practice Guidance.

3.4 The guidance uses the concept of sequential testing and the risk-based approach to flood risk and development. Development priorities are based on the specific flood risk zones outlined within Table 1 of the Planning Practice Guidance. These flood risk zones have been briefly outlined below for reference:

Zone 1 - Low probability: Land assessed as having a less than 1 in 1,000-year annual probability of river and sea flooding (<0.1%) in any year;

Zone 2 – Medium probability: Land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) and between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year;

Zone 3a – High probability: Land assessed as having a 1 in 100-year or greater annual probability of river flooding (>1%) and a 1 in 200-year or greater annual probability of flooding from the sea (>0.5%) in any year;

Zone 3b – Functional floodplain: Land where water has to flow or be stored in times of flood.

3.5 Consulting Table contained within the NPPF's Planning Practice Guidance classifies residential schemes to be a 'more vulnerable' land-class usage, in terms of flood risk:

More vulnerable

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

3.6 Table 3 of the Planning Practice Guidance (*Flood Risk Vulnerability and Flood Zone 'Compatibility'*) determines that a residential scheme in a Flood Zone 1 area, is deemed to be appropriate:

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Other Potential Sources of Flooding

3.7 A further search of the Environment Agency's mapping also confirms that the site is not shown to be susceptible from flooding as a result of a breach of a nearby reservoir, as illustrated in **Figure 7** on the following page.

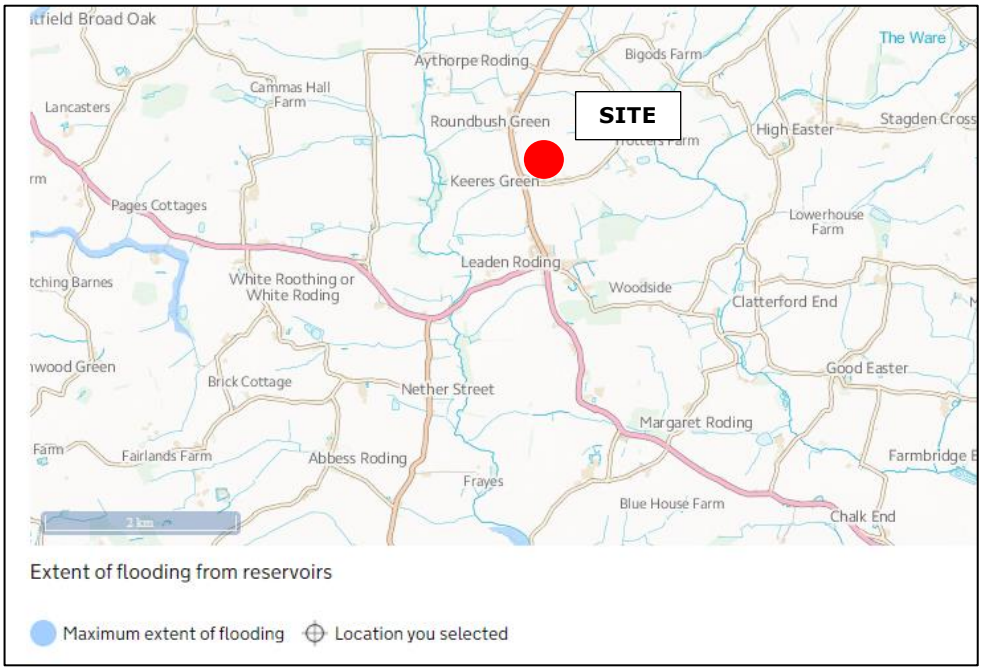


Figure 7: Extent of Reservoir Flooding

3.8 According to the Environment Agency's indicative mapping for the local area, these indicate that the site itself is not susceptible to pluvial/surface water flooding for the medium-risk scenario (1:100-year event) either, as illustrated in **Figure 8** below:

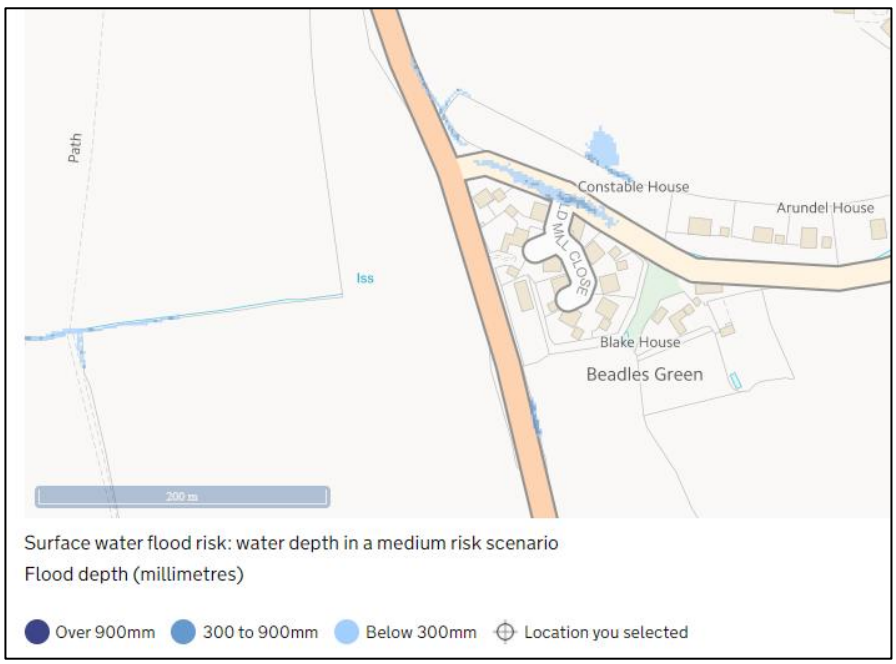


Figure 8: Localised Pluvial/Surface Water Flooding

3.9 According to the records held on the British Geological Survey website, a borehole (BGS Reference TL51SE1) was drilled to a depth of 7.62m to the south of this application site. Groundwater was not encountered. It is therefore concluded that the site is not at risk of any groundwater flooding, even allowing for seasonal variances. A copy of the borehole record has been included within **Appendix D** of this report for further reference.

3.10 In view of this assessment, it is concluded that the properties are not at risk of flooding from any source including fluvial, tidal, a breach of any nearby reservoir, groundwater or pluvial/surface water.

Pre-Development Run-off

3.11 According to the topographical survey, the site is entirely greenfield in nature and therefore the run-off from the site has been hydraulically modelled to establish the rate which could be generated by a 1:1 to 1:100-year rainfall event:

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.400
Area (ha)	0.229	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results	l/s
QBAR Rural	0.7
QBAR Urban	0.7
Q1 year	0.6
Q1 year	0.6
Q30 years	1.5
Q100 years	2.1

Figure 9: Existing Greenfield Run-off Simulation

3.12 It is therefore concluded that the existing site can generate a total surface water run-off rate of 0.6 to 2.1 litres/sec and the post-development discharge rate will be restricted to not exceed this rate, with betterment/reduction provided.

Infiltration Feasibility Appraisal

3.13 The above assessment would only be applicable if a positive outfall is utilised to dispose of the surface water run-off from the scheme. The volume of surface water attenuation could be reduced though, if infiltration drainage techniques can be successfully utilised on the site, providing suitable soil conditions exist.

3.14 The British Geological Survey record plans for the Keeres Green area indicate the site is underlain by the London Clay Formation, which is described as Clay, Silt and Sand, as illustrated in **Figure 10** below:

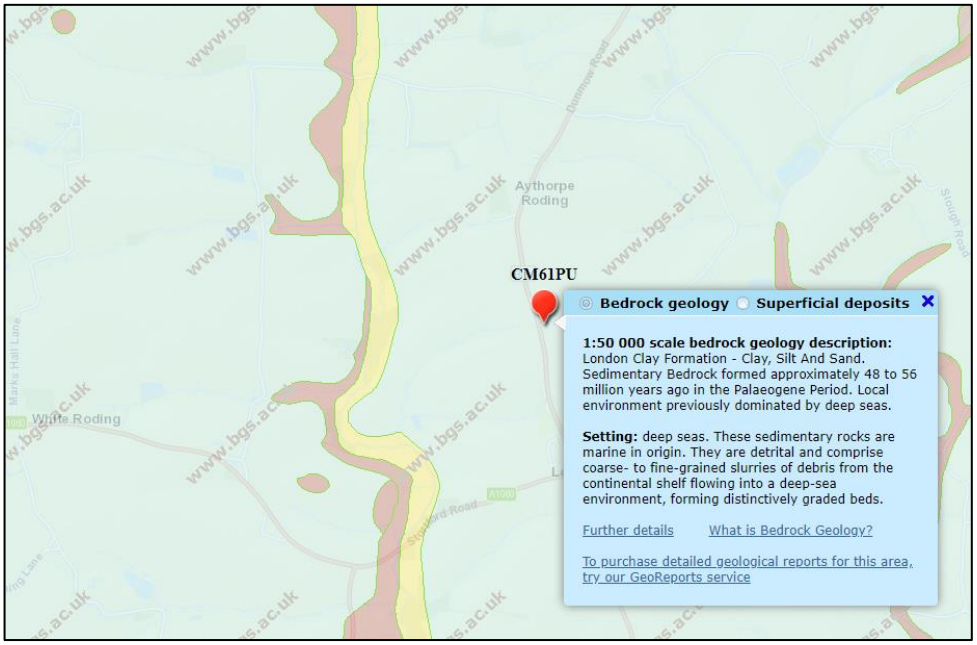


Figure 10: Extract of BGS's Geology Records

3.15 In addition to the above, the BGS borehole record mentioned earlier in this report also encountered the presence of Clay material.

3.16 In view of the underlying stratum formation, it is considered unlikely that the soil will be suitable for supporting the use of infiltration drainage techniques and therefore an alternative method of disposal is required.

3.17 As there is an open channel watercourse present adjacent to the southern boundary of the site, a connection will be provided to this network.

Post-Development Discharge Rate

3.18 The post-development discharge rate will be limited to a commensurate 1:1-year greenfield rate based on the scheme's proposed impermeable area, as illustrated in **Figure 11** below:

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 600 Urban 0.000
Area (ha) 0.082 Soil 0.400 Region Number Region 6

Results l/s

QBAR Rural 0.2
QBAR Urban 0.2

Q100 years 0.7

Q1 year 0.2
Q30 years 0.5
Q100 years 0.7

Figure 11: Post-Development Greenfield Run-off Rate

3.19 It is therefore proposed that the post-development discharge rate will be restricted to a peak flow of 0.2 litres/sec for all events, up to and including the 1:100-year rainfall event (including an additional 40% climate change).

Attenuation Provision

3.20 To drain the site in a sustainable manner whilst complying with the requirements of the NPPF, the strategy will adopt an appropriate form of sustainable drainage systems (SuDS). These forms of SuDS could comprise utilisation of infiltration drainage devices to discharge surface water to the underlying soil stratum (if soil conditions permit), basins/ponds, filter strips and swales, permeable surfaces, geo-cellular units and/or over-sized pipes.

3.21 Adopting the design parameters outlined below, the following preliminary assessment has been conducted using Innovyze's 'Micro Drainage' computer hydraulic modelling suite. Within the simulations, we have also included an additional 40% storage provision as allowance for any potential climate change impact (based on the guidance published by the Environment Agency in February 2016 for the year 2070 to 2115 scenario for a residential scheme):

Table 2: peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

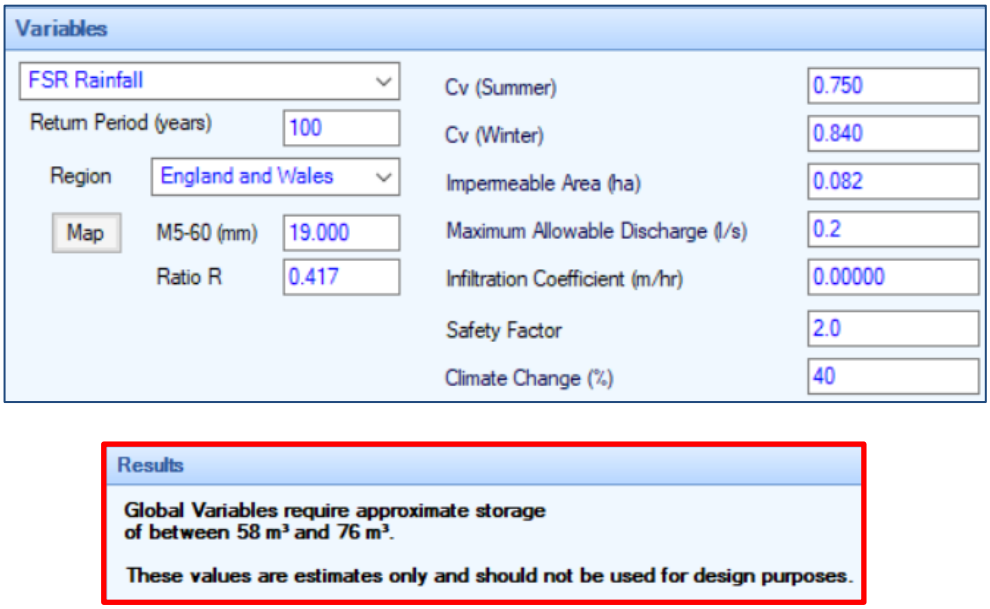


Figure 12: Preliminary Attenuation Simulation

3.22 Based on the above assessment, the preliminary attenuation simulations predict that in the region of 58m^3 to 76m^3 of storage will be required (including an additional 40% increase as an allowance for climate change impact) to facilitate the surface water run-off from the development site.

3.23 The above assessment merely provides an initial preliminary estimate of the volume required at this stage of the report. Detailed hydraulic modelling has been included within the SuDS/Surface Water Drainage Strategy section of this report that follows.

SuDS/Surface Water Drainage Strategy

3.24 For the purposes of this assessment, a SuDS/surface water drainage strategy has been prepared to demonstrate how the run-off will be disposed of, and that the system will be capable of withstanding a 1:100-year rainfall event (including an additional 40% as an allowance for climate change).

3.25 To dispose of the surface water run-off generated by the development scheme, it is anticipated that the run-off will be directed to the nearby open channel watercourse network, at a controlled discharge rate.

3.26 To facilitate the connection works, it is acknowledged that the formal consent will be secured from the Lead Local Flood Authority under S23 of the Land Drainage Act 1991, once planning permission is granted.

3.27 The principles of the strategy will comprise:

- Surface water run-off will be restricted to a commensurate 1:1-year greenfield discharge rate no greater than 0.2 litres/sec for all events, up to and including the 1:100-year rainfall event (plus 40% climate change);
- A suitable flow-control device such as a Hydro-brake (or similar) will be utilised at each outfall to ensure the post-development discharge is not exceeded for all events, up to and including the 1:100-year event (including 40% climate change);
- A hydraulic model has been designed which confirms that the SuDS proposals can withstand the impact of a 1:100-year rainfall event (including an additional 40% as an allowance for potential climate change impact). A copy of the hydraulic simulation output

files for the 1:1, 1:30 and 1:100-year (plus climate change) rainfall event has been included within **Appendix E** of this report for reference;

- The simulation files confirm that the half-drain time for the system is predicted to be 2,726 minutes. The depth of effective storage within the permeable paving has therefore been increased to 650mm as a mitigation measure so that back-to-back 1:30 year rainfall events can be accommodated.

3.28 The principles of the SuDS/surface water drainage strategy have been presented on **Drawing No. 190771-01** and appended to this report for further reference.

Water Quality Assessment

3.29 A residential scheme comprising three residential dwellings with an access road and parking provision, would fall within the low-pollution indices, as outlined in Table 26.2 of Chapter 26 within the CIRIA SuDS Manual 753.

3.30 The following tables outline the water quality assessment in accordance with CIRIA SuDS Manual 753:

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

Table 1: Pollution hazard indices for different land-use classifications (land-use shaded yellow applicable for the development)

3.31 To ensure the target-indices are met, the following performance can be expected from the SuDS/surface water drainage strategy:

Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bio retention system	0.8	0.8	0.8
Permeable pavement	**0.7**	**0.6**	**0.7**
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Downstream Defender (Proprietary Treatment System*)	0.5	0.4	0.8
*Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1-year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 2: Indicative SuDS mitigation indices for discharges to surface waters (SuDS components shaded yellow applicable to this development)

Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day			
	Required mitigation indices		
Source	**TSS**	**Metals**	**Hydrocarbons**
Low	0.5	0.4	0.4
Mitigation Indices			
Permeable Pavement *(Mitigation index$_1$)*	0.7	0.6	0.7
Proprietary Product *(Mitigation index$_2$)*	N/A	N/A	N/A
Total Performance	0.7	0.6	0.7
Check	Criteria Exceeded	Criteria Exceeded	Criteria Exceeded

Total SuDS mitigation index = mitigation index$_1$ + (0.5 x mitigation index$_2$)

Table 3: Indicative SuDS mitigation indices for discharge to surface waters

3.32 As demonstrated in **Tables 1** to **3** above, the mitigation of pollution provided by the development is appropriate for the low-risk, it represents. The performance criteria can be met by implementing a permeable paving system.

Maintenance Regime

3.33 To ensure that the system is regularly maintained, it is anticipated that the external drainage systems will be placed under a formal agreement with an independent Maintenance Company to carry out periodic inspections and any necessary remediation/maintenance works, thus safeguarding the development for the on-going future.

3.34 It is anticipated that a formal Maintenance & Management Plan/Statement will be required to protect the longevity of the scheme's drainage infrastructure and it is recommended a planning

condition is assigned to the Decision Notice/planning permission to fulfil this criteria.

4.0 SUMMARY & RECOMMENDATIONS

4.1 A residential scheme located in a Flood Zone 1 area is deemed to be suitable for development, as defined by the NPPF.

4.2 The site is not at risk of flooding from a fluvial source and/or tidal estuary, groundwater, surface water or a breach of any nearby reservoir.

4.3 No strategic foul or surface water public sewer networks traverse the site and therefore no protection/diversion works are anticipated.

4.4 An allowance for any future urban creep has been included in the assessment as an allowance for any future extension to the buildings.

4.5 Detailed hydraulic modelling has been carried out which demonstrates that the proposed SuDS/surface water drainage system can withstand the impact of a 1:100-year rainfall event (including an additional 40% as an allowance for climate change), thus complying with the requirements of the NPPF.

4.6 In view of this assessment, the report concludes that:

i. The redevelopment scheme and its occupants will not be at an increased risk of flooding;

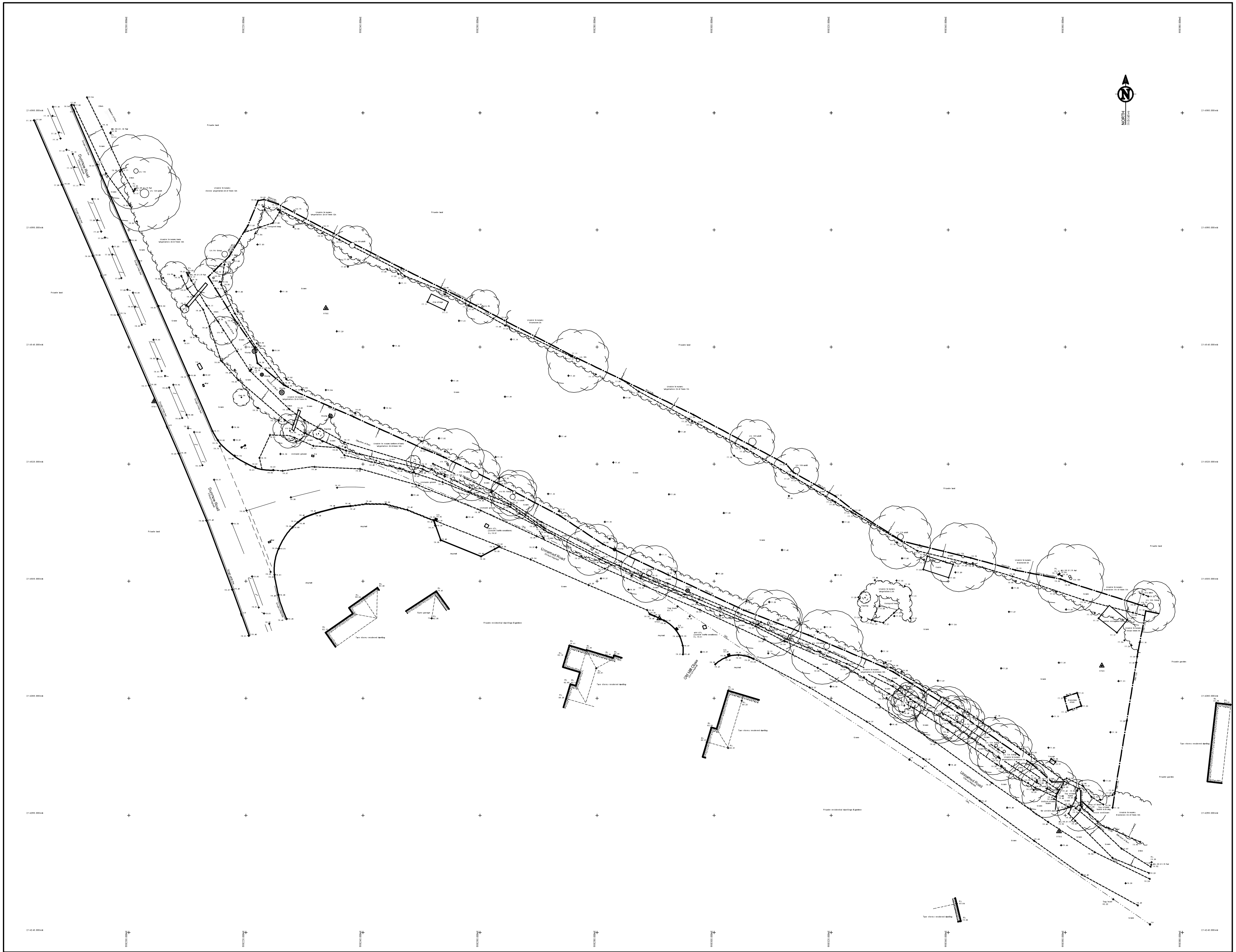
ii. The redevelopment scheme will not increase the risk of flooding elsewhere;

iii. A sustainable drainage scheme can be implemented.

4.7 The findings of this report identify the opportunity to provide a scheme which fully adopts the principles outlined within the NPPF. In this respect, it is anticipated that planning permission can be granted for this application on flood risk and drainage matters. Where additional or further information is required, appropriate planning conditions should be recommended for future consideration.

Appendix A

Topographical Survey



TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

ABBREVIATIONS & SYMBOLS

AH	Arch Head Height	FH	Fire Hydrant	RSJ	Rolled Steel Joint
AR	Assumed Route	FBD	Floor Board Direction	SI	Sign Post
AV	Air Valve	FH	Fire Hydrant	SP	Arch Spring Point Height
BB	Belisha Beacon	FL	Floor Level	SV	Stop Valve
BH	Bore Hole	FP	Flag Pole	SW	Surface Water
BL	Bed Level	FW	Foul Water	SY	Stay
BO	Bollard	GG	Gully Grate	Tac	Tactile Paving
BrP	Brace Post	GV	Gas Valve	TC	Telecom Cover
BS	Bus Stop	HH	Head Height	TH	Trial Pit
BU	Bush	IC	Inspection Cover	THL	Threshold Level
B W	Barbed Wire Fence	IL	Invert Level	TL	Traffic Light
BX	Box (Utilities)	I R	Iron Railings	ToW	Top of Wall
C B	Close Board Fence	KO	Kerb Outlet	TP	Telegraph Pole
CH	Cill Height	LP	Lamp Post	TV	Cable TV Cover
CL	Cover Level	MH	Manhole	UB	Universal Beam
C L	Chain Link Fence	MP	Marker Post	UC	Unknown Cover
C-Lev	Ceiling Level	NB	Name Board	UK	Unknown Tree
Col	Column	OHL	Overhead Line (approx)	USB	Under Side Beam
C P	Chestnut Paling Fence	Pan	Panel Fence	UTL	Unable To Lift
CR	Cable Riser	PB	Post Box	VP	Vent Pipe
DC	Drainage Channel	PM	Parking Meter	WB	Waste Bin
DH	Door Head Height	PO	Post	WH	Weep Hole
DP	Down Pipe	P R	Post & Rail Fence	WL	Water Level
DR	Drain	P W	Post & Wire Fence	WM	Water Meter
EL	Eaves Level	P Wall	Partition Wall	WO	Wash Out
EP	Electric Pole	RE	Rodding Eye		Floor to Ceiling Height
ER	Earth Rod	RL	Ridge Level		
ET	EP+Transformer	RP	Reflector Post	F C	Floor to False Ceiling Ht
FB	Flower Bed	RS	Road Sign		
FBD	Floor Board Direction	RSD	Roller Shutter Door		Survey Control Station

DRAWING NOTE

Topographical Surveys

Trees are drawn to scale showing the average canopy spread. Descriptions and heights should be used as a guide only.

All building names, descriptions, number of storeys, construction type including roof line details are indicative only and taken externally from ground level.

All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including; sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work.

Detail, services and features may not have been surveyed if obstructed or not reasonably visible at the time of the survey.

Measured Building Surveys

Measurements to internal walls are taken to the wall finishes at approx 1m above the floor level and the wall assumed to be vertical.

Cill heights are measured as floor to the cill and head heights are measured from cill to the top of window.

General

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work. Any errors or discrepancies must be notified to Survey Solutions immediately.

The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The survey control listed is only to be used for topographical surveys at the stated scale. All control must be checked and verified prior to use.

Do not scale from this drawing.

CONTROL CO-ORDINATES

STATIONS	EASTINGS	NORTHINGS	LEVEL	DESCRIPTION
ST01	559204.312	214330.734	76.775	Hilti Nail
ST02	559233.670	214346.627	77.214	Peg & Nail
ST03	559366.250	214285.574	77.376	Peg & Nail
ST04	559358.935	214257.294	76.399	Hilti Nail
ST05	559290.647	214293.636	76.413	Hilti Nail

SURVEY GRID AND LEVEL DATUM

The coordinate system established for this survey is related to Ordnance Survey (OS) national grid at a single point using Smartnet, then orientated to grid north with a scale factor of 1.000.

The level datum established for this survey is related to Ordnance Survey (OS) using GPS Smartnet.

To avoid discrepancies any coordinated data used in conjunction with this survey must be derived directly from this control data.

REV	DESCRIPTION	DRAWN	APPR	DATE

SURVEY SOLUTIONS

Ipswich Coventry Yeovil Norwich Perth Nottingham Brentwood

Tel No: 0845 0405 969 Fax No: 0845 0405 970
www.survey-solutions.co.uk enquiries@survey-solutions.co.uk

LAND SURVEYING BUILDING SURVEYING UNDERGROUND SURVEYING

PROJECT TITLE
KEERES GREEN, DUNMOW,
GREAT DUNMOW, ESSEX, CM6 1AN.

DRAWING DETAIL
TOPOGRAPHICAL SURVEY

CLIENT				SCALE
REAL 8 GROUP				1:200
SURVEYOR	SURVEY DATE	CHECKED BY	APPROVED BY	DWG STATUS
PMB	08.02.2019	PJR	TJF	FINAL
DRAWING NUMBER			REVISION	ISSUE DATE
23716se-01				12.02.2019

Original Sheet Size A0H

Appendix B

Public Sewer Asset Record Plan

Asset location search

Property Searches

Ardent Consulting Engineers
Felaw Maltings
44Felaw Street
IPSWICH
IP2 8SJ

Search address supplied Land at Keeres Green, Aythorpe Roding
Dunmow Road
CM6 1PQ

Your reference 190770 - Land at Keeres Green Aythorpe Roding

Our reference ALS/ALS Standard/2019_3952882

Search date 19 February 2019

Keeping you up-to-date

Notification of Price Changes

From 1 September 2018 Thames Water Property Searches will be increasing the price of its Asset Location Search in line with RPI at 3.23%.

For further details on the price increase please visit our website: www.thameswater-propertysearches.co.uk
Please note that any orders received with a higher payment prior to the 1 September 2018 will be non-refundable.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

searchcode

Asset location search

Property Searches

Search address supplied: Land at Keeres Green, Aythorpe Roding, Dunmow Road, CM6 1PQ

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

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

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.

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.

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

Affinity Water Ltd
Tamblin Way
Hatfield

AL10 9EZ
Tel: 0845 7823333

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.

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: 0800 009 3921
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: 0800 009 3921
Email: developer.services@thameswater.co.uk

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2019_3952882

0 10 20 40 60 80 Meters

Scale:	1:1790
Width:	500m
Printed By:	G1KANAGA
Print Date:	19/02/2019
Map Centre:	559250,213250
Grid Reference:	TL5913SW

Comments:

ALS/ALS Standard/2019_3952882

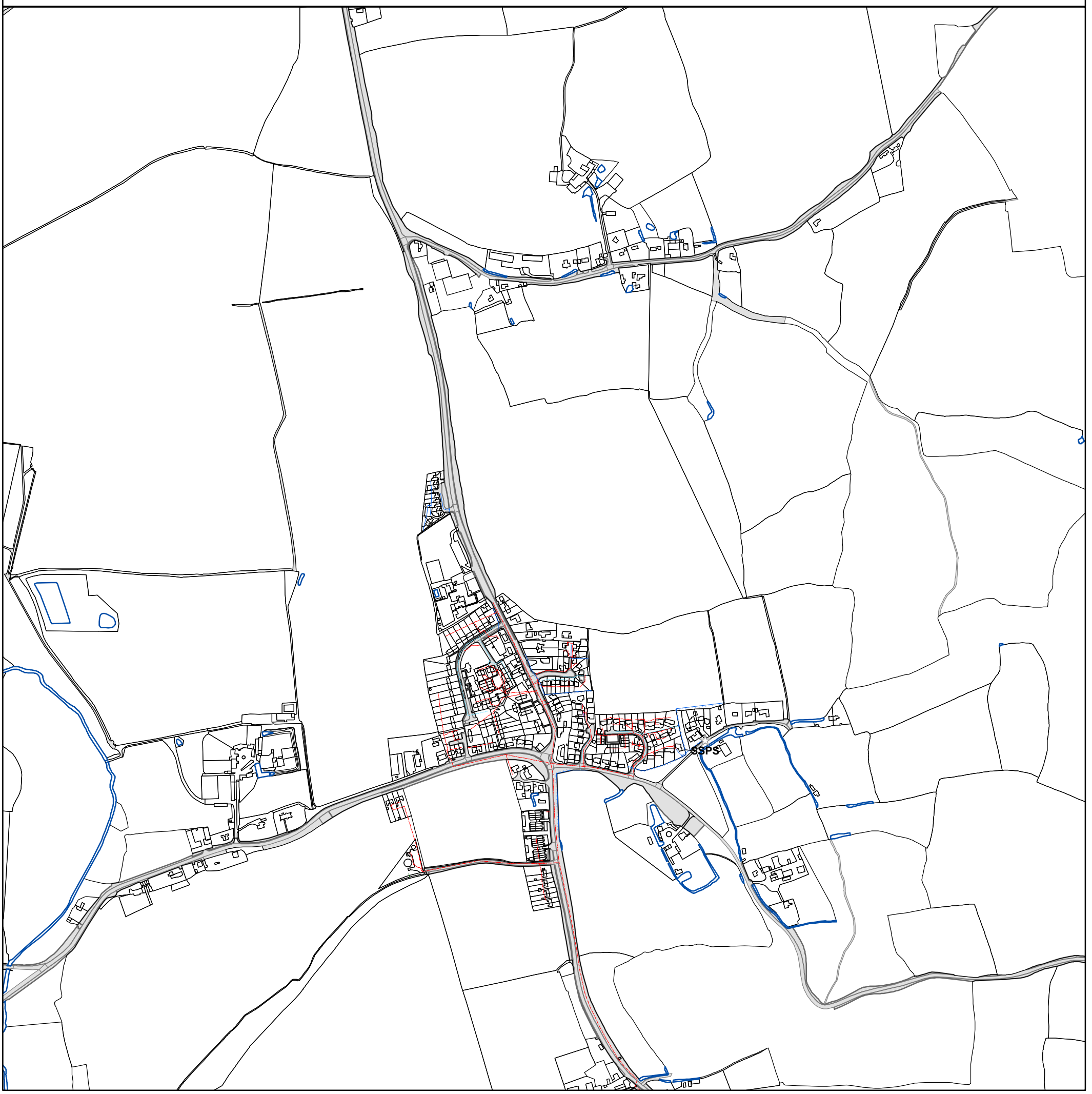
NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
2101	69.54	68.63
2103	69.15	68.28
2105	68.94	68.04
2107	68.74	65.02
4102	71.09	66.75
4201	72.86	67.54
3101	69.8	65.83
4301	73.71	70.34
2302		
3301		
3303	73.54	71.34
411E		
121A		
4407		
4406		
3306		
3309		
3406		
3405		
3409		
4404		
3304		
3305		
341C		
2301	73.63	71.98
3403		
341A		
411A		
411C		
441B		
411D		
121B		
441D		
3412		
221A		
4409		
331B		
331E		

REFERENCE	COVER LEVEL	INVERT LEVEL
2102	69.34	68.4
2104	69	68.16
2106	68.91	67.92
2401	73.57	72.78
4303	73.9	68.26
4402	74	68.94
3401	73.93	72.42
4101	70.36	66.31
2303		
3302		
441A		
2201	71.93	70.75
4302	73.89	68.38
4408		
3308		
3402		
3307		
3407		
3408		
3410		
4405		
3401		
3411		
401A		
421A		
341B		
3311		
431A		
411B		
121C		
441E		
4401	73.86	69.62
4411		
441C		
3413		
411F		
331A		
331C		

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2019_3952882



Scale:	1:7160
Width:	2000m
Printed By:	G1KANAGA
Print Date:	19/02/2019
Map Centre:	559477,213744
Grid Reference:	TL5913NW

Comments:

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.

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 her 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 / OSS	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**

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 the Ombudsman finds that you have suffered actual loss and/or aggravation, distress or inconvenience 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
Web site: www.tpos.co.uk
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

Appendix C

Development Masterplan Layout

PLOT 1

PLOT 2

PLOT 3

OLD MILL CLOSE

NORTH

0 5 10 15 20 25

NOTES / REVISIONS

REV A.
REV B. 07/12/20
REV C. 15/01/21
REV D. 27/01/21
REV E. 05/02/21

LJA
Hohenfels
Douglas
Isle of Man
IM2 5AL

laura@ljonesarchitects.com
07832972705

FOR

REAL GROUP

PROJECT
KEERES GREEN,
DUNMOW

DRAWING
BLOCK PLAN

SCALE
1:500 @A3

DATE
17/02/20

Appendix D

BGS’s Borehole Record

Parish: Headen Roding.

N G.R. ~~5960.1382~~ 5950.1339 LOG OF BOREHOLE Nº 2 TL 51SE 1/1

GROUND LEVEL 242.8 A.O.D
DATE STARTED 24th MARCH 1965
DATE COMPLETED 25th MARCH 1965

TYPE OF BORING SHELL & AUGER
DIA. OF BORING 7¼ ins.
BOREHOLE LINED TO 15 ft. 0 ins.

Geological Formation	Legend	Description of Strata	Depth	Samples	Water Levels	Depth (metres)
		MADE GROUND	2' 9"			(0.84m)
GLACIAL — Chalky Boulder Clay		STIFF MOTTLED BROWN SILTY CLAY WITH STONES AND CHALK	10' 0"			(3.05m)
		DITTO	21' 0"	Slipped		(6.40m)
		STIFF GREY SILTY CLAY WITH STONES AND CHALK	25' 0"	21		(7.62m)

REMARKS:

NO GROUNDWATER ENCOUNTERED

KEY:
- WATER STRUCK
- STANDING WATER LEVEL
- UNDISTURBED SAMPLE
- STANDARD PENETRATION TEST
- (25) Nº OF BLOWS FOR 12" PENETRATION
- ROTARY CORE

SCALE: 1in. = 5 ft.

ORDER Nº 4518 | LABORATORY Nº 2364

SITE INVESTIGATION BY LE GRAND ADSCO

DUNMOW R. D. C. FOR J. D. & D. M. WATSON.

Appendix E

Hydraulic Simulations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.400
Area (ha)	0.229	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	0.7
QBAR Urban	0.7
Q1 year	0.6
Q1 year	0.6
Q30 years	1.5
Q100 years	2.1

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 600 Urban 0.000
Area (ha) 0.082 Soil 0.400 Region Number Region 6

Results l/s

QBAR Rural 0.2
QBAR Urban 0.2

Q100 years 0.7

Q1 year 0.2
Q30 years 0.5
Q100 years 0.7

Summary of Results for 1 year Return Period

Half Drain Time : 507 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	76.527	0.087	0.0	0.2	0.2	2.3	O K
30 min Summer	76.549	0.109	0.0	0.2	0.2	3.5	O K
60 min Summer	76.567	0.127	0.0	0.2	0.2	4.9	O K
120 min Summer	76.583	0.143	0.0	0.2	0.2	6.2	O K
180 min Summer	76.592	0.152	0.0	0.2	0.2	6.9	O K
240 min Summer	76.596	0.156	0.0	0.2	0.2	7.3	O K
360 min Summer	76.601	0.161	0.0	0.2	0.2	7.8	O K
480 min Summer	76.603	0.163	0.0	0.2	0.2	7.9	O K
600 min Summer	76.603	0.163	0.0	0.2	0.2	8.0	O K
720 min Summer	76.603	0.163	0.0	0.2	0.2	8.0	O K
960 min Summer	76.602	0.162	0.0	0.2	0.2	7.9	O K
1440 min Summer	76.597	0.157	0.0	0.2	0.2	7.4	O K
2160 min Summer	76.588	0.148	0.0	0.2	0.2	6.6	O K
2880 min Summer	76.578	0.138	0.0	0.2	0.2	5.7	O K
4320 min Summer	76.556	0.116	0.0	0.2	0.2	4.1	O K
5760 min Summer	76.535	0.095	0.0	0.2	0.2	2.7	O K
7200 min Summer	76.515	0.075	0.0	0.2	0.2	1.7	O K
8640 min Summer	76.496	0.056	0.0	0.2	0.2	0.9	O K
10080 min Summer	76.477	0.037	0.0	0.2	0.2	0.4	O K
15 min Winter	76.537	0.097	0.0	0.2	0.2	2.8	O K
30 min Winter	76.559	0.119	0.0	0.2	0.2	4.3	O K
60 min Winter	76.579	0.139	0.0	0.2	0.2	5.8	O K
120 min Winter	76.596	0.156	0.0	0.2	0.2	7.3	O K
180 min Winter	76.604	0.164	0.0	0.2	0.2	8.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.860	0.0	2.4	26
30 min Summer	19.275	0.0	3.8	40
60 min Summer	12.084	0.0	5.2	68
120 min Summer	7.417	0.0	6.9	128
180 min Summer	5.547	0.0	8.0	186
240 min Summer	4.508	0.0	8.8	244
360 min Summer	3.362	0.0	10.0	360
480 min Summer	2.716	0.0	10.8	434
600 min Summer	2.300	0.0	11.5	494
720 min Summer	2.007	0.0	12.1	558
960 min Summer	1.620	0.0	13.0	686
1440 min Summer	1.197	0.0	14.3	960
2160 min Summer	0.886	0.0	15.6	1368
2880 min Summer	0.715	0.0	16.5	1764
4320 min Summer	0.529	0.0	17.5	2520
5760 min Summer	0.427	0.0	18.0	3240
7200 min Summer	0.361	0.0	18.1	3960
8640 min Summer	0.316	0.0	18.1	4592
10080 min Summer	0.281	0.0	18.0	5248
15 min Winter	29.860	0.0	3.0	26
30 min Winter	19.275	0.0	4.5	40
60 min Winter	12.084	0.0	6.1	68
120 min Winter	7.417	0.0	8.0	126
180 min Winter	5.547	0.0	9.2	182

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	76.610	0.170	0.0	0.2	0.2	8.6	O K
360 min Winter	76.615	0.175	0.0	0.2	0.2	9.2	O K
480 min Winter	76.617	0.177	0.0	0.2	0.2	9.4	O K
600 min Winter	76.617	0.177	0.0	0.2	0.2	9.5	O K
720 min Winter	76.617	0.177	0.0	0.2	0.2	9.4	O K
960 min Winter	76.615	0.175	0.0	0.2	0.2	9.2	O K
1440 min Winter	76.609	0.169	0.0	0.2	0.2	8.5	O K
2160 min Winter	76.594	0.154	0.0	0.2	0.2	7.1	O K
2880 min Winter	76.578	0.138	0.0	0.2	0.2	5.7	O K
4320 min Winter	76.545	0.105	0.0	0.2	0.2	3.3	O K
5760 min Winter	76.509	0.069	0.0	0.2	0.2	1.4	O K
7200 min Winter	76.470	0.030	0.0	0.1	0.1	0.3	O K
8640 min Winter	76.440	0.000	0.0	0.1	0.1	0.0	O K
10080 min Winter	76.440	0.000	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	4.508	0.0	10.1	240
360 min Winter	3.362	0.0	11.5	352
480 min Winter	2.716	0.0	12.5	462
600 min Winter	2.300	0.0	13.2	566
720 min Winter	2.007	0.0	13.9	596
960 min Winter	1.620	0.0	14.9	742
1440 min Winter	1.197	0.0	16.5	1048
2160 min Winter	0.886	0.0	18.0	1492
2880 min Winter	0.715	0.0	19.1	1904
4320 min Winter	0.529	0.0	20.4	2676
5760 min Winter	0.427	0.0	21.2	3344
7200 min Winter	0.361	0.0	21.6	3888
8640 min Winter	0.316	0.0	21.8	0
10080 min Winter	0.281	0.0	21.8	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.420	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.083

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028	4	8	0.027	8	12	0.027

Model Details

Storage is Online Cover Level (m) 77.300

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	43.7
Max Percolation (l/s)	121.4	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	76.440	Cap Volume Depth (m)	0.650

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0018-2000-1485-2000
Design Head (m)	1.485
Design Flow (l/s)	0.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	18
Invert Level (m)	75.715
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.485	0.2	Kick-Flo®	0.161	0.1
Flush-Flo™	0.076	0.1	Mean Flow over Head Range	-	0.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.1	0.800	0.2	2.000	0.2	4.000	0.3	7.000	0.4
0.200	0.1	1.000	0.2	2.200	0.2	4.500	0.3	7.500	0.4
0.300	0.1	1.200	0.2	2.400	0.2	5.000	0.3	8.000	0.4
0.400	0.1	1.400	0.2	2.600	0.3	5.500	0.4	8.500	0.4
0.500	0.1	1.600	0.2	3.000	0.3	6.000	0.4	9.000	0.4
0.600	0.1	1.800	0.2	3.500	0.3	6.500	0.4	9.500	0.4

Summary of Results for 30 year Return Period

Half Drain Time : 1383 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	76.613	0.173	0.0	0.2	0.2	9.0	O K
30 min Summer	76.641	0.201	0.0	0.2	0.2	12.2	O K
60 min Summer	76.667	0.227	0.0	0.2	0.2	15.4	O K
120 min Summer	76.691	0.251	0.0	0.2	0.2	18.5	O K
180 min Summer	76.704	0.264	0.0	0.2	0.2	20.2	O K
240 min Summer	76.712	0.272	0.0	0.2	0.2	21.3	O K
360 min Summer	76.722	0.282	0.0	0.2	0.2	22.6	O K
480 min Summer	76.727	0.287	0.0	0.2	0.2	23.3	O K
600 min Summer	76.730	0.290	0.0	0.2	0.2	23.7	O K
720 min Summer	76.731	0.291	0.0	0.2	0.2	23.8	O K
960 min Summer	76.730	0.290	0.0	0.2	0.2	23.7	O K
1440 min Summer	76.722	0.282	0.0	0.2	0.2	22.7	O K
2160 min Summer	76.711	0.271	0.0	0.2	0.2	21.2	O K
2880 min Summer	76.700	0.260	0.0	0.2	0.2	19.8	O K
4320 min Summer	76.682	0.242	0.0	0.2	0.2	17.4	O K
5760 min Summer	76.664	0.224	0.0	0.2	0.2	15.1	O K
7200 min Summer	76.647	0.207	0.0	0.2	0.2	12.9	O K
8640 min Summer	76.631	0.191	0.0	0.2	0.2	10.9	O K
10080 min Summer	76.615	0.175	0.0	0.2	0.2	9.2	O K
15 min Winter	76.626	0.186	0.0	0.2	0.2	10.3	O K
30 min Winter	76.656	0.216	0.0	0.2	0.2	13.9	O K
60 min Winter	76.683	0.243	0.0	0.2	0.2	17.6	O K
120 min Winter	76.711	0.271	0.0	0.2	0.2	21.1	O K
180 min Winter	76.725	0.285	0.0	0.2	0.2	23.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	73.211	0.0	9.1	27
30 min Summer	47.309	0.0	12.4	41
60 min Summer	29.238	0.0	15.9	70
120 min Summer	17.557	0.0	19.5	130
180 min Summer	12.902	0.0	21.7	188
240 min Summer	10.330	0.0	23.2	248
360 min Summer	7.512	0.0	25.4	366
480 min Summer	5.991	0.0	27.0	486
600 min Summer	5.025	0.0	26.9	604
720 min Summer	4.351	0.0	26.8	722
960 min Summer	3.465	0.0	26.5	960
1440 min Summer	2.511	0.0	25.7	1200
2160 min Summer	1.818	0.0	36.4	1564
2880 min Summer	1.444	0.0	38.2	1968
4320 min Summer	1.044	0.0	40.5	2776
5760 min Summer	0.829	0.0	41.9	3584
7200 min Summer	0.692	0.0	42.8	4392
8640 min Summer	0.598	0.0	43.3	5112
10080 min Summer	0.528	0.0	43.7	5856
15 min Winter	73.211	0.0	10.5	26
30 min Winter	47.309	0.0	13.6	41
60 min Winter	29.238	0.0	18.1	70
120 min Winter	17.557	0.0	22.1	128
180 min Winter	12.902	0.0	24.5	186

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	76.735	0.295	0.0	0.2	0.2	24.4	O K
360 min Winter	76.747	0.307	0.0	0.2	0.2	25.9	O K
480 min Winter	76.754	0.314	0.0	0.2	0.2	26.9	O K
600 min Winter	76.758	0.318	0.0	0.2	0.2	27.4	O K
720 min Winter	76.760	0.320	0.0	0.2	0.2	27.7	O K
960 min Winter	76.761	0.321	0.0	0.2	0.2	27.8	O K
1440 min Winter	76.754	0.314	0.0	0.2	0.2	26.9	O K
2160 min Winter	76.739	0.299	0.0	0.2	0.2	24.9	O K
2880 min Winter	76.725	0.285	0.0	0.2	0.2	23.1	O K
4320 min Winter	76.698	0.258	0.0	0.2	0.2	19.4	O K
5760 min Winter	76.671	0.231	0.0	0.2	0.2	15.9	O K
7200 min Winter	76.646	0.206	0.0	0.2	0.2	12.7	O K
8640 min Winter	76.621	0.181	0.0	0.2	0.2	9.8	O K
10080 min Winter	76.595	0.155	0.0	0.2	0.2	7.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	10.330	0.0	26.3	244
360 min Winter	7.512	0.0	27.5	360
480 min Winter	5.991	0.0	27.4	476
600 min Winter	5.025	0.0	27.4	592
720 min Winter	4.351	0.0	27.2	706
960 min Winter	3.465	0.0	27.0	932
1440 min Winter	2.511	0.0	26.2	1356
2160 min Winter	1.818	0.0	41.3	1688
2880 min Winter	1.444	0.0	43.4	2140
4320 min Winter	1.044	0.0	46.1	3032
5760 min Winter	0.829	0.0	47.9	3872
7200 min Winter	0.692	0.0	49.1	4688
8640 min Winter	0.598	0.0	49.8	5448
10080 min Winter	0.528	0.0	50.4	6160

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.420	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.083

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028	4	8	0.027	8	12	0.027

Model Details

Storage is Online Cover Level (m) 77.300

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	43.7
Max Percolation (l/s)	121.4	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	76.440	Cap Volume Depth (m)	0.650

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0018-2000-1485-2000
Design Head (m)	1.485
Design Flow (l/s)	0.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	18
Invert Level (m)	75.715
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.485	0.2	Kick-Flo®	0.161	0.1
Flush-Flo™	0.076	0.1	Mean Flow over Head Range	-	0.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.1	0.800	0.2	2.000	0.2	4.000	0.3	7.000	0.4
0.200	0.1	1.000	0.2	2.200	0.2	4.500	0.3	7.500	0.4
0.300	0.1	1.200	0.2	2.400	0.2	5.000	0.3	8.000	0.4
0.400	0.1	1.400	0.2	2.600	0.3	5.500	0.4	8.500	0.4
0.500	0.1	1.600	0.2	3.000	0.3	6.000	0.4	9.000	0.4
0.600	0.1	1.800	0.2	3.500	0.3	6.500	0.4	9.500	0.4

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 2726 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	76.688	0.248	0.0	0.2	0.2	18.2	O K
30 min Summer	76.735	0.295	0.0	0.2	0.2	24.3	O K
60 min Summer	76.782	0.342	0.0	0.2	0.2	30.5	O K
120 min Summer	76.829	0.389	0.0	0.2	0.2	36.7	O K
180 min Summer	76.855	0.415	0.0	0.2	0.2	40.1	O K
240 min Summer	76.873	0.433	0.0	0.2	0.2	42.4	O K
360 min Summer	76.894	0.454	0.0	0.2	0.2	45.2	O K
480 min Summer	76.908	0.468	0.0	0.2	0.2	47.0	O K
600 min Summer	76.917	0.477	0.0	0.2	0.2	48.2	O K
720 min Summer	76.923	0.483	0.0	0.2	0.2	49.1	O K
960 min Summer	76.931	0.491	0.0	0.2	0.2	50.0	O K
1440 min Summer	76.931	0.491	0.0	0.2	0.2	50.1	O K
2160 min Summer	76.917	0.477	0.0	0.2	0.2	48.2	O K
2880 min Summer	76.899	0.459	0.0	0.2	0.2	45.9	O K
4320 min Summer	76.870	0.430	0.0	0.2	0.2	42.1	O K
5760 min Summer	76.847	0.407	0.0	0.2	0.2	39.0	O K
7200 min Summer	76.825	0.385	0.0	0.2	0.2	36.2	O K
8640 min Summer	76.805	0.365	0.0	0.2	0.2	33.5	O K
10080 min Summer	76.785	0.345	0.0	0.2	0.2	30.9	O K
15 min Winter	76.707	0.267	0.0	0.2	0.2	20.7	O K
30 min Winter	76.759	0.319	0.0	0.2	0.2	27.5	O K
60 min Winter	76.813	0.373	0.0	0.2	0.2	34.5	O K
120 min Winter	76.866	0.426	0.0	0.2	0.2	41.5	O K
180 min Winter	76.896	0.456	0.0	0.2	0.2	45.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.846	0.0	13.9	27
30 min Summer	86.580	0.0	14.2	42
60 min Summer	53.779	0.0	28.4	72
120 min Summer	32.326	0.0	28.9	130
180 min Summer	23.714	0.0	29.1	190
240 min Summer	18.938	0.0	29.3	250
360 min Summer	13.690	0.0	29.4	368
480 min Summer	10.880	0.0	29.4	488
600 min Summer	9.099	0.0	29.4	608
720 min Summer	7.859	0.0	29.3	726
960 min Summer	6.233	0.0	29.2	966
1440 min Summer	4.490	0.0	28.6	1442
2160 min Summer	3.229	0.0	57.0	2016
2880 min Summer	2.554	0.0	56.1	2340
4320 min Summer	1.832	0.0	52.9	3076
5760 min Summer	1.447	0.0	78.6	3912
7200 min Summer	1.204	0.0	80.8	4696
8640 min Summer	1.035	0.0	82.4	5536
10080 min Summer	0.911	0.0	83.6	6352
15 min Winter	132.846	0.0	14.1	27
30 min Winter	86.580	0.0	14.4	41
60 min Winter	53.779	0.0	28.8	70
120 min Winter	32.326	0.0	29.3	128
180 min Winter	23.714	0.0	29.6	188

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	76.916	0.476	0.0	0.2	0.2	48.0	O K
360 min Winter	76.940	0.500	0.0	0.2	0.2	51.3	O K
480 min Winter	76.957	0.517	0.0	0.2	0.2	53.5	O K
600 min Winter	76.969	0.529	0.0	0.2	0.2	55.0	O K
720 min Winter	76.977	0.537	0.0	0.2	0.2	56.1	O K
960 min Winter	76.987	0.547	0.0	0.2	0.2	57.4	O K
1440 min Winter	76.993	0.553	0.0	0.2	0.2	58.2	O K
2160 min Winter	76.984	0.544	0.0	0.2	0.2	57.0	O K
2880 min Winter	76.965	0.525	0.0	0.2	0.2	54.5	O K
4320 min Winter	76.926	0.486	0.0	0.2	0.2	49.5	O K
5760 min Winter	76.894	0.454	0.0	0.2	0.2	45.2	O K
7200 min Winter	76.863	0.423	0.0	0.2	0.2	41.1	O K
8640 min Winter	76.832	0.392	0.0	0.2	0.2	37.1	O K
10080 min Winter	76.803	0.363	0.0	0.2	0.2	33.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	18.938	0.0	29.8	246
360 min Winter	13.690	0.0	29.9	364
480 min Winter	10.880	0.0	29.9	480
600 min Winter	9.099	0.0	29.9	598
720 min Winter	7.859	0.0	29.9	714
960 min Winter	6.233	0.0	29.7	946
1440 min Winter	4.490	0.0	29.1	1404
2160 min Winter	3.229	0.0	58.1	2064
2880 min Winter	2.554	0.0	57.2	2684
4320 min Winter	1.832	0.0	54.8	3328
5760 min Winter	1.447	0.0	89.1	4224
7200 min Winter	1.204	0.0	91.6	5120
8640 min Winter	1.035	0.0	93.6	5976
10080 min Winter	0.911	0.0	94.3	6864

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.420	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.083

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028	4	8	0.027	8	12	0.027

Model Details

Storage is Online Cover Level (m) 77.300

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	43.7
Max Percolation (l/s)	121.4	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	76.440	Cap Volume Depth (m)	0.650

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0018-2000-1485-2000
Design Head (m)	1.485
Design Flow (l/s)	0.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	18
Invert Level (m)	75.715
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.485	0.2	Kick-Flo®	0.161	0.1
Flush-Flo™	0.076	0.1	Mean Flow over Head Range	-	0.1

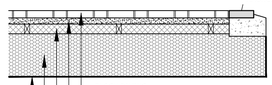
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.1	0.800	0.2	2.000	0.2	4.000	0.3	7.000	0.4
0.200	0.1	1.000	0.2	2.200	0.2	4.500	0.3	7.500	0.4
0.300	0.1	1.200	0.2	2.400	0.2	5.000	0.3	8.000	0.4
0.400	0.1	1.400	0.2	2.600	0.3	5.500	0.4	8.500	0.4
0.500	0.1	1.600	0.2	3.000	0.3	6.000	0.4	9.000	0.4
0.600	0.1	1.800	0.2	3.500	0.3	6.500	0.4	9.500	0.4

Drawings

N

SOLDIER COURSE OF BLOCK ON CONCRETE BED AND HAUNCH AS EDGE RESTRAINT



TYPICAL CONSTRUCTION SPECIFICATION FOR LINED PERMEABLE PAVED STORAGE AREAS (BLOCK PAVED)

TO BE USED FOR ALL SHARED DRIVES, PARKING COURTS AND PRIVATE ACCESS ROADS.

BLOCK PAVING
200 x 100 x 80mm THICK PCC INFILTA PERMEABLE BLOCK PAVING, LAID IN 45° HERRINGBONE PATTERN. COLOUR: TO ARCHITECT'S EXTERNAL WORKS DRAWING.

LAYING COURSE
50mm LAYER OF 2-6.3mm SIZE CLEAN AGGREGATE.

BASE COURSE (SUITABLE AS CONSTRUCTION TRAFFIC RUNNING COURSE PRIOR TO PUNCTURING PROCESS AND LAYING OF BLOCKS)
80mm AC 20 DENSE BASE 100/150 REC TO BS EN 13108-1 ASPHALT CONCRETE, CAREFULLY PUNCTURED WITH 40mmØ HOLES @ 750mm c/c AND FILLED WITH 2-6.3mm SIZE CLEAN AGGREGATE, PRIOR TO INSTALLATION OF LAYING COURSE & BLOCKS.

SUB-BASE
650mm THICK LAYER OF 20mm AGGREGATE (OPEN GRADE CRUSHED STONE WITH MIN 32% VOID RATIO), CLEAN AND FREE FROM ANY FRIABLE MATERIAL, STRICTLY IN ACCORDANCE WITH CHARCON SPECIFICATION FOR TYPE 4/20 MATERIAL TO BS EN 13242.

GEOMEMBRANE
CHARCON GEOMEMBRANE WITH WELDED JOINTS TO PROVIDE WATERTIGHT SEAL TO SUB-BASE (BASE & SIDES).

PERMEABLE PAVING CONSTRUCTION SPECIFIED ABOVE IS SUITABLE FOR CBR VALUES OF BETWEEN 2.5% & 5%.
FOR CBR VALUES <2.5% INCREASE SUB-BASE THICKNESS TO 500mm.

KEY

- SITE BOUNDARY
- RE — PROPOSED RODDING EYE
- PROPOSED SURFACE WATER INSPECTION CHAMBER
- PROPOSED SURFACE WATER SEWER & MANHOLE
- PROPOSED SURFACE WATER CONTROL CHAMBER
- PROPOSED LINED POROUS PAVING ATTENUATION CONSTRUCTION (MINIMUM 650mm SUB-GRADE DEPTH REQUIRED FOR SURFACE WATER STORAGE PURPOSES)
- HATCHED AREA DENOTES APPROXIMATE EXTENT OF DITCH BED TAKEN FROM TOPOGRAPHICAL SURVEY
- PROPOSED HEADWALL / OUTFALL IN TO DITCH
- PPO — PROPOSED PERMEABLE PAVING OUTLET
- PPI — PROPOSED PERMEABLE PAVING INLET
- 1:200 — PROPOSED MINIMUM GRADE OF PERMEABLE PAVING FORMATION LEVEL TO DIRECT WATER TOWARDS PERMEABLE PAVING OUTLET.

RE
SWIC CL:77.30 IL:76.700
1000
MINIMUM FFL 77.450
PPI
1:200
SWMH CL:77.20 IL:76.000
PPO
2250
SWIC CL:77.30 IL:76.700
SWMH CL:77.10 IL:76.000
SWIC CL:77.30 IL:76.700

LOCALISED CULVERTING REQUIRED FOR ACCESS PURPOSES ONLY. TO BE PROVIDED IN ACCORDANCE WITH THE LLFA'S REQUIREMENTS

PROPOSED OUTFALL VIA HEADWALL SUBJECT TO APPROVAL FROM LLFA. IL:75.700(APPROX)

FLOW CONTROL
CL:77.20
IL:75.715
RESTRICTED TO Q1:1yr GREENFIELD RATE OF 0.2 L/S WHEN SUBJECTED TO A 1:100-YEAR (PLUS 40% CLIMATE CHANGE) RAINFALL EVENT

Unnamed Road

Constable House

Seymour House

Reynolds House

Maberly House

OLD MILL CLOSE

Turner

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
6. BACKFILL SHOULD BE PLACED IN LAYERS NOT EXCEEDING 300mm (UNCOMPACTED THICKNESS), EACH LAYER BEING WELL COMPACTED. MECHANICAL COMPACTION EQUIPMENT SHOULD NOT BE USED UNTIL THERE IS A MINIMUM OF 450mm OF COMPACTED MATERIAL ABOVE THE CROWN OF THE PIPE.
7. THE DRAINAGE PROPOSALS HAVE BEEN BASED ON THE DEVELOPMENT MASTERPLAN LAYOUT PRODUCED BY LAURA JONES ARCHITECTS AND ILLUSTRATED ON THEIR DRAWING NO. 0116 REVISION 'E' DATED 05.02.21.
8. THIS DRAWING HAS BEEN BASED UPON A TOPOGRAPHICAL SURVEY PRODUCED BY SURVEY SOLUTIONS, DRAWING NUMBER 23716-SE-01, DATED 12.02.2019.

DRAINAGE STRATEGY NOTES:

9. PRELIMINARY SURFACE WATER ATTENUATION SIMULATIONS HAVE IDENTIFIED A POTENTIAL STORAGE REQUIREMENT OF 44m³-59m³ TO ACCOMMODATE A 1:100 YEAR RAINFALL EVENT (INCLUDING AN ADDITIONAL 40% FOR ANY POTENTIAL CLIMATE CHANGE IMPACT) - BASED ON THE FOLLOWING DESIGN PARAMETERS:

   M5-60mm = 19.00mm
   RATIO, R = 0.420
   IMPERMEABLE AREA = 0.082 HECTARES
   DISCHARGE RATE: 0.2 l/s (EXISTING 1-1 YEAR GREENFIELD RATE)

10. THE SURFACE WATER DETAILS ILLUSTRATED ON THIS PLAN ARE SUBJECT TO HYDRAULIC MODELING DURING THE DETAILED DESIGN STAGE TO ESTABLISH THE PEAK WATER LEVEL ASSOCIATED WITH A 1:100 YEAR RAINFALL EVENT (INCLUDING CLIMATE CHANGE).

NOTE:
DETAILS STATED ARE INDICATIVE AT THIS STAGE AND SUBJECT TO DETAILED DESIGN ONCE THE DEVELOPMENT PROPOSALS HAVE BEEN FINALISED

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

Rev	Description	Drn	Chk	App	Date

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Client
REAL 8 GROUP

Project Title:
LAND OFF KEERES GREEN, AYTHORPE RODING (3 UNIT SCHEME)

Drawing Title:
PRELIMINARY SURFACE WATER DRAINAGE STRATEGY

A1 Scale	Date	Designed by
1:200	FEB 2021	PSA
Drawn by	Checked by	Approved by
PSA	PSA	SJB

Drawing Number: 190771-001 — Rev -