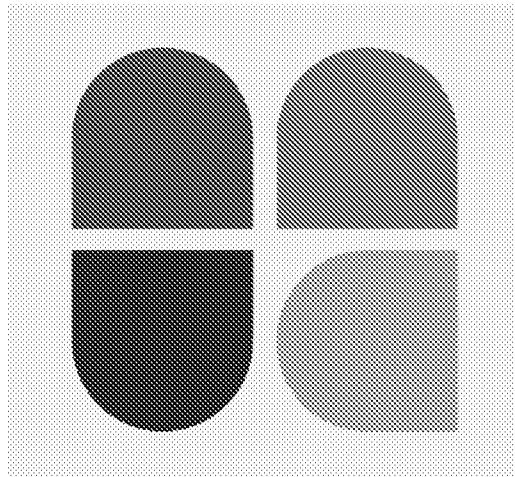




BRIGHT PLAN CIVILS

**LAND ADJACENT TO WAYSIDE,
EASTERGATE LANE**

PROPOSED RESIDENTIAL DEVELOPMENT

Drainage Strategy Report

Prepared on Behalf of

Richard Smith

D2045/DS1.0

25 April 2022

DOCUMENT CONTROL

Project: Land Adjacent to Wayside, Eastergate Lane
 Proposed Residential Development

 Document: Drainage Strategy Report

 Client: Richard Smith

 Reference: D2045/DS1.0

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1 INTRODUCTION

1.1 Background

- 1.1.1 Bright Bright Plan Civils is instructed by Richard Smith to prepare a Drainage Strategy Report to support a planning application for a Proposed Residential Development at the Land Adjacent to Wayside, Eastergate Lane.
- 1.1.2 This report has been undertaken in accordance with National Planning Policy Framework (NPPF) and The Planning Practice Guidance on the use of SuDS for achieving sustainable development.
- 1.1.3 The proposed development will involve the construction of 4 No. four bed residential development - as demonstrated within the preliminary site layout, contained within Appendix A of this report.
- 1.1.4 In preparing this report, Bright Plan Civils has referred to the following documents and information:
- Environment Agency Flood Maps for Planning
 - Long Term Flood Risk Information; Flood Risk Maps
 - Southern Water and Local Authority Drainage Records
 - British Geological Survey & Records
- 1.1.5 This document has been prepared to propose assess drainage constraints and propose a drainage strategy that is appropriate for the design life of the development, without causing offsite impacts from runoff in a design event.
- 1.1.6 This report has been prepared for the benefit of the named Client only.

1.2 Site Location and Description

- 1.2.1 The property is in a residential area of Eastergate, near Chichester. It is adjacent to the residential property called Wayside, off Eastergate Lane to the North and surrounded by fields to the south.
- 1.2.2 A topographical survey of the site has been undertaken and provided by the client. It is included in **Appendix B** of this report.
- 1.2.3 The topographical survey shows that the site falls from the northern corner of the site at 17mAOD, with a gentle slope across the developable area. The levels at the western side of the area proposed for development are 15.75mAOD, however the site rises slightly to 16mAOD in the southeast corner – as detailed in Drawing **PL002**.
- 1.2.4 No existing drainage features were identified within the site or in the vicinity of the boundaries. The existing site is therefore assumed to drain by a combination of overland runoff and infiltration.
- 1.2.5 The nearest watercourse appears to be an ordinary watercourse 700m southwest of the site, which runs south to the Ryebank Rife 3.6 km southeast of the site.
- 1.2.6 The nearest surface water feature is a pond, 150m west of the site, across Fontwell Avenue opposite the junction with Eastergate Lane.
- 1.2.7 The existing site has a total area of approximately 4,578m² (0.458 Ha), with very negligible impermeable areas – as seen in Drawing **PL003**.

1.3 Ground Conditions

- 1.3.1 Site specific ground investigation has been undertaken at the site by Ground Management Ltd on 22nd December 2021 at 2 No. locations on the site, referenced boreholes BH1 And BH2. BH1 was dug to a depth of 3m below ground level (mbgl) and BH2 to 4mbgl. In addition, further testing was undertaken on 25th March 2022 in 3 no. trial pits (between 0.65-2.10mbgl) for the purpose of soakage testing.
- 1.3.2 Report extracts are contained within **Appendix C**.
- 1.3.3 Upon review of the Ground Management Ltd report, it is confirmed that encountered ground conditions broadly consisting of silty CLAY and GRAVEL which was encountered at both locations that testing was undertaken.
- 1.3.4 The ground conditions at the site consist of topsoil to 0.20mbgl (metres below ground level), silty CLAY to between 0.40 - 2.00mbgl, and medium/fine/flint GRAVEL to borehole depths (0.65mbgl – 4.00mbgl). The summary of ground conditions table is within **Appendix C**.
- 1.3.5 Infiltration testing was undertaken in 3 no. trial pits in the centre of the site, with the depth of each trial pit (between 0.65 – 2.10 mbgl deep) penetrating the gravel strata.
- 1.3.6 Infiltration results are summarized below, with a design soakage rate of 4.59×10^{-6} m/s to be utilised for the surface water drainage design.

	Test 1 (m/s)	Test 2 (m/s)	Test 3 (m/s)
Trial Pit 1	1.4×10^{-4}	7.65×10^{-5}	4.71×10^{-5}
Trial Pit 2	9.86×10^{-6}	4.59×10^{-6}	5.38×10^{-6}
Trial Pit 3	3.59×10^{-4}	2.35×10^{-4}	1.73×10^{-4}

- 1.3.7 Alongside this, reference has been made to the British Geological Survey (BGS) website.
- 1.3.8 The BGS geology viewer states that the bedrock geology is likely to consist of 'London Clay Formation – Clay, Silt and Sand', as seen in **Figure 1**.

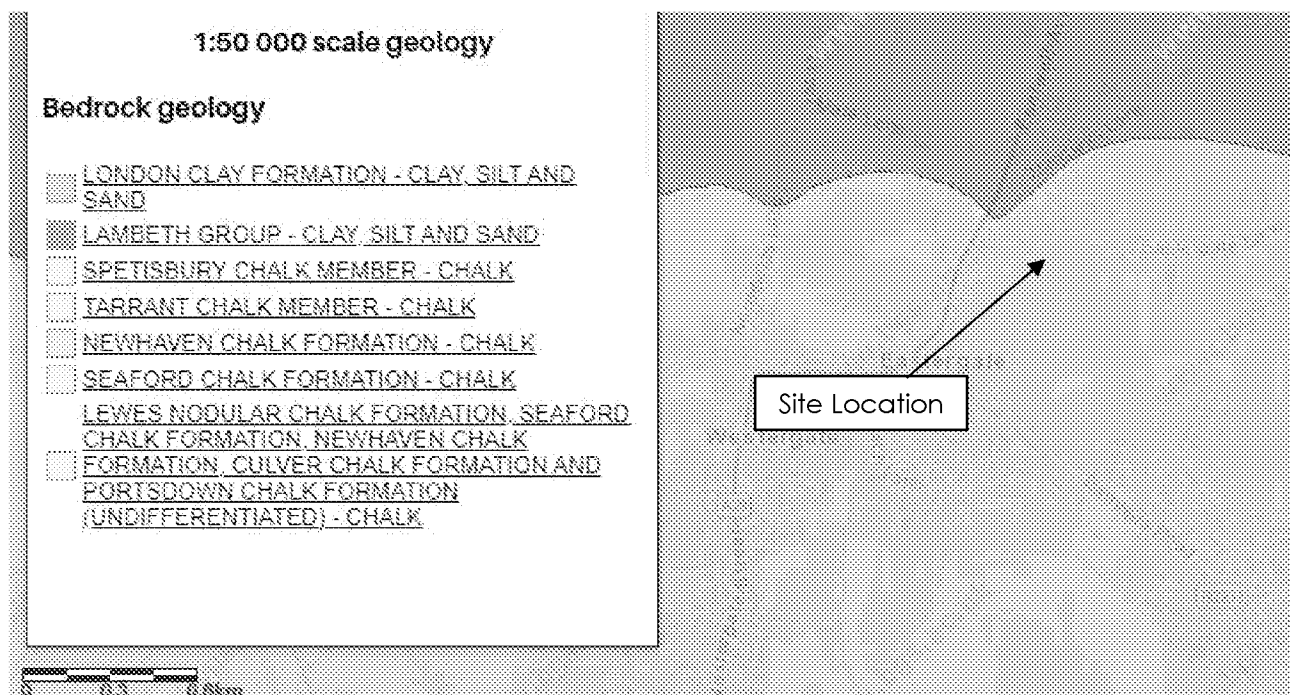


Figure 1. BGS website Bedrock geology

1.3.9 Superficial Deposits are recorded as 'Head - Gravel, Sand, Silt And Clay.', as seen in **Figure 2**.

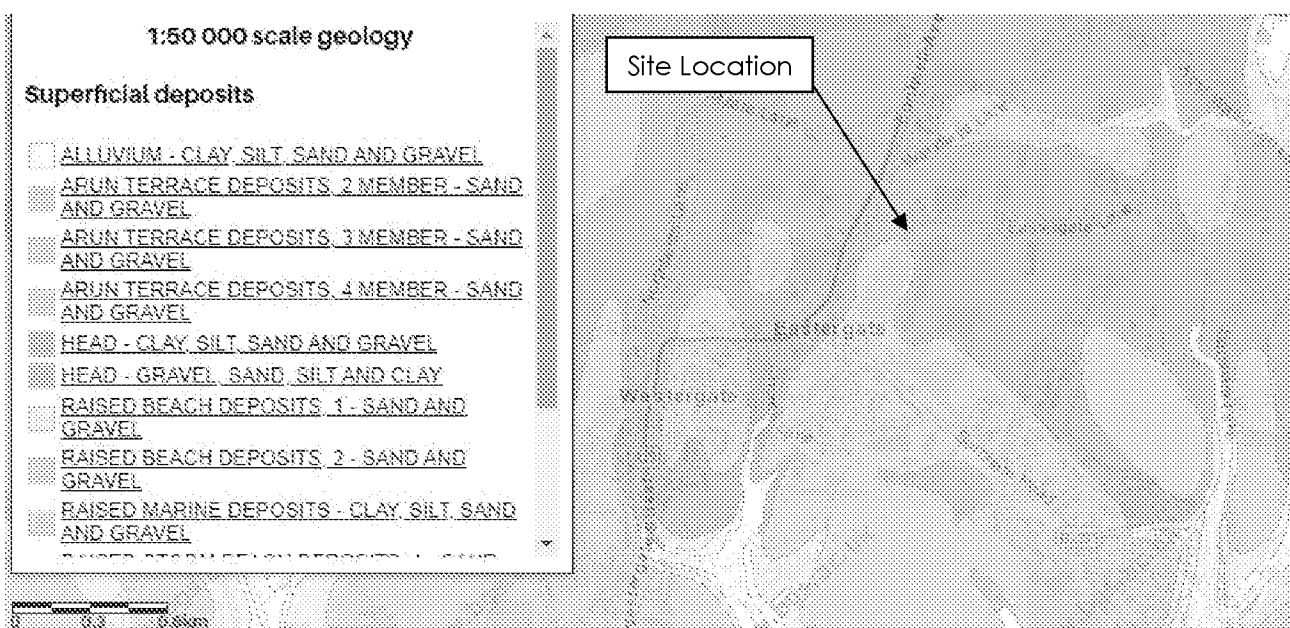


Figure 2. BGS website superficial deposits

1.4 Groundwater

1.4.1 Ground Management Ltd did not encounter groundwater at either of their trial holes during the initial site excavation/investigation in December 2021. Winter groundwater monitoring was undertaken from 22/12/2021 until 02/03/2022, in order to provide maximum expected winter groundwater levels at the site. Winter groundwater monitoring observed peak groundwater levels of 3.01mbgl in BH1 and 3.37mbgl in BH2 in mid-January, before levels receded.

- 1.4.2 Critical review of the borehole records would indicate that borehole BH1 did not penetrate the groundwater table as levels remained constant and at or extremely close to the base of the borehole (~3.0mbgl) throughout the monitoring period, whilst groundwater levels in borehole BH2 were at or close to the borehole depth in December 2021 (~4.0mbgl), rising to their peak (3.37mbgl) throughout January 2022 before receding to the borehole depth once more by February 2022.
- 1.4.3 The Arun District Council Strategic Flood Risk Assessment mapping for areas susceptible to groundwater flooding indicates that the site area is situated within a region of over 75% susceptibility to groundwater. Extracts from the SFRA can be found within **Appendix D**.
- 1.4.4 Mapping managed by MAGIC (magic.defra.gov.uk) provides geographic information concerning the natural environment from across government. This mapping tool has been referred to in order to confirm whether the site is located within either any groundwater source protection zones or groundwater vulnerability zones.
- 1.4.5 The site is situated within a 'Secondary A' Aquifer for both Bedrock and Superficial Drift stratum, as seen in **Figure 4**. This refers to drift deposits and bedrock geology that exhibit variable permeability and may provide groundwater storage or supply at a local or strategic level.

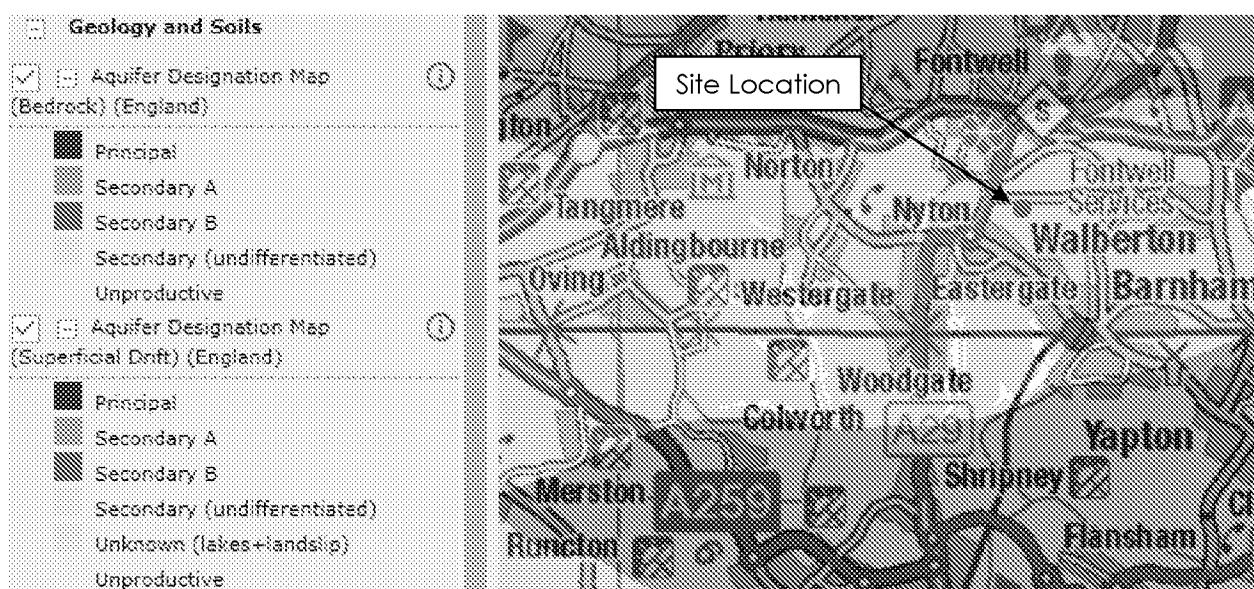


Figure 4. DEFRA Aquifer Designation Map

- 1.4.6 The Groundwater Vulnerability Map (**Figure 5**) confirms that the site falls within a 'Low' groundwater vulnerability zone and within a soluble rock risk zone

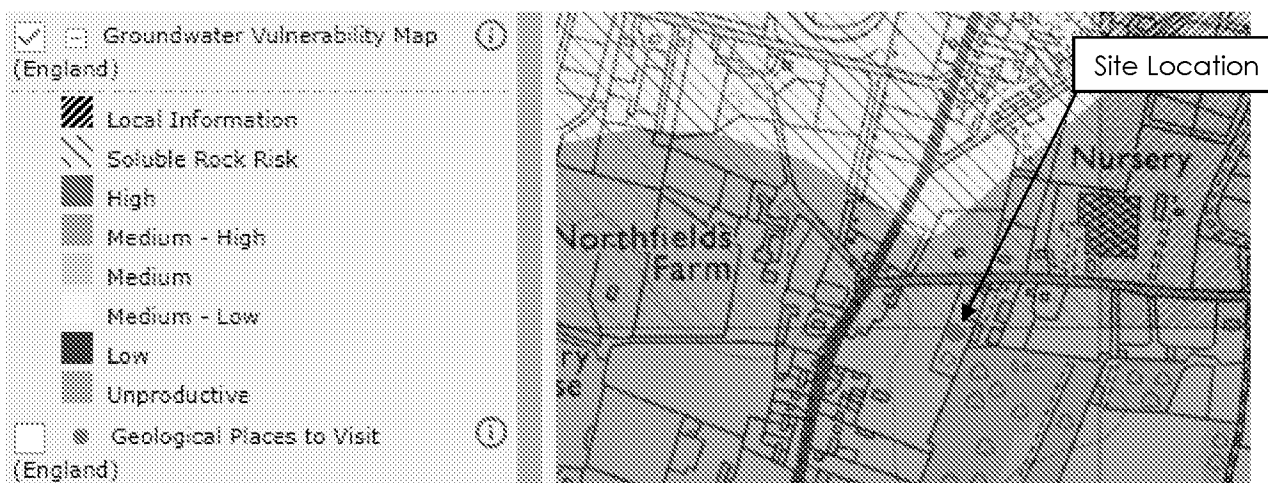


Figure 5. DEFRA Groundwater Vulnerability Map

- 1.4.7 The site is not indicated as within or in the vicinity of any Drinking Water Safeguard Zone, however is within Source Protection Zone 1'c' – which refers to protection of groundwater from pollutants caused by subsurface activity such as deep drilling below the protective geology cover, such as clay strata.

1.5 Existing Drainage

- 1.5.1 The local Water Authority is Southern Water, who provide sewerage services within the area. Public sewer records have been obtained from Southern Water, as contained within this report in **Appendix E**.

1.5.2 Surface Water:

- The Southern Water public sewer records (**Appendix E**) show no public surface water sewers within the vicinity of the site.
- The existing field does not have any formal drainage, and is assumed to drain via a combination of infiltration and runoff.
- The nearest surface water feature is a pond, 150m west of the site, across Fontwell Avenue opposite the junction with Eastergate Lane.
- The nearest watercourse appears to be an ordinary watercourse 700m southwest of the site, which runs south to the Ryebank Rife, 3.6 km southeast of the site.
- Greenfield runoff rate (Q_{bar}) has been calculated to be 0.09l/s.

1.5.3 Foul Water:

- The Southern Water public sewer records (**Appendix E**) show a public 150mm foul water sewer running west along Eastergate Lane before running southwest along Fontwell Avenue.
- There is not expected to be an existing foul water connection from the site, and investigation is required to establish connection arrangements of the proposed development to the existing public foul sewer.
- An existing public surface water manhole on Eastergate Lane is adjacent to the site frontage, and demonstrates cover level as 16.89mAOD and pipe invert level as 14.63mAOD.

1.5.4 Highway Drainage:

- Eastergate Lane appears to be drained via runoff over-the-edge of the highway.

2 FLOOD RISK

2.1 Flood Maps and Modelling

2.1.1 The Environment Agency's on-line Flood Maps for Planning (rivers and sea) show that the site is located within Flood Zone 1, and not in the vicinity of any other flood zones. Flood Zone 1 is defined as land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)

2.1.2 **Figure 6** also shows that the site is not at risk of flooding from rivers or sea.

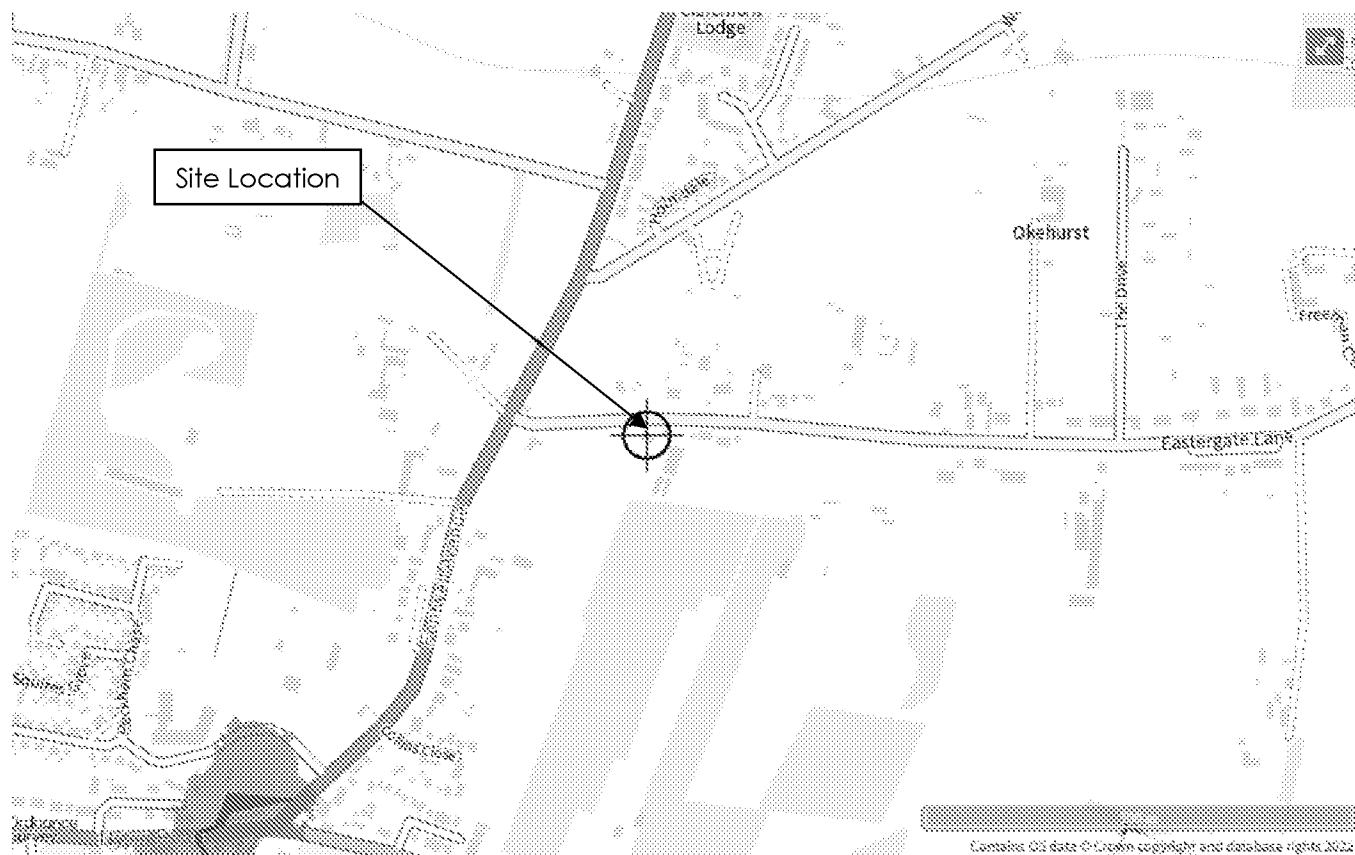


Figure 6. Long Term Flood Risk Map; Flood risk from rivers or the sea

2.1.3 **Figure 7** shows an area of localised surface water flood risk which corresponds with a low point shown on the topographical survey. The water depth in a low risk scenario is 300 to 900mm surrounded by an area which is below 300mm.

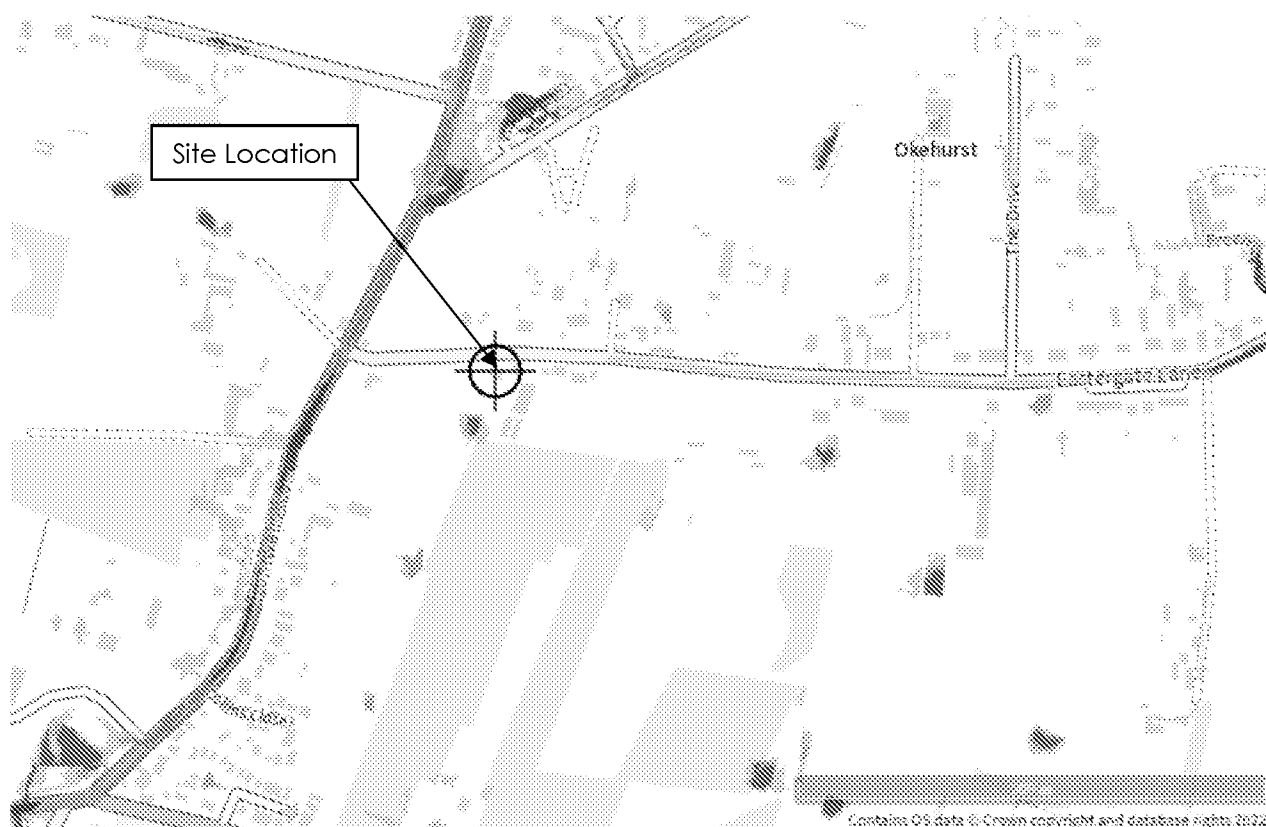


Figure 7. Long Term Flood Risk Map; Flood risk from surface water

2.1.4 **Figure 8** shows that the site is not at risk of flooding from reservoirs.

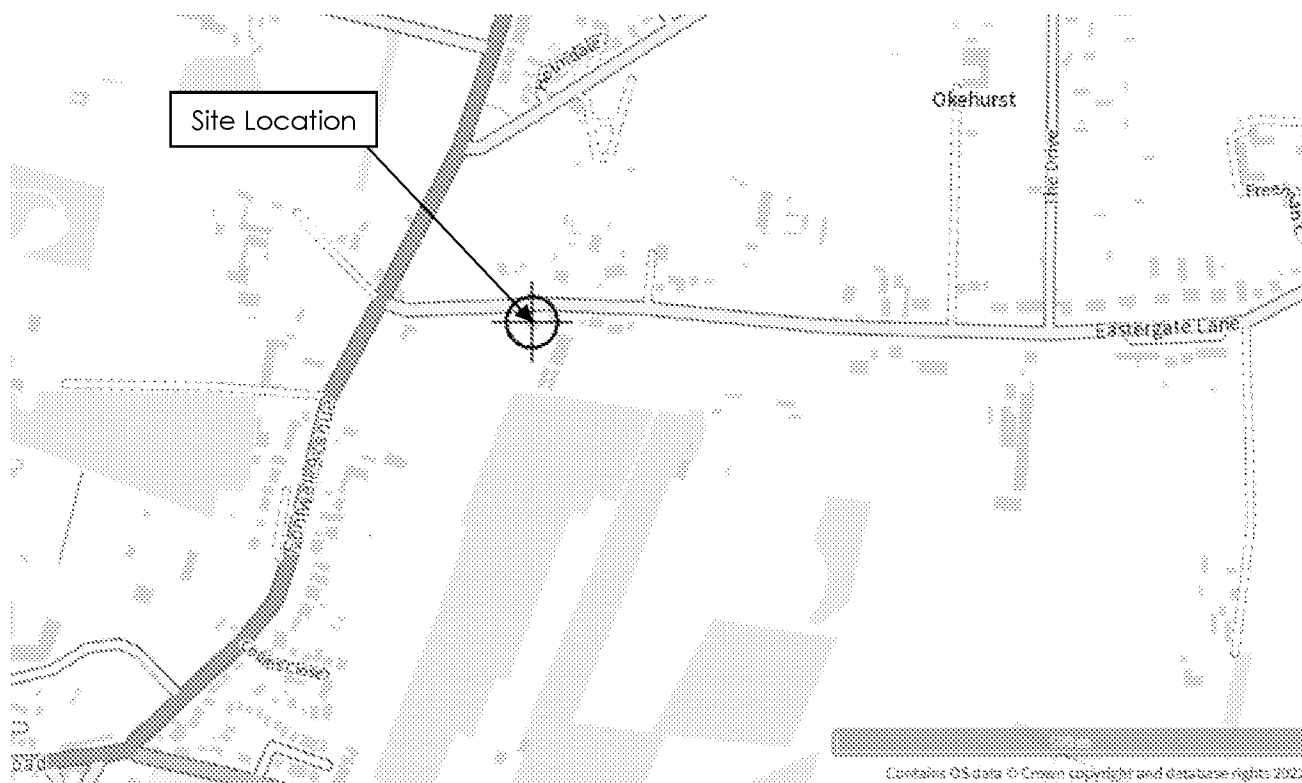


Figure 8. Long Term Flood Risk Map; Flood risk from reservoirs

2.2 Summary of Flood Risk

2.2.1 The potential sources of flooding are:

Source of Flooding	Level of Risk
Rivers and Coastal	Very Low The site is within Flood Zone 1 as is the surrounding area. The site is not in the vicinity of any watercourses or tidal sources.
Surface Water	Very Low to High The long-term flood risk for surface water is classified as 'very low' across the site location apart from a localised area in the south west corner of the site which carries a 'medium-high' surface water flood risk. Surface water flooding within the adjacent highway is also 'very low' to 'low' with depths indicated to be a maximum of 300mm, which not impact access or egress.
Groundwater	Medium BGS records found the site to be situated above variable permeability strata, and the nearby borehole log found groundwater at 4.0mbgl, which may rise seasonally. In addition, the Arun SFRA found the area to be predominantly susceptible to groundwater. The site-specific geotechnical investigation will inform groundwater levels further.
Sewers	Low There are no surface water sewers within the area, no reports of sewer flooding found within SFRA mapping. In view of this information the risk of flooding from this source is deemed to be 'Low'.
Artificial Sources	None The site is not shown to be at risk of flooding due to artificial sources.

2.2.2 The proposed drainage system should be designed in order to provide capacity up to the design event, to mitigate against existing surface water and groundwater flood risk, and provide consideration of potential exceedance routes, so as to not increase the risk of surface water flooding on or off the site.

3 PROPOSED DEVELOPMENT

3.1 Description of Development

- 3.1.1 The proposed development will involve the construction of 4 no. four bedroom residential buildings, with associated landscaping as demonstrated within **Appendix A**.
- 3.1.2 The type of development falls within the 'More Vulnerable' classification (Flood Risk and Coastal Change Table 2) and is appropriate in Flood Zone 1 (Flood Risk and Coastal Change Table 3).
- 3.1.3 The proposed development will increase the hardstanding area of the site; however SuDS measures will be used where possible in order to prevent any increase in the rate of run-off generated by the site.
- 3.1.4 The post-development impermeable/hardstanding area has been determined to be 1,971m² (0.197Ha).
- 3.1.5 The use of Sustainable Drainage System (SuDS) methods and techniques (where site conditions and constraints allow) within the bounds of the site (whilst adhering to the SuDS hierarchy as stated within Building Regulations (Part H) and The CIRIA SuDS Manual C753) will be used ensure no increase in surface water run-off compared to the existing site.
- 3.1.6 The specific Surface Water and Foul Water drainage proposals are detailed in **Section 4** of this report.

4 PROPOSED DRAINAGE STRATEGY

4.1 Surface Water

4.1.1 The SUDS manual and Building Regulations set out a hierarchy of drainage methods to ensure that developments maximise the use of sustainable drainage techniques. The hierarchy favours infiltration methods of disposal over other methods such as watercourse and sewers, as detailed below;

- i. Utilise infiltration techniques
- ii. Attenuate rainwater in ponds or open water features for gradual release
- iii. Attenuate rainwater by storing in tanks or sealed water features for gradual release
- iv. Discharge rainwater direct to a watercourse
- v. Discharge rainwater to a surface water sewer/drain
- vi. Discharge rainwater to a combined sewer

SUDS Technique	Suitable	Comments
Living Roof	Yes	No initial constraints, however pitched roof proposed any may not be consistent with architects proposals.
Basins and Ponds (such as Wetlands, Balancing Ponds, Detention Basins, Retention Ponds)	Yes	Viable, however would need to establish proposals of open land to the east of the site.
Filter strips and swales	Yes	Viable, however would need to establish proposals of open land to the east of the site.
Infiltration Devices - Soakaways - Infiltration trenches and basins	Yes	Underlying ground conditions are indicated as variably permeable so infiltration may be viable especially at shallower depths, however infiltration tests have not been undertaken at this stage.
Permeable surfaces and filter drains (such as gravelled areas and porous block paving)	Yes	As above, and permeable surfaces would also provide a source of treatment and shallow attenuation.
Tanked systems (such as oversized pipes or cellular tanks)	Yes	No initial constraints, would provide considerable attenuation volume.

4.1.2 Geotechnical investigation found a design soakage rate of 4.59×10^{-6} m/s within the underlying GRAVEL strata, however the surface strata consisted of CLAY to a variable depth (0.45mbgl to 2.0mbgl). Maximum groundwater levels were at 3.4mbgl.

4.1.3 Permeable block pavement will be used in the private road with a subbase depth of 500mm and a

permeable geotextile, however it is assumed this will not soak for the purpose of the calculations due to the clay strata and a 73.0m long, 1.0m wide and 1.9m deep gravel soakaway trench will sit beneath the permeable pavement, with the subbase invert levels falling to the soakaway. The bottom of the trench will be at 2.4mbg (1.0m above max. groundwater levels).

4.1.4 Preliminary hydraulic calculations adhere to the following criteria, providing storage capacity without flooding for;

- a 1-in-100 year storm event,
- with an allowance of 40% for climate change
- and an allowance of 10% urban creep

4.1.5 Rear garden patios will fall overland and drain to gardens. Proposed levels ensure no runoff to highway from proposed site.

4.1.6 The strategy above will ensure that there is no increase in the rate of run-off leaving the site, therefore no increase in the risk of flooding from this source.

4.2 Treatment

4.2.1 The use of permeable paving will ensure that run-off from the site receives a level of treatment required by the SuDS manual, with hydrocarbons being filtered by the aggregate and geotextile layers.

4.2.2 In accordance with the CIRIA SuDS Manual C753 regarding methods for managing pollution risks, the risk posed by surface water runoff to the receiving environment depends on the pollution hazard at the site (the source), SuDS treatment techniques (the pathway), and the sensitivity of the environment (the receptor).

4.2.3 The simple index approach considers whether SuDS techniques are appropriate for the site. The states that for SuDS components to deliver adequate treatment, the total pollution mitigation index for each contaminant type should equal or exceed the pollution hazard index.

4.2.4 The SuDS Manual outlines three categories of pollution hazard identification, which vary depending on proposed land use, which are as follows:

- Total Suspended Solids (TSS).
- Metals (M).
- Hydrocarbons (H).

4.2.5 In accordance with C753 Table 26.2, the proposed land uses at the site are categorised as follows:

- Residential Roofs and non-trafficked areas – very low/TSS=0.2/M=0.2/H=0.05
- Low traffic roads and driveways – low/TSS=0.5/M=0.4/H=0.4

4.2.6 In accordance with C753 Table 26.3, the values of SuDS Mitigation indices are provided for permeable paving:

- Permeable Pavement – TSS=0.7/M=0.6/H=0.7

- 4.2.7 As the pollution hazard index does not exceed any pollution mitigation index for any contaminant type, the proposed SuDS methods will provide sufficient treatment for the proposed development.

4.3 Foul Water Drainage

- 4.3.1 An existing foul water sewer runs adjacent the site along Eastergate Lane. A proposed 150mm foul drainage run at 1:135 slope is proposed to achieve a gravity connection to the existing foul sewer manhole.
- 4.3.2 Post development, there will be an estimated increase in peak foul water flows to 0.20 l/s (based on Sewers for Adoption).
- 4.3.3 The infrastructure and connection charges (OFWAT Charging Rules) place the onus on the sewerage undertaker to reinforce their network should there no longer be sufficient capacity to serve the new development. Funding for this is provided by revised charging arrangements for infrastructure and connection charges for each dwelling constructed comprising a Network Reinforcement Charge and Site-Specific Charges. The revised charging arrangement (funded by the developer) covers alterations to the Existing Sewer Network and the sewerage undertaker remains responsible for the cost of reinforcing their Strategic Assets. The developer is responsible for connecting the development to the public sewer network.

4.4 Climate Change

- 4.4.1 In October 2021 the Environment Agency updates the latest climate change allowances (available online at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>), which supports the NPPF in making an allowance for climate change within flood risk assessment. The allowances provide predictions of anticipated change for peak river flow by river basin district and peak rainfall intensity.
- 4.4.2 The table below shows the anticipated changes in extreme rainfall intensity. For flood risk assessments, both the central and upper end allowances should be assessed to understand the range of impact.

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

- 4.4.3 Based on the latest allowances, an increase of 20% should be applied to peak rainfall to this development, with a review undertaken to determine the impact of a 40% increase.

4.5 Urban Creep

- 4.5.1 In accordance with WSCC guidance, an allowance of 10% urban creep has been included in the surface water drainage calculations.

5 MAINTENANCE

5.1 Proposed Maintenance Regime

- 5.1.1 Maintenance is required to ensure the long-term operational performance of the proposed surface water drainage system.
- 5.1.2 The drainage system has been designed to minimise maintenance requirements; however a number of key tasks will need to be undertaken so that the system remains in optimal condition. These operations are summarised in the table below, along with the required frequency of works.

Drainage System feature	Proposed maintenance / remedial works	Required frequency of works
Permeable Paving	Surface sweeping to reduce silt and debris accumulation.	Every 8 to 12 weeks
	Removal / management of weed growth	At least once a year
	Silt removal from permeable surfaces, possibly involving raking out of joints, redressing, removal and remedial works.	As required / to be specified by manufacturer
Diffuser units & catch pits, gully sumps and drains	Inspection and additional cleansing as required.	Annual
	Desilting	Year 1, Year 3, then every 5 years
Pipework	Jetting to clear blockages	As required

- 5.1.3 The responsibility of maintenance regime will be determined by the Developer, by agreed appointment.

Permeable Paving / Diffuser Units

- 5.1.4 The areas of permeable paving are designed to allow infiltration of surface water run-off through the joints in the block paving surface course and into the subbase below. The water is then collected and discharged into the positive drainage system.
- 5.1.5 As part of the permeable paving system, diffuser units are used to discharge surface water run-off from roof areas into the sub-base, as well as forming links between areas of permeable paving. These diffuser units are small heavy-duty cellular units which allow more efficient discharge of surface water into the sub-base base of the permeable paved areas.
- 5.1.6 The areas of permeable paving will require additional maintenance measures to ensure they operate as designed. Failure in carrying out this maintenance, could increase the risk of flooding. The additional measures are as follow:

- Periodic surface sweeping to reduce silt and debris accumulation. The permeable surfaces should be swept at least every 8 to 12 weeks with additional sweeps in the autumn to clear fallen leaves
- Removal / management of weed growth, as required. Typically, once or twice a year for regularly used areas
- Periodic silt removal from permeable surfaces as described by the manufacturer. If any areas are showing signs of ponding, they shall be dealt with by raking out the joints and redressing. The entire surface shall be monitored and when there are signs of excessive siltation resulting in poor drainage over the whole area, the blocks shall be taken up and a replacement of bedding layer and geotextile shall be undertaken
- Redressing of joints on the block paving as required
- Catchpits upstream of diffuser units, should be emptied and inspected on the same regime as all catchpits specified previously set out in this document

Remedial/Repair Actions

- 5.1.7 Significant storm events may cause considerable damage to SuDS and their associated components. As such, it may be necessary to inspect and carry out essential recovery works to return the feature to full working order.
- 5.1.8 Resetting of uneven blocks by lifting block area, removing bedding material and relaying to match original design are all actions which may need to be undertaken.

Accidental Spillages

- 5.1.9 It is not envisaged that any materials are to be stored onsite once the development has been completed, which could cause major spills and potential pollution issues within the drainage system. If this situation alters in the future consultation with a specialist will be required in order to confirm if any upgrades to the existing system are necessary.
- 5.1.10 Minor spillages of fuels and oils will be dealt with by the permeable paving and deep trapped gullies, by bio-degrading and collecting the hydrocarbons respectively.

Future Alterations to the Development

- 5.1.11 Any future alterations to the permeable paving should be confirmed by a specialist. Where possible any future services are to avoid being located through areas of permeable paving. If new services are required to run through areas of permeable paving, services should be installed below the depth of permeable paving with the permeable system reinstalled above.

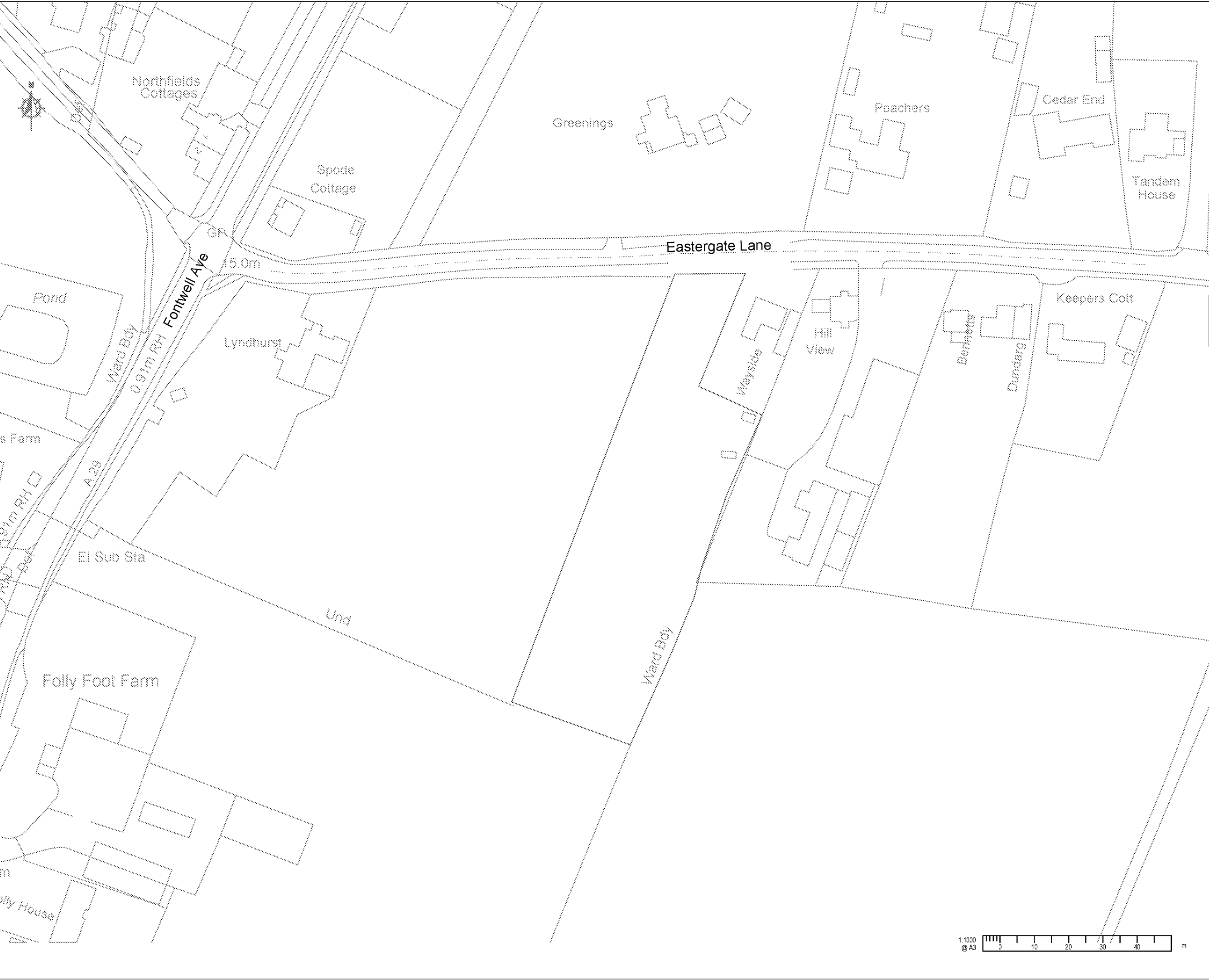
6 OFFSITE IMPACTS

- 6.1.1 The proposed development will not result in any increase in runoff from the site, and therefore will not cause an increase in flood risk offsite.
- 6.1.2 Post development foul water flows will contribute an increase to the sewer network compared to the previous use – it is expected that the foul sewer flow will be 0.20l/s.
- 6.1.3 The effects of climate change have been considered in the design of the proposed surface water drainage system, to ensure there is no off-site impact.

7 SUMMARY

- 7.1.1 This site-specific drainage strategy report is based on Flood Maps, Public Sewer Records, BGS records, site-specific geotechnical information, and consultation with the Lead Local Flood Authority.
- 7.1.2 The topographical survey shows that the site falls from the northern corner of the site at 17mAOD, with a gentle slope across the developable area. The levels at the western side of the area proposed for development are 15.75mAOD, however the site rises slightly to 16mAOD in the southeast corner.
- 7.1.3 No existing drainage features were identified within the site or in the vicinity of the boundaries. The existing site is therefore assumed to drain by a combination of overland runoff and infiltration.
- 7.1.4 The site area is 0.45Ha, and the proposed impermeable areas will increase to 0.197Ha as a result of the development.
- 7.1.5 The proposed development comprises the construction of 4 No. residential properties.
- 7.1.6 Post-development surface water run-off will be managed through sustainable drainage measures, with the installation of permeable paving and a trench soakaway with runoff discharged via infiltration, without causing surface water flooding on site.
- 7.1.7 The wastewater from the proposed development will discharge to the public foul sewer network, with connection arrangement to be confirmed subject to site investigation. A gravity connection is viable however final site levels will need to account for a gravity foul drainage connection to the existing sewer manhole.
- 7.1.8 The completion of the development will not increase flood risk on or off the site.
- 7.1.9 In conclusion, this development is suitable with regards to flood risk and surface water drainage.

DRAWINGS



NOTES

A3

1. This drawing is to be read in conjunction with all other BPC drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.

2. BPC accepts no responsibility for inaccuracies in data provided by third parties such as topographic surveys or Ordnance Survey mapping.

3. Do not scale, work to figured dimensions only. All dimensions are in millimeters unless noted otherwise and all levels are in metres from the topographic survey datum.

4. Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain.

-SITE LOCATION PLAN KEY-

Site Boundary - 4,578m² (0.45Ha)

PLANNING

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Rev.

Amendments

Date

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Drawing Status

Planning

Client

Richard Smith

Project

Land Rear of Wayside
PO20 3SJ

Drawing Title

Site Location Plan

Scale

1:1000

Date

Apr 2022

Drawn By

JHL

Checked

DJL

Drawing No.

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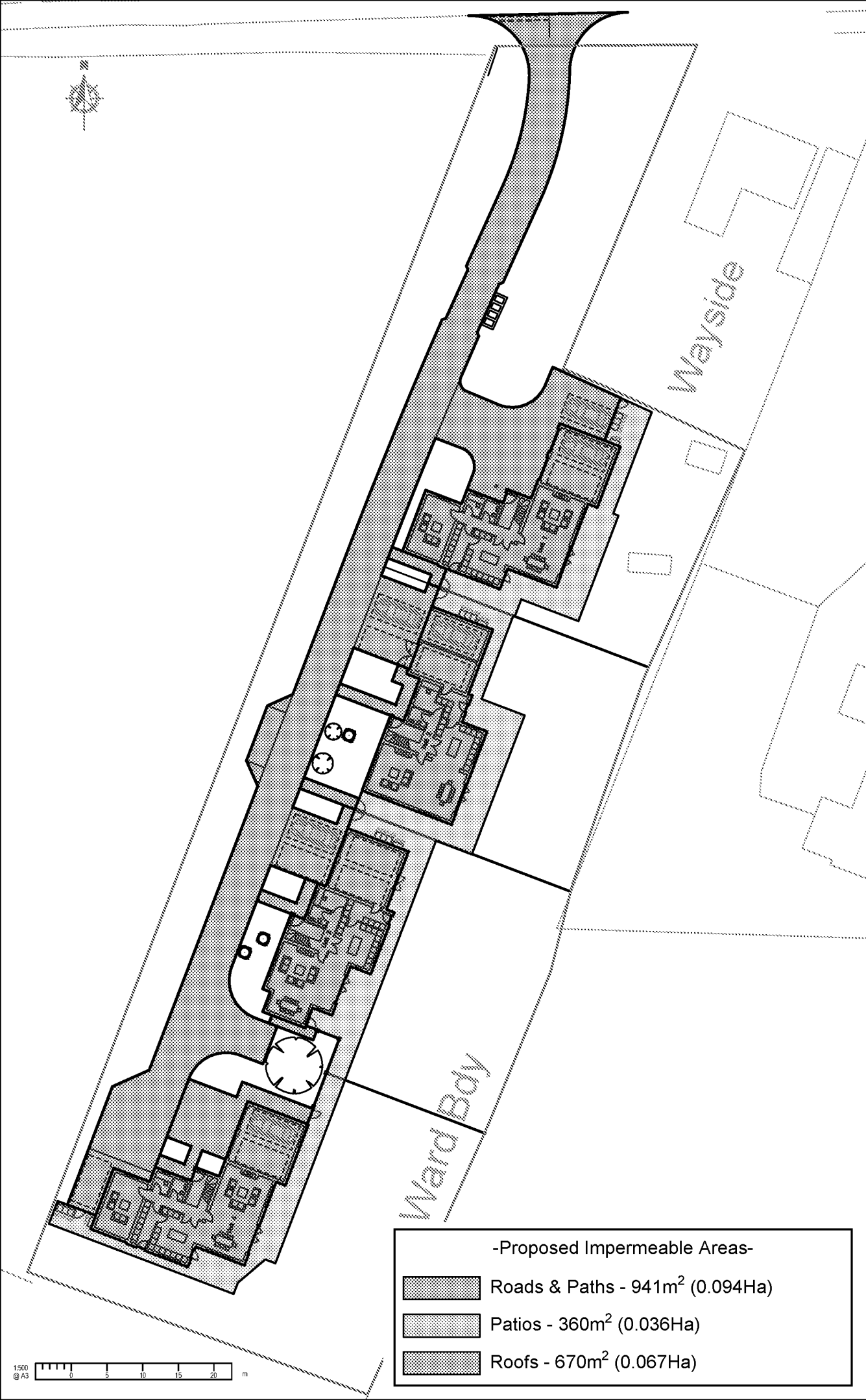
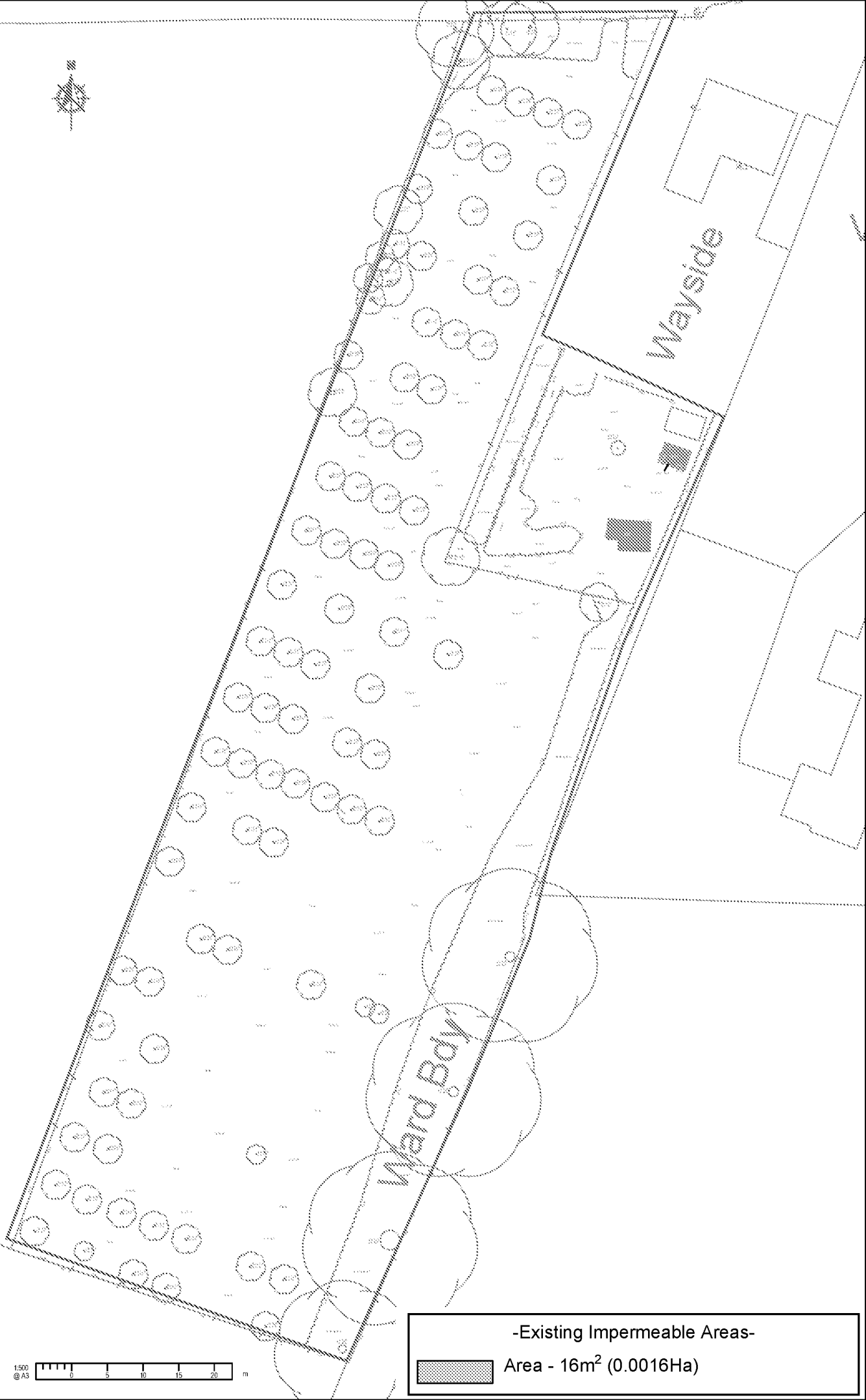
30

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m

APRIN DISTRICT COUNCIL

22/04/2022



NOTES

A3

1. This drawing is to be read in conjunction with all other BPC drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.

2. BPC accepts no responsibility for inaccuracies in data provided by third parties such as topographic surveys or Ordnance Survey mapping.

3. Do not scale, work to figured dimensions only. All dimensions are in millimeters unless noted otherwise and all levels are in metres from the topographic survey datum.

4. Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain.

PLANNING

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	Original Issue	22/4/22
Rev.	Amendments	Date

BRIGHT PLAN CIVILS

Transport Planning and Infrastructure Design Consultants

2 West Barn, Norton Lane, Chichester, West Sussex PO20 3AF

Tel: 01243 210418

www.bpcivils.co.uk enquiries@bpcivils.co.uk

Drawing Status

Planning

Client

Richard Smith

Project

Land Rear of Wayside
PO20 3SJ

Drawing Title

Impermeable Area Comparison

Scale	Date	Drawn By	Checked
1:500	Apr 2022	JHL	DJL

Drawing No.	Rev
D2045-PL200	-

APIN DISTRICT COM

21/BN/88/22/PL



-EXISTING SITE KEY-	
	Site Boundary (6604m ² - 0.66 Ha.)
	Existing Spot Level
	Existing Contour (Primary)
	Existing Contour (Secondary)
	Existing Slope
	Overland Flow Arrow
	Ultimate Low Point

Contours are only as accurate as the initial land survey information.
Contours are approximate only and spot levels may vary slightly on site.

NOTES

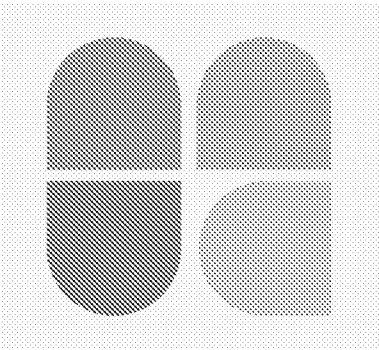
1. This drawing is to be read in conjunction with all other BPC drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.
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	Original Issue	22/4/22
Rev.	Amendments	Date



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2 West Barn, Norton Lane, Chichester, West Sussex PO20 3AF
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Drawing Status	PLANNING		
Client	Richard Smith		
Project	The Land Rear of Wayside PO20 3SJ		
Drawing Title	Existing Levels		
Scale	1:500	Date	Apr 2022
Drawn By	JHL	Checked	DJL
Drawing No.	D2045-PL300		Rev

-SURFACE WATER STRATEGY-

- Surface water disposal should be managed in view of the SuDS hierarchy;
- 1. Infiltration
- 2. Watercourse
- 3. Public Surface Water Sewer(s)

Geotechnical investigation found a design soakage rate of 4.59 x 10⁻⁶ m/s within the underlying GRAVEL strata, however the surface strata consisted of CLAY to a variable depth (0.45mbgl to 2.0mbgl). Maximum groundwater levels were at 3.4mbgl.

Permeable block pavement will be used in the private road with a subbase depth of 500mm and a permeable geotextile, however it is assumed this will not soak for the purpose of the calculations due to the clay strata and a 73.0m long, 1.0m wide and 1.9m deep gravel soakaway trench will sit beneath the permeable pavement, with the subbase invert levels falling to the soakaway. The bottom of the trench will be at 2.4mbg (1.0m above max. groundwater levels).

Preliminary hydraulic calculations adhere to the following criteria, providing storage capacity without flooding for;

- a 1-in-100 year storm event,
- with an allowance of 40% for climate change
- and an allowance of 10% urban creep
- Rear garden patios will fall overland and drain to gardens
- Proposed levels ensure no runoff to highway from proposed site.

-FOUL WATER STRATEGY-

- Foul water disposal should adhere to the following hierarchy;
- 1. Public Sewer
- 2. Private Treatment Plant
- 3. Septic Tank and Drainage Field
- 4. Cesspool

It is proposed that, post-development, foul flows generated by the site will outfall to the public foul water sewer north of the site.

A S106 application will be required, and approval will need to be obtained from Southern Water.

A gravity connection would be viable to connect to the public foul sewer, via manhole 8001 (proposed main run to be a 150mm diameter pipe @ 1:135 slope).

Final proposed site levels dependent on ensuring foul gravity connection is viable.

-HIGHWAY DRAINAGE STRATEGY-

- Proposed site levels ensure all proposed hardstanding surfaces fall to the proposed surface water site drainage.
- No additional impermeable areas to highway drainage.

-PRELIMINARY DRAINAGE KEY-

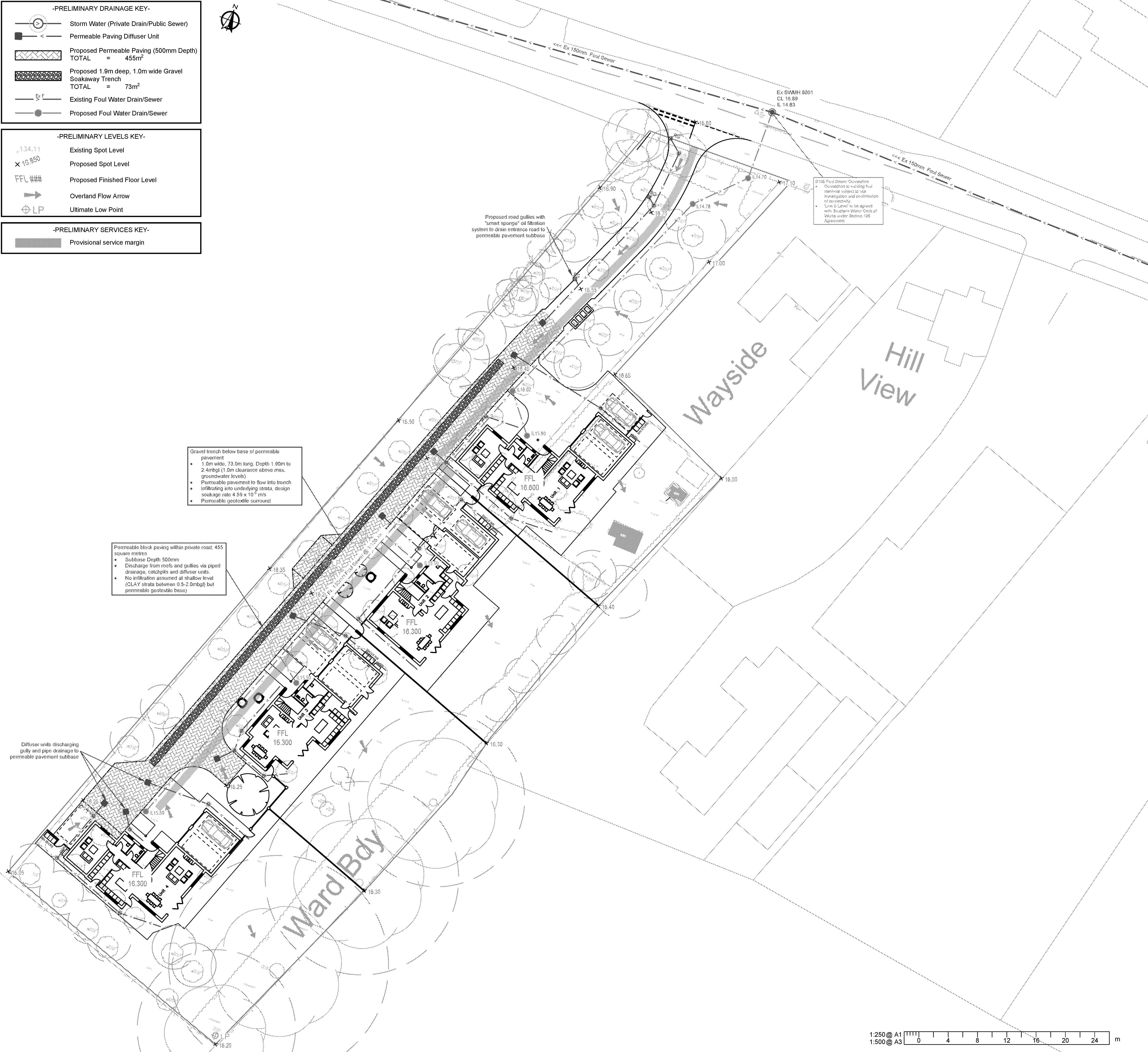
- Storm Water (Private Drain/Public Sewer)
- Permeable Paving Diffuser Unit
- Proposed Permeable Paving (500mm Depth)
TOTAL = 455m²
- Proposed 1.9m deep, 1.0m wide Gravel Soakaway Trench
TOTAL = 73m²
- Existing Foul Water Drain/Sewer
- Proposed Foul Water Drain/Sewer

-PRELIMINARY LEVELS KEY-

- Existing Spot Level
- Proposed Spot Level
- Proposed Finished Floor Level
- Overland Flow Arrow
- Ultimate Low Point

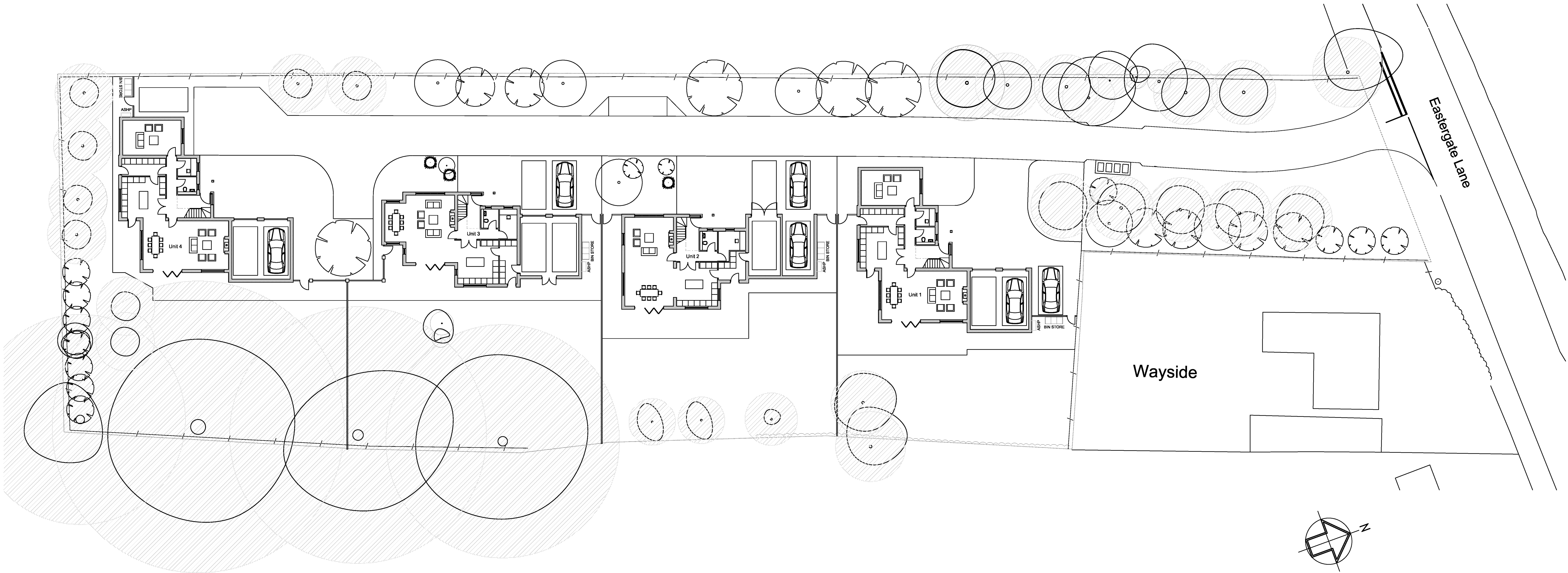
-PRELIMINARY SERVICES KEY-

- Provisional service margin



APPENDICES

Appendix A Proposed Site Plan



Figured dimensions and levels to be used.
Any inaccuracies must be notified to the architect.
Detail drawings and large scale drawings take precedence over smaller drawings.
Note: All references to structural elements are based on the structural engineers drawings. Refer to the S/E Drawings for construction dwgs.

Revisions:		
A	Alignment Revised	03-11-2021
B	Main Road Introduced	06-11-2021
C	Unit 4 Revised	15-11-2021
D	Site Plan Revised	09-12-2021
E	Site Plan Revised	19-12-2021
F	Site Plan Revised	21-12-2021
G	Detail Changed	31-01-2022
H	Detail Changed	04-02-2022
J	Detail Changed	11-03-2022

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PLANNING		
BUILDING CONTROL		
DESIGN		
CONSTRUCTION	Approved	

conceptworld
architects | designers

8 Main Street | Bilton | Rugby | Warwickshire | CV22 7NB
Tel : 07525 921451 E-mail : conceptworld@btinternet.com

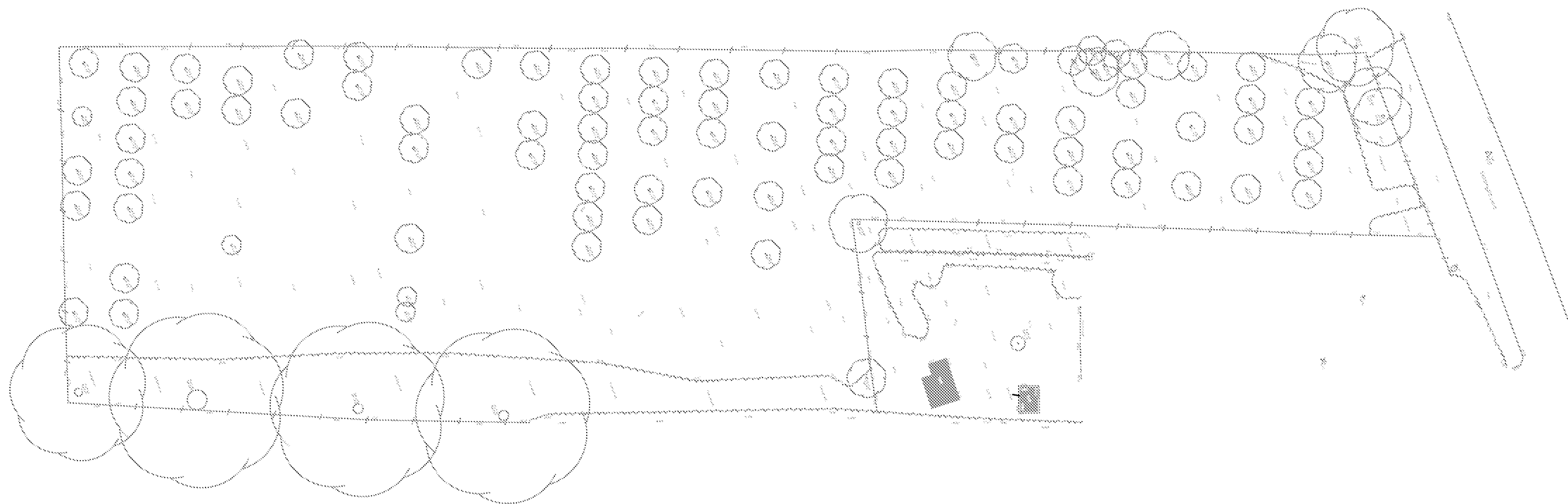
Contract: PROPOSED RESIDENTIAL DEVELOPMENT OF 4 HOUSES
LAND ADJACENT TO WAYSIDE, EASTERGATE LANE

Title: CONCEPT DESIGN - SITE LAYOUT PLAN, PROPOSED PLANS
AND ELEVATIONS

Drawing No.	Rev.
1194/A/01	J

Scale: 1:200@A1
Date: NOV2021
Drawn: GI
Checked:

Appendix B Topographic Survey



Appendix C Geotechnical Information

3.0 GROUND AND GROUNDWATER CONDITIONS

- 3.1 Descriptions of the soils encountered are presented on the attached exploratory hole logs. The findings can be summarised as follows:

Strata	Thickness (m)	Depth to base of strata (m bgl)
TOPSOIL	0.2 - 0.25	0.2 - 0.25
Firm and soft to firm silty CLAY Becoming stiff with depth. Occasional gravel	1.1 - 1.15	1.3 - 1.4
Silty CLAY with much flint gravel	0.6 – 0.8	2.0 – 2.1
Well graded flint GRAVEL with much silt to gravel size chalk	> 1.0 – 1.9	> 3.0 - > 4.0

- 3.2 Groundwater was not encountered in either borehole during the investigation. Subsequent monitoring of the installed standpipes has recorded variation of groundwater level. The highest observed groundwater levels of 3.01m and 3.07m below ground level in BH1 and BH2 respectively. A copy of the monitoring records up to 2/3/22 are appended.

Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm, Clay Lane, Fishbourne

PROJECT NO: G6483

FIGURE REF: Figure 3

PROJECT: Wayside, Eastergate Lane, Eastergate

PREPARED: AJHT

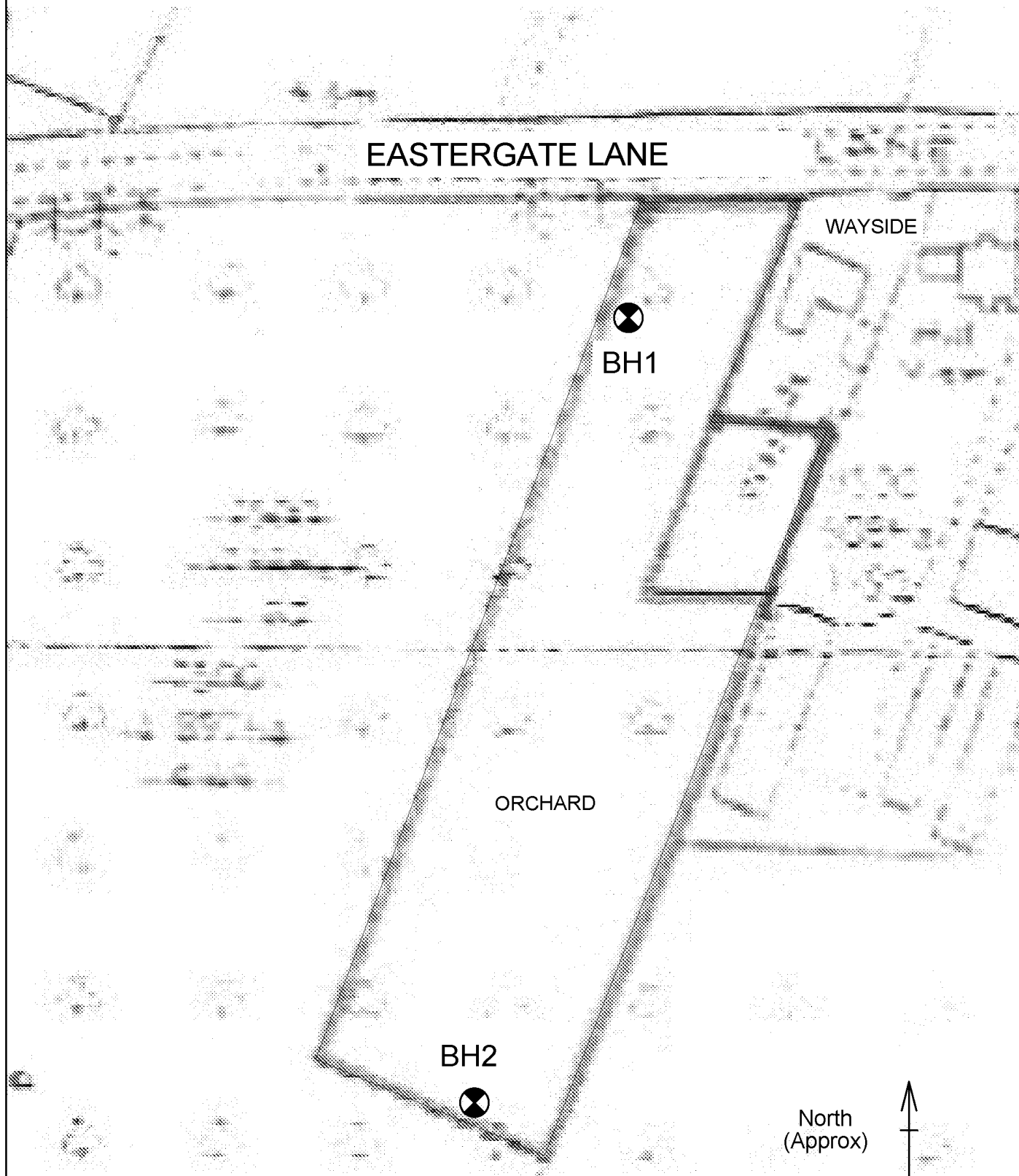
SECTION: Soakage Testing

CHECKED: AJHT

TITLE: Exploratory Hole Location Plan

DATE: December 2021

HOLE LOCATIONS ARE INDICATIVE ONLY UNLESS DIMENSIONED



Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AP

Site

side, Eastergate Lane PO20 3SJ

Number
BH1

Excavation Method Handheld window sampler	Dimensions 80mm to 1.10m 60mm to 2.00m 50mm to 3.00m	Ground Level (mOD)	Client Richard Smith	Job Number G6483
	Location See Location Plan	Dates 22/12/2021	Engineer Bright Plan Civils	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.25	Grass over moist dark brown slightly sandy (fine) slightly clayey silt TOPSOIL with a little subangular flint gravel (mainly medium). Some roots up to 3mm dia. ... with some coarse subangular to subrounded flint gravel below 1.5m		
			HV at 0.5m : 40, 40, 45 kPa			Soft to firm becoming firm orange brown silty CLAY. Occasional root up to 5mm dia.		
			HV at 0.9m : 85, 110, 125 kPa		(1.15)	... stiff below 0.9m		
			HV at 1.4m : unable to pen		1.40	Stiff orange brown silty CLAY with much coarse medium and fine subangular flint gravel		
					(0.60)			
					2.00	Well graded coarse medium and fine subangular flint GRAVEL with much cream chalk silt and fine chalk gravel		
					(1.00)			
					3.00	Complete at 3.00m		

Remarks Borehole remained stable and open during excavation Groundwater was not encountered 19mm dia. standpipe installed to 3.0m - 2.5m slotted with geosoc, 0.5m plain with bentonite pellet seal	Scale (approx) 1:25	Logged By AT
	Figure No. G6483.BH1	

Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AB

Site

Wayside, Eastergate Lane PO20 3SJ

Number
BH2

Excavation Method

Handheld window sampler

Dimensions

80mm to 1.10m
50 / 60 to 3.00m
40mm to 4.00m

Ground Level (mOD)

Client

Richard Smith

Job
Number
G6483

Location

See Location Plan

Dates

22/12/2021

Engineer

Bright Plan Civils

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.20	Grass over moist dark brown slightly sandy (fine) slightly clayey silt TOPSOIL with a little coarse medium and fine subangular flint gravel		
					0.20	Firm becoming stiff orange brown silty CLAY. Occasional root up to 5mm dia.		
					1.10	... with a little coarse medium and fine subangular flint gravel below 0.6m		
					1.10	... increasing stiffness with depth		
					1.30	Orange brown well graded coarse medium and fine subangular flint GRAVEL with much silty clay		
					0.80			
					2.10	Compact cream well graded coarse medium and fine subangular flint GRAVEL with some silt to fine gravel size chalk		
					1.90			
					4.00	Complete at 4.00m		

Remarks

Borehole remained stable and open during excavation
Groundwater was not encountered
19mm dia. standpipe installed to 3.0m - 2.5m slotted with geosoc, 1.5m plain with bentonite pellet seal

Scale
(approx)

1:25

Logged
By

AT

Figure No.

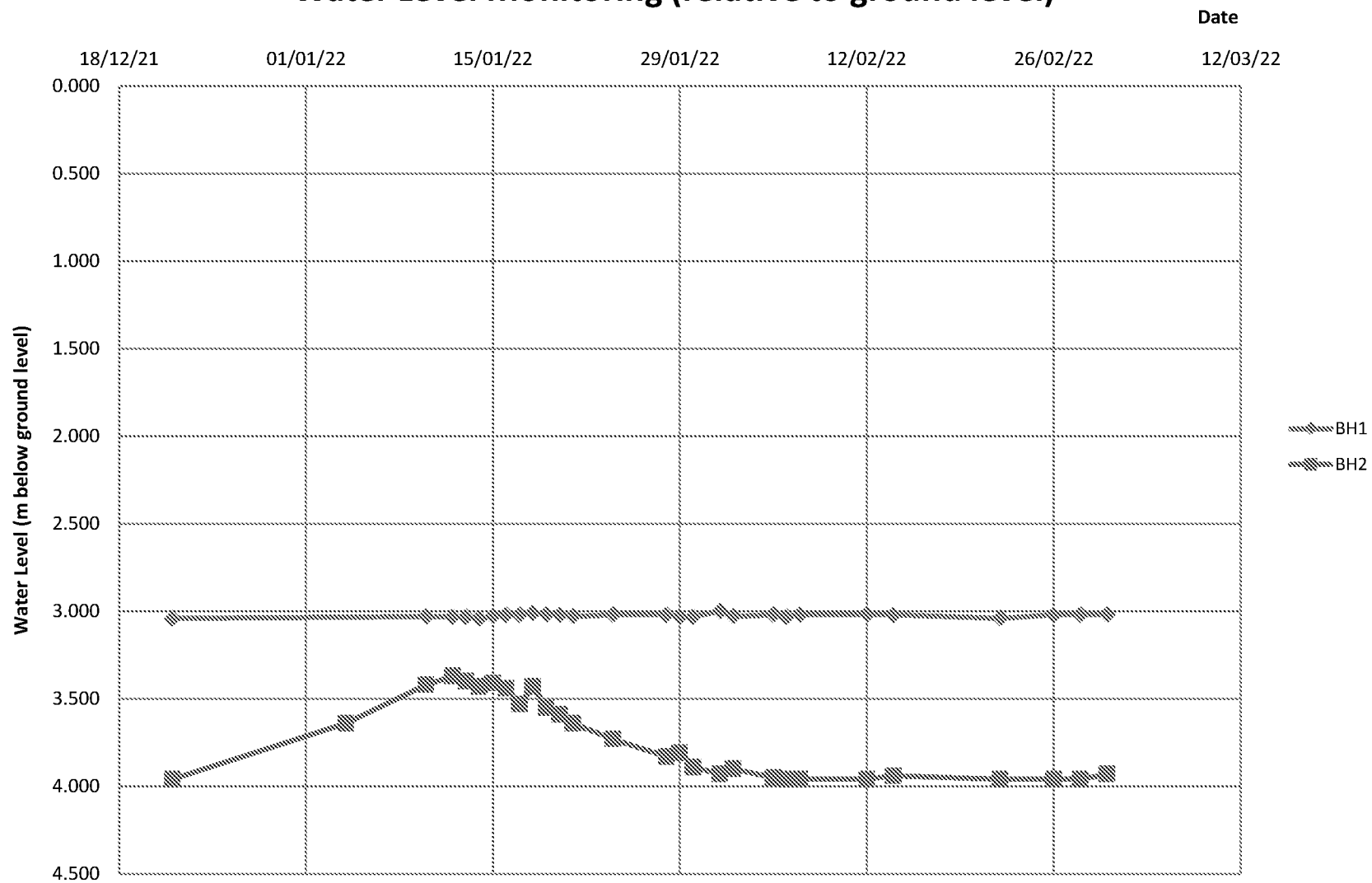
G6483.BH2

	BH1	BH2				
Upstand (m)	0.370	0.450				
Ground Level (mAOD)	0.000	0.000				
Cover level (mAOD)	0.370	0.450				
Base dip (m)	3.410	4.410				

Ground levels estimated by reference to

[illegible]

G6483 Wayside, Eastergate Lane Water Level Monitoring (relative to ground level)



Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm, Clay Lane, Fishbourne
CHICHESTER, West Sussex PO18 8AB
Phone/Fax: 01243 575073

PROJECT NO: G6483

FIGURE REF: Figure 3 Rev1

PROJECT: Wayside, Eastergate Lane, Eastergate

PREPARED: AJHT

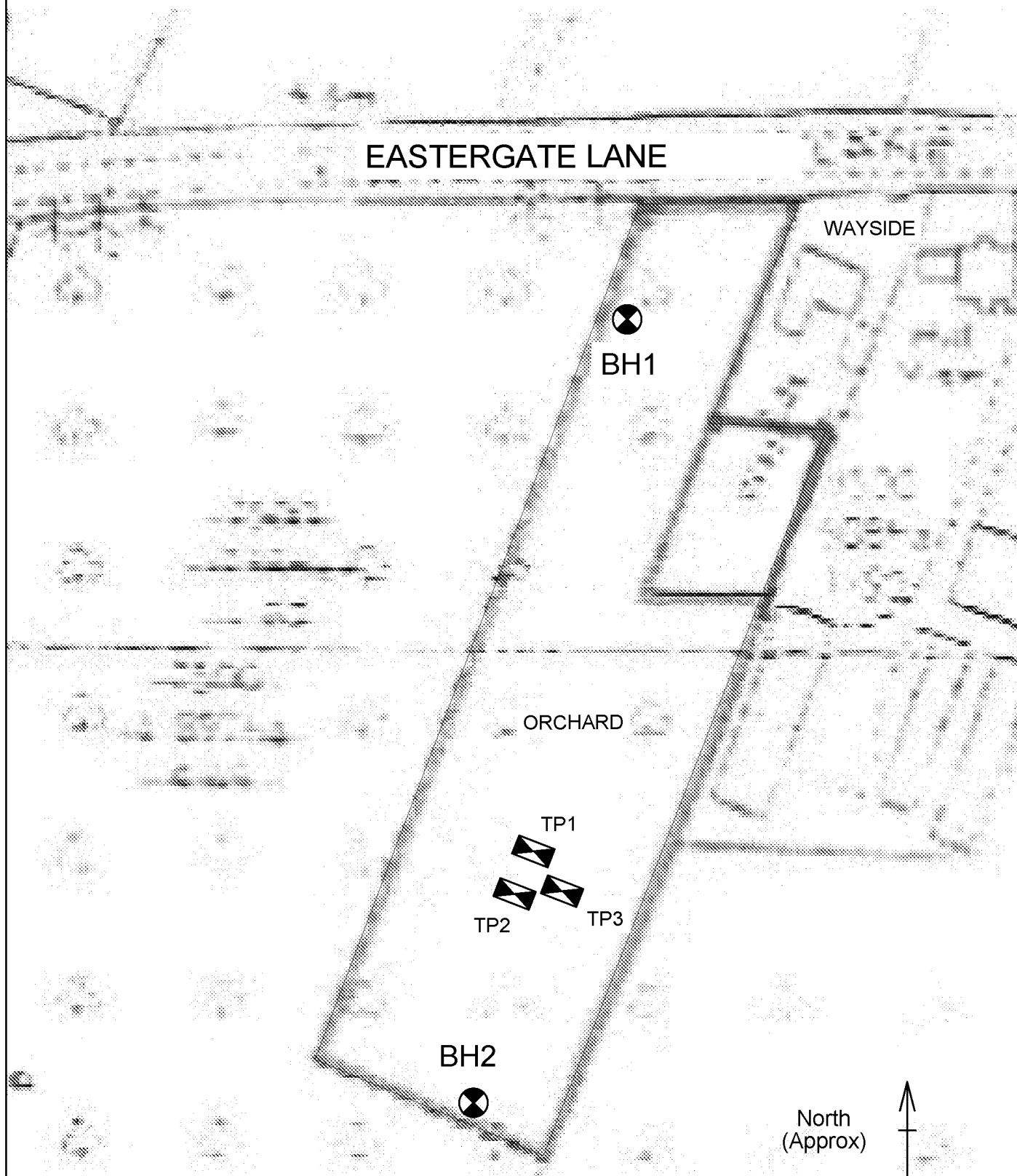
SECTION: Soakage Testing

CHECKED: AJHT

TITLE: Exploratory Hole Location Plan

DATE: March 2022

HOLE LOCATIONS ARE INDICATIVE ONLY UNLESS DIMENSIONED



Ground Management Ltd

Civil and Geotechnical Engineering Services

Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AB

mail@groundmanagement.co.uk

Site

Wayside, Eastergate Lane PO20 3SJ

**Trial Pit
Number**

TP1

Excavation Method

Machine excavated using
Takeuchi TB216

Dimensions

0.3 x 1.3

Ground Level (mOD)

Client

Richard Smith

Job Number

G6483

Location

See Location Plan

Dates

25/03/2022

Engineer

Bright Plan Civils

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Grass over moist orange brown slightly sandy (fine) slightly clayey silt TOPSOIL		
					(0.20) 0.20	Firm orange brown silty CLAY with occasional coarse medium and fine subangular flint gravel		
					(0.70)			
					0.90 (0.15)	Medium dense orange brown well graded coarse medium and fine angular to subangular flint GRAVEL with much slightly sandy silty clay		
					1.05	Complete at 1.05m		

HV at 0.7m : 60, 55, 70
kPa

Plan

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Remarks

Pit sides remained stable and vertical during excavation
Groundwater was not encountered

Scale (approx)

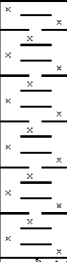
1:25

Logged By

AT

Figure No.

G6483.TP1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Grass over moist brown and orange brown slightly sandy (fine) slightly clayey silt TOPSOIL		
					(0.20) 0.20	Firm orange brown silty CLAY with occasional coarse medium and fine subangular flint gravel		
					(0.85)			
					1.05	Medium dense orange brown well graded coarse medium and fine angular to subangular flint GRAVEL with much slightly sandy silty clay		
					(0.60)			
					1.65	... stratum extended to 1.8m at west end of pit		
					(0.45)	Medium dense well graded, mainly coarse and medium, angular to subangular flint GRAVEL with much cream friable silt to fine gravel size chalk		
					2.10	Complete at 2.10m		

Plan 	Remarks Pit sides remained stable and vertical during excavation Groundwater was not encountered		
	Scale (approx) 1:25	Logged By AT	Figure No. G6483.TP2

Civil and Geotechnical Engineering Services

Robin Hill Farm Clay Lane Fishbourne
CHICHESTER West Sussex PO18 8AB

Site

Wayside, Eastergate Lane PO20 3SJ

**Trial Pit
Number**
TP3

Excavation Method

Machine excavated using
Takeuchi TB216

Dimensions

0.3 x 1.0

Ground Level (mOD)

Dates

25/03/2022

Client

Richard Smith

Job	Rate	Time	Cost
1			
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Number
G6483**Location**

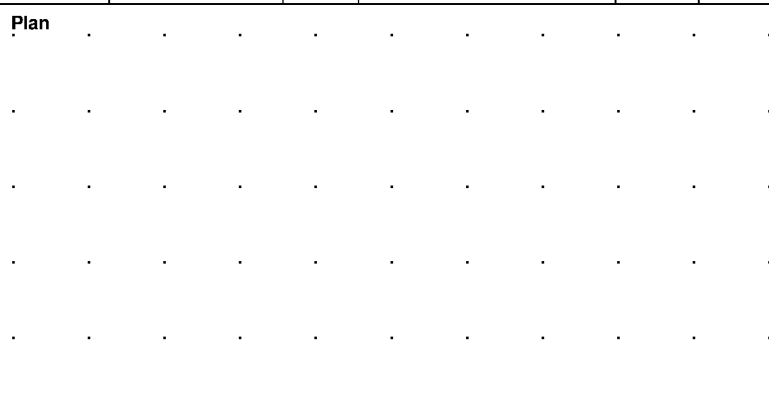
See Location Plan

Engineer

Bright Plan Civils

Sheet

1/1

Plan 	Remarks Pit sides remained stable and vertical during excavation Groundwater was not encountered		
	Scale (approx) 1:25	Logged By AT	Figure No. G6483.TP3

G6483 Wayside Eastergate Lane Soakage Test

TP1 Test 1

Test Start Date: 25-Mar-22

Dimensions (m):

width = 0.30

length = 1.30

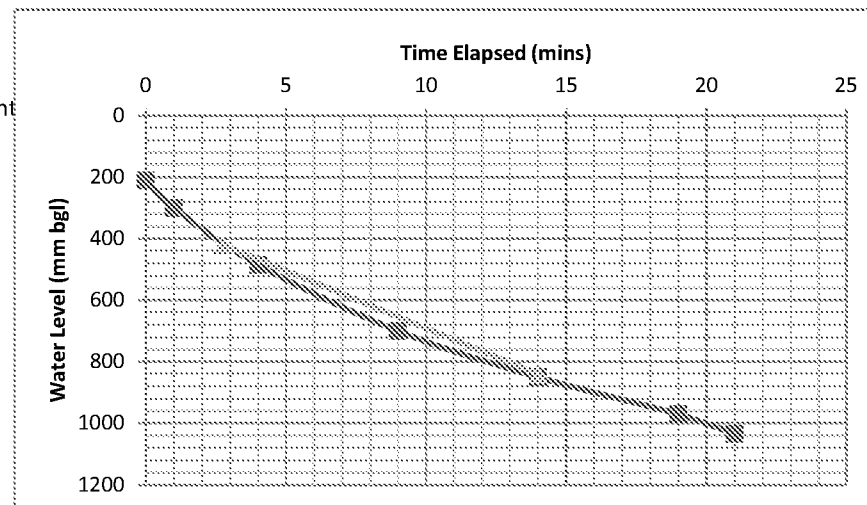
depth = 1.05

[illegible]

End Fit

Weather

Dry & Bright



	Time (mins)	
t0	210	
t25	420	2.75
t50	630	
t75	840	14
t100 (BH1)	1050	
	fall	0.84
	t25 - t75	0.42
	Area t50	1.734

Infiltration Coefficient = 0.00014 m/s

G6483 Wayside Eastergate Lane
Soakage Test

TP1 Test 2

Test Start Date: 25-Mar-22

Dimensions (m):

```
width = 0.30
```

length = 1.30

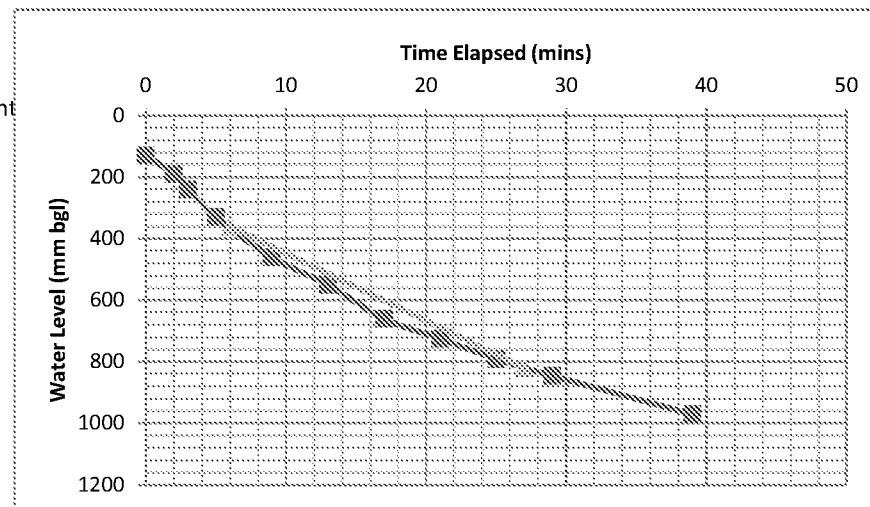
depth = 1.05

[illegible]

End Fit

Weather

Dry & Bright



	Time (mins)	
t0	130	
t25	360	6
t50	590	
t75	820	27
t100 (BH1)	1050	
	fall	0.92
	t25 - t75	0.46
	Area t50	1.862

Infiltration Coefficient = 7.65E-05 m/s

G6483 Wayside Eastergate Lane Soakage Test

TP1 Test 3

Test Start Date: 25-Mar-22

Dimensions (m):

width = 0.30

length = 1.30

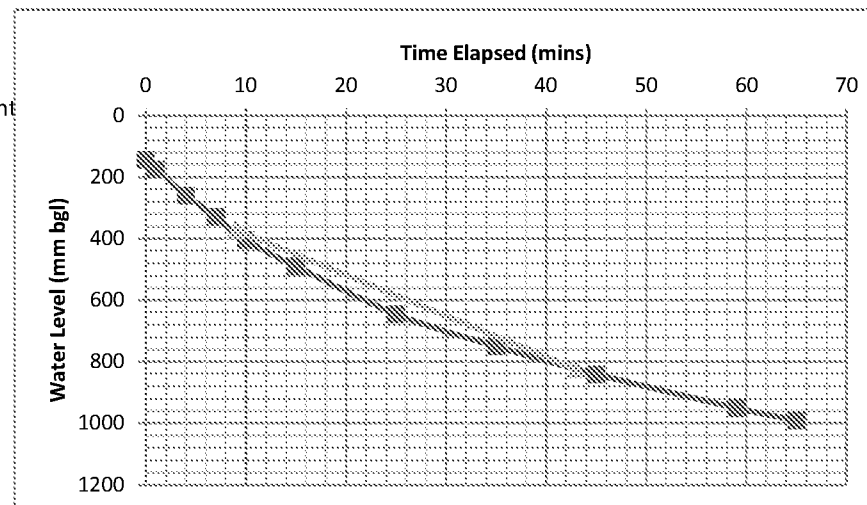
depth = 1.05

[illegible]

End Fit

Weather

Dry & Bright



		Time (mins)
t0	145	
t25	371.25	9
t50	597.5	
t75	823.75	43
t100 (BH1)	1050	
	fall	0.905
	t25 - t75	0.4525
	Area t50	1.838

Infiltration Coefficient = 4.71E-05 m/s

G6483 Wayside Eastergate Lane
Soakage Test

TP2 Test 1

Test Start Date: 25-Mar-22

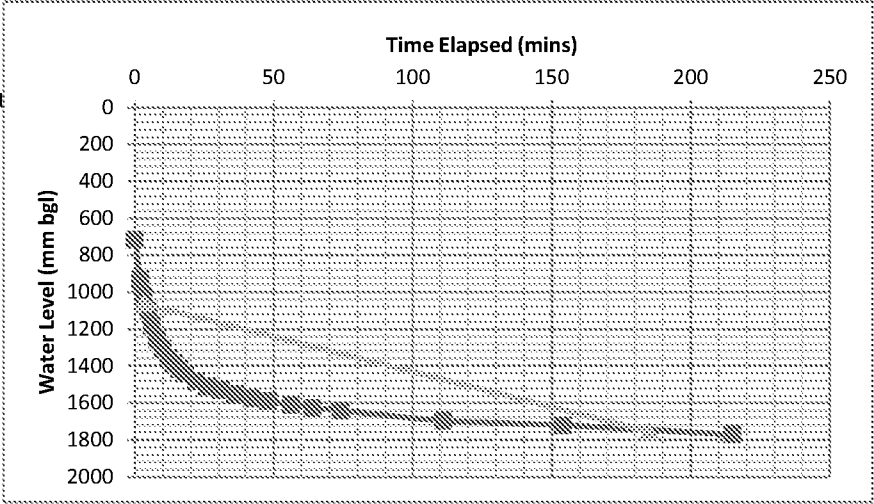
Dimensions (m): width = 0.30 length = 1.70 depth = 2.10

Date	Time	Date and time	Elapsed	Dip
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25/03/2022	12:32	25/03/2022 12:32	0	715
25/03/2022	12:34	25/03/2022 12:34	2	930
25/03/2022	12:35	25/03/2022 12:35	3	1020
25/03/2022	12:37	25/03/2022 12:37	5	1100
25/03/2022	12:38	25/03/2022 12:38	6	1180
25/03/2022	12:40	25/03/2022 12:40	8	1255
25/03/2022	12:42	25/03/2022 12:42	10	1305
25/03/2022	12:44	25/03/2022 12:44	12	1355
25/03/2022	12:46	25/03/2022 12:46	14	1385
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25/03/2022	13:14	25/03/2022 13:14	42	1575
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25/03/2022	13:28	25/03/2022 13:28	56	1610
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25/03/2022	13:46	25/03/2022 13:46	74	1640
25/03/2022	14:23	25/03/2022 14:23	111	1695
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25/03/2022	16:07	25/03/2022 16:07	215	1770
25/03/2022	16:52	25/03/2022 16:52	260	1795

End Fit

Weather

Dry & Bright



	Time (mins)	
t0	715	
t25	1061.25	3
t50	1407.5	
t75	1753.75	185
t100 (BH1)	2100	
fall		1.385
t25 - t75		0.6925
Area t50		3.28

Infiltration Coefficient = 9.86E-06 m/s

G6483 Wayside Eastergate Lane Soakage Test

TP2 Test 2

Test Start Date: 25-Mar-22

Dimensions (m):

width = 0.30

length = 1.70

depth = 2.10

[illegible]

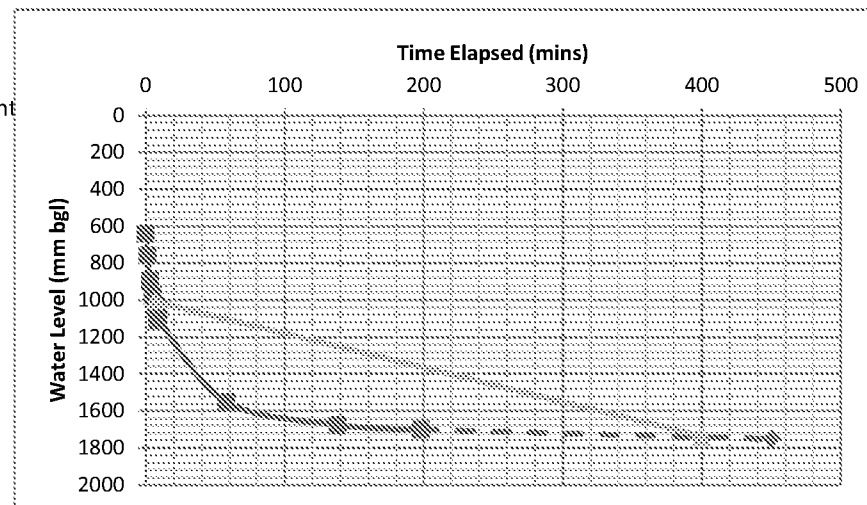
End Fit

|Weather

Dry & Bright

1700

1750 Projected



		Time (mins)
t0	640	
t25	1005	6
t50	1370	
t75	1735	400
t100 (BH1)	2100	
	fall	1.46
	t25 - t75	0.73
	Area t50	3.43

Infiltration Coefficient = 4.59E-06 m/s

G6483 Wayside Eastergate Lane Soakage Test

TP2 Test 3

Test Start Date: 26-Mar-22

Dimensions (m):

width = 0.30

length = 1.70

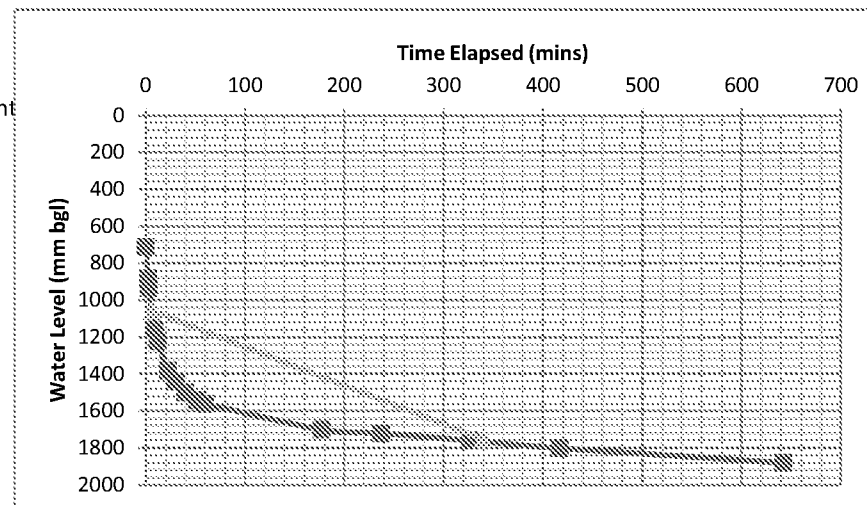
depth = 2.10

[illegible]

End Fit

Weather

Dry & Bright



		Time (mins)
t0	710	
t25	1057.5	6
t50	1405	
t75	1752.5	340
t100 (BH1)	2100	
	fall	1.39
	t25 - t75	0.695
	Area t50	3.29

Infiltration Coefficient = 5.38E-06 m/s

G6483 Wayside Eastergate Lane Soakage Test

TP3 Test 1

Test Start Date: 25-Mar-22

Dimensions (m):

width = 0.30

length = 1.00

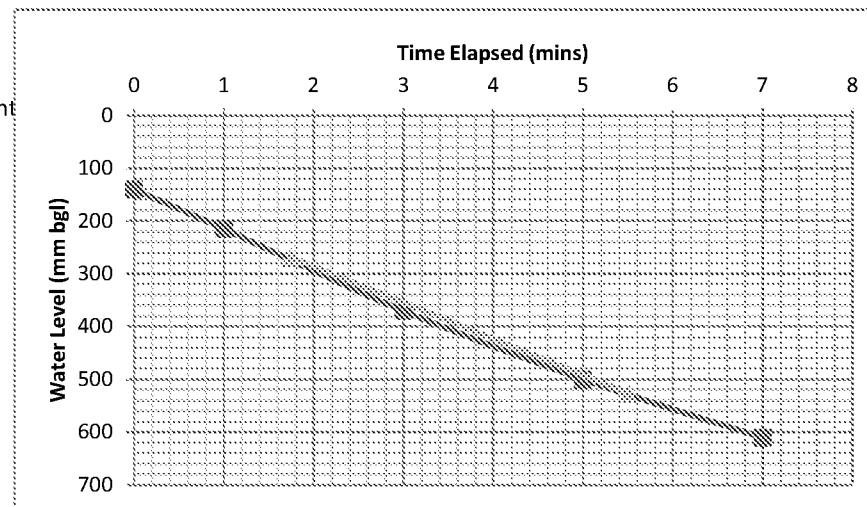
depth = 0.65

[illegible]

End Fit

Weather

Dry & Bright



	Time (mins)	
t0	140	
t25	268.75	1.75
t50	397.5	
t75	526.25	5.5
t100 (BH1)	655	
	fall	0.515
	t25 - t75	0.2575
	Area t50	0.9565

Infiltration Coefficient = 0.000359 m/s

G6483 Wayside Eastergate Lane Soakage Test

TP3 Test 2

Test Start Date: 25-Mar-22

Dimensions (m):

width = 0.30

length = 1.00

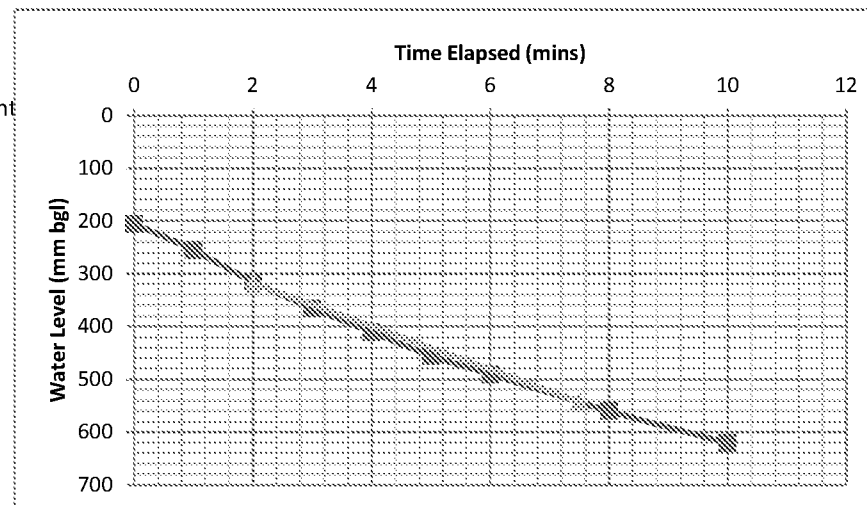
depth = 0.65

[illegible]

End Fit

Weather

Dry & Bright



	Time (mins)	
t0	205	
t25	317.5	2
t50	430	
t75	542.5	7.5
t100 (BH1)	655	
	fall	0.45
	t25 - t75	0.225
	Area t50	0.872

Infiltration Coefficient = 0.000235 m/s

G6483 Wayside Eastergate Lane Soakage Test

TP3 Test 3

Test Start Date: 25-Mar-22

Dimensions (m):

```
width = 0.30
```

length = 1.00

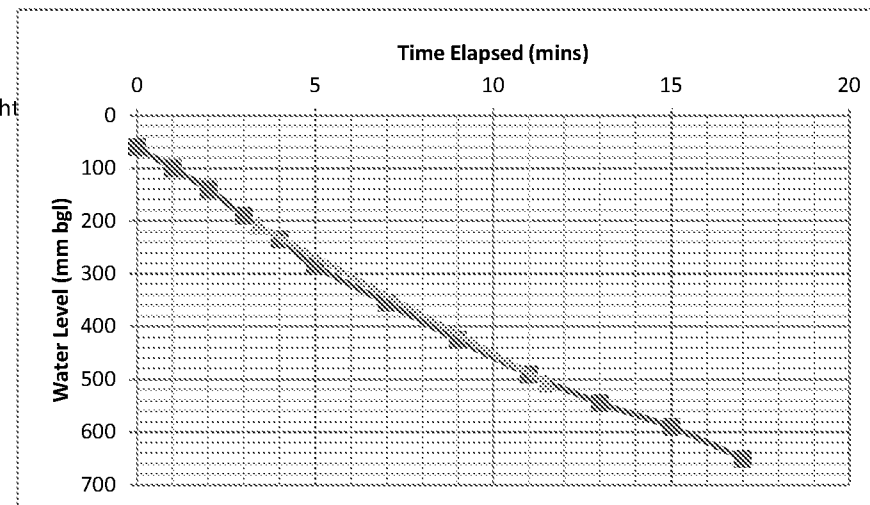
depth = 0.65

[illegible]

End Fit

|Weather

Dry & Bright



		Time (mins)
t0	60	
t25	208.75	3.4
t50	357.5	
t75	506.25	11.5
t100 (BH1)	655	
	fall	0.595
	t25 - t75	0.2975
	Area t50	1.0605

Infiltration Coefficient = 0.000173 m/s

Appendix D SFRA Extracts



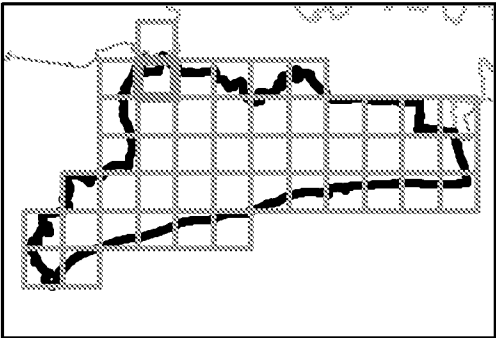
Notes

The Areas Susceptible to Groundwater Flooding (ASGWf) is a strategic scale map showing groundwater flood areas on a 1km square grid. The data was produced to annotate Indicative Flood Risk Areas for Preliminary Flood Risk Assessment (PFRA) studies and allow the Lead Local Flood Authorities (LLFAs) to determine whether there may be a risk of flooding from groundwater.

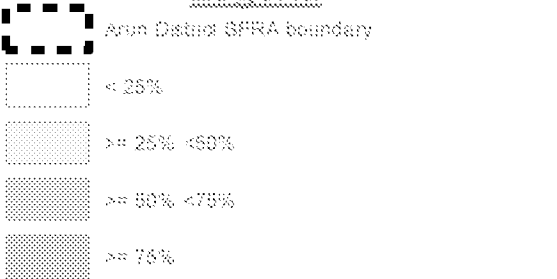
This data shows the proportion of each 1km grid square where geological and hydrogeological condition show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring. It does not take account of the chance of flooding from groundwater rebound. This dataset covers a large area of land and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The ASGWf data should be used only in combination with other information, for example local data or historic data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.

Key Plan



Legend



REF	Date	Comments
A	June 2012	-
B		
C		

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ARUN DISTRICT COUNCIL

LEVEL 1 SFRA: APPENDIX F AREAS SUSCEPTIBLE TO GROUNDWATER

Sheet No: 41 of 48 Index Number: AGC_A1

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Appendix E Public Sewer Records



(c) Crown copyright and database rights 2021 Ordnance Survey 100031673

Date: 08/12/21

Scale: 1:1250

Map Centre: 494836,106052

Data updated: 23/11/21

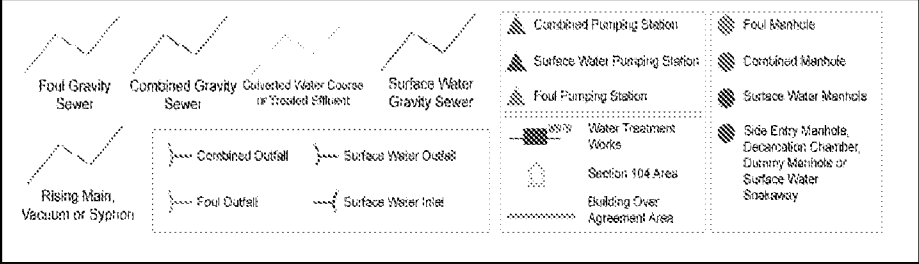
Our Ref: 732731 - 1

Wastewater Plan A3

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2021 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



searches@bpcivils.co.uk
D1915



Appendix F Proposed Drainage Calculations



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	250.0
Additional Flow (%)	10	Minimum Velocity (m/s)	0.75
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.500
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

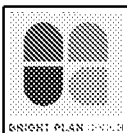
Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
12	0.010	5.00	16.300	1200	494792.049	105985.693	0.600
11	0.023	5.00	16.300	1200	494797.423	106000.340	0.600
10	0.015	5.00	16.600	1200	494797.117	106012.531	0.600
9	0.015	5.00	16.600	1200	494814.142	106026.770	0.600
8	0.015	5.00	16.450	1200	494800.851	106027.493	0.800
7	0.010	5.00	16.350	1200	494795.095	106013.300	0.800
6	0.011	5.00	16.275	1200	494791.021	106002.787	0.841
5	0.026	5.00	16.300	1200	494773.438	105950.773	0.800
4	0.010	5.00	16.300	1200	494783.145	105965.794	0.600
3	0.015	5.00	16.225	1200	494777.680	105967.872	0.800
2	0.011	5.00	16.225	1200	494784.016	105985.794	0.845
1			16.200	1200	494782.201	105986.487	0.825

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.004	2	1	1.943	0.600	15.380	15.375	0.005	328.6	300	5.99	64.9
6.000	12	2	8.034	0.600	15.700	15.580	0.120	66.9	100	5.14	69.4
1.003	6	2	18.380	0.600	15.434	15.380	0.054	340.4	300	5.95	65.1
4.001	3	2	19.009	0.600	15.425	15.380	0.045	422.4	300	5.71	66.3
4.000	5	3	17.617	0.600	15.500	15.425	0.075	234.9	300	5.29	68.6
5.000	4	3	5.847	0.600	15.700	15.625	0.075	78.0	100	5.11	69.6
3.000	11	6	6.854	0.600	15.700	15.634	0.066	103.8	100	5.15	69.4
1.002	7	6	11.275	0.600	15.550	15.494	0.116	97.2	300	5.59	66.9
2.000	10	7	2.163	0.600	16.000	15.750	0.250	8.7	100	5.01	70.2
1.001	8	7	15.316	0.600	15.650	15.550	0.100	153.2	300	5.47	67.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.004	0.791	55.9	31.1	0.545	0.525	0.161	0.0	160	0.812
6.000	0.942	7.4	2.1	0.500	0.545	0.010	0.0	36	0.810
1.003	0.846	59.8	17.3	0.541	0.545	0.089	0.0	110	0.734
4.001	0.759	53.6	10.1	0.500	0.545	0.051	0.0	88	0.584
4.000	1.021	72.2	5.3	0.500	0.500	0.026	0.0	55	0.603
5.000	0.872	6.9	2.1	0.500	0.500	0.010	0.0	38	0.766
3.000	0.754	5.9	4.8	0.500	0.541	0.023	0.0	68	0.837
1.002	1.595	112.7	11.0	0.500	0.541	0.055	0.0	63	1.024
2.000	2.643	20.8	3.1	0.500	0.500	0.015	0.0	26	1.902
1.001	1.268	89.6	6.0	0.500	0.500	0.030	0.0	52	0.730



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	9	8	13.311	0.600	16.000	15.850	0.150	88.7	100	5.27	68.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.817	6.4	3.1	0.500	0.500	0.015	0.0	49	0.808

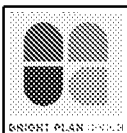
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.004	1.943	388.6	300	Circular	16.225	15.380	0.545	16.200	15.375	0.525
6.000	3.034	66.9	100	Circular	16.300	15.700	0.500	16.225	15.580	0.545
1.003	18.330	340.4	300	Circular	16.275	15.434	0.541	16.225	15.380	0.545
4.001	19.009	422.4	300	Circular	16.225	15.425	0.500	16.225	15.380	0.545
4.000	17.617	234.9	300	Circular	16.300	15.500	0.500	16.225	15.425	0.500
5.000	5.847	78.0	100	Circular	16.300	15.700	0.500	16.225	15.625	0.500
3.000	6.854	103.8	100	Circular	16.300	15.700	0.500	16.275	15.634	0.541
1.002	11.275	97.2	300	Circular	16.350	15.550	0.500	16.275	15.434	0.541
2.000	2.163	8.7	100	Circular	16.600	16.000	0.500	16.350	15.750	0.500
1.001	15.916	153.2	300	Circular	16.450	15.650	0.500	16.350	15.550	0.500
1.000	13.311	88.7	100	Circular	16.600	16.000	0.500	16.450	15.850	0.500

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.004	2	1200	Manhole	Adoptable	1	1200	Manhole	Adoptable
6.000	12	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.003	6	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
4.001	3	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
4.000	5	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
5.000	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3.000	11	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.002	7	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
2.000	10	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.001	8	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.000	9	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
12	494792.049	105985.693	16.300	0.600	1200					
							0	6.000	15.700	100
11	494797.423	106000.340	16.300	0.600	1200					
							0	3.000	15.700	100
10	494797.117	106012.531	16.600	0.600	1200					
							0	2.000	16.000	100



Manhole Schedule

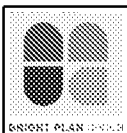
Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
9	494814.142	106026.770	16.600	0.600	1200		0	1.000	16.000	100
8	494800.851	106027.493	16.450	0.800	1200		1	1.000	15.850	100
						0	1.001	15.650	300	
7	494795.095	106013.300	16.350	0.800	1200		1	2.000	15.750	100
						2	1.001	15.550	300	
						0	1.002	15.550	300	
6	494791.021	106002.787	16.275	0.841	1200		1	3.000	15.634	100
						2	1.002	15.434	300	
						0	1.003	15.434	300	
5	494773.438	105950.773	16.300	0.800	1200		0	4.000	15.500	300
4	494783.145	105965.794	16.300	0.600	1200		0	5.000	15.700	100
3	494777.680	105967.872	16.225	0.800	1200		1	5.000	15.625	100
						2	4.000	15.425	300	
						0	4.001	15.425	300	
2	494784.016	105985.794	16.225	0.845	1200		1	6.000	15.500	100
						2	4.001	15.380	300	
						3	1.003	15.380	300	
						0	1.004	15.380	300	
1	494782.201	105986.487	16.200	0.825	1200		1	1.004	15.375	300

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

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 %)
1	0	0	0
30	0	0	0
100	40	10	0

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	15.600	Slope (1:X)	270.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.500
Safety Factor	2.0	Width (m)	8.450	Inf Depth (m)	0.500
Porosity	0.32	Length (m)	54.000		

Node 1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.01652	Invert Level (m)	13.800	Depth (m)	1.900
Side Inf Coefficient (m/hr)	0.01652	Time to half empty (mins)	755	Inf Depth (m)	1.900
Safety Factor	2.0	Pit Width (m)	1.000	Number Required	1
Porosity	0.32	Pit Length (m)	73.000		



Results for 1 year Critical Storm Duration. Lowest mass balance: 95.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	12	10	15.730	0.030	1.4	0.0439	0.0000	OK
15 minute winter	11	10	15.755	0.055	3.2	0.1044	0.0000	OK
15 minute winter	10	10	16.023	0.023	2.1	0.0381	0.0000	OK
15 minute winter	9	10	16.040	0.040	2.1	0.0649	0.0000	OK
15 minute winter	8	10	15.694	0.044	4.1	0.0661	0.0000	OK
15 minute winter	7	11	15.602	0.052	7.5	0.0717	0.0000	OK
15 minute winter	6	11	15.531	0.097	12.1	0.1346	0.0000	OK
15 minute winter	5	10	15.545	0.045	3.7	0.0805	0.0000	OK
15 minute winter	4	10	15.732	0.032	1.4	0.0462	0.0000	OK
15 minute winter	3	11	15.516	0.091	7.1	0.1376	0.0000	OK
15 minute winter	2	11	15.510	0.130	21.5	0.1811	0.0000	OK
1440 minute winter	1	990	14.778	-0.597	1.3	22.8567	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	12	6.000	2	1.4	0.703	0.183	0.0155
15 minute winter	11	3.000	6	3.1	0.740	0.530	0.0291
15 minute winter	10	2.000	7	2.1	1.592	0.100	0.0028
15 minute winter	9	1.000	8	2.0	0.716	0.318	0.0379
15 minute winter	8	1.001	7	4.1	0.565	0.046	0.1108
15 minute winter	7	1.002	6	7.5	0.564	0.066	0.1562
15 minute winter	6	1.003	2	12.1	0.503	0.202	0.4493
15 minute winter	5	4.000	3	3.6	0.358	0.050	0.2176
15 minute winter	4	5.000	3	1.4	0.661	0.198	0.0120
15 minute winter	3	4.001	2	6.6	0.291	0.123	0.4507
15 minute winter	2	1.004	1	21.2	0.801	0.378	0.0514
1440 minute winter	1	Infiltration		0.5			



Results for 30 year Critical Storm Duration. Lowest mass balance: 95.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	12	10	15.751	0.051	3.5	0.0741	0.0000	OK
15 minute winter	11	11	15.849	0.149	8.0	0.2829	0.0000	SURCHARGED
15 minute winter	10	10	16.039	0.039	5.2	0.0640	0.0000	OK
15 minute winter	9	10	16.070	0.070	5.2	0.1146	0.0000	OK
480 minute winter	8	464	15.722	0.072	1.2	0.1087	0.0000	OK
480 minute winter	7	456	15.721	0.171	2.2	0.2363	0.0000	OK
480 minute winter	6	456	15.720	0.286	3.5	0.3989	0.0000	OK
480 minute winter	5	456	15.721	0.221	1.0	0.3932	0.0000	OK
15 minute winter	4	10	15.754	0.054	3.5	0.0788	0.0000	OK
480 minute winter	3	464	15.720	0.295	2.0	0.4447	0.0000	OK
480 minute winter	2	456	15.723	0.343	6.3	0.4772	0.0000	SURCHARGED
480 minute winter	1	464	15.718	0.343	6.3	49.8786	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	12	6.000	2	3.4	0.894	0.463	0.0308
15 minute winter	11	3.000	6	7.5	0.961	1.266	0.0516
15 minute winter	10	2.000	7	5.2	1.985	0.248	0.0056
15 minute winter	9	1.000	8	5.0	0.884	0.783	0.0759
480 minute winter	8	1.001	7	1.2	0.395	0.013	0.4168
480 minute winter	7	1.002	6	2.2	0.418	0.020	0.6250
480 minute winter	6	1.003	2	3.5	0.359	0.059	1.2840
480 minute winter	5	4.000	3	1.0	0.251	0.014	1.1079
15 minute winter	4	5.000	3	3.4	0.835	0.500	0.0240
480 minute winter	3	4.001	2	2.0	0.233	0.037	1.3364
480 minute winter	2	1.004	1	6.3	0.573	0.113	0.1368
480 minute winter	1	Infiltration		0.8			



Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 95.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	12	555	16.133	0.433	0.6	0.6492	0.0000	FLOOD RISK
15 minute winter	11	12	16.208	0.508	15.9	1.0018	0.0000	FLOOD RISK
600 minute winter	10	555	16.140	0.140	0.9	0.2347	0.0000	SURCHARGED
15 minute winter	9	11	16.278	0.278	10.4	0.4680	0.0000	SURCHARGED
600 minute winter	8	555	16.139	0.489	1.8	0.7551	0.0000	SURCHARGED
600 minute winter	7	555	16.140	0.590	3.3	0.8301	0.0000	FLOOD RISK
600 minute winter	6	555	16.139	0.705	5.9	1.0004	0.0000	FLOOD RISK
600 minute winter	5	555	16.137	0.637	1.6	1.1760	0.0000	FLOOD RISK
600 minute winter	4	555	16.136	0.436	0.6	0.6538	0.0000	FLOOD RISK
600 minute winter	3	555	16.136	0.711	3.3	1.0969	0.0000	FLOOD RISK
600 minute winter	2	555	16.151	0.771	10.3	1.0929	0.0000	FLOOD RISK
480 minute winter	1	456	16.135	0.760	10.4	103.7451	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute winter	12	6.000	2	0.6	0.532	0.087	0.0629
15 minute winter	11	3.000	6	13.5	1.730	2.285	0.0536
600 minute winter	10	2.000	7	1.4	1.271	0.065	0.0169
15 minute winter	9	1.000	8	9.0	1.148	1.400	0.1024
600 minute winter	8	1.001	7	1.8	0.430	0.020	1.0785
600 minute winter	7	1.002	6	4.4	0.430	0.039	0.7940
600 minute winter	6	1.003	2	5.9	0.374	0.098	1.2943
600 minute winter	5	4.000	3	1.8	0.276	0.025	1.2406
600 minute winter	4	5.000	3	1.3	0.502	0.192	0.0457
600 minute winter	3	4.001	2	3.7	0.248	0.068	1.3386
600 minute winter	2	1.004	1	13.4	0.600	0.239	0.1368
480 minute winter	1	Infiltration		0.8			