



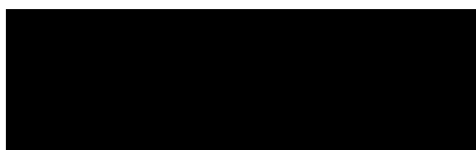
Sundial Planning

Cinders Lane, Yapton

Flood Risk Assessment and Drainage Strategy

January 2017

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



creative minds safe hands



Document Control

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Yapton.docx

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Issue	Date	Status
1	30.01.17	First Issue
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Contents Page

1.0	Introduction.....	1
2.0	Site Conditions and Planning Policy	2
3.0	Flooding	5
4.0	Surface Water Drainage Strategy	7
5.0	Foul Drainage Strategy	10
6.0	Summary and Conclusion	11

Figures

Figure 1 – Site Layout Plan

Figure 2 – EA Flood Map for Planning

Figure 3 – Government Surface Water Flood Risk Map

Figure 4 – Topographical Survey

Figure 5 – BGS Maps

Figure 6 – Sewer Flooding Map

Appendix Contents

Appendix A – Sewer Records

Appendix B - Calculations

Appendix C - Drainage Strategy

Appendix D - Photographs



1.0 Introduction

1.1 Brief

- 1.1.1 WYG have been commissioned by Sundial Planning to produce a Flood Risk Assessment (FRA) in support of an outline planning application for 51 dwellings with all matters reserved except for access.
- 1.1.2 This report has been produced to identify, and where appropriate recommend mitigation to, any flooding issues associated with the proposed development, following the requirements of the Environment Agency (EA), West Sussex Council and Southern Water.
- 1.1.3 The purpose of this report is to demonstrate how the development complies with planning policy on flood risk – National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance (PPG).

1.2 Report Structure

- 1.2.1 The structure of this report is summarised as follows:
 - ❖ Section 2: Describes existing conditions with respect to flooding and drainage; along with design proposals;
 - ❖ Section 3: Provides a commentary on how flood risk from a range of potential sources may or may not constrain development proposals;
 - ❖ Section 4: Describes how surface water from the development area can be drained in a sustainable manner, without increasing the risk of flooding elsewhere;
 - ❖ Section 5: Describes how foul drainage from the new development may be discharged;
 - ❖ Section 6: Presents a summary of the report and identifies the main conclusions that can be drawn.



2.0 Site Conditions and Planning Policy

2.1 Existing Conditions

- 2.1.1 The site is located to the east of Yapton village with access to the site to be provided via Cinders Lane which is to be accessed from Bilsham Road. The site layout and location can be seen in Figure 1.
- 2.1.2 The site is approximately 1.75ha and was formerly a horticultural nursery and is currently occupied by overgrown vegetation, ad-hoc storage of various materials and disused glasshouses.
- 2.1.3 There is an existing drainage ditch at the western boundary of the site which flows to the south but is currently backfilled at the south western boundary of the application site. There is also an existing drainage ditch along the eastern boundary of the application site.
- 2.1.4 The Greenfield run-off rate for the site has been calculated, using ICP SUDS and the Qbar rate is 6.3l/s. All calculations can be seen in Appendix C.
- 2.1.5 The adjoining land to the north comprises existing allotments and the land to the south comprises an existing employment use with countryside beyond. The adjoining land to the east comprises farmland and the site is adjoined to the west by the rear gardens of residential properties fronting Cherry Avenue.

2.2 Topography

- 2.2.1 A full topographical survey of the site has been undertaken, which shows that the site is flat with levels ranging from 6.9mAOD to 6.1mAOD across the site. There is a gradual fall from north to south; however, there are localised high and low points across the site.



2.3 Hydrology

- 2.3.1 There are two drainage ditches that travel along the western and eastern boundary of the application site. The ditch to the west of the application site is backfilled at the south western corner. The ditch along the eastern boundary flows away from the site via a series of drainage ditches before reaching the Ryebank Rife.
- 2.3.2 In order to manage the surface water that flows along the western boundary of the application site, and to prevent this surface water leaving the drainage ditch in an extreme weather event, it is proposed to convey this surface water across the application site into the drainage ditch to the east.

2.4 Hydrogeology

- 2.4.1 Geological mapping highlights that the site is underlain by Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation and Culver Chalk Formation. Overlying this are superficial River Terrace Deposits, comprising Sand, Silt and Clay. This can be seen in Figure 5.

2.5 Groundwater

- 2.5.1 The site is not located within a groundwater source protection zone, though is above a Secondary A Aquifer, as designated by the EA, defined as “permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.”

2.6 Proposed Development

- 2.6.1 The applicant is proposing to provide 51 dwellings together with requisite access and open space.
- 2.6.2 The proposed site plan can be seen in Figure 1.
- 2.6.3 The main access is to be from Bilsham Road along Cinders Lane.

2.7 Policy Context

- 2.7.1 The National Planning Policy Framework (NPPF) currently sets out the Government’s planning policies for England.



2.7.2 The Planning Policy Guidance (supporting the NPPF) defines Flood Zone 1 in the table, shown below.

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
 × Development should not be permitted.

Table 1 – Table 3 from Planning Policy Guidance (Flood Risk and Coastal Change) 15 04 2015

2.7.3 Under the NPPF, residential buildings are classified as 'highly vulnerable'. As the site is in Flood Zone 1, the development is considered appropriate.



3.0 Flooding

3.1 Introduction

3.1.1 There are a wide range of potential mechanisms which can cause flooding. Each potential source of flooding is discussed individually below:

3.2 Tidal or Main River Flooding

3.2.1 The location of the site in relation to possible sources of flood risk is shown in Figure 3.

3.2.2 There are no main rivers in close proximity of the site.

3.2.3 The nearest watercourses to the site are drainage ditches at the southern and eastern boundaries of the application site.

3.2.4 The nearest main River is the Ryebank Rife located approximately 540m to the west of the application site.

3.2.5 None of the above watercourses present a flood risk to the site which is in Flood Zone 1, defined as land having a less than 1 in 1000 annual probability of flooding.

3.3 Surface Water Flooding

3.3.1 Surface water flooding can occur during high intensity rainfall events as sheet run off from fields or hard paved areas. The site is shown to be at predominantly low risk of surface water flooding (on the Government's Long Term Flood Risk from Surface Water map).

3.3.2 From the map, it can be seen that there are small localised areas of surface water flooding associated with the small watercourses and also on a low point along Cinders Lane.

3.3.3 In order to prevent this risk of flooding going forward, upgrade works to Cinders Lane will include all necessary gullies in order to manage runoff into the surface water system and the ditch to the west of the application site will be conveyed via a culvert to the ditch to the east of the application site to avoid the backfilled area of ditch.

3.3.4 The Government surface water flood risk map is shown in Figure 4.



- 3.3.5 Surface water flooding will be managed going forward by the implementation of the Surface Water Drainage Strategy set out in Section 4.

3.4 Sewer Flooding

- 3.4.1 Liaison is underway with Southern Water to confirm that there are no incidences of sewer flooding within the vicinity of the application site.
- 3.4.2 The sewer flooding history map within the Arun District Council SFRA indicates that there are three recorded incidences of sewer flooding within Yapton. These appear to be located away from the application site. However, sewer capacity should be checked with Southern Water to ensure that upgrade works to the network are not needed. Refer to Figure 6.

3.5 Groundwater Flooding

- 3.5.1 The larger area in which Yapton is located has been indicated as an area where groundwater emergence is possible within the Arun District Council SFRA. In order to confirm whether this issue is a factor for the application site, groundwater monitoring should be carried out.
- 3.5.2 Groundwater monitoring should be carried out in winter months in order to ensure that groundwater levels are at their highest as a factor of safety and to ensure safe design. Groundwater monitoring will also be important in deciding the method of surface water disposal at the site.

3.6 Flood Risk from other sources

- 3.6.1 On rare occasions a development may be subject to flood risk from upstream features such as reservoirs, where there is a theoretical risk of failure. At this development it has been identified that there is no flood risk from other sources.



4.0 Surface Water Drainage Strategy

- 4.1.1 As the site is located in Flood Zone 1, the key objective is to ensure that the development does not increase the potential of flooding elsewhere, and if the opportunity arises, to reduce the potential for flooding off site. This objective can be achieved by designing a drainage strategy for the development which will set the strict framework to be followed during the detailed drainage design..
- 4.1.2 The surface water drainage strategy will be delivered in accordance with prevailing local and national planning policy. Currently, the most significant factors influencing the design of the drainage strategy are the Flood and Water Management Act 2010, Arun District Council's Strategic Flood Risk Assessment, the National Planning Policy Framework (NPPF) and relevant chapters of the Planning Practice Guidance (PPG). This drainage strategy sets the guidelines for future detailed design, but more importantly, it demonstrates that a sustainable drainage solution is deliverable at this site, complying with all relevant planning and legislative criteria. The most important function of this drainage strategy is to demonstrate that the development will not increase flood risk elsewhere.
- 4.1.3 In addition to ensuring flood risk is not increased mitigation, where possible, to existing flooding will be considered.
- 4.1.4 All calculations have been based on a range of rainfall return events up to and including the 1% AEP (1 in 100 year) event plus 40% climate change allowance.
- 4.1.5 The drainage strategy set out below and in the drawing in Appendix C is indicative and is expected to be refined through detailed design.
- 4.1.6 The method of discharge of surface water is critical to ensuring that flood risk will not be increased elsewhere. Planning Practice Guidance and Building Regulations dictate the hierarchy for discharge options. In order of preference these are:
- » To the ground (infiltration);
 - » To a surface water body;
 - » To a surface water sewer, highway drain or another drainage system;
 - » To a combined sewer;



- 4.1.7 Due to the watercourse to the west of the application site being backfilled, in order to prevent surface water flooding from this source it is proposed to place a 450mm pipe laid at a gradient of 1 in 400 across the site, in order to convey surface water to the watercourse to the east. Refer to Appendix C.
- 4.1.8 If levels within the channel do not allow a feasible connection across the site, the levels within the channel can be raised in order to allow flow through the culvert and prevent the backing up of the ditch at the backfilled area.
- 4.1.9 In order to fit the culvert under the road, re-profiling and a slight raise of the carriageway may be required in order to achieve the low gradient culvert run with the required depth of cover to the culvert. It is assumed that the headwall of the culvert will be at approximately 66.3mAOD and the outfall will be at approximately 65.8mAOD. A survey should be carried out including the ditch beds to ensure that this is feasible. Refer to Appendix C.
- 4.1.10 Infiltration testing has not been carried out to date, and it is expected that this could be undertaken post planning to inform any infiltration devices which may be suitable for the site. It is considered that zero infiltration on site is the 'worst case scenario' for on-site drainage from a land-take point of view, meaning that if infiltration rates are suitable for soakaways or similar devices, any SuDS features may reduce in size. In the event of infiltration being possible, it is proposed that a drainage strategy utilising infiltration is adopted.
- 4.1.11 The next suitable preference in the discharge hierarchy is to discharge into a surface water body. As the ditch to the west is unsuitable for drainage it is proposed that the surface water should discharge to the drainage ditch to the east where it can reach the watercourse network through a series of drainage ditches.
- 4.1.12 The Greenfield run off rates for the development are set out below:

Magnitude	Q1	Qbar	Q30	Q100
Run-Off (l/s)	5.4	6.3	14.4	20.2



- 4.1.13 To provide betterment on Greenfield conditions, it is proposed to limit discharge to the watercourse to the Qbar rate for events up to the Q100 + 40% climate change event.
- 4.1.14 From the conceptual layout, the development will result in an impermeable area of approximately 0.91ha.
- 4.1.15 Using Micro Drainage software, it has been calculated that approximately 699m³ of attenuation is required for the 100 year (plus 40% climate change) using the discharge method. This will then be discharged at a controlled rate of 6.3/s into the watercourse to the south east of the application site, provided infiltration is not a suitable method of surface water discharge. It is expected that if infiltration is viable, the volume of attenuation will reduce.
- 4.1.16 Where possible the ground should be re-profiled to add a slight gradient from west to east so that surface water drains naturally towards the point of discharge. Given that the site is flat, this will not require unfeasible ground work.
- 4.1.17 Attenuation is proposed in two main features: a dry basin in north eastern corner of the development close to the point of discharge and in crated attenuation under the LEAP/LAP.
- 4.1.18 The maintenance, management and responsibility of the drainage system, as well as the culvert will lie with the site owner.
- 4.1.19 The indicative surface water drainage strategy is shown in Appendix C.



5.0 Foul Drainage Strategy

5.1 Local Public Sewers

- 5.1.1 Southern Water asset maps indicate that there are no foul sewers within the application boundary.
- 5.1.2 There are two possible locations where a foul connection could be made; these are prior to the Bilsham Road pumping station (at approximately MH9601 from the SW plans) or close to the access location further north on Bilsham Road (at approximately MH0702). Both of these connection points will be subject to capacity confirmation from Southern Water.
- 5.1.3 A connection to the foul sewer upstream of the Bilsham Road pumping station may be possible via a gravity connection to Manhole 9601. However, to achieve this; a requisition through numerous properties will be required and confirmation of available capacity from Southern Water will be required. There may be capacity issues at this pumping station.
- 5.1.4 A connection to the foul sewer along the proposed access will be possible without a requisition; however, due to the level of the existing assets and the site levels, a gravity connection is not likely to be a feasible option. A foul pumping station can be provided at the low point of the site, near the southern boundary which can pump foul flows into the foul sewer at approximately MH0702, should capacity exist.
- 5.1.5 Points 5.1.3 and 5.1.4 demonstrate that methods of disposal of foul sewerage will be possible at the application site. Southern Water are obligated to accept foul flows from new development, however, they may require upgrade works to their network funded by the developer to facilitate this.
- 5.1.6 The development will contain 51 residential dwellings and based on British Flows and Loads 4 a foul rate of 2.36l/s has been calculated.



6.0 Summary and Conclusion

6.1 Summary

WYG were commissioned by Sundial Planning to produce a Flood Risk Assessment (FRA) and Drainage Strategy to accompany a planning application for the proposed development at Cinders Lane, Yapton.

6.2 Conclusions

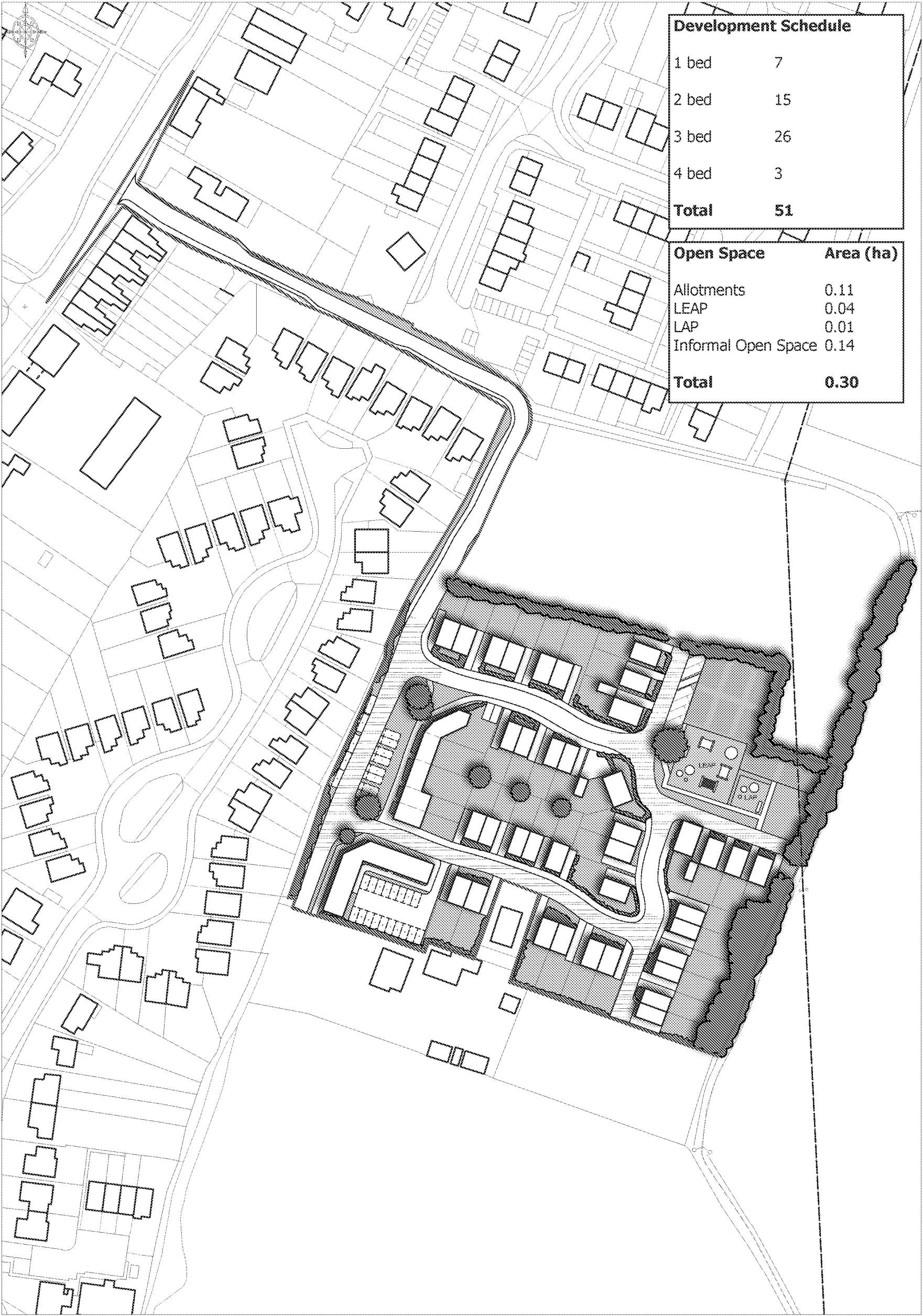
The conclusions of this Flood Risk Assessment (FRA) and Drainage Strategy are as follows:

- ✧ The Applicant is proposing to erect fifty one new dwellings at a site covering approximately 1.75 hectares.
- ✧ Groundwater monitoring and infiltration testing to BRE365 should be carried out to determine whether infiltration drainage is a viable option of surface water disposal. Should infiltration drainage be feasible, it is the preferred method of discharge.
- ✧ To provide betterment on Greenfield conditions, it is proposed to limit discharge to an existing drainage ditch to the east of the site at the Qbar rate for events up to the Q100 + 40% climate change event, should infiltration drainage prove unviable.
- ✧ A culvert will be placed to convey surface water from the backfilled drainage ditch to the west of the application site to the drainage ditch to the east of the application site.
- ✧ Foul drainage will discharge to the Southern Water network, subject to the provision of capacity via one of the two methods described in Section 5.
- ✧ This FRA demonstrates that the site will not increase the risk of flooding elsewhere, and indeed will reduce the risk of flooding in the vicinity of the site by controlled discharge being at the Qbar rate for events up to and including the Q100 + 40% climate change event. This will be possible by providing approximately 699m³ of attenuation or a suitable infiltration system if possible.

Cinders Lane, Yapton



Figures



Land at Cinders Lane, Yapton

CONCEPTUAL LAYOUT

DWG N^o: HP16098 003
Conceptual Layout 003a

Drawn: MA

Checked: JH

Scale: 1:1250 @ A3

Date: 12/12/2016

Notes:

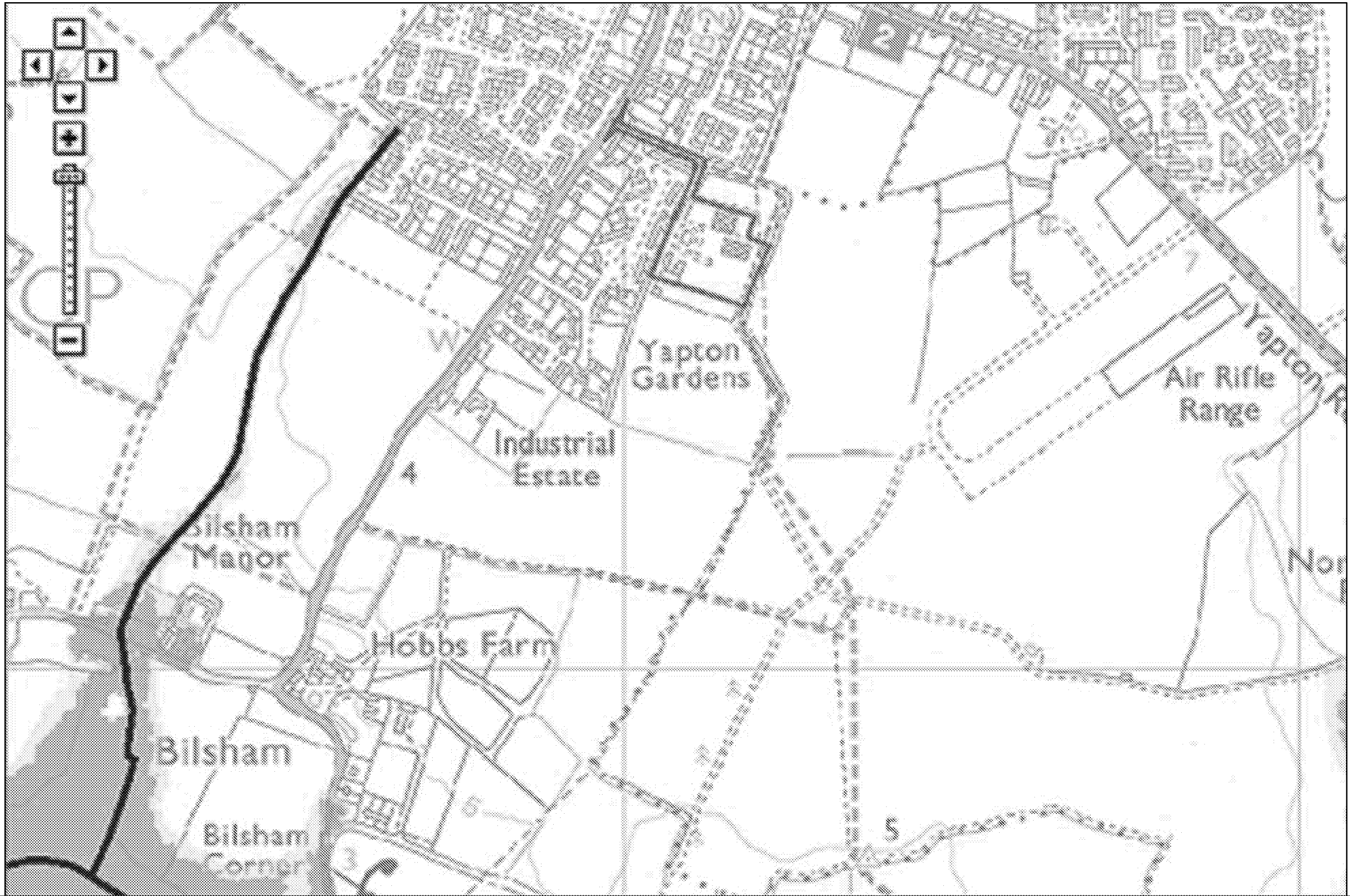
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This drawing is for illustrative purposes only and is subject to detailed topographical survey and site investigation, including ground conditions, contaminants, drainage, design and planning/ density regulation. The feasibility of the design shown, therefore, must not be relied upon. It has not been considered in respect of the CDM.

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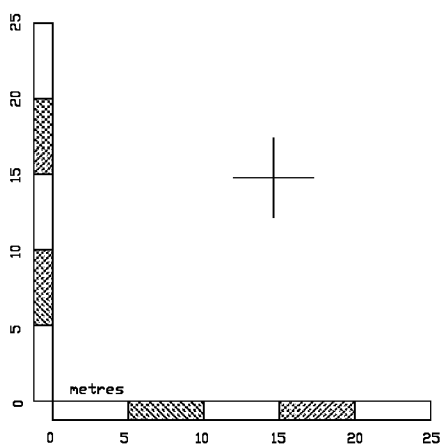
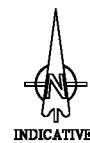
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					DRAWN:	DRAWING NUMBER:
					PG	FIGURE 2
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						DRAWN:	PG	CHECKED:	MM	DATE:	20.12.16	SCALES:	NTS	SHEET SIZE:	A3	DRAWING NUMBER:	FIGURE 3		REVISION:	-

- KEY:
- bt British Telecom
 - cb Control Box
 - cl Cover Level
 - ctv Cable Television
 - dk Drop Kerb
 - el Electric
 - ep Electricity Pole
 - fn Fire Hydrant
 - gl Gully
 - gsv Gas Stop Valve
 - ht Height
 - ic Inspection Cover
 - il Invert Level
 - lp Lamp Post
 - mk Marker
 - o/h Overhead
 - pb Post Box
 - pkg Plan Crossing
 - nd Name Plate
 - rs Road Sign
 - sv Stop Valve
 - tb Telephone Box
 - tl Traffic Light
 - tt Top of Tree
 - th Threshold
 - tw Top of Wall
 - uti Unable to Lift
 - vp Vent Pipe
 - wm Water Meter
 - wsv Water Stop Valve



NOTES:
LEVELS RELATE TO O.S.DATUM
TREE SPECIES SHOULD BE VERIFIED WHERE OF
CRITICAL IMPORTANCE
THE ARCHITECT SHOULD SATISFY HIMSELF THAT ALL TREES
LIKELY TO AFFECT HIS DESIGN HAVE BEEN SHOWN

P STUBBINGTON LAND SURVEYS LTD

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CLIENT: - BUILDING POTENTIAL
CONTRACT: - CINDERS LANE
YAPTON
TITLE: - EXISTING SURVEY
SCALE: - 1: 500 @A1
DRAWING NO. 4779/ 03
DATE: - NOVEMBER 2016
SURVEYOR: - PS



Surface
Geology

3D
Models



Borehole
Scans



Earthquake
Timeline

Surface Geology

- ☐ Superficial only
- ☐ Bedrock only
- ☒ Bedrock and Superficial

Visible geology:
1:50 000 scale

Geology
Key

[More on digital geology](#)

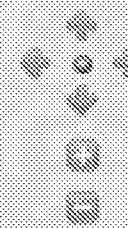
☒ Bedrock geology ☐ Superficial deposits ✕

1:50 000 scale bedrock geology description:
Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation. Sedimentary Bedrock formed approximately 71 to 94 million years ago in the Cretaceous Period. Local environment previously dominated by warm chalk seas.

Setting: warm chalk seas. These rocks were formed in warm shallow 'Chalk' shelf seas with little sediment input from land. They often consist of a calcareous ooze of the microscopic remains of plankton, especially the disc shaped calcite plates or coccoliths that make up the spherical coccolithophores.

[Further details](#) [What is Bedrock Geology?](#)

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Go to
Location

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Basemap

100% 0%

Geology Transparency

Grid Ref: 501500, 102013



REV	DETAILS	DRAWN	CHECKED	DATE	PROJECT: Cinders Lane, Yapton				CLIENT: Sundial Planning			
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					DRAWN: PG	CHECKED: MM	DATE: 20.12.16	SCALE: NTS	SHEET SIZE: A3	DRAWING NUMBER: FIGURE 5	REVISION: -	



REV	DETAILS	DRAWN	CHECKED	DATE		PROJECT: Cinders Lane, Yapton					CLIENT: Sundial Planning	
						DRAWING TITLE: SFRA Historical Flood Map					WYG Transport ***** part of WYG group 5th Floor, Longcross Court 47 Newport Road, Cardiff, CF24 0AD t: 029 2082 9200 f: 029 2045 5321 e: transport.cardiff@wyg.com wyg	
						DRAWN: PG	CHECKED: MM	DATE: 20.12.16	SCALES: NTS	SHEET SIZE: A3	DRAWING NUMBER: FIGURE 6	REVISION: -

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Cinders Lane, Yapton



Appendices

Cinders Lane, Yapton



Appendix A – Sewer Records

102963



102386

O.S. REF. SU9802NW		Drawn by: yadavs	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. WATERWORKS, SEWER, PIPES AND CONDUITS OF SOUTHERN WATER SERVICES LIMITED WATERWORKS, SEWER, PIPES AND CONDUITS MAY INCLUDE BURIED ADJACENT PROPERTY
Scale: 1:2500			
Title: 229785_Cinders Lane, Yapton, B		Date: 10/01/2017	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.

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SEWER RECORDS PAGE 2 OF 2

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Drawn by: yadavsa	
Title: 229785_Cinders Lane, Yapton, B	
Date: 10/01/2017	



Appendix B – Calculations

WYG		Page 1
5th Floor, Longcross Court 47 Newport Road Cardiff CF24 0AD		
Date 19/12/2016 10:21 File	Designed by paul.graham Checked by	
Micro Drainage		Source Control 2015.1
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©1982-2015 XP Solutions		



Variables

Results

Design

Overview 2D

Overview 3D

Vt

Quick Storage Estimate

FSR Rainfall

Return Period

Regi

Ma

M5-60

Ratio R

▼

100

England and Wal

▼

19.000

0.350

Cv (Summer)

Cv (Winter)

Impermeable Area

Maximum Allowable Discharge (l/s)

Infiltration Coefficient

Safety Factor

Climate Change (%)

0.750

0.840

0.910

6.3

0.00000

2.0

40

Analyse

OK

Cancel

Help

Enter Climate Change between -100 and 600



Variables

Results

Design

Overview 2D

Overview 3D

Vt

Quick Storage Estimate

Results

Global Variables require approximate storage of between 545 m³ and 776 m³.

These values are estimates only and should not be used for design purposes.

Analyse

OK

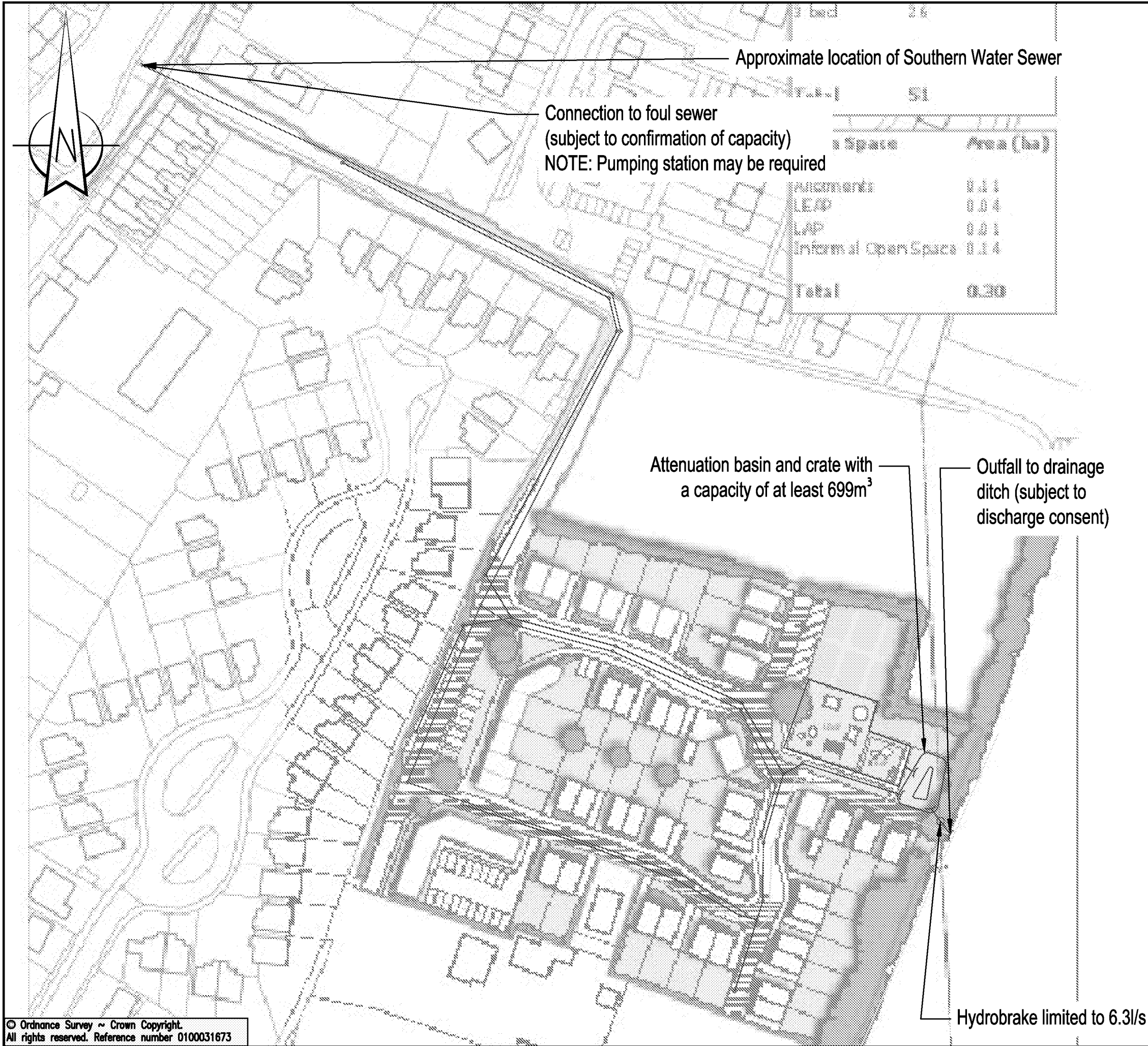
Cancel

Help

Enter Climate Change between -100 and 600



Appendix C – Drainage Strategy



- Land Drainage Culvert
- Proposed Surface Water Sewer
- Proposed Foul Sewer
- Existing Drainage Ditch

REV	DETAILS	DRAWN	CHECKED	DATE
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Sundial Planning

PROJECT:
Cinders Lane, Yapton

DRAWING TITLE:
Indicative Drainage Strategy

SCALES:	1:1000	SHEET SIZE:	A3
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Cinders Lane, Yapton



Appendix D – Photographs





