

MAC
Pre-Planning
Engineering
Flood Risk Assessment

**Proposed Residential Development
Land off Ashwell Street
Ashwell
Hertfordshire**

**Revision D: November 2024
Report Reference: 190-FRA-02-D**

Report Originator(s)

Martin Andrews MEng (Hons) CEng MICE MCIHT
Director
martin.andrews@mac-ltd.co.uk

Alexander Nelson BEng (Hons)
Principal Engineer
alexander.nelson@mac-ltd.co.uk

Revision Record

Revision	Date	Description	Written	Approved
0	31.05.24	Planning Issue	AN	MJA
A	13.06.24	Revised layout	MJA	MJA
B	20.08.24	Revised Layout	ZS	MJA
C	23.10.24	Revised Layout	ZS	MJA
D	06/11/24	Updated Layout	MJA	MJA

1.0 Introduction

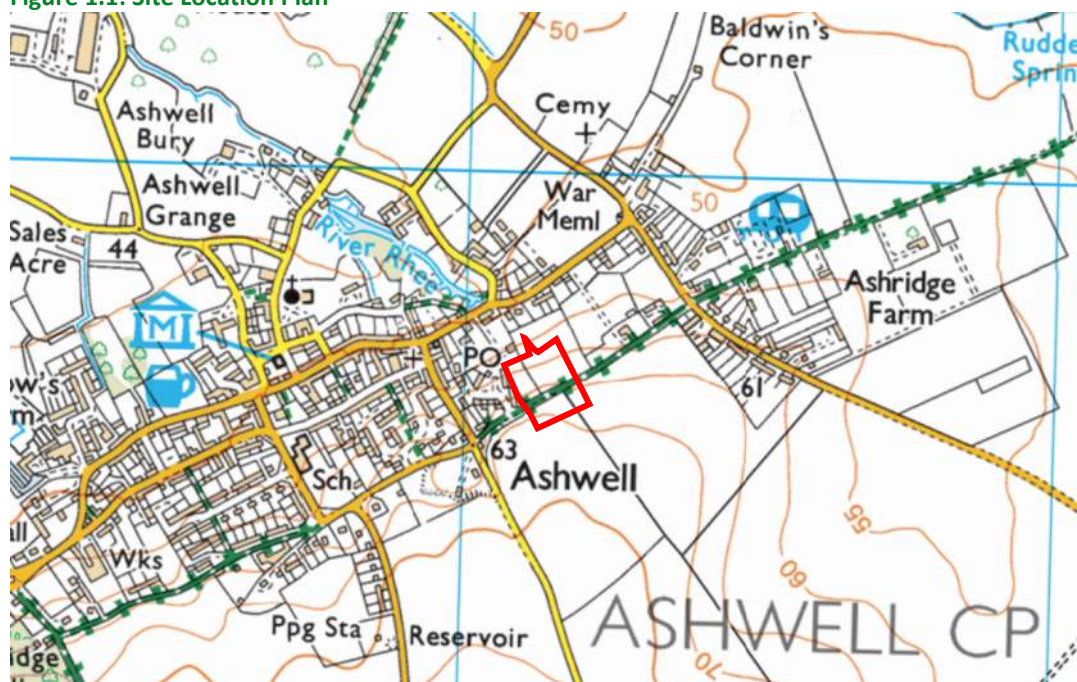
1.1 Instructions

- 1.1.1 This Flood Risk Assessment has been prepared from instructions received from Manor Oak Homes.
- 1.1.2 The report has been prepared to support the submission of a full planning application.
- 1.1.3 The benefit of this report is to our instructing Client.

1.2 Site Location

- 1.2.1 The proposed residential development is located at land off Ashwell Street, Ashwell, as shown in **Figure 1.1** below and enclosed in **Appendix A**. The approximate National Grid Reference for the site is E527142 N239704.

Figure 1.1: Site Location Plan



1.3 Current Use and Description

- 1.3.1 The site currently comprises undeveloped grazing land. The existing site is shown on the topographical survey enclosed in **Appendix B**.
- 1.3.2 There are no watercourses located adjacent to the site. The site falls from south to north and is bound by residential development on the western, northern and eastern site boundaries.

1.4 Proposed Development

- 1.4.1 The proposed development will comprise 14 dwellings. The proposed development layout is shown on the plan enclosed in Appendix C.
- 1.4.2 In line with paragraph 006 of the Planning Practice Guidance for 'Flood risk and costal change' the lifetime of a residential development is considered to be at least 100 years.
- 1.4.3 The 'Flood Risk Vulnerability Classification' of various development types is defined within Annex 3 of the National Planning Policy Framework (NPPF) – December 2023. A residential development is classified as a More Vulnerable development. The relevant extract from Annex 3 of the NPPF is set out below.

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.

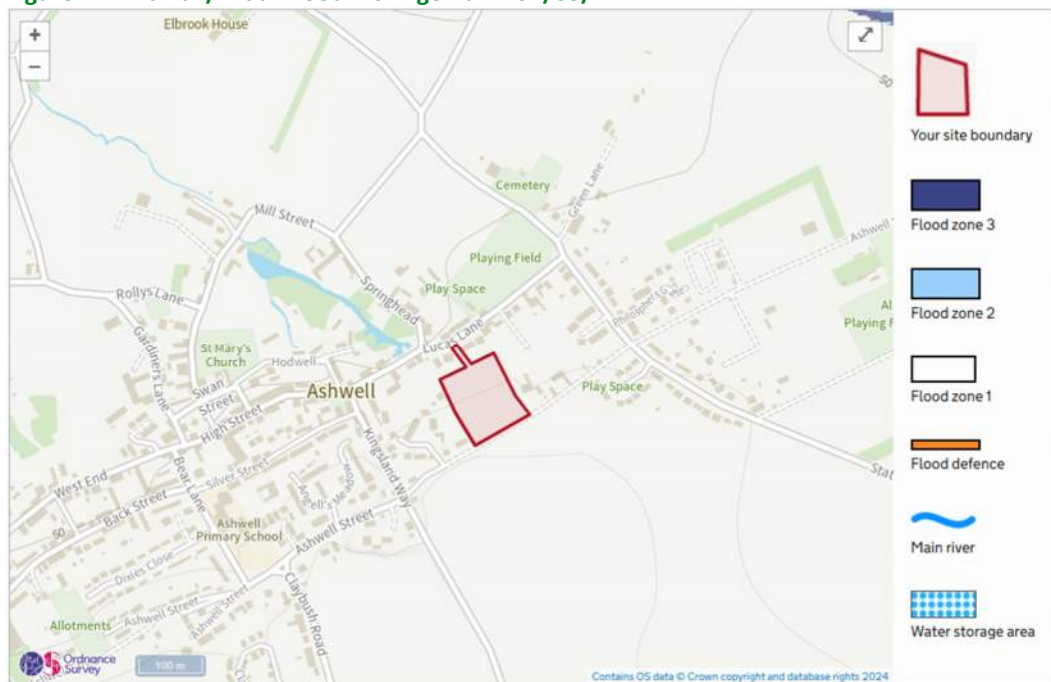
2.0 Site Specific Flood Risk

- 2.1.1 The maps included in this report are from the original 2019 application, however, we have reviewed the most current maps and whilst based on a different mapping background the extents of flooding are identical. Therefore, we have continued to use the old flood maps for ease.

2.2 Risk of Fluvial / Tidal Flooding

- 2.2.1 The likelihood of fluvial and tidal flooding is defined on the Environment Agency's map 'Flood Map for Planning'. This flood map is published on the gov.uk website.
- 2.2.2 An extract of this flood map is provided below in **Figure 2.1**. The approximate site boundary is shown in red.

Figure 2.1: Fluvial / Tidal Flood Risk - gov.uk – 31/05/24



Source: <https://flood-map-for-planning.service.gov.uk>

- 2.2.3 The Environment Agency's flood map shows that the proposed development site is located within Flood Zone 1 (Low Probability) and as such, the development is at a low (less than 1 in 1000 years) of flooding from rivers or the sea.

2.3 Risk of Surface Water Flooding

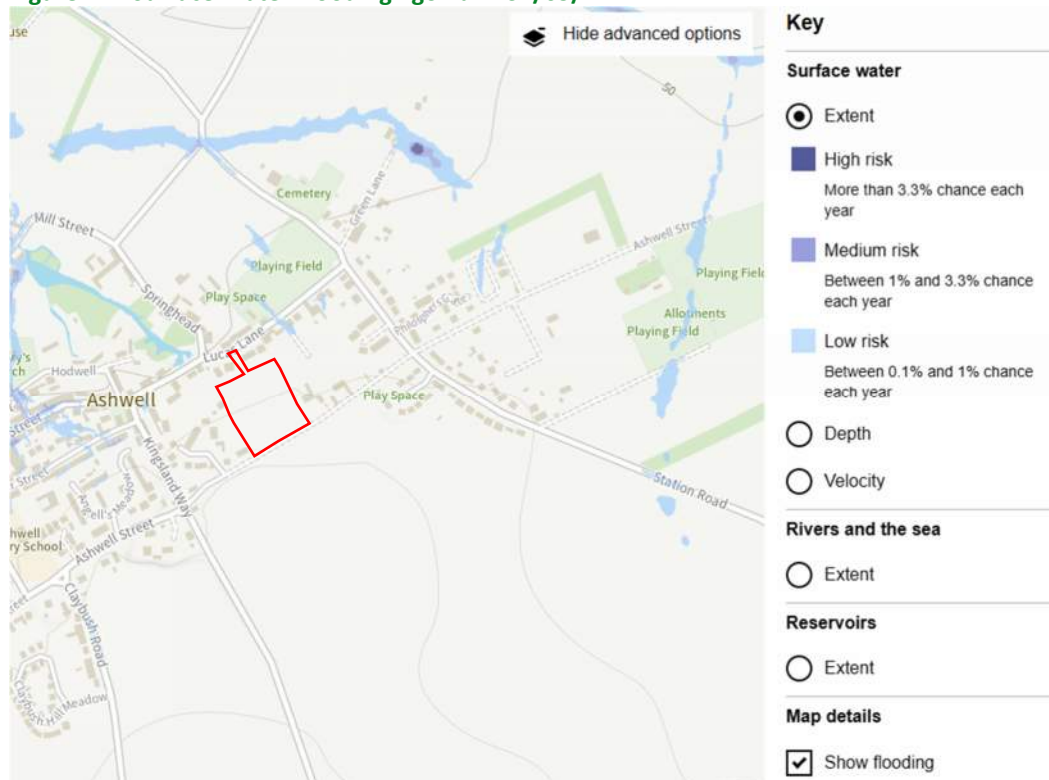
2.3.1 The likelihood of surface water flooding is defined on the Environment Agency's map 'Flood risk from surface water'. This flood map is published on the gov.uk website.

2.3.2 An extract of this flood map is provided below in **Figure 2.2**. The approximate site boundary is shown in red.

2.3.3 Regarding the accuracy of this map the EA state that:

"Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding. Because of this, we report the highest risk within 20m of a specific location, such as an individual property. This means reports for neighbouring properties may show different levels of risk."

Figure 2.2: Surface Water Flooding - gov.uk - 31/05/24

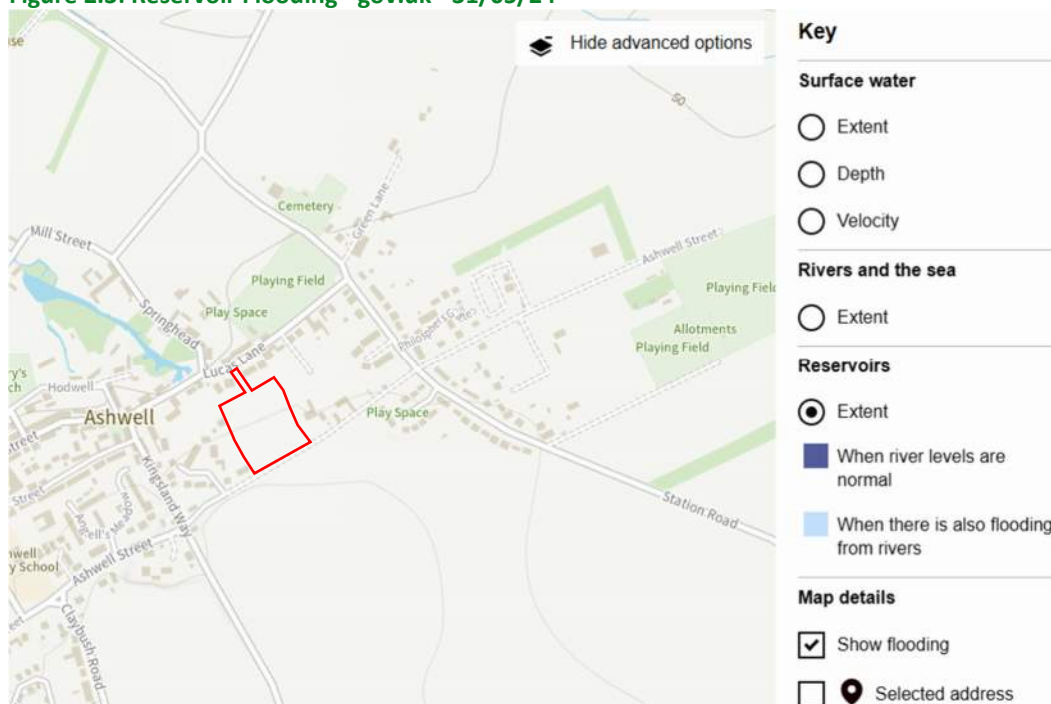


2.3.4 The site is in an area of very low surface water flood risk.

2.4 Risk of Reservoirs, Canals and Other Artificial Sources Flooding

- 2.4.1 The likelihood of reservoir water flooding is defined on the Environment Agency's map 'Flood risk from reservoirs'. This flood map is published on the gov.uk website.
- 2.4.2 An extract of this flood map is provided below in **Figure 2.3**. The approximate site boundary is shown in red.

Figure 2.3: Reservoir Flooding - gov.uk - 31/05/24



- 2.4.3 The site is not at risk of reservoir flooding. We are not aware of any canals or other artificial sources which may cause flooding on the development site.

2.5 Risk of Ground Water Flooding

- 2.5.1 We do not have any records of ground water flooding within the vicinity of the site. We therefore consider the risk of sewer flooding to be low.

2.6 Risk of Sewer Flooding

- 2.6.1 We do not have any records of sewer flooding within the vicinity of the site. We therefore consider the risk of sewer flooding to be low.

2.7 Previous Flood Events

- 2.7.1 The Environment Agency's Historic Flood Map does not show any flooding within the boundary of the site. The Environment Agency's "Historic Flood Map is a GIS layer showing the maximum extent of all individual Recorded Flood Outlines from river, the sea and groundwater springs and shows areas of land that have previously been subject to flooding in England. Records began in 1946 when predecessor bodies to the Environment Agency started collecting detailed information about flooding incidents".

2.8 Summary of Flood Risk

- 2.8.1 The proposed development site is located within Flood Zone 1 and is at a low risk of flooding from all other sources.

2.9 Flood Resilience

- 2.9.1 Whilst there is no known risk of flooding on the site, Finished Floor Levels of the buildings will have a 150mm free board above existing ground levels as requested by the Lead Local Flood Authority.

2.10 Flood Risk Vulnerability and Flood Zone 'Compatibility'

- 2.10.1 The suitability of different development types to be built and occupied within a particular Flood Zone is defined within Table 2 of the Planning Practice Guidance for 'Flood Risk and Coastal Change'. Table 2 is replicated below in **Table 2.1** below. This table maps vulnerability classes against the flood zones to indicate where development is 'appropriate' and where it should not be permitted.
- 2.10.2 The proposed residential development is located within Flood Zone 1 and is classified as More Vulnerable development. Based on this categorisation of the development it is considered 'appropriate'.

Table 2.1: Flood risk vulnerability and flood zone 'incompatibility'

Flood Zone	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 *	×	×	×	✓*

✓ Development is appropriate

× Development should not be permitted.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

" * " In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

3.0 Surface Water Management

3.1 Existing Drainage

3.1.1 The is currently undeveloped with no positive drainage.

3.2 Existing Discharge Rate

3.2.1 The existing discharge rate for the site has been calculate using the IH124 method. Full calculations are enclosed in **Appendix F**. Whilst the input parameters and results are summarised in **Appendix E** below.

Table 3.1: Existing Run-off Rate Calculation Parameters and Results

Parameter	Value
Proposed Drained Area (ha)	0.321, see Appendix E
SAAR (mm)	569
Soil Index / SPR	1 / 0.10
Region	5
Results	Value
Q_{Bar} (l/s)	0.0
Q1 (l/s)	0.0
Q30 (l/s)	0.1
Q100 (l/s)	0.2

3.2.2 The Q_{Bar} rate for the site is 0.0 l/s. It is proposed to discharge all surface water using infiltration techniques, therefore there will be no surface water discharge from the site.

3.3 Proposed Method of Discharge

3.3.1 Paragraph 56 of the Planning Practice Guidance for ‘Flood Risk and Coastal Change’ defines the hierarchy of drainage options. Where reasonably practicable the aim should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system; and
4. to a combined sewer.

3.3.2 Each of these is considered separately below:

Into the ground

3.3.3 Infiltration testing has been undertaken by Geo-Environmental Ltd, a copy of their report is enclosed in Appendix H.

3.3.4 Their investigation found that the geology on the site comprises Topsoil overlying Zig Zag Chalk formation. Ground water was not encountered during the investigations.

3.3.5 Infiltration testing was undertaken in 5 locations, three of which were undertaken at depths of 1.7m to 2.25m below ground level (bgl) and two at depths of 0.6m and 1.1m bgl. The results of the testing are summarised in **Table 3.2** below.

Table 3.2: Soakage Test Results

Location	Permeability (m/s)		
	Test 1	Test 2	Test 3
SA01 – deep	1.6×10^{-4}	1.0×10^{-4}	9.8×10^{-5}
SA02 – shallow	6.2×10^{-6}	Insufficient time to undertake further testing	
SA03 – deep	2.3×10^{-4}	2.1×10^{-4}	1.5×10^{-4}
SA04 – shallow	2.8×10^{-5}	1.1×10^{-4}	Insufficient time to undertake third testing
SA05 – deep	4.4×10^{-4}	4.1×10^{-4}	4.7×10^{-4}

3.3.6 Infiltration is therefore a viable option for surface water disposal. As such other methods of drainage do not need to be considered further.

3.3.7 During the course of a previous application, ground water monitoring was requested by the LLFA. The scope for the groundwater monitoring water monitoring was agreed. Evidence of this agreement, together with a copy of the resultant report are enclosed in **Appendix H**. the Groundwater monitoring showed that there was no groundwater within proximity of the base of the proposed infiltration features.

3.4 Proposed Drainage Strategy

- 3.4.1 Surface water discharge from the proposed development will be disposed of using infiltration techniques.
- 3.4.2 All paved areas will utilise permeable paving. The areas of permeable paving will only serve themselves and no additional roof areas.
- 3.4.3 Rainwater from these roofs will outfall to plot geocellular soakaways located within the gardens. To provide treatment the surface water will pass through a rain garden feature either as part of a raised planter or a planted bed located adjacent to a garden boundary.
- 3.4.4 The proposed surface water drainage strategy is shown on the drawing enclosed in in Appendix D.

Design Parameters

- 3.4.5 Surface water drainage will be designed using the rainfall parameters from the Flood Estimation Handbook (FEH).
- 3.4.6 New Climate Change (CC) allowances were published by the Environment Agency in May 2022. The new data can be accessed using an interactive webpage which provides the peak rainfall intensity climate change allowances for the 2050s and 2070s epoch. The CC allowance is set on a catchment basis.
- 3.4.7 The proposed development is located within Cam and Ely Ouse Management Catchment. The proposed development is expected to have a lifespan which exceeds the 2060s; therefore, the 2070s epoch will be used. For drainage design the Upper End Allowance must be used, the parameters for this catchment and epoch are replicated in **Table 3.3** below.

Table 3.3: Climate change allowances for peak rainfall

Annual Exceedance Rainfall Event	Upper End Allowance
3.3%	35%
1%	40%

- 3.4.8 To ensure a worst-case assessment is undertaken a 40% climate change allowance will be used for the 1% annual exceedance rainfall event.

3.5 Attenuation Design

3.5.1 Surface water attenuation is required to store excess water during an extreme event whilst maintaining the observed infiltration rate. Surface water will be attenuated within permeable paving and plot geocellular soakaways.

3.5.2 As the permeable paving only drains its own area the size of the permeable paving is irrelevant as the ratio of drained area to sub-base is identical. The permeable paving design parameters are summarised in the table below.

Table 3.4: Attenuation Calculation Parameters and Results – Permeable Paving

Parameter	Value
Return Period (years)	100 + 40% Climate Change
Rainfall Parameters	FEH22
Drained Area (ha)	0.209, See Appendix E includes 10% urban creep
Infiltration Rate	6.2×10^{-6} m/s (0.02232 m/hr) – worst case
Factor of Safety	2.0
Porosity	30%
Results	Value
Permeable Paving	Min Sub-base depth for storage – 0.242m

3.5.3 Geocellular soakaway design parameters and soakaway sizes are set out in the table below. Each soakaway has been labelled in the table based on the plot it serves.

Table 3.5: Attenuation Calculation Parameters and Results – Geocellular Soakaways

Parameter	Value
Return Period (years)	100 + 40% Climate Change
Rainfall Parameters	FEH22
Drained Area (ha)	0.144, See Appendix E includes 10% urban creep
Infiltration Rate	6.2×10^{-6} m/s (0.02232 m/hr) – worst case
Factor of Safety	1.5
Porosity	96%
Results	Value (L x W x D)
1	4 x 3 x 0.8m
2	1.5 x 5 x 1.2m
3	4 x 4 x 0.8m
4	3 x 3 x 0.8m
5	4 x 3 x 0.8m
6	2.5 x 2 x 0.8m
7	2.5 x 2 x 0.8m
8	3 x 3 x 0.8m
9	5 x 3 x 0.8m
10	3 x 3 x 0.8m
11	4 x 3 x 0.8m
12	8m ² X 1.2m
13	3 x 3 x 0.8m
14	3 x 3 x 0.8m
Total Storage Requirement (m³)	101

- 3.5.4 Surface water drainage will utilise both permeable paving and geocellular soakaways for individual plots across the site. Infiltration rates of 6.2×10^{-6} m/s to 4.4×10^{-4} m/s were recorded for the 5 separate soakaway locations. However, to undertake a worst-case assessment, a design infiltration rate of 6.2×10^{-6} m/s (0.02232 m/hr), will be used to size all infiltration-based SuDS features. Full calculations are enclosed in **Appendix F** whilst design parameters are set out below.
- 3.5.5 Given that the worst-case infiltration rate has been used for design purposes, some of the infiltration features are currently illustrated on the appended Proposed Drainage Strategy drawing, with capacities exceeding what it truly required. At the detailed design stage, the final soakaway design for individual plots will be based on the results of the closest soakaway testing location.

3.6 Exceedance Events

- 3.6.1 The drainage has been designed to ensure that all events up to and including the 1 in 100-year event plus 40 % climate change. Infrequent events with a return period greater than the 1 in 100-year plus climate change event could lead to the capacity of the proposed drainage strategy being exceeded. Natural levels of the site mean water would flow from south to north towards Lucas Lane.
- 3.6.2 The final level design of the site will ensure that exceedance flows are directed to low risk areas of the site such as POS and away from buildings. An area of POS shown on the drawing enclosed in **Appendix J** will be dishd to create exceedance storage with a maximum depth of 150mm. Water that can be stored in this area would infiltrate into the ground overtime, as the underlying geology has been shown to be permeable. This area would not need additional maintenance and would only be used during the most extreme events.

3.7 Maintenance Requirements

- 3.7.1 The drainage will be designed in line with Building Regulations, and the “Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England (“the Code”); as well as local SUDS guidance to ensure compliance with best practice guidance, thus minimising the maintenance requirements.
- 3.7.2 The ownership of each drainage element and maintenance responsibility is set out below in **Table 3.6**. As Hertfordshire County Council do not normally adopt highways all roads on the development will be privately owned. Those that would traditionally be adopted will be put under the care of a management company.

Table 3.6: Surface Water Maintenance

Drainage	Maintainer
Drains	Home owner
Household SuDS – geocellular soakaways	Home owner
Private Permeable – drainage serving one dwelling only	Home owner
Communal Paving – drainage serving more than one dwelling	Management company
Adopted sewers	Water company

3.7.3 The drainage network will require limited maintenance, but the requirements will be as follows:

Permeable Paving – taken from the SUDS Manual

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers' recommendations – pay particular attention to areas where water runs onto pervious pavement from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contribution and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly to the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements.
Remedial Actions	Remedial any landscaping which through vegetation maintenance or soil slip has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitate of surface and upper structure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
	Initial inspection	Monthly for three months after installation
Monitoring	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly. 48h after large storms in first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Bioretention Systems (including rain gardens) – taken from the SUDS Manual

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular Maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional Maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

Geo-cellular Attenuation

All maintenance should follow manufactures current guidance, but generally as per SUDS Manual requirements.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly	Annually
	Remove sediment from pre-treatment structures and / or internal forebays	Annually or as required.
Remedial Actions	Repair / rehabilitate inlets, outlet, overflow and vents.	As required
Monitoring	Inspect /check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Pipes

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Open any inspection chambers and remove and debris.	Annually
Remedial Actions	Remediate any damaged pipe works.	As required
Monitoring	Monitor inspection chambers	Annually

3.8 Water Quality Assessment – Simple Index Approach

3.8.1 The details for the simple index method are set out in the SUDS Manual. This document specifies the pollution load from various use types and is shown below in **Figure 3.1**.

Figure 3.1: Pollution Hazard Indices - From SUDS Manual

TABLE 26.2 Pollution hazard indices for different land use classifications				
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 (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

3.8.2 Various SUDS components have different SUDS mitigation incidences which are also set out in the SUDS Manual and replicated below in **Figure 3.2**.

Figure 3.2: SUDS Mitigation Indices - From SUDS Manual

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

- 3.8.3 For the element of the site that will comprise permeable paving, the worst-case pollution will come from the road. The pollution and mitigation indices are compared in the table below.

Land Use (worst case)	TSS	Metals	Hydrocarbons
Individual property driveways, low traffic roads, less than 300 vehicles per day	0.5	0.4	0.4
Mitigation	TSS	Metals	Hydrocarbons
Permeable paving	0.7	0.6	0.7

- 3.8.4 Individual plots will convey surface water flows through rain gardens, prior to discharging to rear garden soakaways. The proposed soakaways will be constructed using geocellular crates; therefore, it is the proposed rain gardens which will provide water quality treatment in this instance. The pollution and mitigation indices are compared in the table below.

Land Use (worst case)	TSS	Metals	Hydrocarbons
Residential roofing	0.2	0.2	0.05
Mitigation	TSS	Metals	Hydrocarbons
Bioretention system (where the system is not designed as an infiltration component)	0.8	0.8	0.8

- 3.8.5 The proposed mitigation is greater than or equal to the pollution loading, therefore, the proposed strategy is acceptable.
- 3.8.6 Additional mitigation is not required as a result of the site being located in Groundwater Source Protection Zone III.

4.0 Foul Water Management

4.1 Existing Drainage

- 4.1.1 The site is currently a field, therefore does not have any existing foul water infrastructure.
- 4.1.2 Existing adopted sewers within the vicinity of the site are shown on the asset plan enclosed in Appendix G.

4.2 Proposed Drainage Strategy

- 4.2.1 Foul water will discharge to Anglian Water's foul sewer located within Lucas Lane to the north of the development site. Anglian Water has confirmed that their sewer has adequate capacity to accommodate foul water flows from the development site. A copy of their response is enclosed in Appendix I.

4.3 Maintenance Requirements

- 4.3.1 The drainage will be designed in line with Building Regulations and 'the Code' to ensure compliance with best practice guidance thus minimising the maintenance requirements. A full maintenance plan for the site will be developed at the detailed design stage.
- 4.3.2 The person / authority responsible for maintenance of the drainage will depend on ownership which will vary across the site as detailed design and adoption progresses the exact body responsible for adoption of the various surface water aspects will become clear. Typical responsibilities are set out below in Table 4.1.

Table 4.1: Foul Water Maintenance

Drainage	Maintainer
Drains	Home owner
Private Sewers	Home owner / management company
Adopted sewers	Water company

5.0 Conclusions

5.1 Site location and proposed development

- 5.1.1 The proposed development for 14 dwellings is located at land off Ashwell Street, Ashwell, Hertfordshire

5.2 Flood Risk

- 5.2.1 The proposed development is located within Flood Zone 1 and at a low risk of flooding from all sources.
- 5.2.2 The proposed development's vulnerability classification is compatible with the Flood Zone therefore the development is appropriate.

5.3 Surface Water Management

- 5.3.1 The proposed development will drain via infiltration. All roads will drain via permeable paving, whilst all plots will have surface water flows conveyed through rain gardens, prior to discharging to rear garden soakaways.

5.4 Foul Water Management

- 5.4.1 Foul water will discharge to the adopted sewer located in Lucas Lane to the north of the development site.

Appendix A

Location Plan

MAC drawing no. 190-FRA01



T: 01604 340544 Northampton Office
E: info@mac-ltd.co.uk W: mac-ltd.co.uk
Martin Andrews Consulting Ltd

Client: Manor Oak Homes

Project: Residential Development
Land off Ashwell Street
Ashwell, Hertfordshire

Date: 08/04/19

Drw: MJA

Chk: MJA

Scale: 1:10,000

Size: A4

Title: Site Location Plan

Drawing No. 190-FRA01

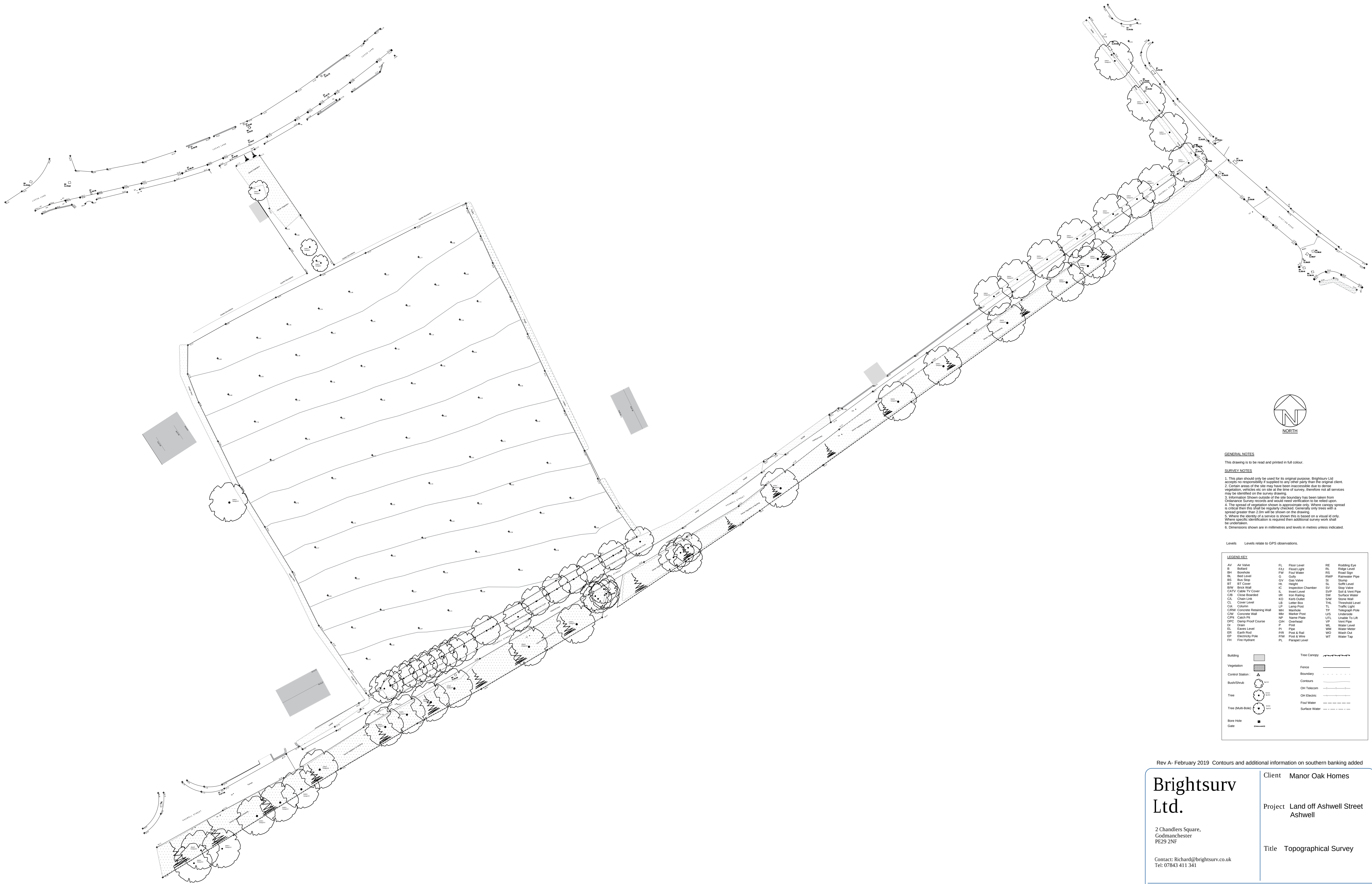
Revision -

- Transport Assessments
- Flood Risk Assessments
- Highway Advice
- Drainage Strategies



Appendix B

Topographical Survey
Brightsurv Ltd drawing no. BRI106 T01 A



GENERAL NOTES
This drawing is to be read and printed in full colour.

- SURVEY NOTES**
1. This plan should only be used for its original purpose. Brightsurv Ltd accepts no responsibility if supplied to any other party than the original client.
 2. Certain areas of the site may have been inaccessible due to dense vegetation, vehicles etc on site at the time of survey, therefore not all services may be identified on the survey drawing.
 3. Information shown outside of the site boundary has been taken from Ordnance Survey records and would need verification to be relied upon.
 4. The spread of vegetation shown is approximate only. Where canopy spread is critical then this shall be regularly checked. Generally only trees with a spread greater than 2.0m will be shown on the drawing.
 5. Where the density of a service is shown this is based on a visual id only. Where specific identification is required then additional survey work shall be undertaken.
 6. Dimensions shown are in millimetres and levels in metres unless indicated.

Levels Levels relate to GPS observations.

LEGENDARY		
AV Air Valve	FL Floor Level	RE Ridding Eye
B Ballast	FLD Flood Light	RL Ridge Level
BH Borehole	FW Fuel Water	RS Road Sign
BL Bell Level	G Gully	RWP Rainwater Pipe
BS Bus Stop	GV Gas Valve	SL Storm
BT BT Cover	HL Height	SL Soft Level
BW Brick Wall	IC Inspection Chamber	SV Stop Valve
CATV Cable TV Cover	IL Invert Level	SVP Soil & Vent Pipe
CB Close Boarded	IR Iron Railing	SW Surface Water
CL Chain Link	KO Kerb Outlet	SW Stone Wall
CL Corner Level	LP Lamp Post	TAL Trench Level
CL Column	LP Lamp Post	TL Traffic Light
CM Concrete Reinforcing Wall	Mir Marker Post	TP Telegraph Pole
CN Conch Pit	MP Marker Post	URS Underside
DPC Damp Proof Course	NP Name Plate	UTL Unstable To Lit
D Drain	OH Overhead	VP Vent Pipe
EL Eaves Level	P Pipe	WL Water Level
EP Earth Road	PR Post & Rail	WM Water Meter
EP Electricity Pole	PW Post & Wire	WO Wash Out
FL Fire Hydrant	PL Parapet Level	WT Water Tap

Building	Tree Canopy
Vegetation	Fence
Control Station	Boundary
Bush/Shrub	Contours
Tree	OH Telecom
Tree (Multi Bole)	Pond Water
Bore Hole	Surface Water
Gate	

Rev A- February 2019 Contours and additional information on southern banking added

Brightsurv Ltd.

2 Chandlers Square,
Godmanchester
PE29 2NF

Contact: Richard@brightsurv.co.uk
Tel: 07843 411 341

Client **Manor Oak Homes**

Project **Land off Ashwell Street
Ashwell**

Title **Topographical Survey**

Scale at A1 1:500	Drawn by RB	Checked by RB	Date January 2019
Status For Information	Project ref BRI106	Drawing no. T01	Revision A

Appendix C

Proposed Site Plan
AT Architecture drawing no. A_2133 PL100 Rev-B

NOTES:

AT ARCHITECTURE LIMITED
WWW.ATARCHITECTURELTD.COM
OXFORD HOUSE, CLIFTONVILLE, NN1 5BE
ASHLEY.THOMPSON@AT-ARCHITECTURE.UK

NO DIMENSIONS TO BE SCALED FROM DRAWING
ALL DIMENSIONS ARE APPROXIMATE AND TO BE
CHECKED ON SITE

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B	LJB	01.11.24	LANDSCAPE BUFFER ADDED
A	LJB	15.08.24	BOUNDARY AMENDED
REV:	BY:	DATE:	DETAILS:

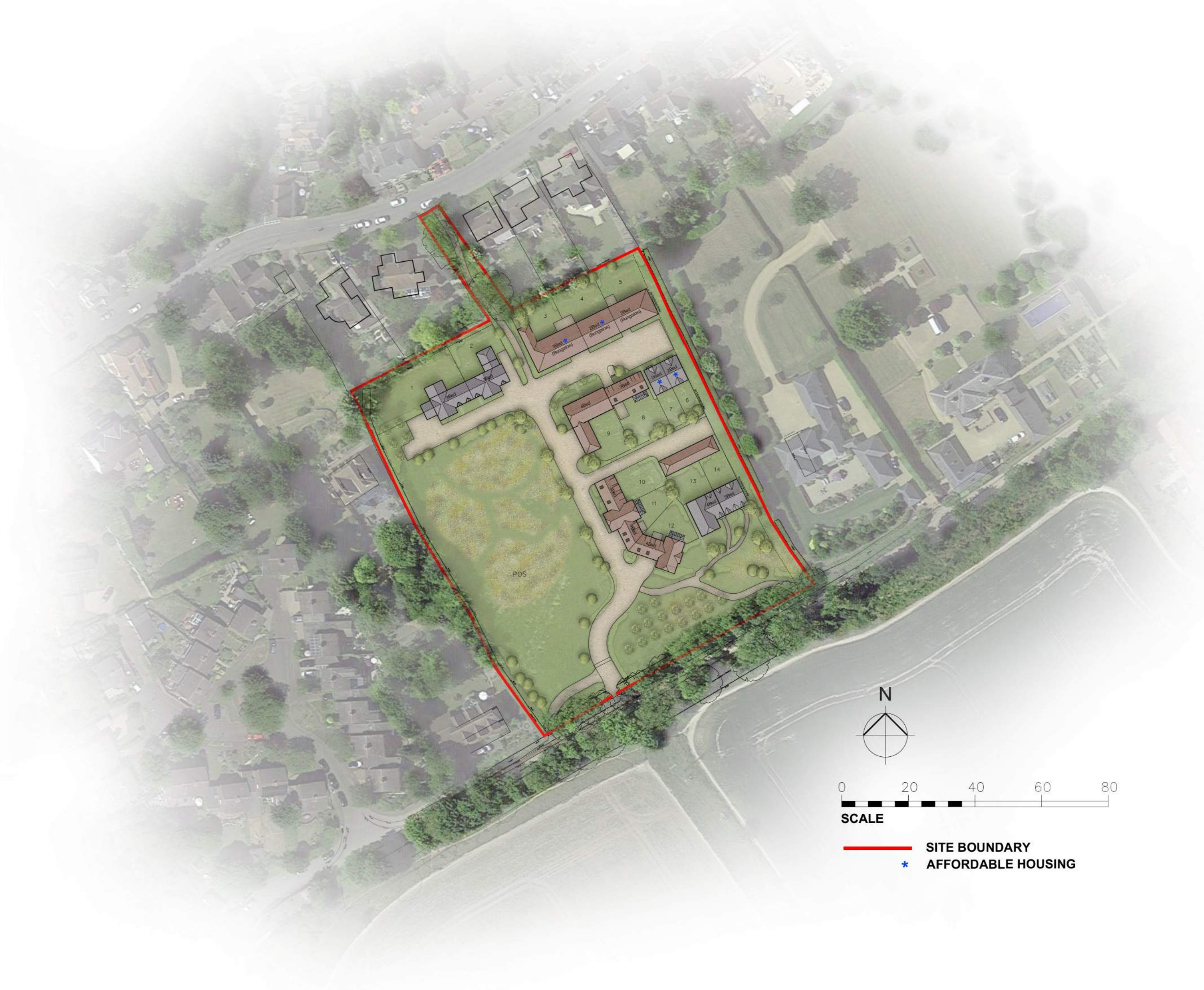


PROJECT:
**Ashwell Street
ASHWELL**

DRAWING TITLE:
Proposed Site Plan

SCALE: 1:1000 (A3) STAGE: Planning DATE: Mar 2024

DRAWING NO: **A_2133 PL100** REVISION: **B**

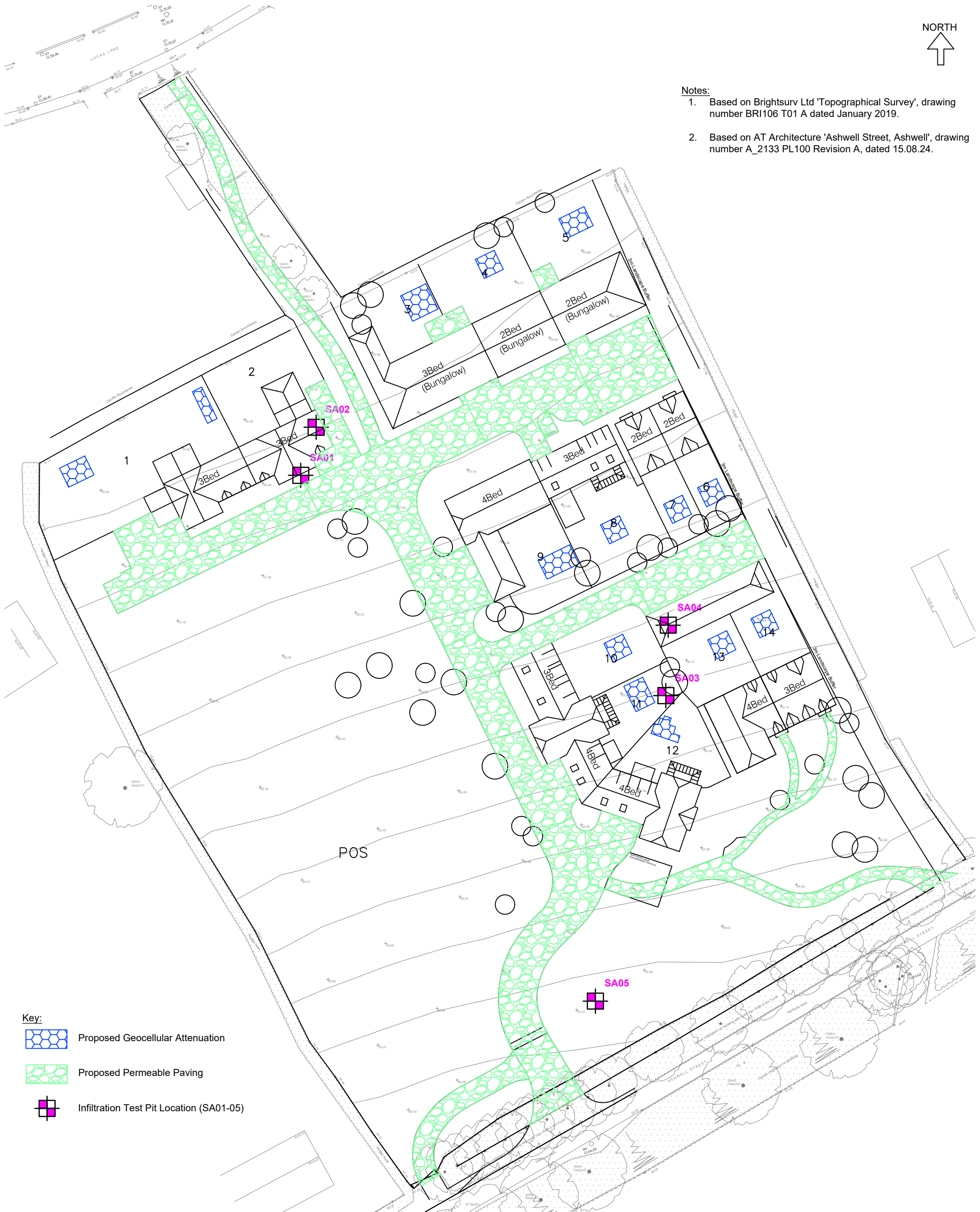


SCALE

— SITE BOUNDARY
*** AFFORDABLE HOUSING**

Appendix D

Proposed Drainage Strategy
MAC drawing no. 190-FRA23C
Typical Section Through SUDS Features
MAC drawing no. 190-FRA15



- Notes:
1. Based on Brightsurv Ltd 'Topographical Survey', drawing number BR1106 T01 A dated January 2019.
 2. Based on AT Architecture 'Ashwell Street, Ashwell', drawing number A_2133 PL100 Revision A, dated 15.08.24.

Key:

 Proposed Geocellular Attenuation

 Proposed Permeable Paving

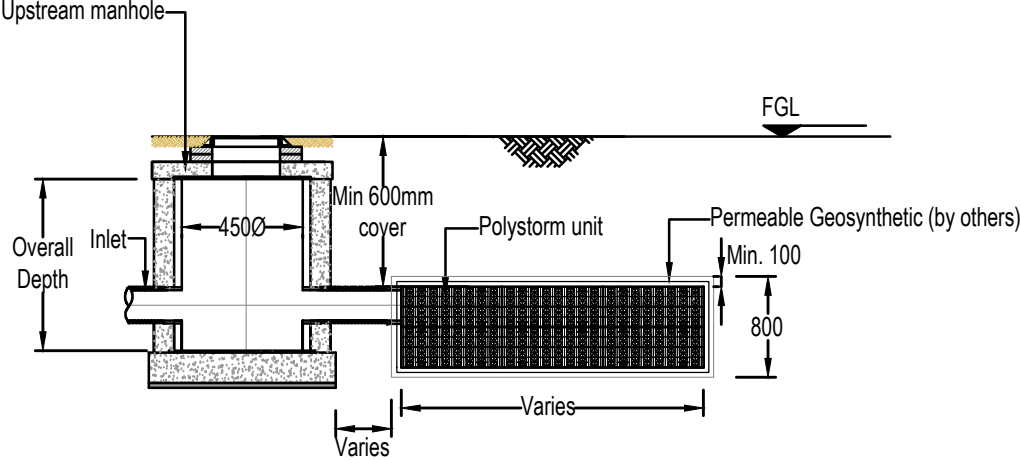
 Infiltration Test Pit Location (SA01-05)



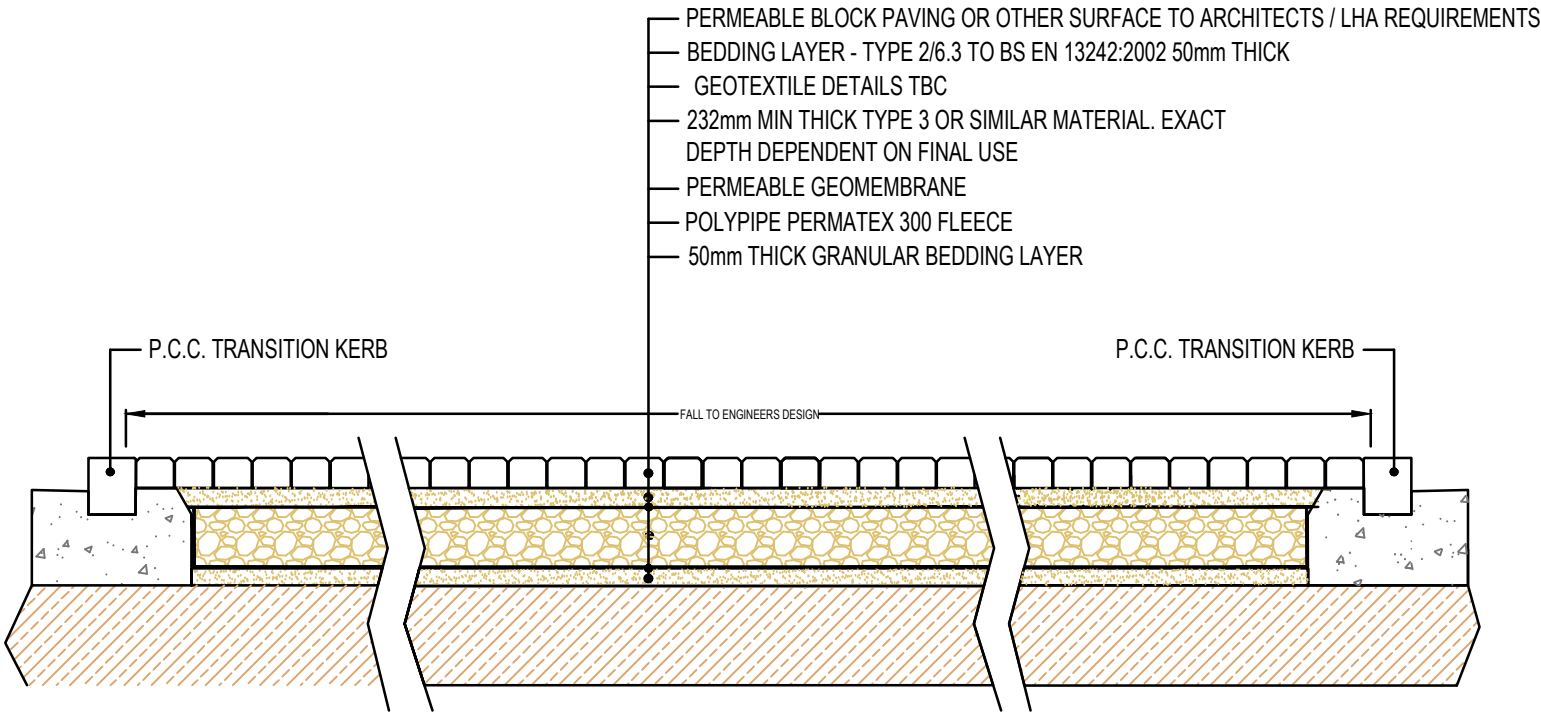
T: 01604 340544 Northampton Office
E: info@mac-ltd.co.uk W: mac-ltd.co.uk
Martin Andrews Consulting Ltd

- Transport Assessments
- Flood Risk Assessments
- Highway Advice
- Access Design
- Drainage Strategies
- Vehicle tracking

Client: Manor Oak Homes		Project: Land off Ashwell Street Ashwell	
Title: Proposed Drainage Strategy		Date: 23.10.24	
		Drw: ZS	
		Chk: MJA	
Drawing No: 190-FRA23		Scale: 1:500	
		Size: A3	
Revision: C			



Typical Section Through Plot Soakaway
Scale (1:75)



TYPICAL SECTION THROUGH PERMEABLE BLOCK PAVING
Scale (1:20)



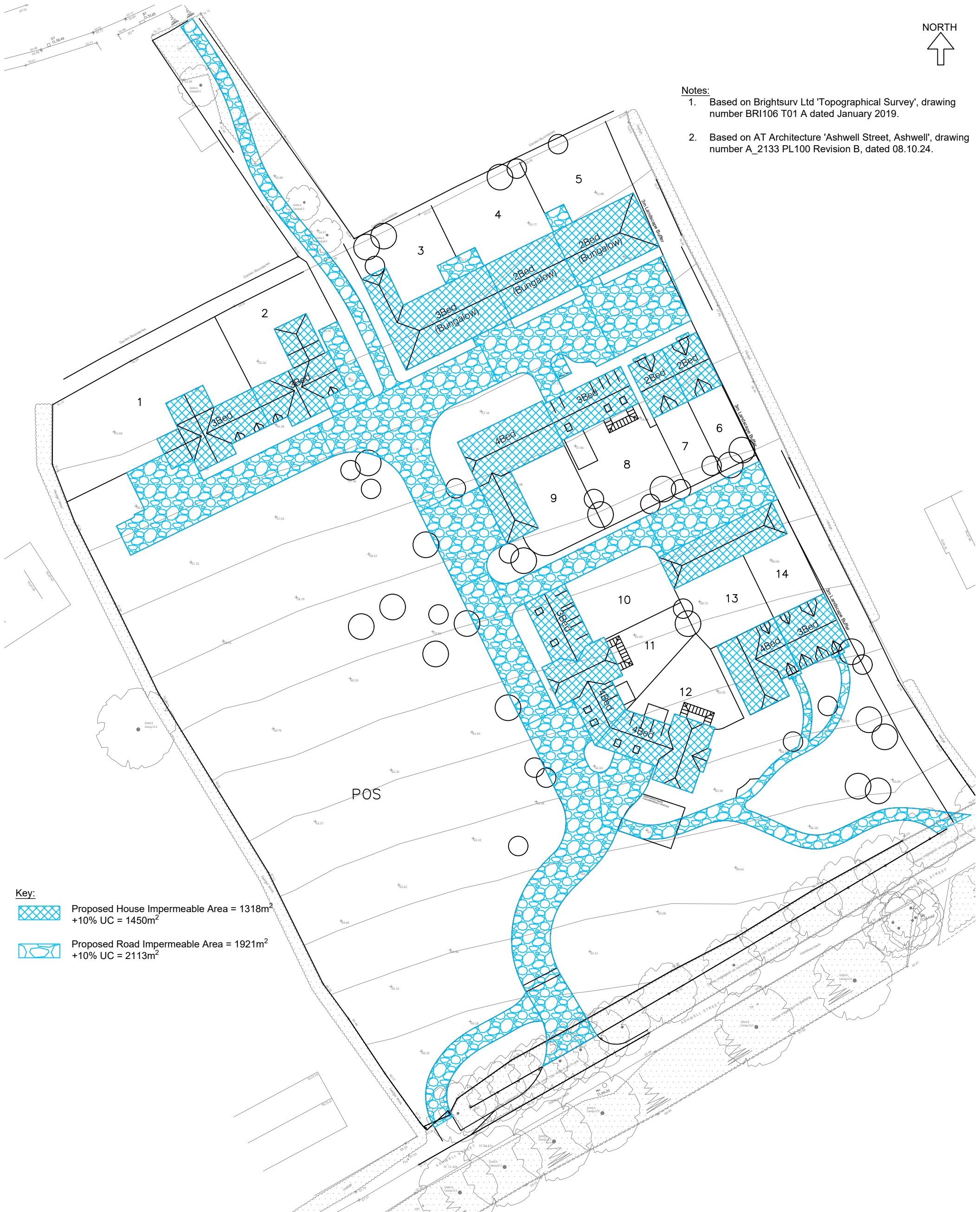
T: 01604 340544 Northampton Office
E: info@mac-ltd.co.uk W: mac-ltd.co.uk
Martin Andrews Consulting Ltd

- Transport Assessments
- Flood Risk Assessments
- Highway Advice
- Access Design
- Drainage Strategies
- Vehicle tracking

Client: Manor Oak Homes		Project: Land off Ashwell Street Ashwell	
Title: Typical Sections Through SUDS Features		Date: 26/05/23	
		Drw: MJA	
		Chk: MJA	
Drawing No: 190-FRA15		Revision: -	Scale: As Noted
			Size: A3

Appendix E

Proposed Impermeable Area
MAC drawing no. 190-FRA22C



- Notes:
1. Based on Brightsurv Ltd 'Topographical Survey', drawing number BR1106 T01 A dated January 2019.
 2. Based on AT Architecture 'Ashwell Street, Ashwell', drawing number A_2133 PL100 Revision B, dated 08.10.24.

Key:

 Proposed House Impermeable Area = 1318m²
+10% UC = 1450m²

 Proposed Road Impermeable Area = 1921m²
+10% UC = 2113m²



T: 01604 340544 Northampton Office
E: info@mac-ltd.co.uk W: mac-ltd.co.uk
Martin Andrews Consulting Ltd

- Transport Assessments
- Flood Risk Assessments
- Highway Advice
- Access Design
- Drainage Strategies
- Vehicle tracking

Client: Manor Oak Homes

Project: Land off Ashwell Street
Ashwell

Title: Proposed Impermeable Area

Date: 23.10.24

Drw: ZS

Chk: MJA

Drawing No: 190-FRA22

Revision: C

Scale: 1:500

Size: A3

Appendix F
Drainage 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	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
1	0.005	5.00	100.000	1.000	1.000	1.000

Simulation Settings

Rainfall Methodology	FEH-13	Drain Down Time (mins)	240	100 year (l/s)	0.1
Summer CV	0.750	Additional Storage (m³/ha)	20.0	Check Discharge Volume	✓
Winter CV	0.840	Check Discharge Rate(s)	✓	100 year 360 minute (m³)	
Analysis Speed	Normal	1 year (l/s)	0.0		
Skip Steady State	x	30 year (l/s)	0.1		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

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

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.55
Greenfield Method	IH124	Growth Factor 100 year	3.56
Positively Drained Area (ha)	0.284	Betterment (%)	0
SAAR (mm)	569	QBar	0.0
Soil Index	1	Q 1 year (l/s)	0.0
SPR	0.10	Q 30 year (l/s)	0.1
Region	5	Q 100 year (l/s)	0.1
Growth Factor 1 year	0.87		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	0.284	Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Invert Level (m)	99.000	Slope (1:X)	50.0
Side Inf Coefficient (m/hr)	0.02232	Time to half empty (mins)	489	Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

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
180 minute winter	1	144	99.242	0.242	0.8	2.1650	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
180 minute winter	1	Infiltration	0.2

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	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
1	0.013	5.00	100.000	1.000	1.000	1.500
2	0.012	5.00	100.000	5.000	5.000	1.400
3	0.018	5.00	100.000	10.000	10.000	1.000
4	0.010	5.00	100.000	15.000	15.000	1.000
5	0.012	5.00	100.000	20.000	20.000	1.000
6	0.005	5.00	100.000	25.000	25.000	1.000
7	0.005	5.00	100.000	30.000	30.000	1.000
8	0.008	5.00	100.000	35.000	35.000	1.000
9	0.015	5.00	100.000	40.000	40.000	1.000
10	0.007	5.00	100.000	45.000	45.000	1.000
11	0.010	5.00	100.000	50.000	50.000	1.000
12	0.012	5.00	100.000	55.000	55.000	1.400
13	0.010	5.00	100.000	60.000	60.000	1.000
14	0.007	5.00	100.000	65.000	65.000	1.500

Simulation Settings

Rainfall Methodology	FEH-13	Drain Down Time (mins)	240	100 year (l/s)	0.2
Summer CV	0.750	Additional Storage (m³/ha)	20.0	Check Discharge Volume	✓
Winter CV	0.840	Check Discharge Rate(s)	✓	100 year 360 minute (m³)	
Analysis Speed	Normal	1 year (l/s)	0.0		
Skip Steady State	x	30 year (l/s)	0.1		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

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

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.55
Greenfield Method	IH124	Growth Factor 100 year	3.56
Positively Drained Area (ha)	0.321	Betterment (%)	0
SAAR (mm)	569	QBar	0.0
Soil Index	1	Q 1 year (l/s)	0.0
SPR	0.10	Q 30 year (l/s)	0.1
Region	5	Q 100 year (l/s)	0.2
Growth Factor 1 year	0.87		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	0.321	Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m ³)	

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	98.500
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	1150

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	12.0	12.0	0.800	12.0	23.2	0.801	0.0	23.2

Node 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	98.600
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	1118

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	7.5	7.5	1.200	7.5	23.1	1.201	0.0	23.1

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	1026

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	16.0	16.0	0.800	16.0	28.8	0.801	0.0	28.8

Node 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	950

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	9.0	9.0	0.800	9.0	18.6	0.801	0.0	18.6

Node 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	987

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	12.0	12.0	0.800	12.0	23.2	0.801	0.0	23.2

Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	826

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	5.0	5.0	0.800	5.0	13.0	0.801	0.0	13.0

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	826

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	5.0	5.0	0.800	5.0	13.0	0.801	0.0	13.0

Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	950

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	9.0	9.0	0.800	9.0	18.6	0.801	0.0	18.6

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	1010

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	15.0	15.0	0.800	15.0	27.8	0.801	0.0	27.8

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	950

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	9.0	9.0	0.800	9.0	18.6	0.801	0.0	18.6

Node 11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	987

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	12.0	12.0	0.800	12.0	23.2	0.801	0.0	23.2

Node 12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	98.600
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	1113

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	8.0	8.0	1.200	8.0	24.8	1.201	0.0	24.8

Node 13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	915

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	9.0	9.0	0.800	9.0	19.8	0.801	0.0	19.8

Node 14 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02232	Safety Factor	1.5	Invert Level (m)	98.500
Side Inf Coefficient (m/hr)	0.02232	Porosity	0.96	Time to half empty (mins)	1031

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	9.0	9.0	0.800	9.0	19.8	0.801	0.0	19.8

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
480 minute winter	1	472	99.282	0.782	0.9	9.1424	0.0000	OK
480 minute winter	2	472	99.776	1.176	0.9	8.6719	0.0000	OK
720 minute winter	3	690	99.814	0.814	0.9	12.5888	0.0000	OK
360 minute winter	4	352	99.782	0.782	0.9	6.9119	0.0000	OK
480 minute winter	5	472	99.725	0.725	0.9	8.5283	0.0000	OK
480 minute winter	6	456	99.734	0.734	0.4	3.5953	0.0000	OK
480 minute winter	7	456	99.734	0.734	0.4	3.5953	0.0000	OK
960 minute winter	8	900	99.628	0.628	0.3	5.5300	0.0000	OK
600 minute winter	9	570	99.709	0.709	0.9	10.4219	0.0000	OK
720 minute winter	10	690	99.542	0.542	0.4	4.7584	0.0000	OK
360 minute winter	11	352	99.577	0.577	0.9	6.7611	0.0000	OK
480 minute winter	12	472	99.697	1.097	0.9	8.6094	0.0000	OK
360 minute winter	13	352	99.777	0.777	0.9	6.8655	0.0000	OK
720 minute winter	14	690	99.038	0.538	0.4	4.6964	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
480 minute winter	1	Infiltration	0.1
480 minute winter	2	Infiltration	0.1
720 minute winter	3	Infiltration	0.1
360 minute winter	4	Infiltration	0.1
480 minute winter	5	Infiltration	0.1
480 minute winter	6	Infiltration	0.1
480 minute winter	7	Infiltration	0.1
960 minute winter	8	Infiltration	0.1
600 minute winter	9	Infiltration	0.1
720 minute winter	10	Infiltration	0.1
360 minute winter	11	Infiltration	0.1
480 minute winter	12	Infiltration	0.1
360 minute winter	13	Infiltration	0.1
720 minute winter	14	Infiltration	0.1



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Date: 31/10/18 Scale: 1:1000 Map Centre: 527144,239700 Title: G2384754-1

COMMERCIALDW
DRAINAGE AND WATER ENQUIRY

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent

- Decommissioned Sewer
(colour denotes effluent type)
- Private Sewer
(colour denotes effluent type)
- Rising Main
(colour denotes effluent type)

- Manhole
(colour denotes effluent type)
- Public Pumping Station
- Private Pumping Station
- Decommissioned Pumping Station

- Public Sewage Treatment Works
- Private Sewage Treatment Works
- Outfall
- Inlet



This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2018 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

14th March 2019

Our ref: GE17964/SA01/190314



Oscar Briggs
Manor Oak Homes
White Lodge Farm
Walgrave
Northampton
NN6 9PY

Dear Oscar,

RE: Land on the north side of Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5LN – Soakage Testing

We are pleased to present the results of the soakage testing undertaken at the above site. The soakage tests were undertaken broadly in accordance with BRE Digest 365 'Soakaway Design' BRE, 2016 with the testing limited to a single day.

A geo-environmental engineer attended site on the 8th March 2019 to undertake the intrusive investigation. Soakage testing was undertaken in five trial pits (SA01 to SA05) which were located to provide a broad coverage of the site.

Background

It is understood that the site is proposed to be developed for a residential land use and associated development infrastructure. As such, soakage testing was required to confirm the suitability of underlying soils for soakaway drainage and to inform the planning, design and construction strategies for the site.

Published geological records indicate that the ground conditions were likely to comprise Zig Zag Chalk Formation.

Site Description

The site comprised a rectangular shaped area with a narrow spur of land protruding to the north. At the time of the investigation, the site was used for grazing sheep, with the northern spur formed of a section of garden. The site surface was noted to slope moderately downhill to the north-west (a fall of approximately 15m over 140m). The main body of the site was bounded by post and wire fencing in addition to mature deciduous trees on the south-eastern boundary and variously hedgerows, shrubs and wooden garden fencing on the remaining boundaries. The spur was bounded to the north-west by a tall hedgerow with shrubs forming the north-east and south-west boundaries. Access to the site was off Ashwell Street via a gate in the southern corner of the field.

Ground Conditions

The ground conditions encountered were relatively consistent with those anticipated from published maps, i.e. a thickness of Topsoil overlying, soil and rock of the Zig Zag Chalk Formation. A generalised summary of the encountered conditions is presented in Table 1.

Geo-Environmental Services Ltd
Unit 7 Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex BN6 9GL
+44(0)1273 832972 www.gesl.net

Environmental Consultants | Geotechnical Engineers | Site Investigations

Geo-Environmental Services Ltd incorporated in England number 3214980 VAT number 679544479



Top (m bgl)	Base (m bgl)	Geology
0	0.30 – 0.80	TOPSOIL: Typically pale brown slightly sandy or slightly gravelly SILT. Gravel is fine sub-angular chalk.
0.30 – 0.80	0.60– 1.90	ZIG ZAG CHALK FORMATION (Structureless): (All locations) – Structureless white CHALK composed gravel sized clasts in a silt and sand sized matrix. Clasts are extremely weak. Occasional cobble sized clasts in SA02 and SA03. (CIRIA Grade Dc)
0.90 – 1.90	1.70+ – 2.60+	ZIG ZAG CHALK FORMATION (Moderately Weathered): (SA01, SA03 and SA05) – White moderately weathered CHALK very weak. Randomly orientated discontinuities with spacing ranging between c. 10-300mm apart. The discontinuities were open and ranged between 2-10mm and were infilled with chalk silt matrix. (CIRIA Grade C2-C5)

Table 1 Summary of Ground Conditions

Groundwater was not encountered within any of the exploratory holes during the intrusive investigation. Monitoring to determine any possible variation in groundwater levels over time did not form part of the scope of investigation.

For further details of the ground conditions encountered, reference should be made to the trial pit logs included within Appendix A.

Soakage Testing

Soakage testing was undertaken broadly in accordance with BRE Digest 365 Soakaway Design in all five trial pits. Testing was undertaken in SA01, SA03 and SA05 at depths between 1.70m and 2.25m bgl, suitable for likely proposed conventional stormwater soakaways. Testing in SA02 and SA04 was undertaken at 0.60m and 1.10m bgl to inform the design of permeable pavement. Wherever possible with the days testing agreed, three filling and drainage cycles were completed to form the soakage test in each trial pit.

The results of the testing are summarised in Table 2 below. The soakage test results are included within Appendix B.

Location	Permeability (m/s)		
	Test 1	Test 2	Test 3
SA01	1.6×10^{-4}	1.0×10^{-4}	9.8×10^{-5}
SA02	6.2×10^{-6}	Insufficient time to undertake further testing	
SA03	2.3×10^{-4}	2.1×10^{-4}	1.5×10^{-4}
SA04	2.8×10^{-5}	1.1×10^{-5}	Insufficient time to undertake third test
SA05	4.4×10^{-4}	4.1×10^{-4}	4.7×10^{-4}

Table 2 Soakage Test Results

Conclusions

The testing undertaken indicates that the moderately weathered Chalk at the site is likely to be suitable for stormwater drainage via conventional soakaways. The structureless Chalk, present at shallower depths, is also likely to be suitable for soakaway drainage albeit with lower permeabilities recorded. The near-surface structureless Chalk at the site is also likely to be suitable for permeable paving.

Where soakaways are situated in Chalk these should be located >10m from buildings.

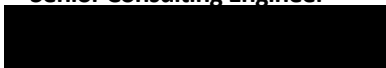
Closure

We trust that we have interpreted your instructions correctly, and please do not hesitate to contact us should you have any queries.

Yours sincerely
For and on Behalf of Geo-Environmental



SHAUN ARMITAGE BSc (Hons), FGS
Senior Consulting Engineer



Enc	Figure 1	Site Location Plan
	Figure 2	Exploratory Hole Locations Plan
	Appendix A	Exploratory Hole Logs
	Appendix B	Soakage Test Results



Project:	Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5QD			Title	Site Location Plan	
Client:	Manor Oak Homes			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net	 Geo-Environmental	
Ref No:	GE17964	Revision:	0			
Drawn:	SA	Date:	30/01/2019			
Figure:	1	Scale:	Not To Scale			

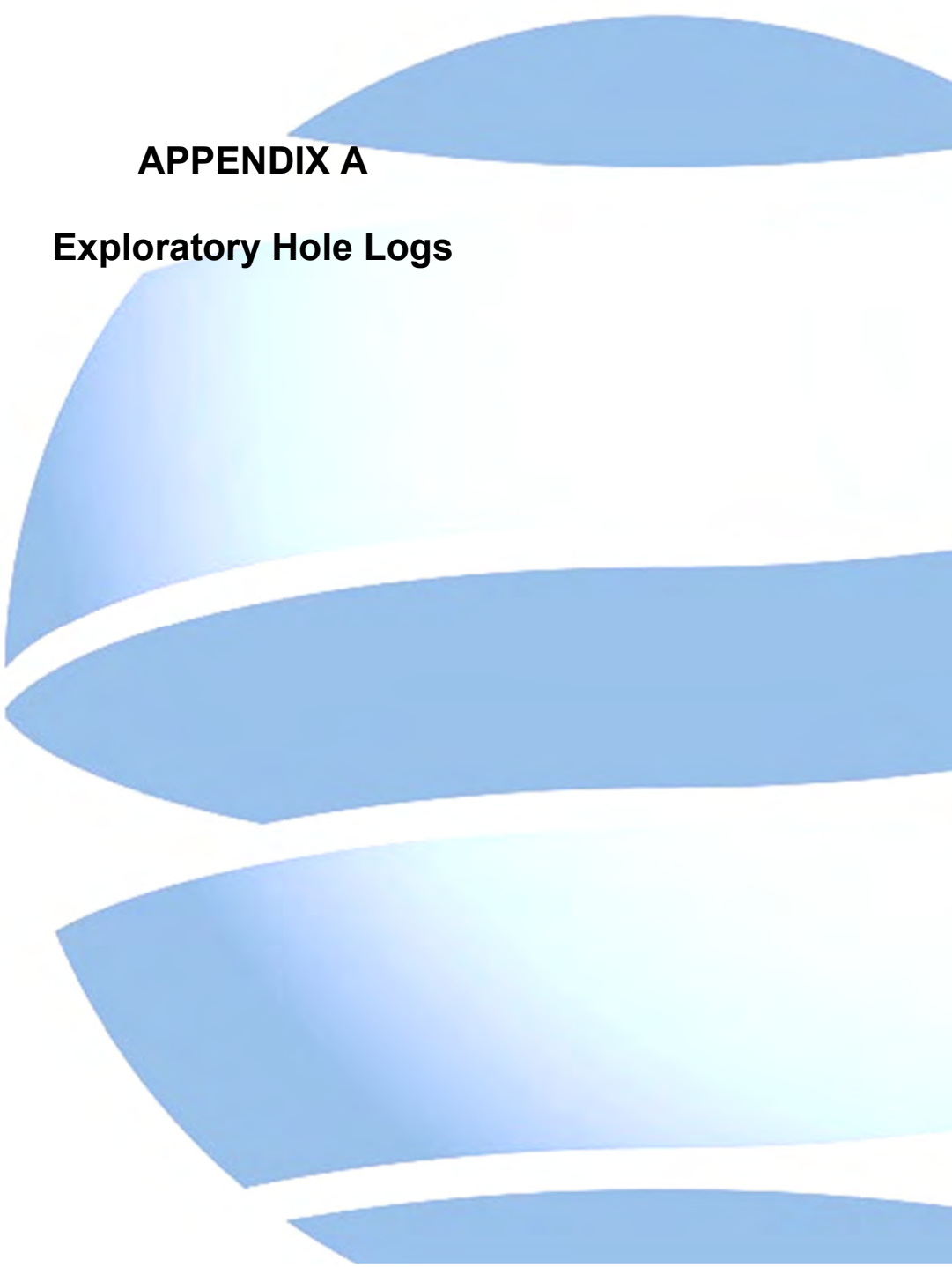
Project Title: Ashwell Street, Ashwell
Location : Baldock, Hertfordshire, SG7 5QD
Project No. : GE17964
Client : Manor Oak Homes

Title : Figure 2 - Exploratory Hole Location Plan
Scale: 1:1000
Engineer: SA



- Legend Key
- Locations By Type - Empty
 - Locations By Type - TP





APPENDIX A

Exploratory Hole Logs



Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

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Trial Pit Log

Trial Pit No

SA01

Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE17964

Co-ords: 527117.00 - 239727.00
Level:

Date
08/03/2019

Location: Baldock, Hertfordshire, SG7 5QD

Dimensions (m): 1.70

Depth
2.60

0.50



Scale
1:25

Logged
SA

Client: Manor Oak Homes

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.80			Pale brown slightly sandy SILT with occasional rootlets. Topsoil depth reduces to 0.5m bgl. TOPSOIL	
				1.90			Structureless white CHALK composed gravel sized clasts in a silt and sand sized matrix. Clasts are extremely weak. (CIRIA Grade Dc) ZIG ZAG CHALK FORMATION	1
				2.60			White moderately weathered CHALK very weak. Randomly orientated discontinuities spaced c. 10-200mm apart open 2-10mm infilled with chalk silt matrix. (CIRIA Grade C3-C5) ZIG ZAG CHALK FORMATION	2
							End of Pit at 2.60m	3
								4
								5

Remarks Soakaway test undertaken. Collapsed to 2.25m bgl during test 1

Stability Sides stable





Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Geo-Environmental www.gesl.net

Trial Pit Log

Trial Pit No

SA02

Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE17964

Co-ords: 527119.00 - 239734.00
Level:

Date
08/03/2019

Location: Baldock, Hertfordshire, SG7 5QD

Dimensions (m):

1.30

Depth
1.10

0.50



Scale
1:25

Logged
SA

Client: Manor Oak Homes

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.60			Pale brown slightly sandy SILT with occasional rootlets. TOPSOIL	
				1.10			Structureless white CHALK composed gravel sized clasts in a silt and sand sized matrix with occasional cobble sized clasts. Clasts are extremely weak. (CIRIA Grade Dc) ZIG ZAG CHALK FORMATION	1
							End of Pit at 1.10m	
								2
								3
								4
								5

Remarks Soakaway test undertaken

Stability Sides stable





Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Geo-Environmental www.gesl.net

Trial Pit Log

Trial Pit No

SA03

Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE17964

Co-ords: 527170.00 - 239697.00
Level:

Date
08/03/2019

Location: Baldock, Hertfordshire, SG7 5QD

Dimensions (m): 1.50

Depth
2.20

0.50



Scale
1:25

Logged
SA

Client: Manor Oak Homes

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.30			Brown slightly gravelly SILT with occasional rootlets. Gravel is fine sub-angular chalk TOPSOIL	
				1.60			Structureless white CHALK composed gravel sized clasts in a silt and sand sized matrix with occasional cobble sized clasts. Clasts are extremely weak. (CIRIA Grade Dc) ZIG ZAG CHALK FORMATION	1
				2.20			White moderately weathered CHALK very weak. Randomly orientated discontinuities spaced c. 300mm apart open c. 5mm infilled with chalk silt matrix. (CIRIA Grade C2) ZIG ZAG CHALK FORMATION	2
							End of Pit at 2.20m	3
								4
								5

Remarks Soakaway test undertaken

Stability Sides stable





Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Geo-Environmental www.gesl.net

Trial Pit Log

Trial Pit No

SA04

Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE17964

Co-ords: 527170.00 - 239707.00
Level:

Date
08/03/2019

Location: Baldock, Hertfordshire, SG7 5QD

Dimensions (m):

1.40

Depth
0.60

0.50



Scale
1:25

Logged
SA

Client: Manor Oak Homes

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			Brown slightly gravelly SILT with occasional rootlets. Gravel is fine sub-angular chalk. TOPSOIL
				0.60			Structureless white CHALK composed gravel sized clasts in a silt and sand sized matrix. Clasts are extremely weak. (CIRIA Grade Dc) ZIG ZAG CHALK FORMATION
							End of Pit at 0.60m

1

2

3

4

5

Remarks Soakaway test undertaken

Stability Sides stable





Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Geo-Environmental www.gesl.net

Trial Pit Log

Trial Pit No
SA05
Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE17964

Co-ords: 527161.00 - 239653.00
Level:

Date
08/03/2019

Location: Baldock, Hertfordshire, SG7 5QD

Dimensions (m): 1.50
Depth 1.70

Scale
1:25

Logged
SA

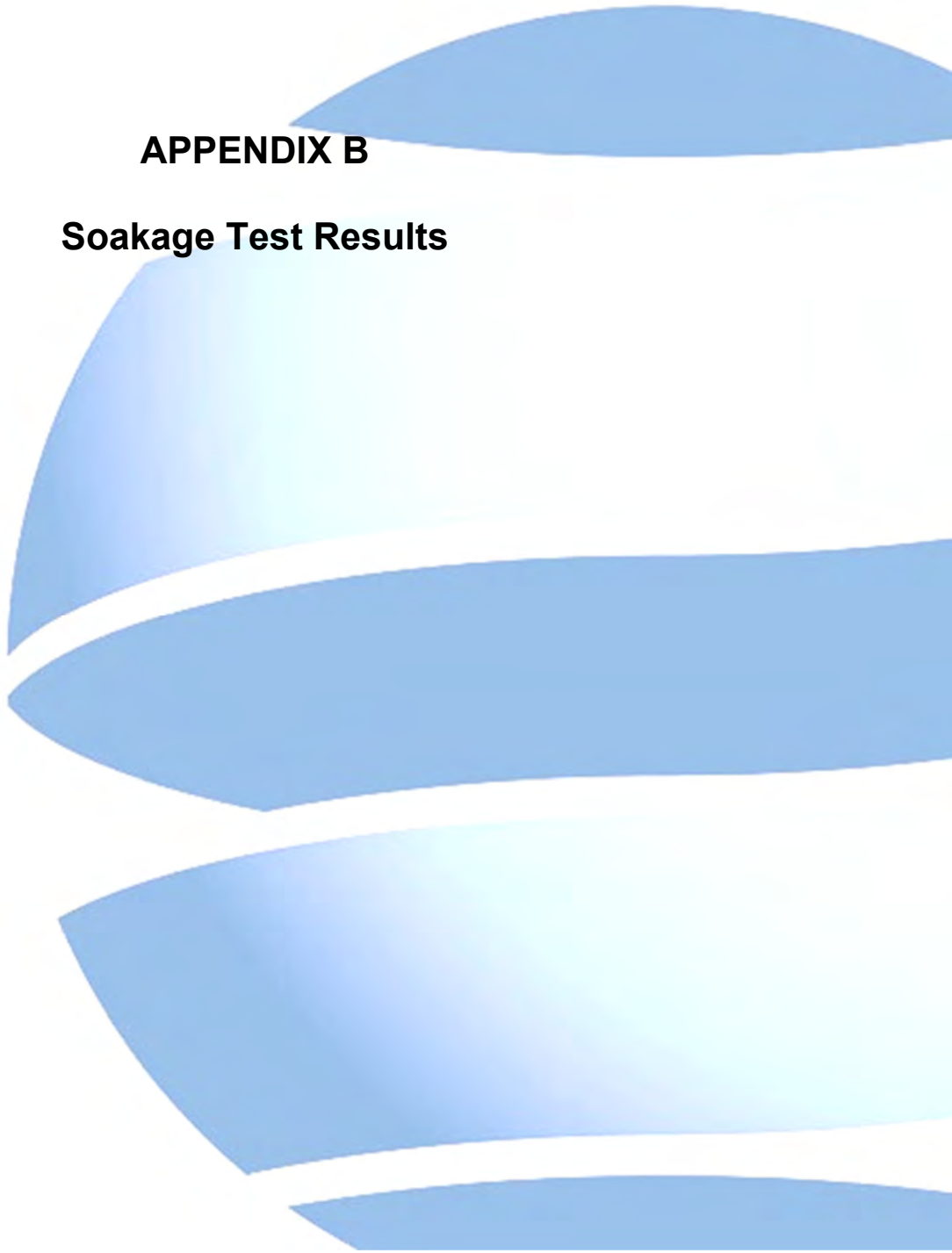
Client: Manor Oak Homes

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			Pale brown slightly sandy slightly gravelly SILT. Gravel is fine sub-angular chalk. TOPSOIL
				0.90			Structureless white CHALK composed gravel sized clasts in a sand sized matrix. Clasts are extremely weak. (CIRIA Grade Dc) ZIG ZAG CHALK FORMATION
				1.70			White moderately weathered CHALK very weak. Randomly orientated discontinuities spaced c. 10-100mm apart open c. 3-5mm infilled with chalk silt matrix. (CIRIA Grade C3-C4) ZIG ZAG CHALK FORMATION
							End of Pit at 1.70m

Remarks Soakaway test undertaken

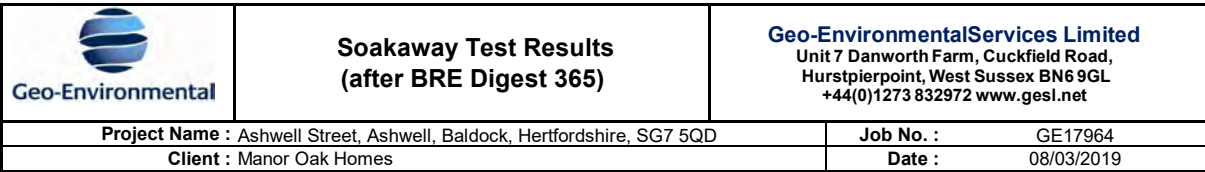
Stability Sides stable





APPENDIX B

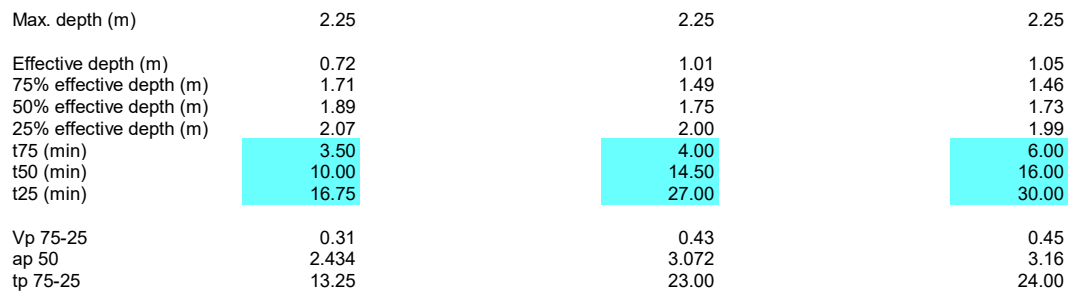
Soakage Test Results



Geo-Environmental Services Limited
Unit 7 Danworth Farm, Cuckfield Road,
Hurstpierpoint, West Sussex BN6 9GL
+44(0)1273 832972 www.gesl.net

Job No. : GE17964

Date : 08/03/2019

[illegible][illegible]

Soil infiltration rate (m/s)	1.6E-04	1.0E-04	9.8E-05
Soil infiltration rate (mm/hr)	5.69E+02	3.65E+02	3.53E+02

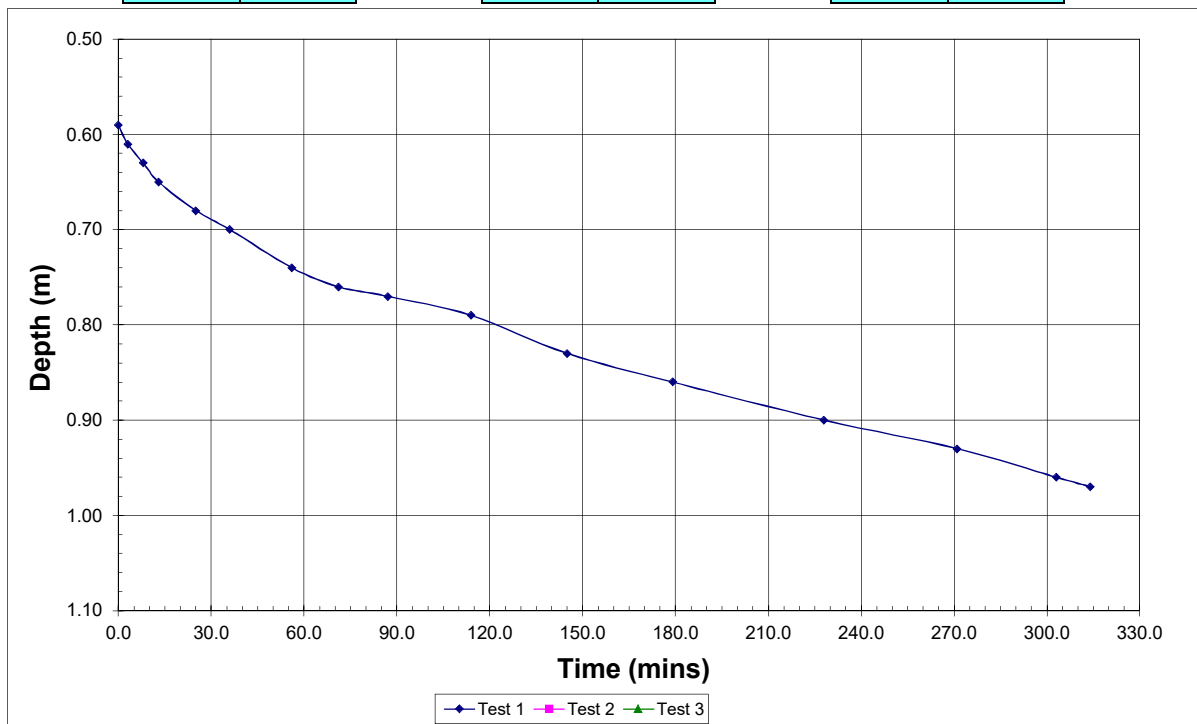
 Geo-Environmental	Soakaway Test Results (after BRE Digest 365)	Geo-Environmental Services Limited Unit 7 Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net
Project Name : Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5QD		Job No. : GE17964 Date : 08/03/2019
Client : Manor Oak Homes		

Pit reference	SA02
Pit depth (m)	1.10
Pit width (m)	0.50
Pit length (m)	1.30
Depth to standing water (m)	

Test 1	
Time (min)	Depth (m)
0.0	0.59
3.0	0.61
8.0	0.63
13.0	0.65
25.0	0.68
36.0	0.70
56.0	0.74
71.0	0.76
87.0	0.77
114.0	0.79
145.0	0.83
179.0	0.86
228.0	0.90
271.0	0.93
303.0	0.96
314.0	0.97

Test 2	
Time (min)	Depth (m)

Test 3	
Time (min)	Depth (m)



Max. depth (m)	1.10	1.10	1.10
Effective depth (m)	0.51	1.10	1.10
75% effective depth (m)	0.72	0.28	0.28
50% effective depth (m)	0.85	0.55	0.55
25% effective depth (m)	0.97	0.83	0.83
t75 (min)	45.00		
t50 (min)	170.00		
t25 (min)	314.00		
Vp 75-25	0.17	0.36	0.36
ap 50	1.568	2.63	2.63
tp 75-25	269.00	0.00	0.00

Soil infiltration rate (m/s)	6.5E-06		
Soil infiltration rate (mm/hr)	2.36E+01		

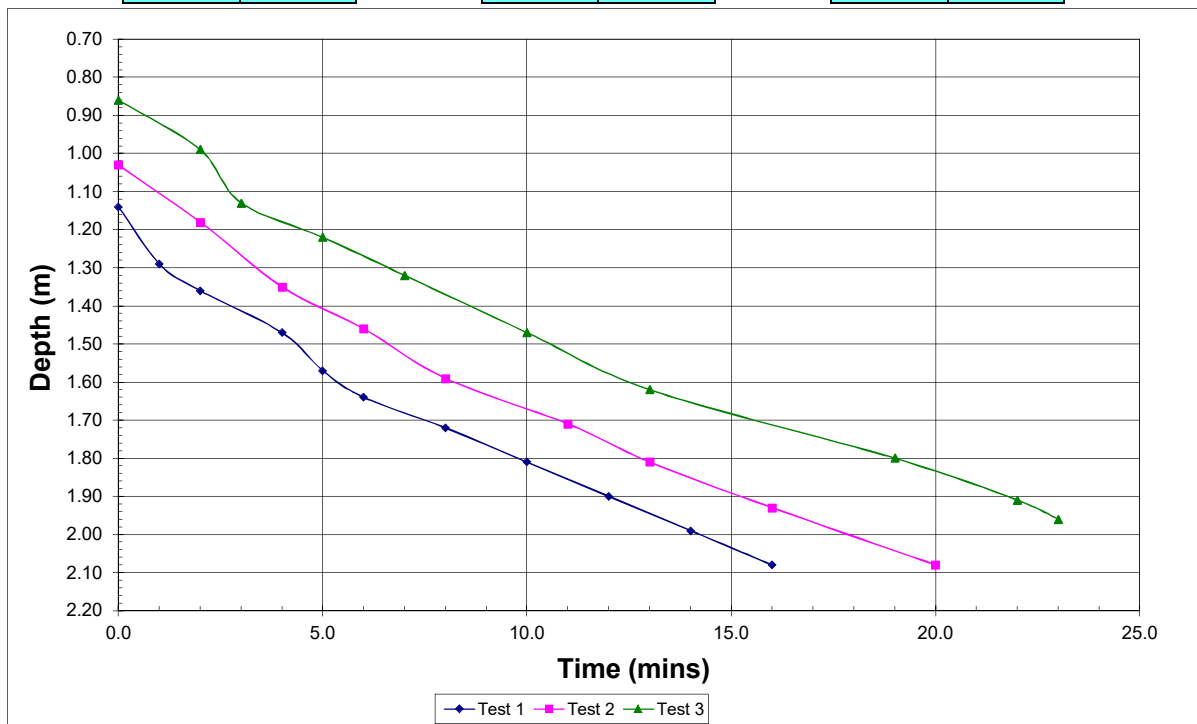
 Geo-Environmental	Soakaway Test Results (after BRE Digest 365)	Geo-Environmental Services Limited Unit 7 Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net
Project Name : Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5QD		Job No. : GE17964
Client : Manor Oak Homes		Date : 08/03/2019

Pit reference	SA03
Pit depth (m)	2.20
Pit width (m)	0.50
Pit length (m)	1.50
Depth to standing water (m)	

Test 1	
Time (min)	Depth (m)
0.0	1.14
1.0	1.29
2.0	1.36
4.0	1.47
5.0	1.57
6.0	1.64
8.0	1.72
10.0	1.81
12.0	1.90
14.0	1.99
16.0	2.08

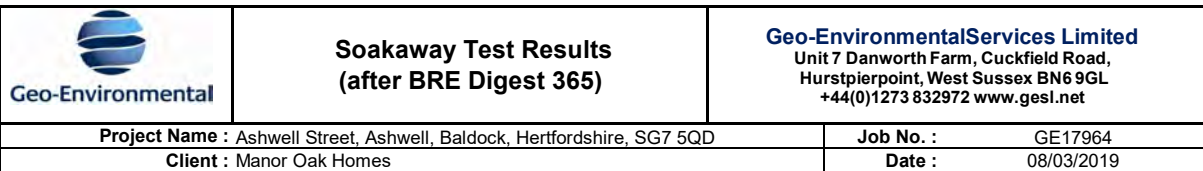
Test 2	
Time (min)	Depth (m)
0.0	1.03
2.0	1.18
4.0	1.35
6.0	1.46
8.0	1.59
11.0	1.71
13.0	1.81
16.0	1.93
20.0	2.08

Test 3	
Time (min)	Depth (m)
0.0	0.86
2.0	0.99
3.0	1.13
5.0	1.22
7.0	1.32
10.0	1.47
13.0	1.62
19.0	1.80
22.0	1.91
23.0	1.96

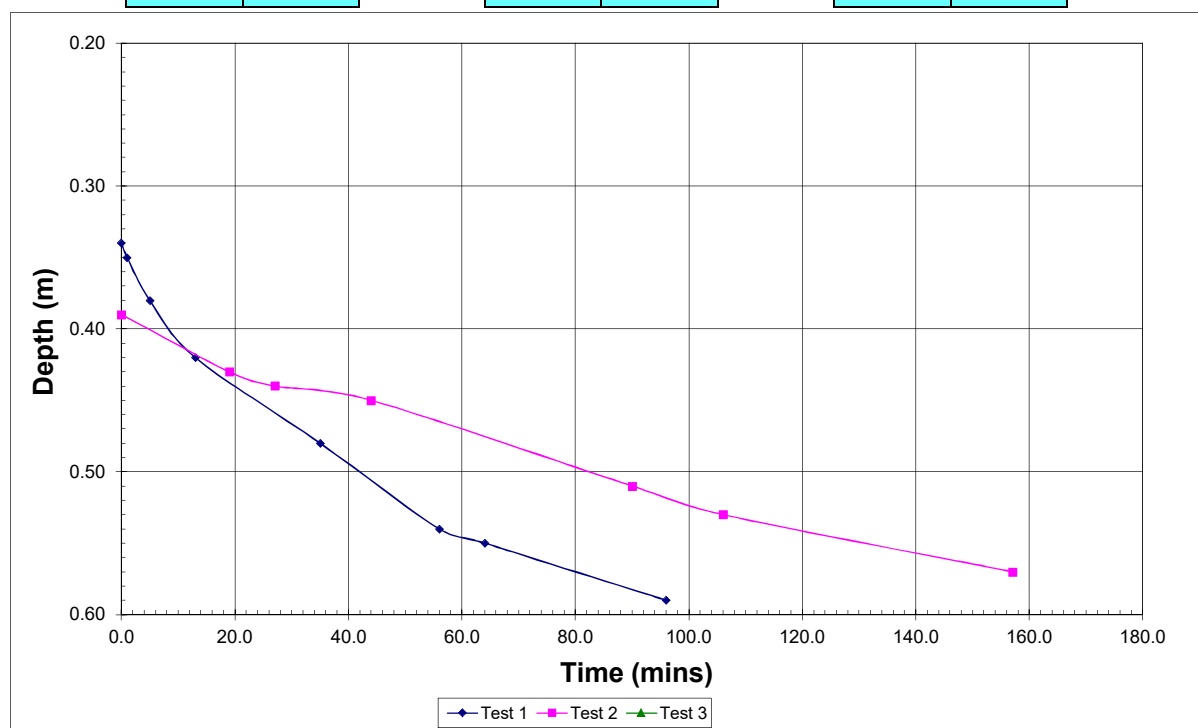


Max. depth (m)	2.20	2.20	2.20
Effective depth (m)	1.06	1.17	1.34
75% effective depth (m)	1.41	1.32	1.20
50% effective depth (m)	1.67	1.62	1.53
25% effective depth (m)	1.94	1.91	1.87
t75 (min)	3.00	3.75	5.00
t50 (min)	6.75	8.75	11.00
t25 (min)	13.00	15.25	21.00
Vp 75-25	0.40	0.44	0.50
ap 50	2.87	3.09	3.43
tp 75-25	10.00	11.50	16.00

Soil infiltration rate (m/s)	2.3E-04	2.1E-04	1.5E-04
Soil infiltration rate (mm/hr)	8.31E+02	7.41E+02	5.49E+02



Pit reference	SA04
Pit depth (m)	0.60
Pit width (m)	1.40
Pit length (m)	0.50
Depth to standing water (m)	

[illegible][illegible][illegible]

Max. depth (m)	0.60	0.60	0.60
Effective depth (m)	0.26	0.21	0.60
75% effective depth (m)	0.41	0.44	0.15
50% effective depth (m)	0.47	0.50	0.30
25% effective depth (m)	0.54	0.55	0.45
t75 (min)	10.00	27.00	
t50 (min)	31.00	83.00	
t25 (min)	56.00	132.00	
Vp 75-25	0.09	0.07	0.21
ap 50	1.194	1.099	1.84
tp 75-25	46.00	105.00	0.00

Soil infiltration rate (m/s)	2.8E-05	1.1E-05	
Soil infiltration rate (mm/hr)	9.94E+01	3.82E+01	

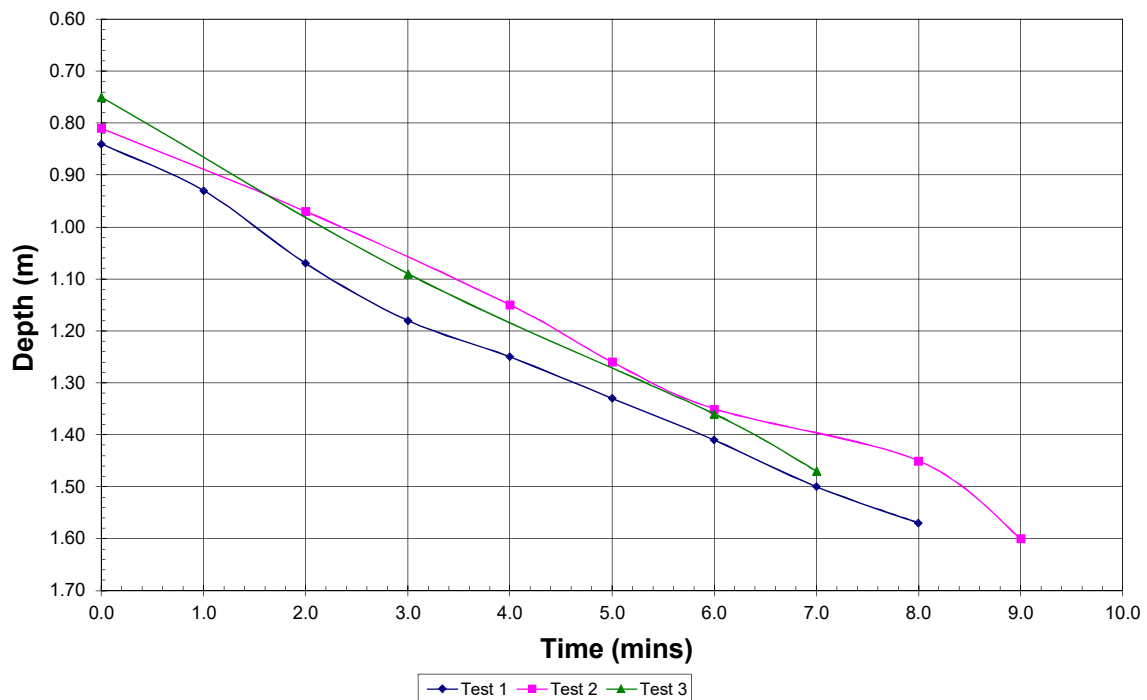
Project Name : Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5QD

Job No. : GE17964

Client : Manor Oak Homes

Date : 08/03/2019

Pit reference	SA05
Pit depth (m)	1.70
Pit width (m)	0.50
Pit length (m)	1.50
Depth to standing water (m)	

[illegible][illegible][illegible]

Max. depth (m)	1.70	1.70	1.70
Effective depth (m)	0.86	0.89	0.95
75% effective depth (m)	1.06	1.03	0.99
50% effective depth (m)	1.27	1.26	1.23
25% effective depth (m)	1.49	1.48	1.46
t75 (min)	1.90	2.70	2.10
t50 (min)	4.30	5.00	4.50
t25 (min)	6.90	8.10	6.90
Vp 75-25	0.32	0.33	0.36
ap 50	2.47	2.53	2.65
tp 75-25	5.00	5.40	4.80

Soil infiltration rate (m/s)	4.4E-04	4.1E-04	4.7E-04
Soil infiltration rate (mm/hr)	1.57E+03	1.47E+03	1.68E+03

1st May 2020

Our ref: GE18955/LL02/200501



Oscar Briggs
Manor Oak Homes
White Lodge Farm
Walgrave
Northampton
NN6 9PY

Dear Oscar,

RE: Land on the North side of Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5LN – Groundwater Monitoring

Further to the completion of the groundwater monitoring programme at the above site, we write to provide a summary of the works undertaken and the compiled groundwater monitoring results for the site.

In total we undertook the following exploratory holes/investigation points on the 16th March 2020:

- 5No. window sampler boreholes to 3.0m bgl (WS1-WS5) which were installed with groundwater monitoring standpipes to 3.0m bgl.

Groundwater monitoring within the borehole standpipes was subsequently undertaken on four subsequent occasions as approximately fortnightly intervals on the following dates, as agreed with the client:

- 18th March 2020;
- 30th March 2020;
- 15th April 2020;
- 29th April 2020;

It was understood that it was agreed with Hertfordshire Council that the winter monitoring period could be reduced to monitoring within March and April 2020 due to the notably wet winter preceding the monitoring period to enable winter groundwater monitoring to be completed within the early part of 2020.

Figure 1 presents the site's location and Figure 2 presents the borehole locations.

The 5No. borehole locations were located to provide a general spatial coverage across the length of the site and to target the infiltration area proposed for permeable paving.

Ground Conditions

The ground conditions encountered comprised a thickness of Topsoil overlying the Zig Zag Chalk Formation. The geology encountered was noted to be in line with the geology previously encountered on the site during previous soakage testing undertaken in March 2019.

A summary of the encountered soil conditions is presented in Table 1.

Geo-Environmental Services Ltd
Unit 7 Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex BN6 9GL
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Geo-Environmental Services Ltd incorporated in England number 3214980 VAT number 679544479



Top (m bgl)	Base (m bgl)	Geology
0.00	0.30 – 0.50	TOPSOIL: Grass over dark brown gravelly SILT with abundant rootlets. Gravel is fine to medium sub angular flint and chalk.
0.30 – 0.50	3.00 +	ZIG ZAG CHALK: Recovered as structureless heavily weathered off white to brown CHALK composed of gravelly silt with some brown and orange staining. Gravel is medium dense, white with some black specks.

Table 1 Summary of Ground Conditions

For more detailed descriptions of the ground conditions at specific locations, reference should be made to the exploratory hole logs presented in Appendix A.

Obstructions

No obstructions were encountered within the intrusive investigation works undertaken. The presence of obstructions elsewhere on site cannot be completely discounted.

Groundwater

Groundwater was not encountered within the exploratory holes during the intrusive investigation works in March 2020, in addition groundwater was not recorded within any of the monitoring boreholes during the four return groundwater monitoring visits undertaken in March and April 2020.

In addition, the previous investigation undertaken on the site in March 2019 comprising soakage testing also did not encounter groundwater within excavations to maximum depth of 2.60m bgl.

The full results of the groundwater monitoring are presented within Appendix B.

Closure

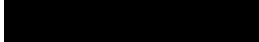
We trust we have interpreted your request correctly and provide sufficient information for your current requirements. If you have any questions or queries in relation the information provided at this stage, please contact the undersigned.

Yours sincerely

For and on Behalf of Geo-Environmental



LAURA LEGATE CGeol, CSci, BSc (Hons), MSc, FGS
Regional Manager - West



Enc Figure 1 – Site Location Plan
 Figure 2 – Exploratory Hole Location Plan

Appendix A – Exploratory Hole Logs
Appendix B – Groundwater Monitoring Results





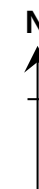
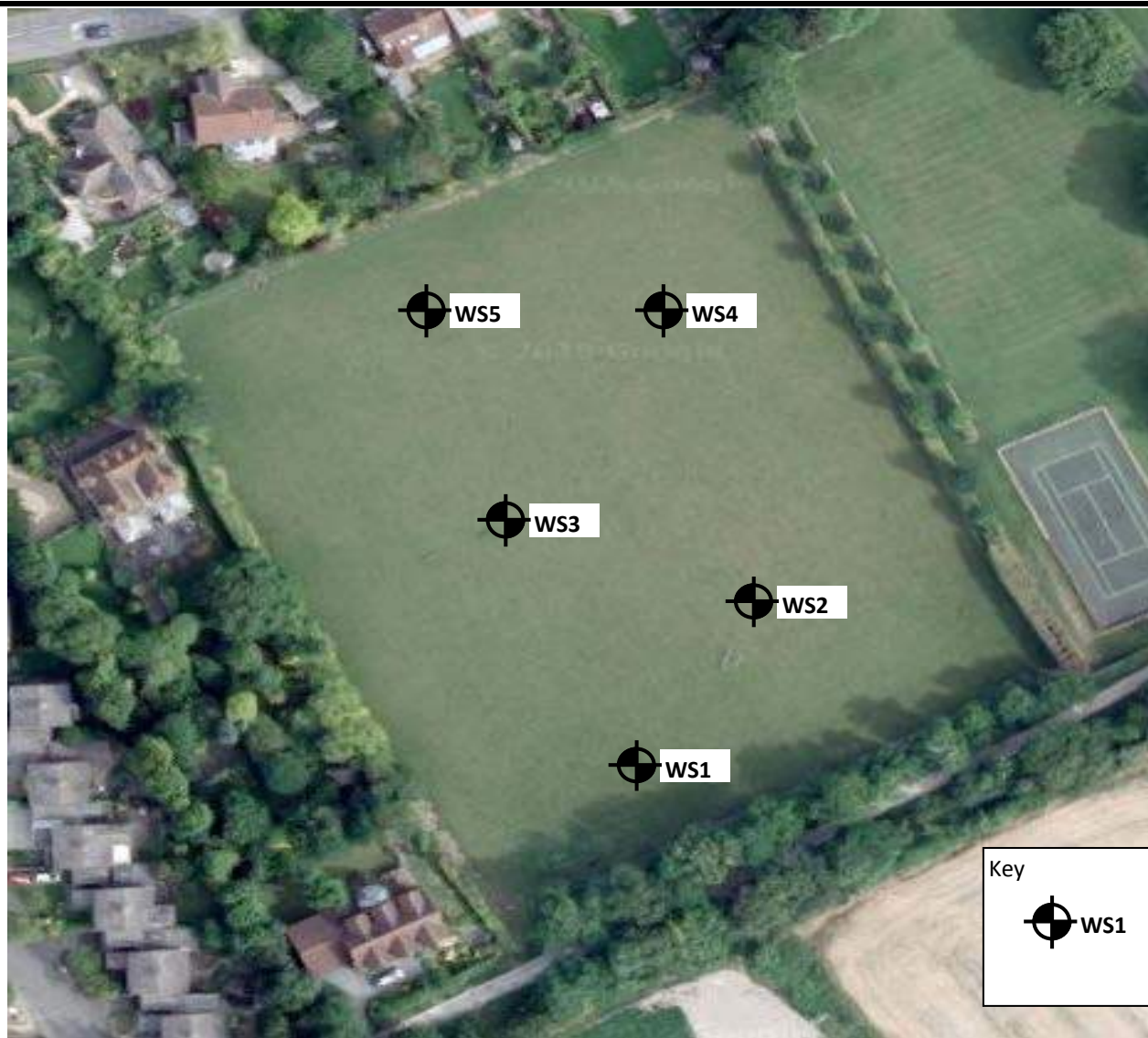
Figures





Project:	Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5QD			Title	Site Location Plan	
Client:	Manor Oak Homes			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net  Geo-Environmental		
Ref No:	GE18955	Revision:	0			
Drawn:	SA	Date:	10/03/2020			
Figure:	1	Scale:	Not To Scale			





Key

 **WS1** Windowless sample to 3.0m bgl with standpipe

Project:	Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5QD			Title	Exploratory Hole Location Plan	
Client:	Manor Oak Homes			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net	 Geo-Environmental	
Ref No:	GE18955	Revision:	1			
Drawn:	SA	Date:	16/03/2020			
Figure:	2	Scale:	Not To Scale			





Appendix A

Exploratory Hole Logs





www.gesl.net

Borehole No.

Sheet 1 of 1

Co-ords:

Hole Type
WLS

Level:

Scale
1:25

Dates: 16/03/2020

Logged By
KOD





Geo-Environmental www.gesl.net

Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Borehole Log

Borehole No.

WS2

Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE18955

Co-ords:

Hole Type
WLS

Location: Ashwell, Baldock, Hertfordshire

Level:

Scale
1:25

Client: Manor Oak Homes

Dates: 16/03/2020

Logged By
KOD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Grass over dark brown slightly gravelly SILT with abundant rootlets. Gravel is fine to medium sub angular flint and chalk.	
					0.50			Recovered as off white to brown heavily weathered CHALK composed of gravelly silt with brown and orange staining.	
								Recovered as off white to cream weathered CHALK composed of silty gravel with orange staining. Gravel is medium dense white with frequent black specks.	
									1
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									



Geo-Environmental www.gesl.net

Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Borehole Log

Borehole No.

WS3

Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE18955

Co-ords:

Hole Type
WLS

Location: Ashwell, Baldock, Hertfordshire

Level:

Scale
1:25

Client: Manor Oak Homes

Dates: 16/03/2020

Logged By
KOD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Grass over dark brown slightly gravelly SILT with abundant rootlets. Gravel is fine to medium sub angular flint and chalk.	
					0.60			Recovered as brown and off white structureless heavily weathered CHALK composed of silty gravel. Gravel is medium dense white with some black specks	
					1.10			Recovered as off white to brown structureless heavily weathered CHALK composed of gravelly silt with brown and orange staining. Gravel is medium dense white with some black specks	1
								Recovered as off white to cream structureless weathered CHALK composed of gravelly silt with some orange staining. Gravel is medium dense white with frequent black specks	2
					3.00			End of Borehole at 3.00m	3
									4
									5
Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks			
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to				
						Dry			





Geo-Environmental
www.gesl.net

Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Borehole Log

Borehole No.

WS4

Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE18955

Co-ords:

Hole Type
WLS

Location: Ashwell, Baldock, Hertfordshire

Level:

Scale
1:25

Client: Manor Oak Homes

Dates: 16/03/2020

Logged By
KOD

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40			Grass over dark brown slightly gravelly SILT with abundant rootlets. Gravel is fine to medium sub angular flint and chalk.	
					0.60			Brown and off white structureless heavily weathered CHALK composed of gravel and silt. Gravel is medium dense white with some black specks. Recovered as off white to structureless weathered CHALK composed of gravelly silt with some orange staining. Gravel is medium dense white with black specks.	
					3.00			End of Borehole at 3.00m	

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
						Dry





www.gesl.net

Geo-Environmental www.gesl.net

Borehole No.

WS5

Sheet 1 of 1

Project Name: Ashwell Street, Ashwell

Project No.
GE18955

Co-ords:

Hole Type
WLS

Location: Ashwell, Baldock, Hertfordshire

Level:

Scale
1:25

Client: Manor Oak Homes

Dates: 16/03/2020

Logged By
KOD





Appendix B

Groundwater Monitoring Results



Project: Land on the North Side of Ashwell Street, Ashwell, Baldock, Hertfordshire, SG7 5LN
Ref: GE18955
Client: Manor Oak Homes

Location	Date	GWL (m bgl)
WS1	18/03/20	Dry
WS2	18/03/20	Dry
WS3	18/03/20	Dry
WS4	18/03/20	Dry
WS5	18/03/20	Dry
WS1	30/03/20	Dry
WS2	30/03/20	Dry
WS3	30/03/20	Dry
WS4	30/03/20	Dry
WS5	30/03/20	Dry
WS1	15/04/20	Dry
WS2	15/04/20	Dry
WS3	15/04/20	Dry
WS4	15/04/20	Dry
WS5	15/04/20	Dry
WS1	29/04/20	Dry
WS2	29/04/20	Dry
WS3	29/04/20	Dry
WS4	29/04/20	Dry
WS5	29/04/20	Dry

Martin Andrews

From: Sophie Taylor <[REDACTED]>
Sent: 10 March 2020 12:13
To: Martin Andrews
Cc: FRMConsultations
Subject: RE: Ground Water Monitoring- Land North Of Ashwell Street And South Of Lucas Lane 20/00126/FP

Dear Martin

The reason we are agreeing to the proposed change is due to the recent wet prolonged weather period, therefore the testing should take place as soon as possible for a minimum of 2 months. Testing to start next week would be acceptable.

If you could advise your client to update the local planning authority to the agreed testing so they are aware we are currently liaising with you to try and overcome our current objection.

Kind Regards
Sophie



Sophie Taylor
Flood Risk Management Support | Environmental Resource Planning | Environment & Infrastructure
Hertfordshire County Council
County Hall, Pegs Lane, Hertford, SG13 8DN Postal Point: CHN215
E: [REDACTED]



Please note I do not work Thursdays and Fridays. If your query is urgent and relates to a planning application or ordinary watercourse consent please e-mail FRMConsultations@herfordshire.gov.uk

From: Martin Andrews <martin.andrews@mac-ltd.co.uk>
Sent: 10 March 2020 12:05
To: Sophie Taylor <Sophie.Taylor@hertfordshire.gov.uk>
Cc: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>



Subject: RE: Ground Water Monitoring- Land North Of Ashwell Street And South Of Lucas Lane 20/00126/FP

Sophie,

Are you able to confirm that the timings set out below are acceptable?

Martin Andrews | MEng (Hons) CEng MICE MCIHT | Director

On behalf of Martin Andrews Consulting Ltd

T: 01604 340544 | [REDACTED]

W: www.mac-ltd.co.uk | Northampton Office

Martin Andrews Consulting Ltd (Registered in England & Wales 11317116)

From: Martin Andrews
Sent: 09 March 2020 12:52
To: Sophie Taylor [REDACTED]
Cc: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>
Subject: RE: Ground Water Monitoring- Land North Of Ashwell Street And South Of Lucas Lane 20/00126/FP

Sophie,

Thank you for confirming.



I've spoken to our geotechnical consultant and they think they can install the boreholes on Fri 13/03 with monitoring commencing mid w.c 16/03. Is this acceptable?

There might be a bit of slippage in the programme / start date. Is there an end date after which testing would not be acceptable?

Martin Andrews | MEng (Hons) CEng MICE MCIHT | **Director**

On behalf of Martin Andrews Consulting Ltd

T: 01604 340544 | [REDACTED]

W: www.mac-ltd.co.uk | Northampton Office

Martin Andrews Consulting Ltd (Registered in England & Wales 11317116)

Registered Office: 8 Corn Kiln Close, Cogenhoe, NN7 1NX

From: Sophie Taylor [REDACTED]
Sent: 09 March 2020 12:39
To: Martin Andrews [REDACTED]
Cc: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>
Subject: RE: Ground Water Monitoring- Land North Of Ashwell Street And South Of Lucas Lane 20/00126/FP

Dear Martin

I can confirm that following the recent prolonged weather conditions we can agree that it would be acceptable to undertake the ground water monitoring now for a 2 month period as proposed in your e-mail dated 28 February 2020.

Kind Regards
Sophie



Sophie Taylor
Flood Risk Management Support | Environmental Resource Planning | Environment & Infrastructure
Hertfordshire County Council
County Hall, Pegs Lane, Hertford, SG13 8DN Postal Point: CHN215
[REDACTED]



Please note I do not work Thursdays and Fridays. If your query is urgent and relates to a planning application or ordinary watercourse consent please e-mail FRMConsultations@hertfordshire.gov.uk

From: Martin Andrews [REDACTED]
Sent: 06 March 2020 12:01
To: Sophie Taylor [REDACTED]
Cc: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>
Subject: RE: Ground Water Monitoring



F.A.O FRMC,

Can someone please advise on your local ground water monitoring requirements. If surveys are to be undertaken this side of the window they need to be undertaken asap.

Martin Andrews | MEng (Hons) CEng MICE MCIHT | **Director**

On behalf of Martin Andrews Consulting Ltd

T: 01604 340544 | M: 07719 319973

E: martin.andrews@mac-ltd.co.uk

W: www.mac-ltd.co.uk | Northampton Office

Martin Andrews Consulting Ltd (Registered in England & Wales 11317116)
Registered Office: 8 Corn Kiln Close, Cogenhoe, NN7 1NX

From: Martin Andrews
Sent: 06 March 2020 11:59
To: Sophie Taylor [REDACTED]
Cc: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>



Subject: RE: Ground Water Monitoring

Sophie,

Sorry to chase again, are you able to advise?

Martin Andrews | MEng (Hons) CEng MICE MCIHT | **Director**

On behalf of Martin Andrews Consulting Ltd

T: 01604 340544 | [REDACTED]

W: www.mac-ltd.co.uk | Northampton Office

Martin Andrews Consulting Ltd (Registered in England & Wales 11317116)
Registered Office: 8 Corn Kiln Close, Cogenhoe, NN7 1NX

From: Martin Andrews
Sent: 05 March 2020 08:44
To: Sophie Taylor [REDACTED]
Cc: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>



Subject: RE: Ground Water Monitoring

Sophie,

It is for land north of Ashwell Street, Ashwell – your objection letter is attached.

Martin Andrews | MEng (Hons) CEng MICE MCIHT | **Director**

On behalf of Martin Andrews Consulting Ltd

T: 01604 340544 | [REDACTED]

W: www.mac-ltd.co.uk | Northampton Office

From: Sophie Taylor [REDACTED]
Sent: 04 March 2020 12:40
To: Martin Andrews [REDACTED]
Cc: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>
Subject: RE: Ground Water Monitoring

Dear Martin

Thank you for your e-mail.

I would be grateful if you could confirm which planning application and development proposal you are referring to so I may advise you further.

Kind Regards
Sophie



Sophie Taylor
Flood Risk Management Support | Environmental Resource Planning | Environment & Infrastructure
Hertfordshire County Council
County Hall, Pegs Lane, Hertford, SG13 8DN Postal Point: CHN215
[REDACTED]



Please note I do not work Thursdays and Fridays. If your query is urgent and relates to a planning application or ordinary watercourse consent please e-mail FRMConsultations@hertfordshire.gov.uk

From: Fiona Lai [REDACTED] **On Behalf Of** FRMConsultations
Sent: 28 February 2020 13:54
To: Sophie Taylor [REDACTED]
Subject: FW: Ground Water Monitoring

From: Martin Andrews [REDACTED]
Sent: 28 February 2020 13:52
To: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>
Subject: Ground Water Monitoring

F.A.O Sophie Taylor

I've received an objection with the following requirement:

"We therefore require a minimum of a 3 month monitoring period of ground water between the months of November- May. It may be possible to require this as a pre-commencement condition, however this will need to be agreed with the applicant and the LPA."



Is the period to the end or start of May i.e. is there time to undertake the survey now or do we need to wait until November. Also given the amount of rain we have had this winter would a two month monitoring period be acceptable?

Martin Andrews | MEng (Hons) CEng MICE MCIHT | **Director**

On behalf of Martin Andrews Consulting Ltd

T: 01604 340544 [REDACTED]

W: www.mac-ltd.co.uk | Northampton Office

Martin Andrews Consulting Ltd (Registered in England & Wales 11317116)

Registered Office: 8 Corn Kiln Close, Cogenhoe, NN7 1NX

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Appendix I
Water Company Pre-development Enquiry

Martin Andrews

From: no-reply-InFlow@anglianwater.co.uk
Sent: 05 September 2019 16:33
To: Martin Andrews
Subject: Response for the FurtherQuestion



Dear Martin Andrews,

Please find attached our response to your further question Used Water .

I've recently reviewed your report, you have provided advice based on a FW connection to Woodforde Close. This would require a FW pumping station. The site can access Lucas Lane to the north via a finger of land which is marked on the attached. Can you please advise whether a FW connection to the sewer located in Lucas Lane is acceptable? This was the preferred discharge point on the completed application form.

Anglian Water Response

Good afternoon and thank you for your correspondence. I can confirm that a foul gravity connection for 25 dwellings can be made to manhole no. 0702`in Lucas Lane on the 150mm sewer at NGR TL2709339790. Please accept my apology for your preferred connection location not being assessed in your original report..

Please do not hesitate to contact the Pre-Development Team on 0345 606 6087 option 1 or via the portal should you have any questions related to our response.

__*____*____*____*____*____*____*____*____*____*____*____*____*____*____*____*____*

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Anglian Water Services Limited

Registered Office: Lancaster House, Lancaster Way, Ermine Business Park, Huntingdon, Cambridgeshire, PE29 6XU

Registered in England No 2366656

Please consider the environment before printing this email.

**Pre-Planning
Assessment Report**
LAND OFF ASHWELL STREET, ASHWELL
146099/903883043/1/0056190

Section 1: Proposed development

Thank you for submitting a pre-planning enquiry. This has been produced for Martin Andrews Consulting Ltd. Your reference number is **146099/903883043/1/0056190**. If you have any questions upon receipt of this report, please contact the Pre-Development team on 03456 066087 or email planningliaison@anglianwater.co.uk.

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	No. Of units
Dwellings	25

The anticipated residential build rate is:

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12
Build rate	25	0	0	0	0	0	0	0	0	0	0	0

Site grid reference no.

TL2714139699

Development type

Greenfield

Planning application status

Unknown

The comments contained within this report relate to the public water mains and sewers indicated on our records. Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2: Assets affected

Our records indicate that there are no public water mains/public sewers or other assets owned by Anglian Water within the boundary of your development site. However, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3: Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and influent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Ashwell Water Recycling Centre, which currently has capacity to treat the flows from your development site. Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental and regulation driven changes.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. The nearest practicable connection is to the 150mm diameter sewer at manhole 0608 in Woodforde Close at National Grid Reference NGR TL2707739605. Anglian water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

You indicated on the Pre-Planning Application form that a connection to the public surface water sewer network. Therefore a capacity assessment has not been made on the public surface water network.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website at <http://www.anglianwater.co.uk/developers/suds.aspx>. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating that the assets can be maintained both now and

in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website at: <http://www.anglianwater.co.uk/developers/suds.aspx>

The proposed method of surface water disposal is not relevant to Anglian Water; we suggest that you contact the relevant Local Authority, Lead Local Flood Authority, the Environment Agency or the Internal Drainage Board, as appropriate.

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

As a result of the recent charging rules published by Ofwat, our charging regime has changed. Your development site will be required to pay a Zonal charge for each new property connecting to the public sewer that benefits from Full planning permission.

Payment of the Zonal charge must be made before premises are connected to the public sewer. More information on the Zonal charge can be found at <http://www.anglianwater.co.uk/developers/charges>

The Zonal charge consists of two elements. The first is called the 'Fixed Element' which is the same in nature to the Infrastructure charge applied prior to April 2018. The second is called the 'Variable Element' which may vary each financial year.

The elements are combined together to create the 2018/19 Zonal charge for Sewerage:

Fixed Element	£ 370
Variable Element	£ 101

In most circumstances zonal charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage). However, if the new connection is to non-household premises, the fixed element is calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge. Details of the relevant multiplier for each fitting can be found at our web-page: <http://www.anglianwater.co.uk/developers/charges/>

The total Zonal charge payable for your site for Sewerage is:

Zonal charge per new connection - Sewerage	No. Of Units	Total amount payable
£ 471	25	£ 11,775.00

It has been assumed that the onsite used water network will be provided under a section 104 Water Industry Act application.

It is recommended that you also budget for connection costs. Please note that we offer alternative types of connections depending on your needs and these costs are available at our website.

Section 4: Map of Proposed Connection Points

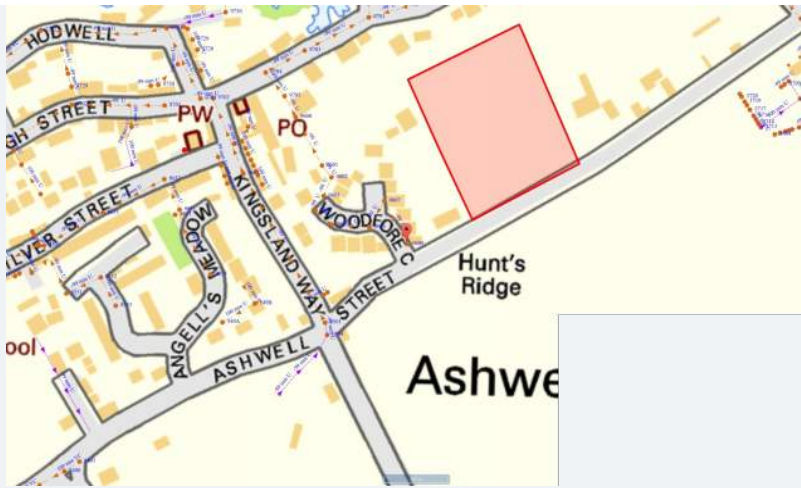


Figure 1: Showing your used water point of connection

Section 5: Useful Information

Used water

Water Industry Act – Key Used Water Sections:

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185:

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website at <http://www.anglianwater.co.uk/developers> or via our Development Services team on 03456 066087.

Sustainable drainage systems:

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. Therefore our preferred method of surface water disposal is through the use of Sustainable Drainage Systems (SuDS). SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website at <http://www.anglianwater.co.uk/developers/suds.aspx>. We also recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for the area to discuss your application.

Private sewer transfers:

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

- Surface water sewers and lateral drains that did not discharge to the public sewer, e.g. those that discharged to a watercourse.
- Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.
- Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

Encroachment:

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website at

<http://anglianwater.co.uk/developers/encroachment.aspx>

Locating our assets:

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from . All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge. We have more information on our website at: <http://www.anglianwater.co.uk/developers/our-assets/>

Summary of charges:

A summary of this year's water and used water connection and infrastructure charges can be found at <http://www.anglianwater.co.uk/developers/charges>

Disclaimer:

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

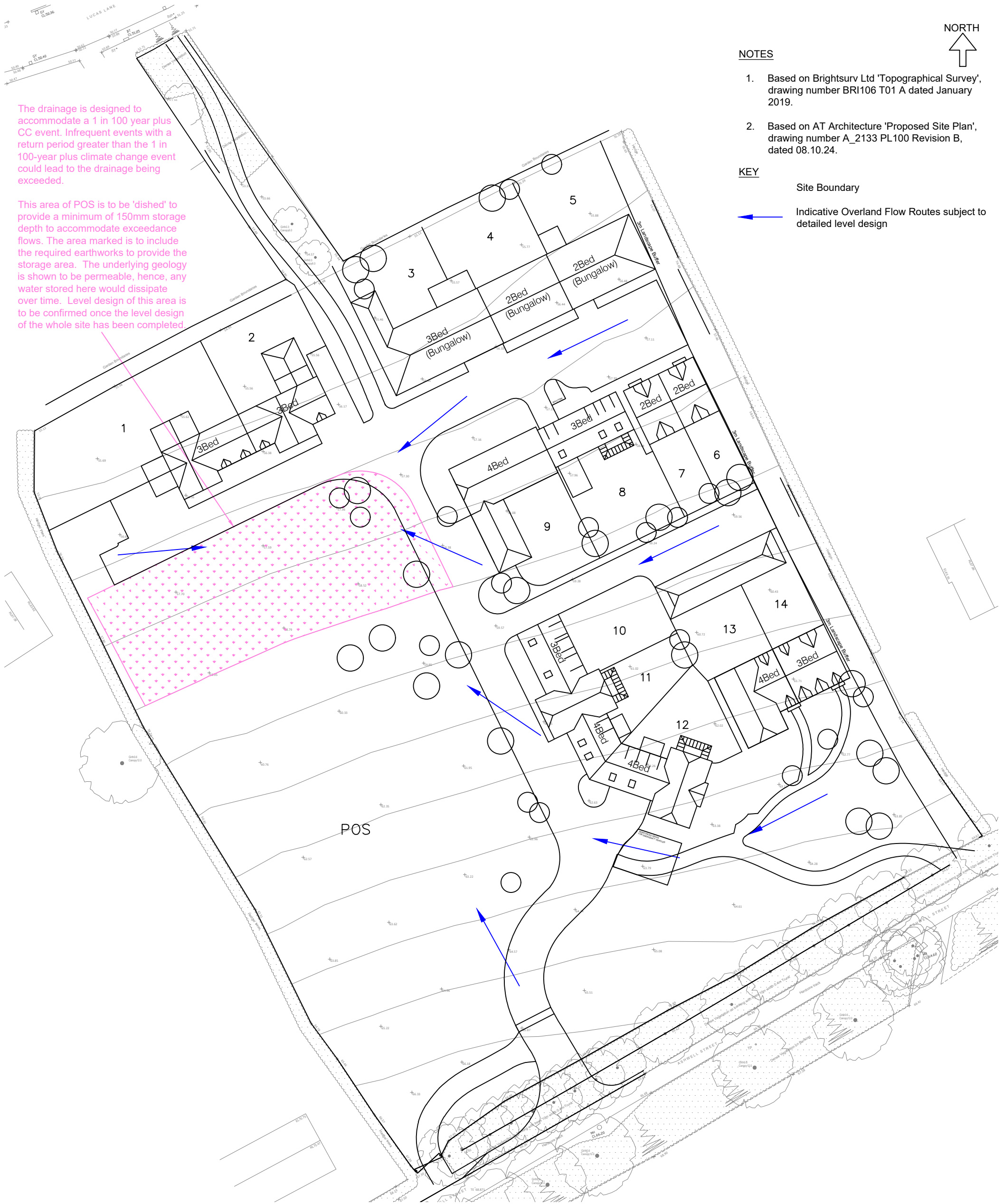
Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water, or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content. Furthermore in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid for the date printed and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s).

Appendix J

Exceedance Routes
MAC drawing no. 190-FRA24B



T: 01604 340544 Northampton Office
E: info@mac-ltd.co.uk W: mac-ltd.co.uk
Martin Andrews Consulting Ltd

- Transport Assessments
- Flood Risk Assessments
- Highway Advice
- Access Design
- Drainage Strategies
- Vehicle tracking

Client: Manor Oak Homes

Project: Land off Ashwell Street
Ashwell

Title: Flood Exceedance Routes

Date: 23.10.24

Drw: ZS

Chk: MJA

Drawing No: 190-FRA24

Revision: C

Scale: 1:500

Size: A3