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LAND EAST OF SHRIPNEY ROAD, SHRIPNEY FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY



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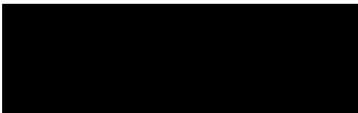
**LAND EAST OF SHRIPNEY ROAD, SHRIPNEY
FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY**

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1. INTRODUCTION

- 1.0.1 Ramboll UK Limited (Ramboll) was appointed by Hanbury (PM) Ltd on behalf of Ashmarden Ltd Retirement Benefit Scheme ('client') to undertake a Flood Risk Assessment (FRA) and develop an outline surface water and outline foul water drainage design strategy for a proposed residential development at Land East of Shripney Road, Shripney, West Sussex.
- 1.0.2 The key sources of information used to prepare this report include:
- i. Topographical site survey information provided by Siteline Geomatic Surveyors (Drawing No. 657SH02, May 2018);
 - ii. Site Investigation information provided by Ashdown Site Investigation Ltd (Reference: R18-13442-4, April 2019);
 - iii. Proposed site layout plans provided by Davies Landscape Architects;
 - iv. CIRIA – C753 The SuDS Manual (2015);
 - v. The British Geological Survey (BGS) maps;
 - vi. National Planning Policy Framework (NPPF) (updated February 2019);
 - vii. National Planning Practice Guidance (NPPG): Flood Risk and Coastal Change (April 2015);
 - viii. Sewers for Adoption: A Design and Construction Guide for Developers (7th Edition, August 2012);
 - ix. Arun District Council level 1 Strategic Flood Risk Assessment (August 2016);
 - x. West Sussex County Council Surface Water Management Guidance; and
 - xi. The Environment Agency's (EA) online database of indicative floodplain and hydrogeological maps and detailed flood modelling data.
- 1.0.3 Ramboll cannot accept liability for the accuracy or otherwise of any information derived from third party sources.
- 1.1 Scope and Objectives**
- 1.1.1 This document considers the risks of various sources of flooding to the site and the consequent risk of flooding to downstream receptors (such as people, property, habitats, infrastructure and statutory sites) from the proposed development as a result of surface water runoff. A comparison is made between the current situation and the proposed future development.
- 1.1.2 This FRA has been carried out in accordance with the National Planning Policy Framework (NPPF)¹. It is to be used to assist the Local Planning Authority (LPA) and EA, when considering the flooding issues of the proposed development, as part of a planning application. An FRA is required as parts of the site have been identified to be at potential risk of flooding.
- 1.1.3 This report provides the following information:
- i. An assessment of the flood risk at the site, based upon regulatory authority flood data and the flood maps provided by the EA, and Strategic Flood Risk Assessment (SFRA);
 - ii. An assessment of the suitability of the site for the intended land use in accordance with national policy (the Sequential and Exception Tests);
 - iii. An assessment of the impact of the new development in terms of surface water runoff and foul water;
 - iv. Proposals for measures to mitigate the generation of surface water runoff water as well as foul water generated by the proposed development; and
 - v. Proposals to mitigate any residual flood risks to the development (if any).

2. SITE CONTEXT

2.1 Application Site Description

- 2.1.1 The site is located within Shripney, north of Bognor Regis, UK, centred at National Grid reference 493891E, 102136N. It is approximately 2.1 hectares (ha) in area and lies adjacent to A29, which runs along the western boundary of the site. Aside from an unmarked access track leading into the site from the A29 and a small field shelter, the site comprises entirely undeveloped grassland, with hedgerows and trees forming the boundaries of the site. A public sewer pumping station and electricity substation are located immediately northwest of the site. A drainage watercourse is situated in the western part of the site, parallel to the site boundary and a second watercourse is located immediately east of the site in the form of a roadside ditch.
- 2.1.2 The site location plan is provided in Figure 1, at the rear of this report.

2.2 Site Topography

- 2.2.1 A topographic survey was undertaken in May 2018 by Siteline Geomatic Surveyors (Drawing No. 657SH02). Site ground levels vary between approximately 1.9 mAOD and 3.5 mAOD. Although there is an overall fall broadly across the site towards the south, there is a drainage watercourse situated along part of the western site boundary and levels in the western part of the site fall towards the watercourse, varying from approximately 1.9 mAOD along parts of the western site boundary, immediately west of the watercourse, to 2.5 mAOD to the east of the watercourse.

2.3 Geological Setting

- 2.3.1 The British Geological Survey (BGS) map of the area (1:50,000 scale map series) indicates the site is underlain by River Terrace Deposits (RTD) (typically sands, silts and clays), which in turn are underlain by the Lewes Nodular Chalk Formation of the White Chalk Subgroup.
- 2.3.2 There are no BGS historic borehole records situated within the site. The closest BGS borehole record to the site (BGS Reference SU905W74) is located approximately 100 m northwest of the site, at National Grid Reference 493690E, 102550N. This confirms the presence of sandy clay with chalk beneath. Groundwater was encountered within the borehole at 510 m below ground level (bgl).
- 2.3.3 In addition to BGS records, Ashdown Site Investigation Ltd have provided details of two borehole logs of 5m depth within the site (dated December 2018) and completing groundwater monitoring for these two logs between December 2018 and April 2019 (Site Reference R18-13442-4). Both borehole logs confirmed the presence of sandy clay on site up to depths of 3 m and 3.5 mbgl underlain by chalk. The groundwater monitoring results shown groundwater levels to vary between 0.8m and 1.85 mbgl for one borehole and 0.6m and 1.25 mbgl for the second. At the time of writing further groundwater monitoring is currently in process at the site.

2.4 Hydrological Settings

- 2.4.1 A drainage watercourse is located along the south-eastern site boundary. This flows in a broadly south east direction to join with Lidsey Rife, a main river, approximately 1 km southeast of the site.
- 2.4.2 A second drainage watercourse is located along part of the western site boundary. This is understood to pass out of the site and beneath the A29 via a culvert and flow in a broadly southwest direction to join with Aldingbourne Rife, also a main river, approximately 850 m southwest of the site. Lidsey Rife joins with Aldingbourne Rife approximately 1.85 m south of the site and flows into the English Channel a further 1.2 km downstream.

2.5 Hydrogeological Settings

- 2.5.1 The EA website shows aquifers and provides designations which are in line with the Water Framework Directive and are based on maps produced by the BGS. Groundwater bodies have been identified in both the superficial strata and in the bedrock beneath the site. The River Terrace Deposits are classified as 'Secondary A aquifer' (i.e. permeable strata 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). The Lewes Nodular Chalk Formation is classified as a 'Principal Aquifer' (i.e. rock strata of rock or drift deposits that have high intergranular and/or fracture permeability meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale).
- 2.5.2 The EA has developed Groundwater Source Protection Zones (SPZs) to assist in the assessment of risk to groundwater supplies taken from an abstraction point. The site does not lie within a Groundwater Source Protection Zone; however, the aquifers beneath the site are classified as having 'Major Aquifer Intermediate' and (in the southern portion of the site) 'Major Aquifer High' vulnerability classifications.

2.6 Existing Drainage Regime and Surface Water Runoff

- 2.6.1 As discussed in Section 2.1, the site comprises almost entirely undeveloped greenfield land. Greenfield runoff rates for the site have been calculated for the planning application area (2.1 ha) using the Interim Code of Practice for Sustainable Drainage Systems (ICP SuDS) method in MicroDrainage 2018. The results of the calculations are shown in Table 2.1 below. The outputs from MicroDrainage are provided in Appendix B, at the rear of this report.

Table 2.1: Greenfield Runoff Rate Calculations

Return Period (years)	1-in-1	1-in-2	1-in-10	1-in-30	1-in-100
Greenfield runoff rates (l/s)	6.5	6.8	12.4	17.4	24.5

2.7 Existing Flood Risk

Fluvial and Tidal Flood Risk

- 2.7.1 The flood risk zones shown on the flood maps for planning are defined in Table 2 of the Technical Guidance to the NPPF and these are:

Zone 1: Low Probability

According to the NPPF, land in this zone is considered to have less than 1-in-1000 annual probability of river or sea flooding in any year. This is < 0.1%.

Zone 2: Medium Probability

According to the NPPF, land in this zone is considered to have between a 1-in-100 and 1-in-1000 annual probability of river flooding in any year (between 1% and 0.1%) or between a 1-in-200 and 1-in-1000 annual probability of sea flooding in any year (0.5%-0.1%).

Zone 3a: High Probability

According to the NPPF, land in this zone is considered to have a 1-in-100 or greater annual probability of river flooding in any year (>1%) or a 1-in-200 or greater annual probability of flooding from the sea in any year (>0.5%).

Zone 3b: The Functional Floodplain

According to the NPPF, land in this zone is used for water flow or storage in times of flood. This flood zone should be identified by a Strategic Flood Risk Assessment (SFRA). It is considered to have a 1-in-20 or greater chance of river flooding in any year which is > 5%. Another probability however can also be agreed between the LPA and the EA.

- 2.7.2 The EA flood map for planning shows the vast majority of the site to be situated within Flood Zone 1, with a very small area along the western site boundary situated within Flood Zone 2 and a very small area along the south eastern site boundary within Flood Zone 3. This pattern of flooding follows the topography of the site, with flooding in the very low ground levels along the south eastern site boundary and along the western site boundary where the drainage watercourse is location, prior to ground levels rising steeply immediately east of the watercourse.
- 2.7.3 The EA has also provided detailed flood modelling data, including flood levels for three node points across the site and corresponding modelling flood outlines, for both tidal and fluvial flood events. The EA flood modelling data is included in Appendix B, at the rear of this report.
- 2.7.4 Data is provided for both the present-day scenario and when taking into account the predicted effects of climate change. For fluvial flood events, scenarios are provided using allowances for increases in rainfall intensity due to climate change of 35%, 45% and 105%. For tidal flood events, scenarios are provided for both the 2070 and the year 2115.
- 2.7.5 The EA also confirm that flood defences are present in the area in the form of high ground. Due to the permanent nature of the defences. i.e. the level of defence provided is not able to be adjusted, such as with a sluice gate, the modelled defended scenario is considered to be appropriate when assessing flood risk to the site.
- 2.7.6 For the tidal defended scenario, there is no flooding at all within or adjacent to the site, even when accounting for all climate change scenarios after consideration of the presence of existing flood defences.
- 2.7.7 Only for the undefended tidal flood risk scenario is there predicted to be a risk of flooding at the site. Although this is not considered to be a realistic scenario, and is not, therefore, used in the detailed assessment of flood risk to the proposed development, the Local Planning Authority has indicated that the climate change adjusted, undefended, tidal flood risk scenario should be used to inform a Sequential Test of the proposed development.
- 2.7.8 For the fluvial defended scenario, in line with the indicative flood maps for planning and site topography, there is flooding shown at the very perimeters of the site when taking into account all climate change scenarios for the 1-in-100 year flood event and also the 1-in-1000 year flood event. This occurs along part of the western site boundary and part of the south eastern site boundary. The maximum water depth anticipated is 0.56 m for the extreme +105% climate change scenario.
- 2.7.9 In conclusion, the vast majority of the site is at low risk of tidal and fluvial flooding, with very small parts of the site borders at medium to high risk of fluvial flooding.

Surface Water and Sewer Drainage Flood Risk

- 2.7.10 The EA's indicative surface water flood mapping, available via the online long-term flood risk assessment service, identifies areas in England and Wales at potential risk of surface water (pluvial) flooding. The surface water flood maps define flood risk as follows:

High Risk

Considered to have a greater than 1-in-30 annual probability of surface water flooding in any year (>3.3%).

Medium Risk

Considered to have between a 1-in-30 and 1-in-100 annual probability of surface water flooding in any year (between 3.3% and 1%).

Low Risk

Considered to have between a 1-in-100 and 1-in-1000 annual probability of surface water flooding in any year (between 1% and 0.1%).

Very Low Risk

Considered to have a less than 1-in-1000 annual probability surface water flooding in any year (>0.1%).

- 2.7.11 The EA surface water mapping shows the vast majority of the site to have a very low susceptibility. Very small parts of the western and south eastern site boundaries are shown to range from low-high susceptibility. These correspond largely with areas of lower ground level adjacent to drainage watercourses present in these areas and follow the flooding pattern shown on the tidal and fluvial mapping. Therefore, overall surface water flood risk is considered to be low, with small areas along the site boundary susceptible to ponding.

Groundwater Flood Risk

- 2.7.12 Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata. A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land. Groundwater floods may emerge from either point or diffuse locations. They tend to be long in duration developing over weeks or months and prevailing for days or weeks.
- 2.7.13 There are no known records of groundwater flooding or groundwater flood risk susceptibility at the site. However, as discussed in Section 2.3, groundwater levels measured across the site have been recorded to be as high as 0.6 mbgl. Although groundwater monitoring is currently on going and it is considered unlikely these levels would rise above ground level within the site other than within the watercourses, given these high groundwater levels, the risk of flooding from groundwater is considered to be low-medium.

Artificial Water Bodies

- 2.7.14 The EA's indicative reservoir flood risk maps show that the site is not at risk of reservoir flooding. There are no known artificial waterbodies within or adjacent to the site; therefore flood risk to the site from artificial sources is considered to be low.

Flood Risk Summary

2.7.15 A summary of the existing risk of flooding from all sources is provided in Table 2.2.

Table 2.2: Flooding Sources at the Proposed Development Site

Sources of Flooding	High	Medium	Low	Comments
Tidal/fluviat	x	x	x	The vast majority of the site is at low risk of fluvial flooding, with very small parts of the site borders at medium-high risk of fluvial flooding. The site is protected against tidal flooding by defences in the form of raised ground.
Surface water and drainage flood risk	x	x	x	Overall surface water flood risk is considered to be low, with small areas along the site boundary susceptible to ponding.
Groundwater		x	x	No known historic groundwater flooding or susceptibility, however groundwater levels are known to be high.
Artificial Sources			x	Not at risk of reservoir flooding, no known artificial sources

3. ASSESSMENT OF NEW DEVELOPMENT

3.1 Development Proposal

3.1.1 Outline planning permission is sought for a new residential development at the site comprising 46 new residential properties, along with access via the A29, resident parking provision and associated soft landscaping. The proposed site layout plan is shown in Figure 2, at the rear of this report.

3.2 Flood Risk Vulnerability

3.2.1 According to Table 2 (Flood Risk Vulnerability Classification) in the Planning Practice Guidance to NPPF, buildings used for residential purposes are classified as "More Vulnerable".

3.3 Sequential Test

The Sequential Test (ST) aims to steer development to areas with the lowest probability of flooding. Arun District Council has requested that a ST be carried out for land within "a circle with a radius of approximately 2.13km, from the centre of the site north to the railway line", considering all the other available sites for this type of development.

- 3.3.1 A ST report has been prepared by Planning Consultants Luken Beck have and is presented in Appendix D. The following sources were used to provide evidence of the other available sites within the search area.
- The Arun District Council Housing and Economic Land Availability Assessment (HELAA)
 - The Arun Local Plan & Proposals Map (2018)
 - Rightmove search for Land & Commercial Property with 3 miles of Shripney
- 3.3.2 The Arun District Council Strategic Flood Risk Assessment (SFRA) included hydraulic modelling which was undertaken to provide updated climate change flood mapping in the Arun District for Flood Zone 3a (presented in Appendix D). This mapping, included in Figure 3 of this report, has been assess the flood risk for the potential alternative sites under consideration within the ST report.

- 3.3.3 The ST initially discounted sites that did not meet the following requirements.
- Not have a policy designation for an alternative land use;
 - Identified as either 'Deliverable' or 'Developable' in the Arun District Council HELAA (2018);
 - Located outside of Flood Zone 2 & 3;
 - Not identified in a SFRA future climate change flood zone area;
 - Over 1 hectare in size; and
 - Deliver a comparable number of housing units (40) and housing types.
- 3.3.4 Following the initial assessment, two sites were identified as meeting all of the above criteria and were subjected to a finer grained assessment to determine if they were sequentially preferable locations for development. A summary of the findings of this assessment is provided below.
- 3.3.5 A site off Lees Yard, Lidsey Road, was subject of a refused planning application for 30 dwellings on the 13th March 2019 (Ref: AL/57/18/OUT). The reason for refusal stipulates that this was due to the impact on the landscape character of the defined countryside and a lack of sustainable transport improvements. Frequent reference is made to highway capacity in the Officer's report as part of the planning Application Determination, as well as the need to provide s106 contributions to the A29 realignment. Therefore, this site cannot be delivered before the progression of the aforementioned strategic infrastructure and, consequently, the site is not considered to be 'deliverable' at present.
- 3.3.6 Land at Wings Nursery, Lidsey Road, is identified in the HELAA as a 'deliverable site' and is located adjacent to the settlement boundary of Aldingbourne. This is a distinct settlement from Shripney and redevelopment of the site will not meet the housing needs, particularly the affordable housing needs, of individuals looking for accommodation in this settlement. Outline Planning Permission was granted on the 3rd October 2019 for 55 units (Ref: AL/32/19/OUT) on this land. As a consented site this is now a housing commitment and would not contribute to addressing the shortfall of housing land in Arun District and, as such, the site is discounted on the grounds of being not available.
- 3.3.7 In addition to the above two sites, Arun District Council requested further assessment of two further sites identified as "deliverable". A summary of the findings of this assessment is provided below.
- 3.3.8 Land at Bridge Cottage & The Old Cottage (18AL4), is identified in the HELAA as a 'deliverable site' and is located adjacent to Lidsey. This is a distinct settlement from Shripney and redevelopment of the site will not meet the housing needs, particularly the affordable housing needs, of individuals looking for accommodation in this settlement. The HELAA advises there is the potential for groundwater flooding at the site and protected trees are present. The site capacity also falls below the 40 unit threshold, is part of the Barnham / Eastergate / Westergate Strategic Housing Allocation and close to the A29 realignment scheme. As such is it discounted on the grounds of being neither available or deliverable.
- 3.3.9 Ryefield Farm & Woodgate Centre, Oaktree Lane (WA6) is identified in the HELAA as a 'deliverable site' and located adjacent to Adlingbourne. This is a distinct settlement from Shripney and redevelopment of the site will not meet the housing needs, particularly the affordable housing needs, of individuals looking for accommodation in this settlement, or areas adjacent in Bognor Regis and Bersted. The HELAA advises there is the potential for groundwater flooding at the site, that protected trees are present and the site is in an archaeological notification area. Furthermore, parts of the site are located within Flood Zones 2 and 3. The site is part of the Barnham / Eastergate / Westergate Strategic Housing Allocation and close to the A29 realignment scheme. As such is it discounted on the grounds of being neither available, deliverable or sequentially preferable.
- 3.3.10 On the basis of the above, the proposed development is considered to pass the Sequential Test.

3.4 Exception Test

- 3.4.1 Table 3 (Flood Risk Vulnerability and Flood Zone Compatibility) in the Planning Practice Guidance to NPPF, states that "More Vulnerable" developments are appropriate to locate in Flood Zones 1 and 2,

however for residential development to take place within Flood Zone 3a, the Exception Test is to be applied to assess development suitability. Given no residential properties are proposed within Flood Zone 3a, the Sequential Test is deemed to be passed in this instance, however, given parts of the site fall within Flood Zone 3a, for completeness, the Exception Test requirements are detailed below.

3.4.2 According to the NPPF Planning Practice Guidance to, in order for the Exception Test to be passed the development must meet the following criteria:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and
- a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.4.3 On the basis that the proposed development will provide needed residential properties within Shripney, the first criteria is deemed to be passed. Site occupant safety is discussed in the following section.

- 3.4.4 The parts of the site at risk of flooding do not impact upon any of the proposed residential properties. There are no new buildings proposed in areas at risk of flooding and, aside from the site access road, parts of the site boundary that fall in areas at risk of fluvial flooding are to remain as soft landscaping in line with the existing topography. The site access road is also to be located where an existing unmade access track is already present and again constructed in line with existing topography to tie in with ground levels along the A29; therefore there will be no loss of floodplain as a result of the proposed development.
- 3.4.5 An existing unmade track into the site from the A29 is to be resurfaced to provide vehicular access/ egress to the site. The EA provide a flood level of 2.25 mAOD for the 1-in-100 year fluvial flood event including allowances for climate change of 45% at the node point within the site nearest to this location. Ground levels at this location vary between approximately 2.1 m and 2.4 mAOD, therefore it is likely there may be shallow flood water present at the main entrance to the site during extreme flood events, with deeper levels anticipated along the A29 itself, where ground levels are lower. However, the site is able to be accessed via foot onto the A29 further north along the western site boundary, to the north of the drainage watercourse, where ground levels are higher and no flooding is anticipated either within the site, along the site boundary or along the A29; therefore safe access/ egress to/ from the site remains present even during extreme flood events.
- 3.4.6 On this basis, the second criteria of the Exception Test is also deemed to be passed and the proposed development will be safe to site occupants during a flood event.
- 3.4.7 Despite the overall low flood risk to the site, given areas immediately adjacent to the site are at high risk of flooding, it is recommended that site residents sign up to the EA's Flood Warning Scheme to make sure that they receive advanced notice of anticipated flood events.

3.5 Surface Water Runoff

- 3.5.1 As the site currently comprises almost entirely greenfield land, the proposed development will result in an increase in impermeable area within the site. Furthermore, The NPPF identifies that rainfall intensities will increase in the future as a result of climate change (CC), thereby increasing surface water runoff rates and volumes. The updated EA CC allowance guidance (2016) shows the recommended national precautionary sensitivity ranges for various parameters including peak rainfall intensity. The design life of the new development is considered to be 100 years, therefore an allowance for increases in rainfall intensity of 40% due to the predicted climate change has been applied throughout the surface water drainage strategy development.
- 3.5.2 Table 3.1 summarises the predicted change in peak flows as a result of the development considering a 40% allowance for the predicted effects of climate change. The critical storm duration for runoff is 15 minutes. Calculations are provided in Appendix B, at the rear of this report. Post-development impermeable area percentage used in the runoff calculations was set to 80% of the total site area.

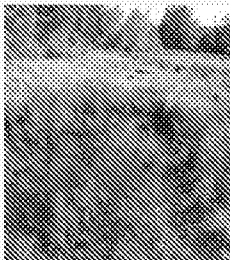
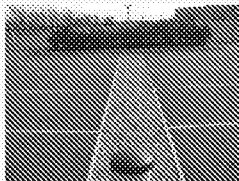
Table 3.1: Surface Water Runoff Rate Calculations

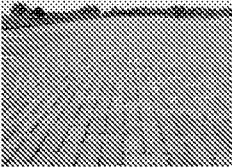
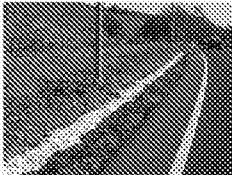
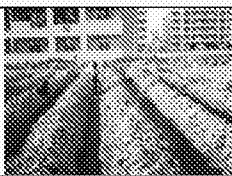
Return Period (years)	1-in-1	1-in-2	1-in-10	1-in-30	1-in-100
Pre-development runoff rates	4.4	5.7	8.8	10.8	14.0
Post-development runoff rates + 40% CC (l/s)	202.8	259.3	399.7	494.5	647.2

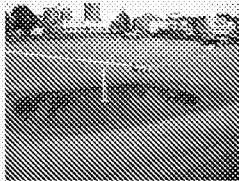
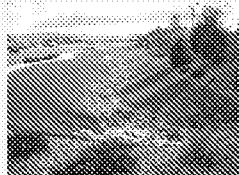
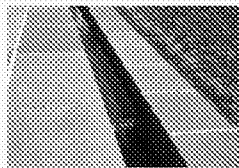
3.6 Assessment of Attenuation Options

- 3.6.1 In line with West Sussex County Council guidance as the Lead Local Flood Authority (LLFA), the use of SuDS is required to be assessed for the sustainable management of surface water runoff from a new development. All SuDS options available for attenuating surface water runoff on site are discussed in Table 3.2 below.

Table 3.2: Sustainable Drainage Options

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
Retention	Balancing pond		Provides both storm water attenuation and treatment. Runoff from each rain event is detained and treated in the pool. The retention time promotes pollutant removal through sedimentation	Good removal of pollutants can be used where groundwater is vulnerable, good community acceptability, high ecological, and amenity benefits	No reduction in runoff volume, land take may limit use in high density sites	 Limited space available within the proposed development site
	Sub-surface storage		Oversized pipes, tank systems and modular geocellular systems that can be used to create a below ground storage structure	Modular and flexible, dual usage (infiltration/storage, high void ratios), can be installed beneath trafficked and soft landscaped areas	No water quality treatment	 Sub-surface storage is appropriate for use though consideration needs to be given to potentially high groundwater levels
Wetland	Shallow wetland		Wetlands provide stormwater attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands detain flows for an extended period to allow sediments to settle and to remove contaminants. They can provide significant ecological benefits	Good pollutant removal and if lined can be used where groundwater is vulnerable. Good community acceptability, ecological and amenity benefits	Land take is high, requires baseflow, little reduction in runoff volume, not suitable for steep sites	 Limited space available within the proposed development site
	Extended detention wetland					
	Pond wetland					
	Pocket wetland					
	Submerged gravel wetland					
	Wetland channel					
Infiltration	Infiltration trench		Surface water runoff can be discharged directly to ground for infiltration by soakaways, basins, or trenches. A prerequisite is that both groundwater and ground conditions are appropriate to	Reduces the volume of runoff, effective at pollutant removal, contributes to groundwater recharge, simple and cost-effective, easy performance observation	Requires appropriate pre-treatment, basins require a large flat area, offset from foundations	 Limited permeability due to underlying clay geology and high groundwater levels
	Infiltration basin					
	Soakaway					

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
Filtration			receive the quality and quantity of water generated			
	Porous paving		Block or porous paving allows runoff to infiltrate through to sub base layer	Reduces the volume of runoff and if designed for infiltration contributes towards groundwater recharge. Easy to install and retrofit. Simple to manage. If lined can be used where groundwater is sensitive	Not suitable for heavily trafficked areas or adoptable roads. Requires regular sweeping to prevent clogging with dirt	Permeable paving could be utilised on the site across areas of hard surfacing. A tanked system is considered most suitable due to potentially high groundwater levels.
	Permeable paving		Water can then be infiltrated into ground or conveyed into storage or drainage systems			
	Surface sand filter		Structures designed to treat surface water runoff through filtration using a sand bed filter medium. The filters can be designed with or without infiltration.	Flexibility of design, efficient in removing pollutants, suitable for retrofits and in tightly constrained urban locations	Not for high sediment content, detention times can support algae growth, minimum hydraulic head of 1.2 m required, possible odour problems, high capital and maintenance cost	There is no requirement for high pollution reduction at the site
	Sub-surface sand filter		Temporary storage of runoff is achieved through ponding above the filter layer. They are used where particularly high pollutant removal is required			
Filtration	Perimeter sand filter		Vegetated strips of land designed to accept runoff as overland sheet flow between a hard-surfaced area and a receiving system	Landscaping features, effective in removing pollutants, flexible layout to fit into landscape, suited for highly impervious areas, good retrofit capability, effective pre-treatment option	Requires landscaping and management, large land requirement, not suitable for steep sites; no significant attenuation or reduction of flows	Limited space available space within the proposed development site
	Bioretention /filter swale		Shallow excavations filled with rubble or stone that create temporary subsurface	Hydraulic benefits achieved with filter trenches, trenches can be incorporated into site	High clogging potential without effective pre-treatment, limited to small	This may be a feasible option.

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
			storage for filtration of storm water runoff Receive lateral inflow from an adjacent impermeable surface	landscaping and fit well beside roads and car parks	catchments, high cost of replacing filter material	
Detention	Detention basin		Surface storage basins that provide flow control through attenuation. Normally dry and in certain situations the land may also function as a recreational facility.	Cater for a wide range of rainfall events, can be used where groundwater is vulnerable, potential for dual land use, easy to maintain	Land take, little reduction in runoff volume, detention depths constrained by levels	 Limited space available space within the proposed development site.
	Enhanced dry swale		Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate.	Incorporate into landscaping, good removal of pollutants, reduces runoff rates and volumes, low cost	Not suitable for steep areas, significant land take, not suitable in areas with roadside parking	 Limited space available space within the proposed development site.
	Enhanced wet swale					
Conveyance	Conveyance swales		Formal linear drainage features in which surface water can be stored or conveyed. They can be incorporated with water features such as ponds or waterfalls where appropriate.	Negate the need for underground pipework. Can provide some attenuation Possible reduction in runoff volume via plant uptake and infiltration	Potential trip/wheel hazard, disabled access issues	 This may be a feasible option.
	Rills					
Source control	Green/brown roof		Multi-layered system that covers the roof of a building with vegetation cover/landscaping over a drainage layer. Designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.	Mimics greenfield state of building footprint for high density developments, good removal of pollutants, ecological benefits, insulates buildings, sound absorption	Additional weight, not appropriate for steep roofs, maintenance of roof vegetation	 This is unlikely to be a feasible option due to weight and maintenance issues.

3.7 Outline Surface Water Drainage Strategy

- 3.7.1 West Sussex County Council has specific guidance with regards to the implementation of SuDS into new developments. The SuDS hierarchy is to be considered throughout the design of new drainage systems. The considerations given to the hierarchy is summarised in Table 3.3 below.

Table 3.3: Considerations to the SuDS Hierarchy

SuDS Hierarchy	Comments
Discharge into the ground	Due to the limited permeability of the soil and the potential for high groundwater levels, discharging runoff into the ground is not considered to be a suitable option for the proposed development.
Controlled discharge to a water body	There are two drainage watercourses adjacent to the site – one situated along the western site boundary, and one situated along the south eastern site boundary. Due to the natural fall in levels across the site and the surface water flood risk along the A29, it is preferable to discharge as much surface water runoff as possible to the watercourse situated to the southeast.
Controlled discharge to surface water sewer	Southern Water sewers are present in close proximity to the site, however discharge of surface water to a watercourse is considered to be preferable.

- 3.7.2 In line with West Sussex County Council guidance, it is proposed to restrict surface water runoff from the proposed development site to greenfield rates prior to discharge to the drainage watercourses. To follow the natural fall across the site and alleviate surface water flood risk along the western site boundary, it is proposed to discharge as much runoff as possible to the watercourse situated immediately south east of the site, with any remaining runoff discharging to the western boundary drainage ditch.
- 3.7.3 To provide this restriction in peak rates, attenuation of surface water is to be provided on site for up to the 1-in-100 year return period, including allowances for increase in rainfall intensity of 40% due to the predicted effects of climate change.
- 3.7.4 Attenuation is proposed in the form of permeable paving with a granular subbase. Depending upon the results of on-going groundwater monitoring within the site, the subbase will either need to be lined to prevent ingress of groundwater to the surface water storage network or utilise a perforated pipe to allow free variation in groundwater levels.
- 3.7.5 An indicative layout of the surface water drainage strategy is provided in Figure 4, at the rear of this report.
- 3.7.6 The surface water drainage strategy will need to be developed further at the appropriate design stage however on the basis of the above, there will be no increase in flood risk to downstream receptors following the development.

3.8 Outline Foul Water Drainage Strategy

- 3.8.1 Southern Water sewer records, included in Appendix C, show the presence of a Southern Water foul sewer situated along the western site boundary, flowing in a northerly direction to a Southern Water pumping station situated immediately northwest of the site boundary. Flows are then pumped to the wider Southern Water network. It is proposed to discharge foul water flows from the proposed development into the Southern Water network at the existing manhole adjacent to the pumping station.
- 3.8.2 A capacity check submitted to Southern Water in June 2019 has confirmed that at present the Southern Water network at this location to accept peak flows from eight residential properties. Based on Sewers for Adoptions guidance of 4000 l per dwelling per day, this equates to a peak rate of 0.4 l/s.
- 3.8.3 Based on the proposed number and size of residential dwellings, peak foul flows have been calculated using British Water Code of Practice. It is therefore proposed to attenuate foul flows within the site prior to pumping flows to the Southern Water sewer network at this reduced peak rate. At the time of writing consultation with Southern Water is currently on going with regards to gaining approval for the proposed foul drainage strategy and agreeing the best location with regards to attenuation of flows in conjunction with the existing Southern Water pumping station.

4. SUMMARY

- i. It is proposed to construct a new 46 unit residential development at Land East of Shripney Road, a 2.1ha greenfield site situated off the A29, Shripney. A drainage watercourse is located along the western site boundary. A second drainage watercourse is also present immediately southeast of the site.
- ii. The vast majority of the site is situated within Flood Zone 1, at low risk of tidal and fluvial flooding, however small parts of the site along the Western and south eastern boundaries are situated within Flood Zones 2 and 3, at medium-high risk of fluvial flooding, when taking into account the predicted effects of climate change. The site is protected against tidal flooding by defences in the form of raised ground.
- iii. Surface water flood risk within the site follows a similar pattern to that of fluvial flooding risk, with areas of lower ground along the western site boundary and south eastern corner of the site shown to be at risk of ponding.
- iv. Although there are no known records of groundwater flooding or groundwater flooding susceptibility at the site, groundwater levels are known to be high, with levels recorded at 0.6 mbgl on site, therefore groundwater flood risk is considered to be medium-low. At the time of writing ground water monitoring at the site is on-going.
- v. All proposed residential properties are to be located in Flood Zone 1. There will be no loss of floodplain volume as a result of the proposed development and dry access/ egress to/from the site is possible during an extreme flood event.
- vi. A Sequential Test was carried out by the planning consultants Luken Beck and is has been concluded that there are no other reasonably available alternative sites within the defined area of search confirmed by Arun District Council and that, therefore, the proposed development is considered to pass the Sequential Test.
- vii. Paragraph 3.4 provides evidence of how the Exception Test has been passed.
- viii. To ensure the safety of site occupants, it is proposed that residents join the EA Flood Warning Scheme, so that they will be informed of extreme flood events prior to their occurrence.
- ix. It is proposed to discharge surface water runoff from the site to the drainage watercourses situated both immediately southeast of the site and along the western boundary, with as much runoff as possible directed towards the southeast to alleviate surface water flood risk.
- x. To ensure there is no increase in flood risk to downstream receptors following development, it is proposed to restrict surface water runoff from both developments to greenfield rates as possible, in accordance with West Sussex County Council guidance. Attenuation of surface water is to be provided within the sites for up to the 1-in-100 year return period, including allowances for increases in rainfall intensity over the lifetime of the development due to climate change.
- xi. Further information regarding the proposed drainage strategy for each site will need to be provided at the appropriate design stage; however on the basis of the above, flood risk to downstream receptors will not increase following development.

FIGURES

FIGURE 1	SITE LOCATION PLAN
FIGURE 2	PROPOSED SITE LAYOUT PLAN
FIGURE 3	SFRA MAPPING
FIGURE 4	SURFACE WATER DRAINAGE STRATEGY
FIGURE 5	SURFACE WATER DRAINAGE DETAILS
FIGURE 6	FOUL WATER DRAINAGE STRATEGY

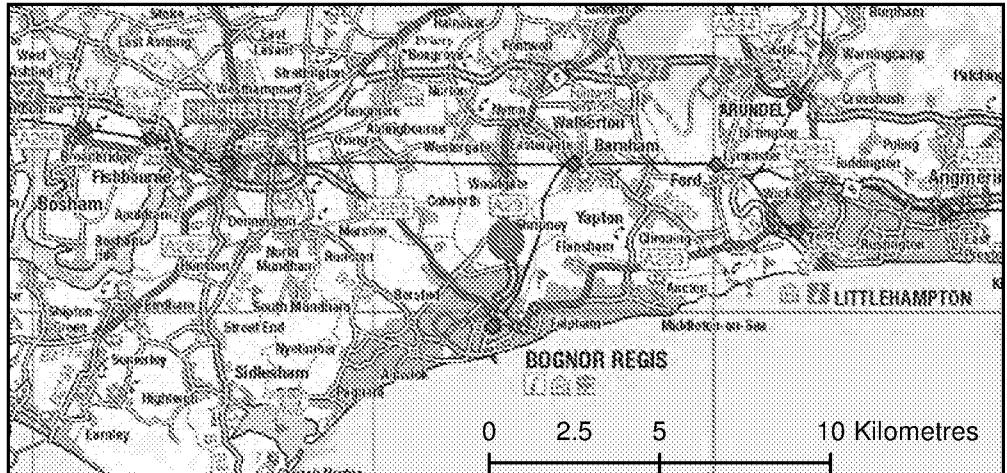
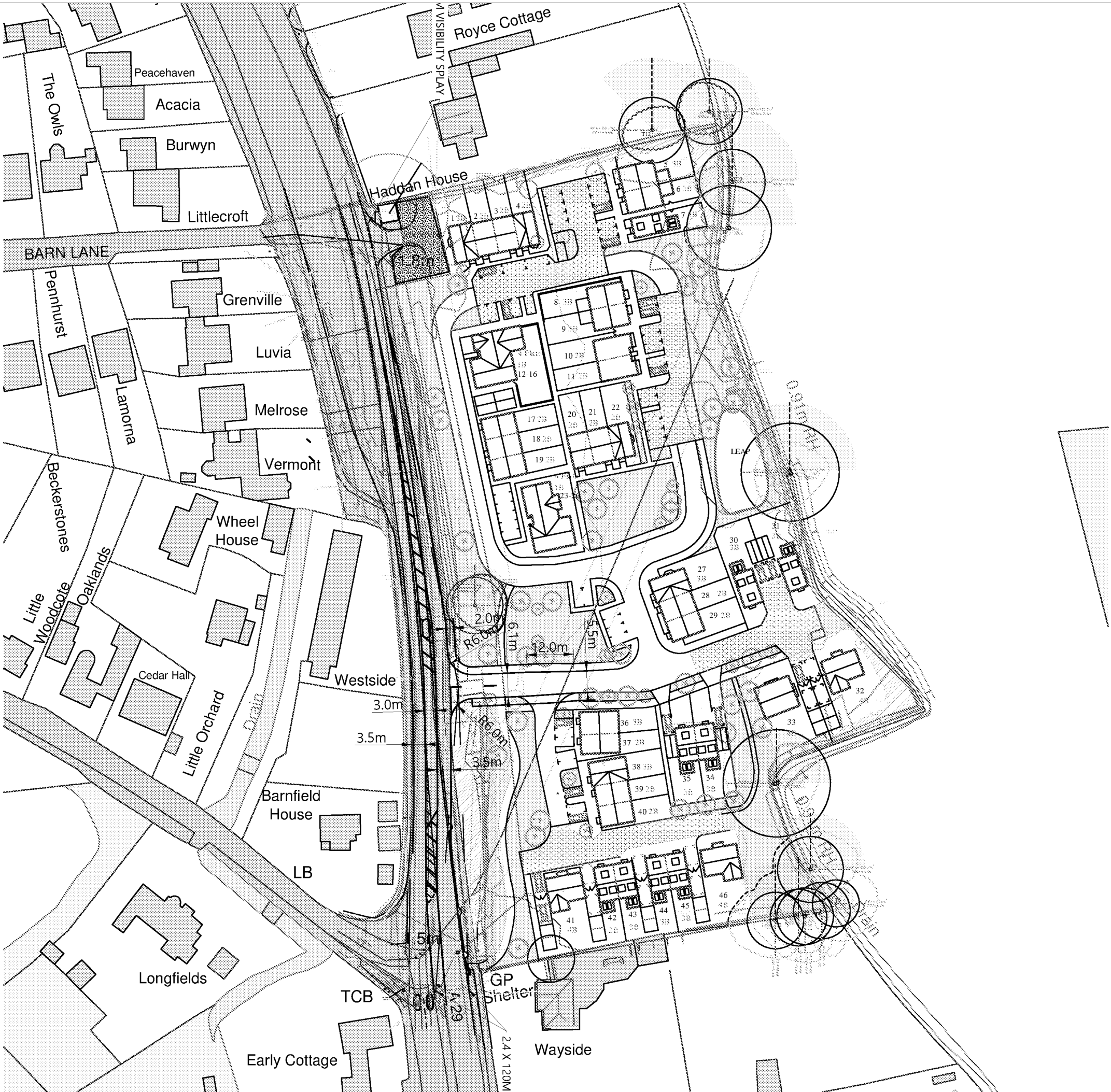


Figure Title Figure 1: Site Location	Project Name Land East of Shripney Road, Shripney	Date September 2019	
Project Number 1620004241	Client Ashmarden Ltd Retirement Benefit Scheme	Scale As shown	
Project Number 1620004241	Client Ashmarden Ltd Retirement Benefit Scheme	Issue 1	Prepared By MA



Residential			
	Affordable	Market	Total
1 Bedroom	4	4	8
2 Bedroom	5	12	17
3 Bedroom	4	12	16
4 Bedroom	1	4	5
			46
Site Area		1.72ha	
Open Space		0.4ha	
Net Density (Ex Open Space)		30.6dph	
Net Density (inc Open Space)		26.7dph	

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CLIENT:
Hanbury Properties

PROJECT:
Land East of Shripney Road, Shripney

DRAWING TITLE:
Preliminary Illustrative Layout

DAVIESLANDSCAPE
ARCHITECTS

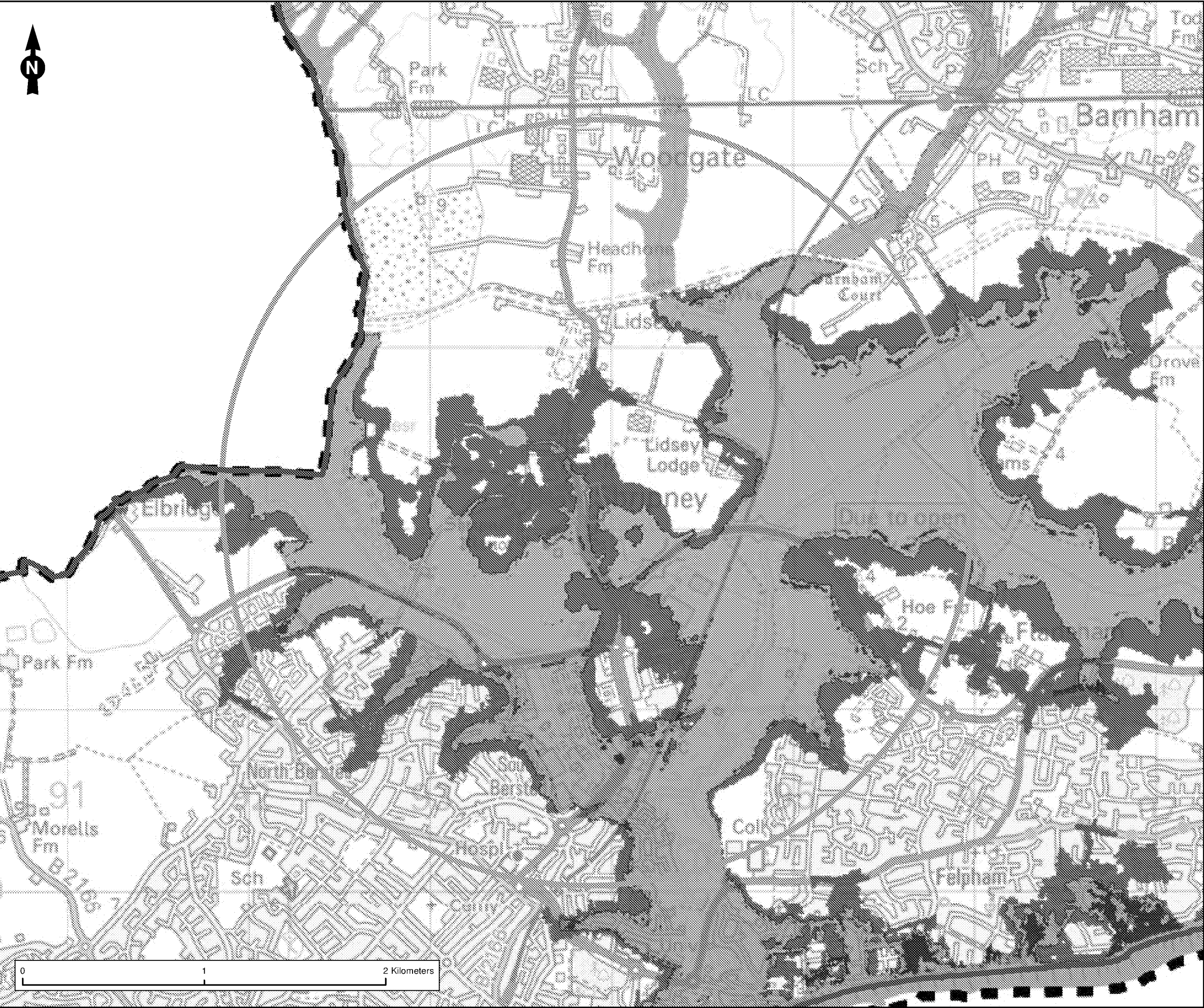
Studio F1, Stroud House, Russell Street, Stroud, Gloucestershire, GL8 3AN
T: 01453 760389 E: info@dl-4.co.uk W: www.dl-4.co.uk

DATE: 13.08.2019 SCALE: 1:1000@ A3

JOB NO.: 1948 DRAWN BY: MD

DWG NO.: DLA.1948.L06. REV: S06

\\shripney\data\server\DA\AV\PROJECTS\1948 Land East of Shripney Rd\Landscapes\Drawings\Sketch\DLA.1948.L06.S - Cad Layout Plan\DLA.1948.L06.S06 Cad Layout Plan.dwg



Legend

- Local Authority District Boundaries (April 2019)
- 2km Search Radius
- Site Boundary
- Arun District SFRA boundary
- Present Flood Zone 3a
- Future Flood Zone 3a (2031)
- Future Flood Zone 3a (2061)
- Future Flood Zone 3a (2111)

Note:
The Current Flood Zone 3a does not extend onto the site beyond the site boundary.
By 2061 the extent of Flood Zone 3a could impact on land in the west and southeast of the site
By 2111 the extent of Flood Zone 3 could impact on the entire site.

However, this does not take account of the presence of existing flood defences which would be expected to prevent such tidal flooding.

Figure Title
Sequential Test Search Extents and Tidal Flood Mapping (SFRA)

Project Name
Shripney

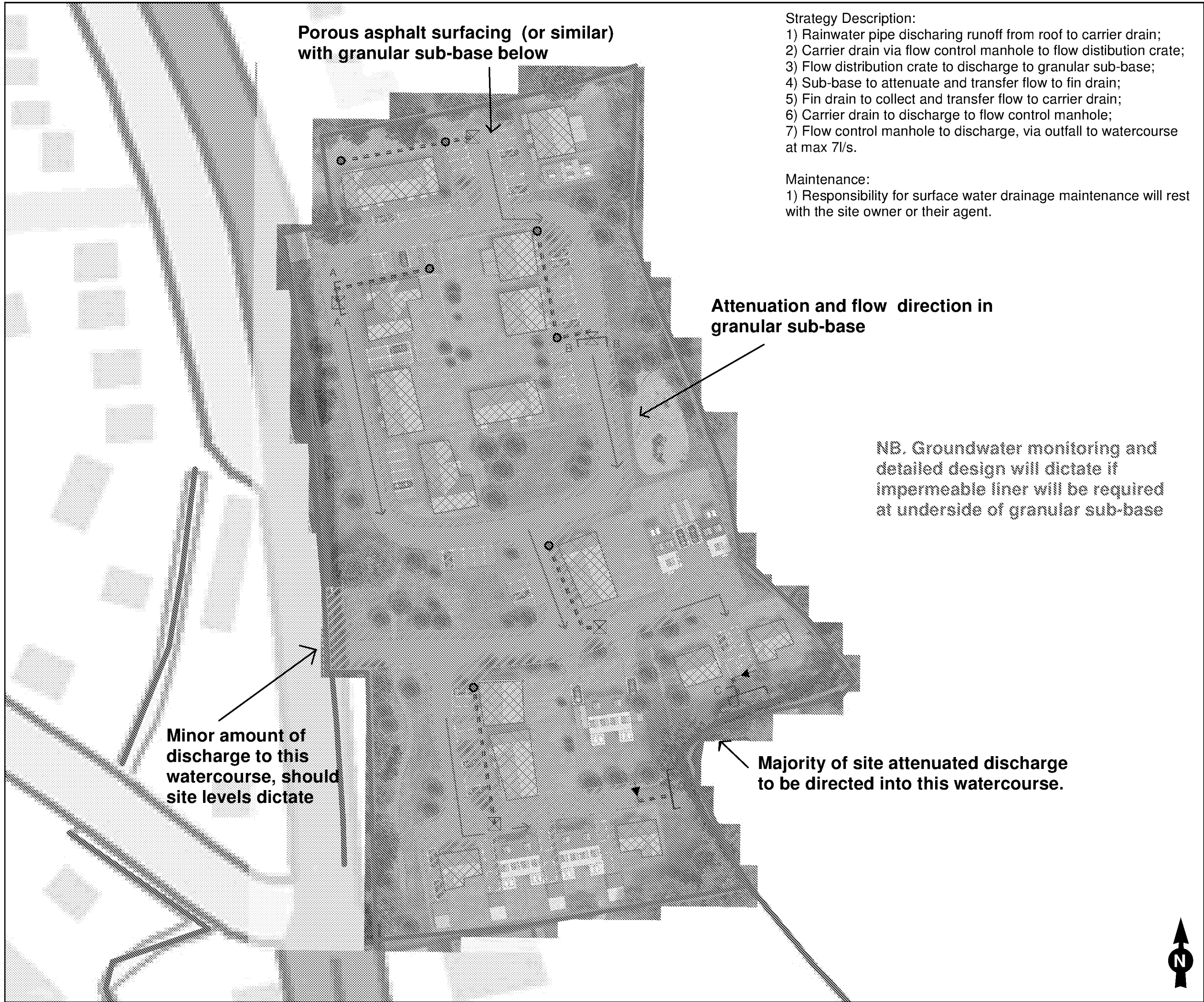
Project Number 1620004241	Figure No. 3
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Date February 2020	Prepared By CD
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Scale 1:20,000 @A3	Issue 1
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Client
Hanbury (PM) Limited





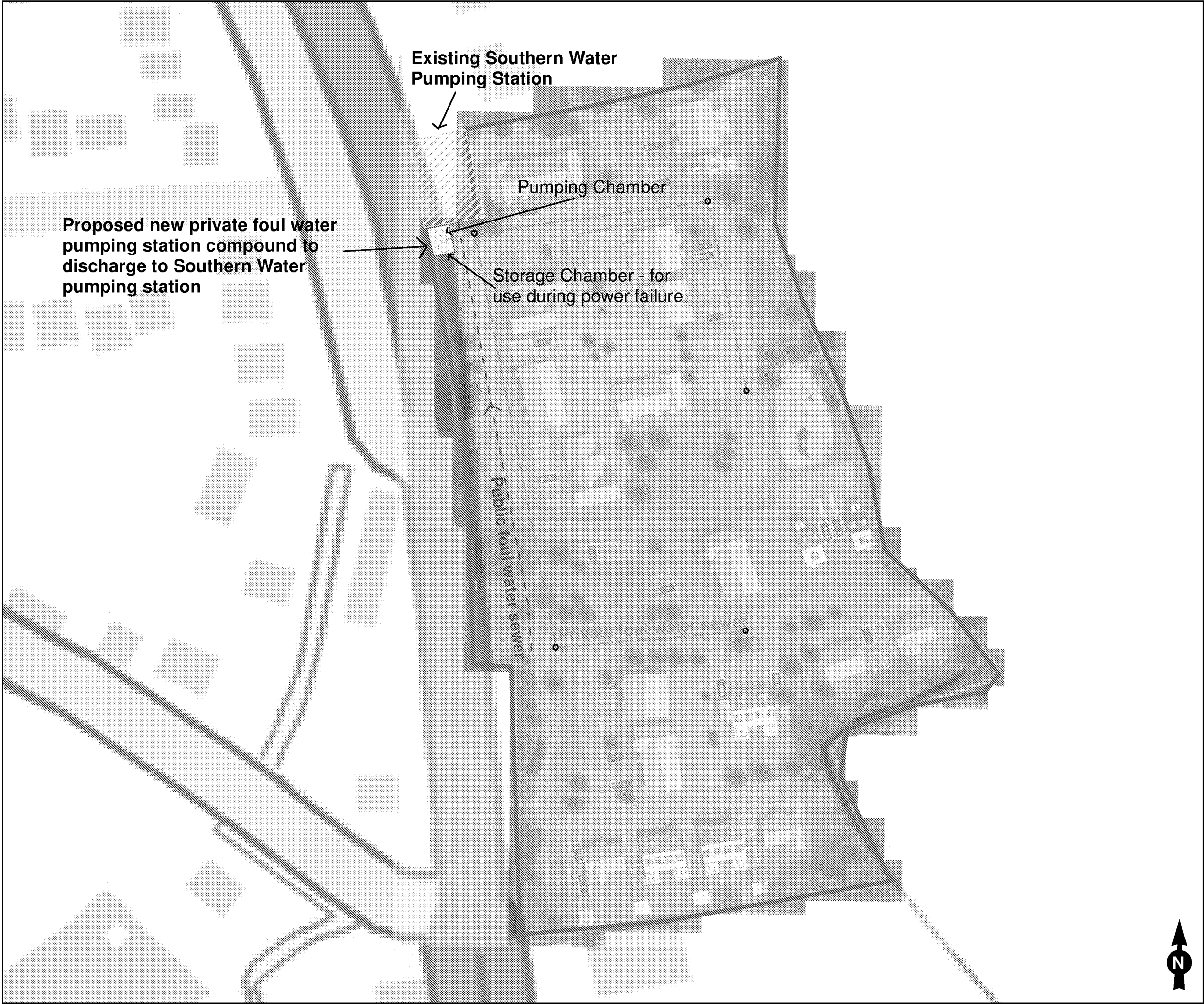
Strategy Description:
1) Rainwater pipe discharging runoff from roof to carrier drain;
2) Carrier drain via flow control manhole to flow distribution crate;
3) Flow distribution crate to discharge to granular sub-base;
4) Sub-base to attenuate and transfer flow to fin drain;
5) Fin drain to collect and transfer flow to carrier drain;
6) Carrier drain to discharge to flow control manhole;
7) Flow control manhole to discharge, via outfall to watercourse at max 7l/s.

Maintenance:
1) Responsibility for surface water drainage maintenance will rest with the site owner or their agent.

- Legend**
- Site Boundary
 - Roof Areas
 - Carrier Drain
 - Surface Water Manhole
 - Flow Distribution Crate
 - Permeable Paving
 - Fin Drain
 - Flow Control Manhole
 - Outlet
 - Surface Water Features

Figure Title	
Surface Water Drainage Strategy	
Project Name	
Land East of Shripney Road	
Project Number	Figure No.
1620004241	04
Date	Prepared By
September 2019	MA
Scale	Issue
1:917 @A3	-
Client	
Ashmarden Ltd Retirement Benefit Scheme	

RAMBOLL



Legend

Site Boundary

Public Foul Sewer

Private Foul Manhole

Private Foul Water Sewer

Pumping Chamber

Storage Chamber

Private Foul Water Pumping Station Compound

Southern Water Pumping Station Compound

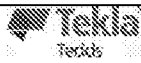
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Foul Water Drainage Strategy	
Project Name	
Land East of Shripney Road	
Project Number	Figure No.
1620004241	6
Date	Prepared By
September 2019	MA
Scale	Issue
1:917 @A3	-
Client	
Ashmarden Ltd Retirement Benefit Scheme	
RAMBOLL	



APPENDIX A SURFACE WATER RUNOFF CALCULATIONS

Ramboll UK Ltd		Page 1
240 Blackfriars Road London SE1 8NW		
Date 17/09/2019 11:39 File	Designed by MANGU Checked by	
Micro Drainage		Source Control 2018.1.1
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 2 SAAR (mm) 745 Urban 0.000 Area (ha) 2.100 Soil 0.400 Region Number Region 7 Results l/s QBAR Rural 7.7 QBAR Urban 7.7 Q2 years 6.8 Q1 year 6.5 Q30 years 17.4 Q100 years 24.5		
©1982-2018 Innovyze		

Ramboll UK Ltd		Page 1
240 Blackfriars Road London SE1 8NW		
Date 17/09/2019 11:42 File	Designed by MANGU Checked by	
Micro Drainage		Source Control 2018.1.1
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©1982-2018 Innovyze		



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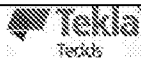
Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 1 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min = 12.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.61
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × M5_15mini = 7.6 mm
Design rainfall intensity	I _{max} = M1_15min / D = 30.3 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 3 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 4.4 l/s



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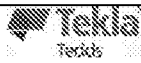
Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 2 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min = 12.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.79
Rainfall for 15min storm with 2 year return period	M2_15min = Z2 × M5_15mini = 9.8 mm
Design rainfall intensity	I _{max} = M2_15min / D = 39.2 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 3 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 5.7 l/s



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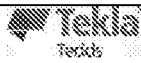
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Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 10 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min = 12.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.23
Rainfall for 15min storm with 10 year return period	M10_15min = Z2 × M5_15mini = 15.2 mm
Design rainfall intensity	I _{max} = M10_15min / D = 60.6 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 3 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 8.8 l/s



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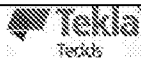
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Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 30 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min = 12.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.51
Rainfall for 15min storm with 30 year return period	M30_15min = Z2 × M5_15mini = 18.6 mm
Design rainfall intensity	I _{max} = M30_15min / D = 74.4 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 3 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 10.8 l/s



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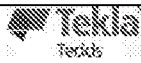
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Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min = 12.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.95
Rainfall for 15min storm with 100 year return period	M100_15min = Z2 × M5_15mini = 24.0 mm
Design rainfall intensity	I _{max} = M100_15min / D = 96.1 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 3 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 14.0 l/s



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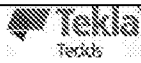
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Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 1 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 40 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min × (1 + p _{climate}) = 17.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.63
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × M5_15mini = 10.9 mm
Design rainfall intensity	I _{max} = M1_15min / D = 43.4 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 80 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 202.8 l/s



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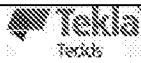
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Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 2 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 40 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min × (1 + p _{climate}) = 17.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.80
Rainfall for 15min storm with 2 year return period	M2_15min = Z2 × M5_15mini = 13.9 mm
Design rainfall intensity	I _{max} = M2_15min / D = 55.6 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 80 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 259.3 l/s



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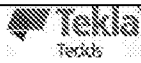
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Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 10 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 40 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min × (1 + p _{climate}) = 17.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.24
Rainfall for 15min storm with 10 year return period	M10_15min = Z2 × M5_15mini = 21.4 mm
Design rainfall intensity	I _{max} = M10_15min / D = 85.6 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 80 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 399.7 l/s



Project				Job no.	
Calcs for				Start page no./Revision 1	
Calcs by M	Calcs date 17/09/2019	Checked by	Checked date	Approved by	Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

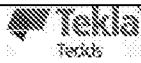
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Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = 15 min
Return period	Period = 10 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.350
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 40 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15mini = Z1 × M5_60min × (1 + p _{climate}) = 17.3 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.24
Rainfall for 15min storm with 10 year return period	M10_15min = Z2 × M5_15mini = 21.4 mm
Design rainfall intensity	I _{max} = M10_15min / D = 85.6 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 21000 m ²
Percentage of area that is impermeable	p = 80 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 399.7 l/s



Project				Job no.	
Calcs for				Start page no./Revision 1	
Calcs by M	Calcs date 17/09/2019	Checked by	Checked date	Approved by	Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

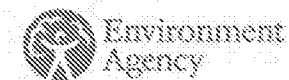
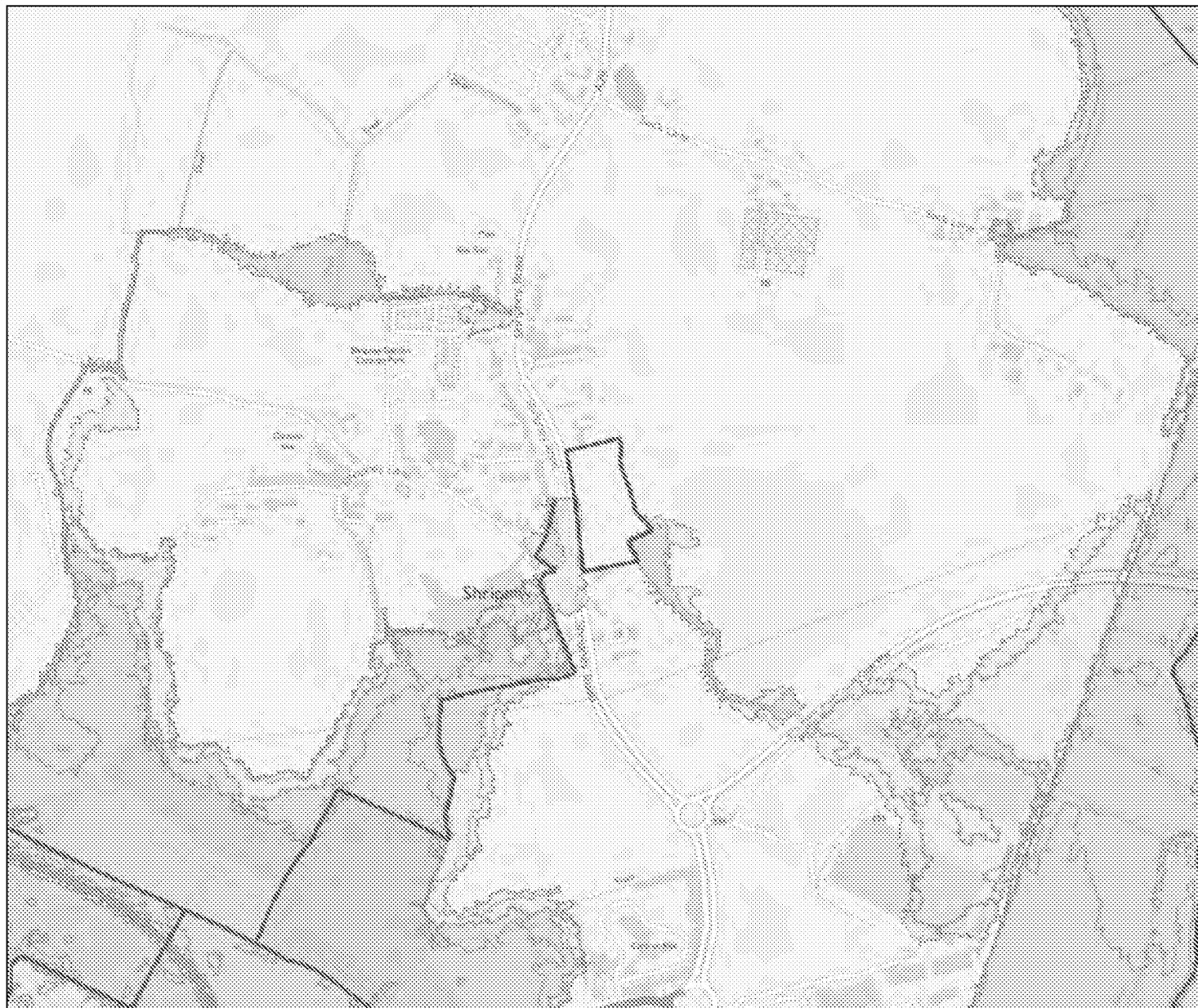
Location of catchment area Brighton
Storm duration $D = 15$ min
Return period Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.350$
5-year return period rainfall of 60 minutes duration $M5_60\text{min} = 20.0$ mm
Increase of rainfall intensity due to global warming $p_{\text{climate}} = 40$ %
Factor Z1 (Wallingford procedure) $Z1 = 0.62$
Rainfall for 15min storm with 5 year return period $M5_15\text{min}_i = Z1 \times M5_60\text{min} \times (1 + p_{\text{climate}}) = 17.3$ mm
Factor Z2 (Wallingford procedure) $Z2 = 2.01$
Rainfall for 15min storm with 100 year return period $M100_15\text{min} = Z2 \times M5_15\text{min}_i = 34.7$ mm
Design rainfall intensity $I_{\text{max}} = M100_15\text{min} / D = 138.7$ mm/hr

Maximum surface water runoff

Catchment area $A_{\text{catch}} = 21000$ m²
Percentage of area that is impermeable $p = 80$ %
Maximum surface water runoff $Q_{\text{max}} = A_{\text{catch}} \times p \times I_{\text{max}} = 647.2$ l/s

APPENDIX B EA FLOOD MODELLING DATA

Flood Map for Planning (Rivers and Sea). Centred NGR 493891E, 102136N. Created 08/07/2019.



Scale 1: 10,000



Flood Map for Planning (Rivers & Sea)

- Sealed Main Rivers
- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Product 4 Flood Risk Data Requested by: Ramboll

Site: Land East of Shripney Road, Bognor Regis, NGR 493891E, 102136N

Table 1: Water Levels: Fluvial Defended

Node Ref	NGR		Modelled Flood Levels in Metres AOD					
			Defended Annual Exceedance Probability					
	Eastings	Northings	5%	1%	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)	0.1%
1	493850	102137	-	-	2.25	2.25	2.44	2.38
2	493944	102084	-	-	-	-	2.19	-
3	493892	102183	-	-	-	-	-	-

Table 2: Water Levels: Tidal Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD			
			Undefended Annual Exceedance Probability			
	Eastings	Northings	0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	493850	102137	-	2.62	3.60	-
2	493944	102084	-	2.66	3.60	-
3	493892	102183	-	2.62	3.60	-

Table 3: Water Levels: Tidal Defended

Node Ref	NGR		Modelled Flood Levels in Metres AOD			
			Defended Annual Exceedance Probability			
	Eastings	Northings	0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	493850	102137	-	-	-	-
2	493944	102084	-	-	-	-
3	493892	102183	-	-	-	-

Table 4: Water Depths: Fluvial Defended

Node Ref	NGR		Modelled Flood Depths in Metres					
			Defended Annual Exceedance Probability					
	Eastings	Northings	5%	1%	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)	0.1%
1	493850	102137	-	-	0.39	0.39	0.56	0.52

Office Address: Guildbourne House, Chatsworth Road, Worthing BN11 1LD.
 Customer services line: 03708 506 506. Email: enquiries@environment-agency.gov.uk
www.gov.uk/government/organisations/environment-agency

2	493944	102084	-	-	-	-	0.30	-
3	493892	102183	-	-	-	-	-	-

Table 5: Water Depths: Tidal Undefended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	493850	102137	-	0.67	1.66	-
2	493944	102084	-	0.51	1.46	-
3	493892	102183	-	0.00	0.92	-

Table 6: Water Depths: Tidal Defended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	493850	102137	-	-	-	-
2	493944	102084	-	-	-	-
3	493892	102183	-	-	-	-

All levels taken from: Aldingbourne Flood Risk Mapping Study, completed by JBA in 2015 and the Arun to East Head Model, completed by JBA in 2016.

Produced on: 08/07/2019

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.



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Legend

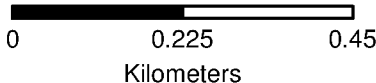
- 1% AEP Plus Climate Change (35%) (Defended Fluvial)
- 1% AEP Plus Climate Change (45%) (Defended Fluvial)
- 1% AEP Plus Climate Change (105%) (Defended Fluvial)
- Site Boundary

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Climate Change (CC) for fluvial models is based on an increase in river flows of 35, 45 & 105% for undefended scenarios.

Defended scenarios only show the superseded 20% increase in flows

Scale: 1:10,000







Environment
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Legend

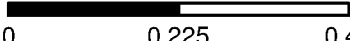
 Site Boundary

 1% AEP (Defended Fluvial)

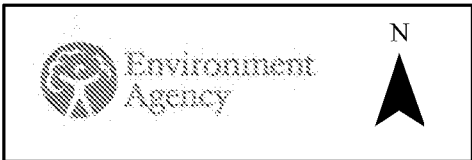
 0.1% AEP (Defended Fluvial)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



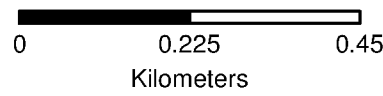
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Kilometers

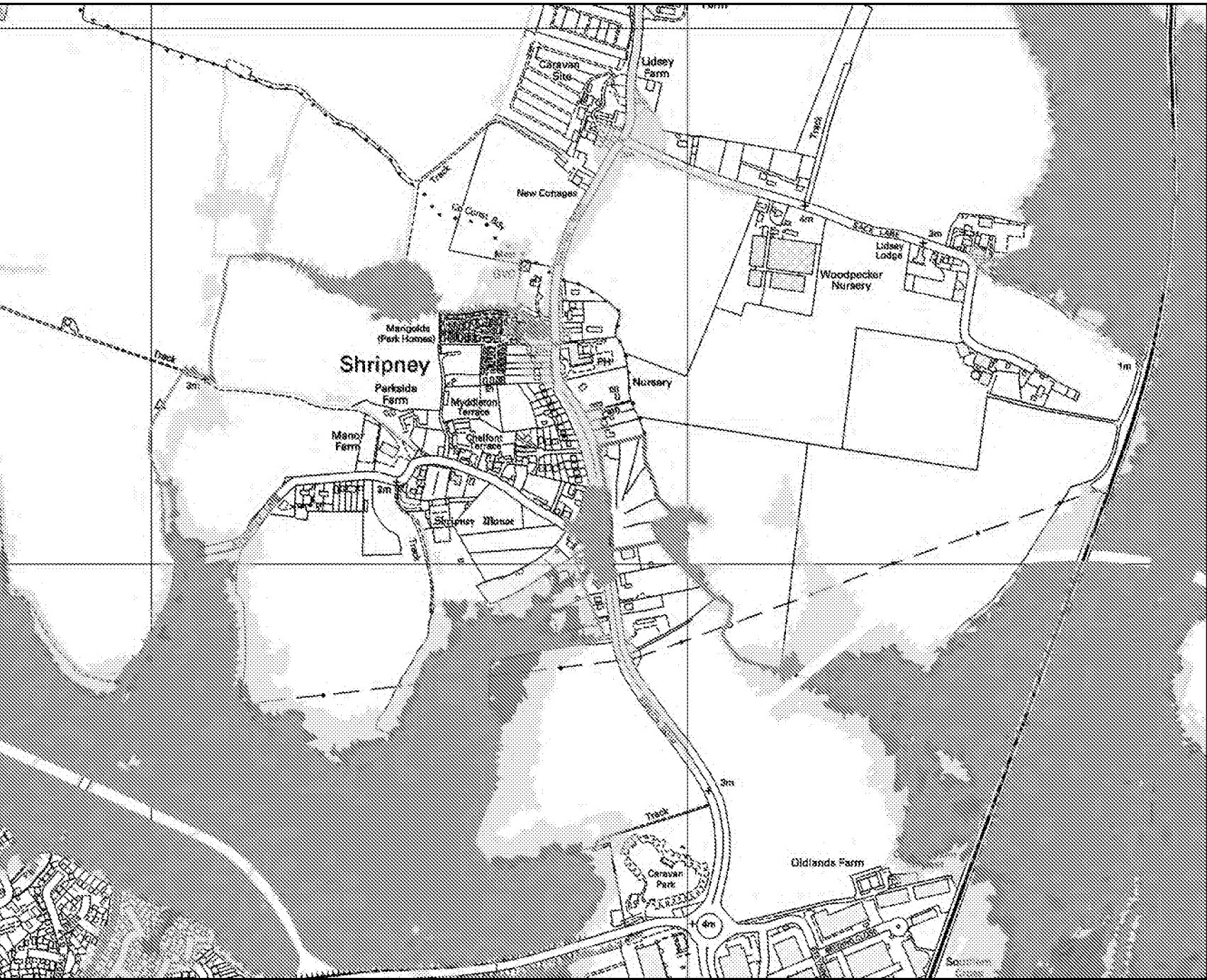


- Legend**
- Site Boundary
 - 0.5% AEP (Defended Tidal)
 - 0.5% AEP (2070) NPPF (Defended Tidal)
 - 0.5% AEP (2115) NPPF (Defended Tidal)
 - 0.1% AEP (Defended Tidal)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000







Environment
Agency

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Legend

-  Site Boundary
-  1% AEP Plus Climate Change (35%) (Undefended Fluvial)
-  1% AEP Plus Climate Change (45%) (Undefended Fluvial)
-  1% AEP Plus Climate Change (105%) (Undefended Fluvial)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Climate Change (CC) for fluvial models is based on an increase in river flows of 35, 45 & 105% for undefended scenarios.

Defended scenarios only show the superseded 20% increase in flows

Scale: 1:10,000

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0.225

0.45

Kilometers





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N

Legend

-  Site Boundary
-  1% AEP (Un defended Fluvial)
-  0.1% AEP (Un defended Fluvial)

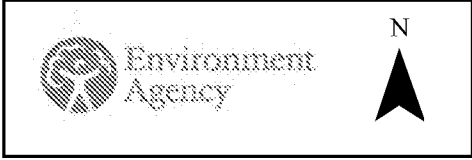
Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



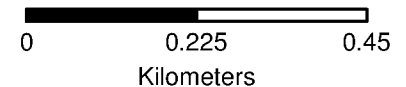
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Kilometers



 Site Boundary
 0.5% AEP (Undefended Tidal)
 0.5% AEP (2070) NPPF (Undefended Tidal)
 0.5% AEP (2115) NPPF (Undefended Tidal)
 0.1% AEP (Undefended Tidal)

Scale: 1:10,000





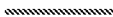


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 Site Nodes

 Main River

Scale: 1:1,500



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APPENDIX C SOUTHERN WATER SEWER RECORDS

APPENDIX D
SEQUENTIAL TEST REPORT

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1. Introduction

- 1.1.1 This sequential test has been produced in support of the proposed development involving the 'Outline application for up to 46 dwellings together with access with all other matters reserved on land east of Shripney Road, Shripney: .
- 1.1.2 In carrying out the sequential test regard has been given to the National Planning Policy Framework (NPPF), the Planning Practice Guidance (PPG) and the guidance provided by the Environment Agency in their document 'Demonstrating the flood risk Sequential Test for Planning Applications'. The purpose of the sequential test is to consider the availability of alternative sites for the development as part of the examination of flood risk.

2. The Site & Proposed Development

- 2.1.1 The site location and description are detailed in full in Chapter 2: Site Context of the already submitted Planning Statement. In summary however, the site comprises unconstrained land that offers approximately 1.8ha that is relatively flat and of sufficient depth to offer opportunities for a comprehensive scheme of housing, open space and landscaping.



Figure 1: Aerial photo showing site extent

3. Sequential Test Approach

3.1 Introduction

- 3.1.1 When undertaking the Sequential Test and comparing reasonably available sites in line with the aforementioned guidance with the application site, the Environment Agency advises that:

„Site should be compared in relation to flood risk Local Plan status; capacity; and constraints to delivery including availability, policy restrictions, physical problems or limitations, potential impacts of development, and future environmental conditions that would be experienced by the inhabitants of the development.“

- 3.1.2 The approach and the key criteria used for comparison are detailed below:

3.2 Locational Criteria

- 3.2.1 Planning Practice Guidance entitled „Applying the Sequential Test to individual planning applications“ advises:

„For individual planning applications where there has been no sequential testing of the allocations in the development plan, or where the use of the site being proposed is not in accordance with the development plan, the area to apply the Sequential Test across will be defined by local circumstances relating to the catchment area for the type of development proposed. For some developments this may be clear, for example, the catchment area for a school. In other cases it may be identified from other Local Plan policies, such as the need for affordable housing within a town centre, or a specific area identified for regeneration. For example, where there are large areas in Flood Zones 2 and 3 (medium to high probability of flooding) and development is needed in those areas to sustain the existing community, sites outside them are unlikely to provide reasonable alternatives.“

(Paragraph: 033 Reference ID: 7-033-20140306)

- 3.2.2 On 5th February 2020 we liaised with the Local Planning Authority to agree the scope of the flood risk sequential test in respect of the proposed development of this site.
- 3.2.3 The LPA responded by email on the 6th February 2020 (Appendix A) and agreed that the locational criteria for the sequential test was „a circle with a radius of approximately 2.13km, from the centre of the site north to the railway line.“

3.3 Identification of Sites

- 3.3.1 To identify potential alternatives to the application site to be assessed by the Sequential Test we have utilised the principle evidence sources of evidence:
- i. The Arun District Council Housing and Economic Land Availability Assessment (HELAA)
 - ii. The Arun Local Plan & Proposals Map (2018)
 - iii. Rightmove search for Land & Commercial Property within 3 miles of Shripney
- 3.3.2 Searches for Land and Commercial Property within 3 miles of Shripney were unsuccessful and the corresponding results were limited to either employment premises or small self-build plots for 1-2 houses. Copies of the search results are provided in Appendix B. There are no sites currently marketed.
- 3.3.3 The principle source of alternative sites assessed by the Sequential Test Assessment is therefore taken from the Arun District Council Housing and Economic Land Availability Assessment (HELAA) carried out in 2018. Sites from the HELAA and within the agreed area / scope are mapped in Figure 2.

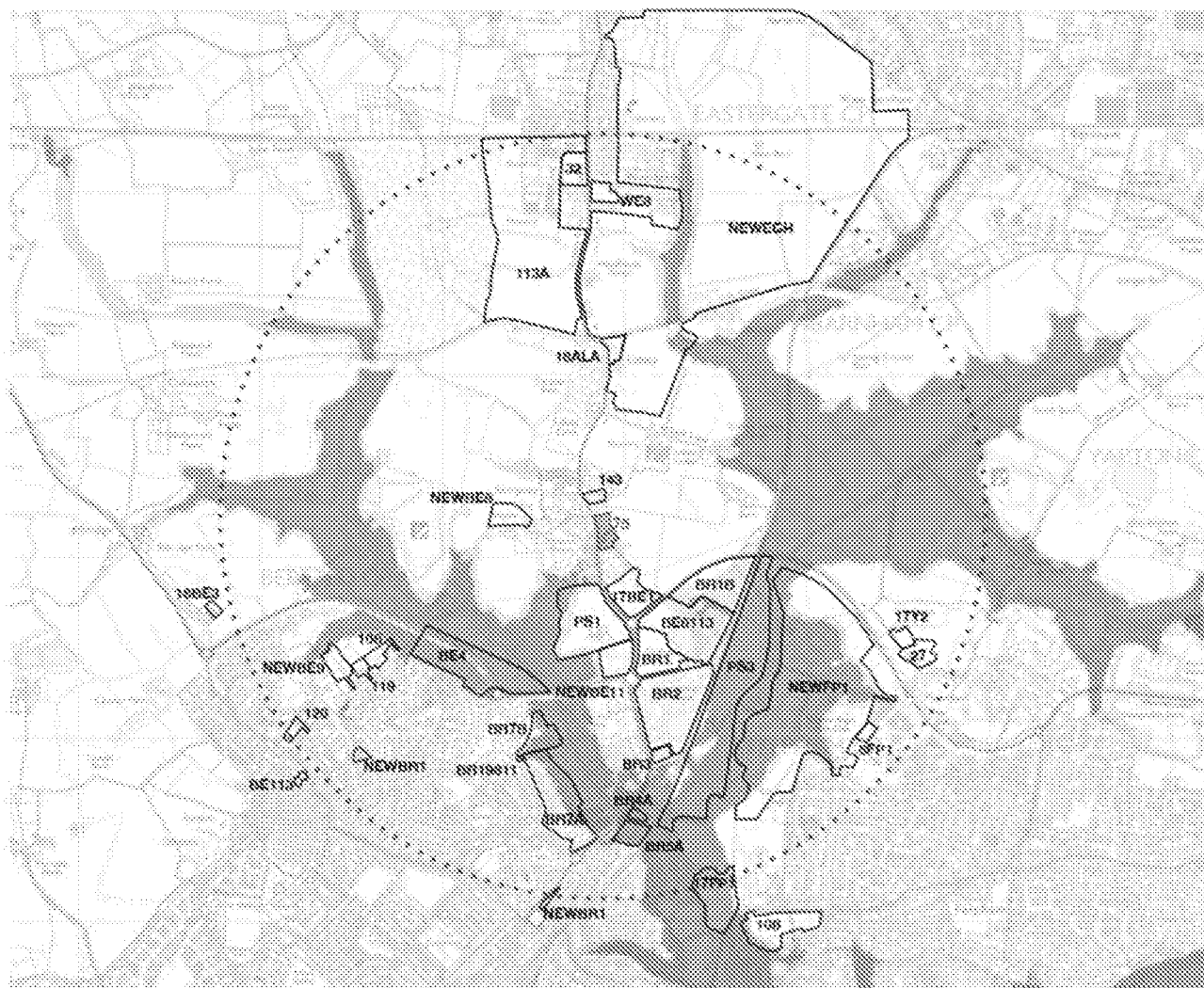


Figure 2: Map showing HELAA (2018) sites within a agreed locational area superimposed on EA Flood Map for Planning

3.4 Flood Risk Criteria

3.4.1 The Planning Practice Guidance advises when the Sequential Test is normally to be applied stating that:

Nor should it normally be necessary to apply the Sequential Test to development proposals in Flood Zone 1 (land with a low probability of flooding from rivers or the sea), unless the Strategic Flood Risk Assessment for the area, or other more recent information, indicates there may be flooding issues now or in the future (for example, through the impact of climate change).

(Paragraph: 033 Reference ID: 7-033-20140306)

3.4.2 The EA flood mapping for planning shows the vast majority of the site is situated within Flood Zone 1, with a very small area along the western site boundary situated within Flood Zone 2 and a very small area along the south eastern site boundary within Flood Zone 3.

3.4.3 As detailed in Chapter 3: Assessment of New Development of the Flood Risk Assessment by Ramboll UK Ltd.

The peripheral parts of the site at risk of flooding do not impact upon any of the proposed residential properties. There are no new buildings proposed in areas at risk of flooding and, aside from the site access road, parts of the site boundary that fall in areas at risk of fluvial flooding are to remain as soft landscaping in line with the existing topography. The site access road is also to be located where an existing unmade access track is already present and again constructed in line with existing topography to tie in with ground levels along the A29; therefore, there will be no loss of floodplain as a result of the proposed development. (Paragraph 3.4.1)

3.4.4 In light of the above the developed area of the site sits within Flood Zone 1 and accordingly sites which sit within Flood Zone 2 & 3 have been discounted as alternative locations for development (See Figure 2).

3.4.5 The Arun District Council Strategic Flood Risk Assessment (2016) assesses the future implications of climate change on development and maps the flood risk expected under climate change for fluvial and tidal / coastal flood risk. Appendix D: Climate Change Mapping of the SFRA provides hydraulic mapping which compares current flood risk with potential future flooding arising through climate change. This includes:

- z Future Flood Zone 3a (2031) +15% flows
- z Future Flood Zone 3a (2061) + 30% flows
- z Future Flood Zone 3a (2111) + 45% flows

3.4.6 The majority of the proposed development site sits within Future Flood Zone 3a (2111) and partially within Future Flood Zone 3a (2061) (See Figure 3).

3.4.7 Accordingly, all sites which are liable for future flooding as a result of climate change have been discounted as alternative locations for development.



Figure 3: Map showing sites with SFRA climate change flood modelling agreed locational area superimposed on EA Flood Map for Planning

3.5 Housing Capacity

- 3.5.1 As Chapter 6.2.1: Housing Land Supply of the Planning Statement advises that Arun District Council has insufficient land to meet its 5 year housing land supply requirement. Additionally, the Council was required to produce an Action Plan as a consequence of its Housing Delivery Test results in November 2018. There is no evidence that either housing land supply or delivery rates have improved and there may be an impending requirement to apply a 20% buffer on housing land.
- 3.5.2 In light of the need to provide housing and, in particular affordable housing, as per Policy AH SP2 of the Arun Local Plan, alternative sites should have the capacity to provide a similar quantum and range of housing types as the proposal.
- 3.5.3 While the application is outline, the indicative mix of housing reflects the requirement for a balanced mix of market and affordable dwelling sizes including family sized accommodation based on the most up to date SHMA recommendations: in Policy H DM1. The site also provides a policy compliant (30%) amount of affordable housing on-site. Details of the indicative housing mix is provided below.

No. Bedrooms	Affordable	Market	Total
1 bed	5	3	8
2 bed	5	12	17
3 bed	2	14	16
4 bed	1	4	5
Total	13	33	46

Table 1: Extract from DAS (pp2) Indicative 'Accommodation Schedule'

- 3.5.4 Accordingly, sites which do not have the capacity to provide 40 housing units have been discounted as alternative locations for development.

3.6 Planning Policy

- 3.6.1 The comparison sites have been assessed to determine if there are any planning policy designations that would affect the delivery of housing. Identified sites have been reviewed against the land use policies of the Arun District Local Plan (2018) and the corresponding Proposals Map. Salient policies include:

Policy EMP DM1: Employment Land: Development Management advises that the Council will 'seek to protect and enhance existing employment sites and premises.' All sites that are existing employment sites are therefore discounted as alternative locations for development.

Policy EMP SP3: Strategic Employment Land Allocations advises that strategic employment land identified will be protected over the plan period. All sites that are strategic employment sites are therefore discounted as alternative locations for development.

Policy SD SP3: Gaps between Settlements stipulates that there will be a presumption against the development of sites with this designation on the Proposals Map. This is to retain a sense of openness and prevent the coalescence of settlements over the Plan period. All sites that are designated as gaps between settlements are discounted as alternative locations for development.

Policy OSR DM1: Open Space, Sport & Recreation advises that the Council will look to protect existing outdoors spaces. All sites that are allocated areas of open space are therefore discounted as alternative locations for development.

Policy H SP1: Housing Requirement provides details of strategic housing allocations which are necessary for meeting the Council's housing land requirement. Such sites are not by definition windfall sites and will not address the shortfall of housing land identified in Chapter 6.2.1: Housing Land Supply of the Planning Statement.

- 3.6.2 There are also a number of policy designations that have been identified which would have a material impact on a site. These are:

Policy TSP3: Safeguarding the Main Road Network in which land identified as necessary for the strategic and supporting road network will be protected from development. Sub-clause i) A29 Realignment and access through the Bamham / Eastergate / Westergate site allocation runs through or in close proximity to a number of sites and as such may impact their deliverability.

Policy ENV DM3: Biodiversity Opportunity Area identifies sites which can retain and sympathetically incorporate local important habitats. While this does not prevent development, it could potentially reduce the density of development.

- 3.6.3 For the purposes of the Sequential Test only deliverable sites (1-5 years) should strictly be included. Developable sites under NPPF terminology are potentially likely to come forward in 6-10 years and as such are 'not available' or likely to deliver housing / affordable housing to meet the identified shortfall. Nevertheless the developable sites from the HELAA have also been considered in this appraisal on their other attributes as well.

4. Assessment of Alternative Available Sites

4.1.1 The Table 2 below contains a list of deliverable and potentially developable sites identified by the evidence sources details in section 3.3 of this report.

4.1.2 The table assesses each site against the location and site / surrounding criteria identified and discounts sites that do not meet these initial requirements.

- ⌘ Not have a policy designation for an alternative land use
- ⌘ Identified as either 'Deliverable' or 'Developable' in the Arun District Council HELAA (2018)
- ⌘ Located outside of Flood Zone 2 & 3
- ⌘ Not identified in a SFRA future climate change flood zone area
- ⌘ Over 1 hectare in size
- ⌘ Deliver a comparable number of housing units (40) and housing types (see chapter 3.5)

4.1.3 Further to this initial overarching assessment the sites listed below were identified as meeting all of the above criteria and were subjected to a finer grained assessment to determine if they were sequentially preferable locations for development.

- ⌘ Land north of Lees Yard, Lidsey Road (WE8)
- ⌘ Wings Nursery, Lidsey Road (32)

4.1.4 Further to correspondence with Council Officers, we were advised to undertake a finer grained assessment of the following additional sites:

- ⌘ Land at Bridge Cottage & The Old Cottage (18AL4)
- ⌘ Ryefield Farm & Woodgate Centre, Oaktree Lane (WA6)

Table 2: Assessment of Alternative Sites

Site Name / Address	Evidence Base	Ref. No	HELAA Status	Planning Policy	Flood Zone	Future Flood Zone 3a	Size	Capacity	Further Assessment
Land at Manor Farm, Shripney	HELAAA	NEWBE8	Not Currently Developable	n/a	1	2111	2.58	90*	NO
The Cottage Nursery Violet Farm, Shripney	HELAAA	143	Commitment Site	n/a	1	2111	-	-	NO
Land North West of Oldlands Farm	HELAAA	17BE1	Deliverable	n/a	2 & 3	Present	3.92	96	NO
Land West Of Shripney Road, (Saltbox)	HELAAA	PS1	Employment	Strategic Employment Site	2 & 3	Present	-	N/A	NO
Oldlands Farm, Bognor Regis	HELAAA	BE6113	Employment	Strategic Employment Site	2 & 3	2061	-	N/A	NO
Oldlands Farm, Bognor Regis	HELAAA	BR1B	Employment	Strategic Employment Site	2 & 3	2111	-	N/A	NO
Land at Oldlands Farm, Bognor Regis	HELAAA	BR1	Employment	Strategic Employment Site	1	2111	-	N/A	NO
Land West of Shripney Road	HELAAA	NEWBE11	Employment	Strategic Employment Site	1	2061	-	N/A	NO
Southern Cross, Industrial Estate	HELAAA	BR2	Existing Employment Site	Existing Employment Site Biodiversity Opportunity Area (Partial)	1	2111	-	N/A	NO
Clock Park, Bognor Regis	HELAAA	BL3	Existing Employment Site	Existing Employment Site Biodiversity Opportunity Area (Partial)	2	2111	-	N/A	NO
LEC Airfield, Bognor Regis	HELAAA	PS3	Employment	Strategic Employment Site	2 & 3	Present	-	N/A	NO
Bognor Golf Course	HELAAA	NEWFP1	Not Currently Developable	Gap Between Settlement	2 & 3	Present	58.08	2,030*	NO
Westward Ho	HELAAA	17Y2	Not Currently Developable	n/a	1	-	0.71	25*	NO
Land east of Hoe Lane	HELAAA	21	Not Currently Developable	n/a	1	-	1.91	67*	NO

North Paddocks	HELAAA	17FP1	Employment Site (potential)	Gap Between Settlement	3	Present	-	N/A	NO
Shripney Trade Park	HELAAA	BR4A	Existing Employment Site	Existing Employment Site Biodiversity Opportunity Area (Partial)	2 & 3	Present	-	N/A	NO
Arun Business Park	HELAAA	BR5A	Existing Employment Site	Existing Employment Site	2 & 3	Present	-	N/A	NO
Land Adjoining Gordon Avenue West	HELAAA	NEWBR1	Deliverable	n/a	1	-	0.31	11	NO
Durban Road Industrial Estate	HELAAA	BR7A	Existing Employment Site	Existing Employment Site	2 & 3	Present	-	N/A	NO
Ash Grove Industrial Estate	HELAAA	BR8A	Existing Employment Site	Existing Employment Site	2 & 3	Present	-	N/A	NO
Westside Supplies, 17-18 Durban Road	HELAAA	BR19811	Deliverable	Existing Employment Site	2 & 3	Present	0.08	14	NO
Bartons County Infant School, Romney Broadwalk	HELAAA	NEWBE10	Deliverable	Neighbourhood Plan Housing Site	1	2111	0.59	16	NO
Land Adjacent to Tesco Express	HELAAA	BE113	Deliverable	Neighbourhood Plan Housing Site	1	-	0.19	7	NO
Land R/O 27 North Bersted Street	HELAAA	120	Commitment	n/a	1	-	1.07	10**	NO
93 North Bersted Street	HELAAA	NEWBE9	Not Currently Developable	Existing Open Space (Partial)	2 & 3	2111	1.2	42*	NO
Rookery Farm, North Bersted Street	HELAAA	119	Not Currently Developable	Existing Open Space (Partial)	1	-	0.67	23*	NO
Rookery Farm, 117 North Bersted Street	HELAAA	106	Not Currently Developable	Existing Open Space (Partial)	2 & 3	2111	1.12	39*	NO
Babsham Business Centre	HELAAA	18BE3	Employment (commitment)	n/a	1	-	-	Not applicable	NO
Land north of Rowan Way	HELAAA	BE4	Not Currently Developable	Existing Open Space	2 & 3	Present	12.81	448*	NO
Bamham / Eastergate / Westergate	HELAAA	NEWEG1	Strategic Housing Allocation	Strategic Housing Site Safeguarded Main Road Network	2 & 3	Present	233.32	1281	NO

Land at Bridge Cottage & The Old Cottage	HELAAA	18AL4	Deliverable	Strategic Housing Site (Partial)	1	-	1.18	25	NO
Land to the west of Westergate Street	HELAAA	113	Not Currently Developable	n/a	1	-	68.85	2,380*	NO
Land west of Westergate Street (Woodgate Nursey)	HELAAA	113A	Developable	n/a	2 & 3	Present	48	118	NO
Land north of Lees Yard, Lidsey Road	HELAAA	WE8	Deliverable	n/a	1	-	1.53	38##	YES
Rye field Farm & Woodgate Centre, Oaktree Lane	HELAAA	WE6	Strategic Housing Allocation	Strategic Housing Site	2 & 3	2111	7.45	134	NO
Wings Nursery, Lidsey Road	HELAAA	32	Deliverable	n/a	1	-	2.6	55#	YES

*Indicative capacity based on 35 units per hectare as no figure is presented in the HELAA

** Permitted number of units in Application Reference BE/45/16/PL

Permitted number of units in Application Reference AL/32/19/OUT

Number of units in Application Reference AL/21/20/OUT

5. Assessment of Individual Sites

5.1 Land off Lees Yard, Lidsey Road (WE8)

- 5.1.1 The site is identified in the HELAA (Site Ref: WE8) as a 'deliverable site'. The site is located adjacent to the settlement boundary of Aldingbourne. This is a distinct settlement from Shripney and redevelopment of the site will not meet the housing needs, particularly the affordable housing needs, of individuals looking for accommodation in this settlement, or are as adjacent in Bognor Regis and Bersted.
- 5.1.2 The site is currently a horse paddock and comprises of a flat, square plot to the south of the settlement. The site is located next to A259 and bounded by trees. The HELAA Assessment Summary Table (See Appendix C) advises that potential constraints for the site includes potential for groundwater contamination and potential contaminated land from adjacent uses.
- 5.1.3 Planning permission for 30 dwellings on this site was refused on the 13th March 2019 (Ref: AL/57/18/OUT). The reason for refusal stipulates that this was due to the impact on the landscape character of the defined countryside and a lack of sustainable transport improvements. A revised outline application is currently pending determination (Ref: AL/21/20/OUT) which proposes 38 units of housing - 26 market and 9 affordable housing.
- 5.1.4 Both planning applications for this site provide fewer homes than the land east of Shripney Lane and sit under the 40 unit threshold detailed in sub-Chapter 5: Housing Capacity of this report. The site has been discounted on this basis accordingly.
- 5.1.5 The site is not in the applicant's ownership, nor is it currently on the market. Indeed, the current live application is evidence that the development of the site is being pursued by a third party. Consequently, the site is also not considered to be 'available' at present.

5.2 Wings Nursery, Lidsey Road (32)

- 5.2.1 The site is identified in the HELAA (Site Ref: 32) and is identified as a 'deliverable site'. The site is located adjacent to the settlement boundary of Aldingbourne. This is a distinct settlement from Shripney and redevelopment of the site will not meet the housing needs, particularly the affordable housing needs, of individuals looking for accommodation in this settlement.
- 5.2.2 The site consists of a relatively flat plot of grazing land and is screened by trees on three sides. There is an access road to the north which serves an adjoining however access to the site is directly off Lidsey Road (A29). The HELAA Assessment Summary Table (See Appendix D) advises that potential constraints for the site includes potential for groundwater flood risk, archaeology and it sits within the Lidsey treatment catchment.
- 5.2.3 Outline Planning Permission was granted on the 3rd October 2019 for 55 units (Ref: AL/32/19/OUT). As a very recently consented site this is now a housing commitment and would not contribute to addressing the shortfall of housing land in Arun District. It is our understanding that the site has been purchased by another developer and is no longer on the market, and as such the site is discounted on the grounds of not being available.

5.3 Land at Bridge Cottage & The Old Cottage (18AL4)

- 5.3.1 The site is identified in the HELAA (Site Ref: 18AL4) and is identified as a 'deliverable site'. The site is located adjacent to Lidsey. This is currently an isolated area with little by way of existing shops, services, public transport facilities or community and cannot presently be considered as a sustainable location.
- 5.3.2 This is a distinct settlement from Shripney and redevelopment of the site will not meet the housing needs, particularly the affordable housing needs, of individuals looking for accommodation in this settlement.
- 5.3.3 The HELAA Assessment Summary Table (See Appendix E) advises that potential constraints for the site includes potential for groundwater flooding and a number of trees on site are protected by TPO's.

- 5.3.4 The HELAA Assessment Summary Table also advises that the indicative capacity of the site is 27 units, and such the site is under the 40 unit threshold detailed in sub-Chapter 5: Housing Capacity of this report. The site has been discounted on this basis accordingly.
- 5.3.5 The site is part of the Bamham / Eastergate / Westergate Strategic Housing Allocation and the route of the A29 realignment is shown to be in close proximity to the site on the Arun District Local Plan (2018) Proposals Map. The delivery of this strategic infrastructure is therefore considered to be a pre-requisite for the delivery of the site. It is evident that the parcel could not exist as a sustainable development in isolation from the wider strategic allocation.
- 5.3.6 Furthermore, the site is not in the applicant's ownership, nor is it currently on the market. The site is neither 'available' or 'deliverable' at present.
- 5.4 Ryefield Farm & Woodgate Centre, Oaktree Lane (WA6)
- 5.4.1 The site is identified in the HELAA (Site Ref: WA6) and is identified as a 'deliverable site'. The site is located adjacent to the settlement Adlingbourne. This is a distinct settlement from Shipney and redevelopment of the site will not meet the housing needs, particularly the affordable housing needs, of individuals looking for accommodation in this settlement, or areas adjacent in Bognor Regis and Bersted.
- 5.4.2 The HELAA Assessment Summary Table (See Appendix F) advises that potential constraints for the site includes potential for groundwater flooding, a number of trees on site are protected by TPO's and the site is in an archaeological notification area.
- 5.4.3 The HELAA also advises that the eastern part of the site is located within flood zone 2, 3a and 3b (fluvial) and flood zone 2 and 3a (tidal). The climate change 100 year future flooding contour also affects this site. The site is not therefore a sequentially preferable.
- 5.4.4 The site is part of the Bamham / Eastergate / Westergate Strategic Housing Allocation and the route of the A29 realignment is shown to be in close proximity to the site on the Arun District Local Plan (2018) Proposals Map. The delivery of this strategic infrastructure is therefore considered to be a pre-requisite for the delivery of the site.
- 5.4.5 Furthermore, the site is not in the applicant's ownership, nor is it currently on the market. The site is neither 'available', 'deliverable' or 'sequentially preferable'.

6. Conclusions of the Sequential Test

- 6.1.1 The sequential assessment has reviewed and relevant and necessary public data sources that have, and will, guide development opportunities in the area of scope confirmed by Arun District Council. Consideration has been given to a range of sites to examine if they are reasonably available and satisfy the assessment criteria detailed in Chapter 3 of this report.
- 6.1.2 Paragraph 033 (Ref. ID: 7-033-20140306) of the NPPF Planning Guidance advocates that when applying the Sequential Test to individual applications, a pragmatic approach on the availability of alternatives should be taken.
- 6.1.3 The report demonstrates that there are no other reasonably available alternative sites within the defined area of search confirmed by Arun District Council. For the above reasons the application site is considered to pass the sequential test. Accordingly, planning permission can be granted for the development.

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Shripney



+ 3 miles



Size & Price



Property Type (1)



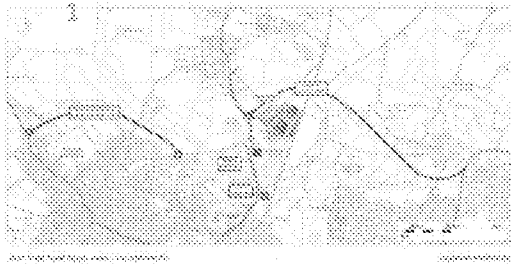
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Land For Sale in Shripney, Bognor Regis, West Sussex, within 3 miles

4 results

Sort: Relevance



Land for sale

Oldlands Farm, Steyning Way, Bognor Regis, West Sussex PO22 9NN

Preliminary Announcement - Exciting new development site with outline consent for a variety of A & B use classes. 4,366 sq m bulky goods retail consent. Of interest to retail warehouse, trade counter, car showroom, drive thru, hold and pub operators. Fronts A30 - Shripney relief road. Leasehol...

COMMERCIAL

Marketed by Lambert Smith Hampton, Southampton

POA

5,000-46,995 sq. ft.



02382 200077
Local call rate



Email agent

Additional commercial listings



Land for sale

****Land for sale** Elmer Road, Elmer, PO22 6LH (under 150 metres to the beach)**

This is a rare opportunity to purchase a building plot with planning permission for 2 new houses. The plot is in an excellent location within 150 metres of the beach. Full plans available on the Arun.gov.uk website reference M/42/19/PL. There is currently a habitable non-standard construction bun...

Marketed by Bell and Blake, Chichester

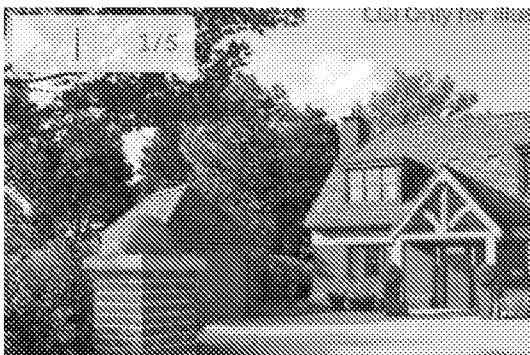
£450,000

01243 935166

Local call rate



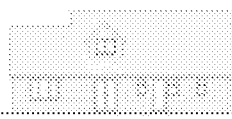
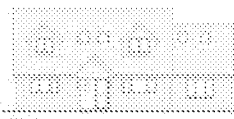
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Land for sale

276 Aldwick Road, Bognor Regis

White & Brooks are delighted to offer for sale this unique building plot situated in this highly sought after residential location of Aldwick. The property will briefly comprise of 3 double bedrooms, two bathrooms, two reception rooms, kitchen and enclosed mature garden. Please call us for more...



NEW HOME

Marketed by White & Brooks, Bognor Regis

£240,000

PLANNING
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03339 873582

Local call rate



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Land for sale

Aldwick Road, BOGNOR REGIS

AUCTION SALE 13 February 2020 - AUCTION VENUE: Macdonald Botley Park Hotel, Winchester Road, Boorley Green, Southampton, SO32 2UA, commencing at 1:00pm. Single building plot with full planning permission for a large three bedroom two reception detached chalet. An excellent small builder/self buil...





Marketed by Fox & Sons, Southampton Auctions

£200,000 Guide Price 

02380 338066
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HELAA Assessment Summary Table - Deliverable - Residential Site

Reference	WE8
Site Location	Land north of Lees Yard, Lidsey Road
Parish	Aldingbourne
Grid Reference	493889 - 104010
Strategic Allocation Site	No
Neighbourhood Plan Site	No
Site Area	1.53
Net Developable Area	1.22
Viability Typologies	3-MG50
Description of Site and Existing Use	This is a flat, square plot to the south of the settlement. The site is located next to A259 and bounded by trees. It is situated on the edge of the built up area and lies within an area which is being considered as a potential location for future strategic development . Horse Paddock.
Settlement	Aldingbourne.
Local Plan Area	Inland Arun Area
Existing Use	Greenfield
Potential Use for Evaluation	Residential.
Constraints	There is potential for groundwater flood risk. Adjacent to an site of potentially contaminated land.
Suitability Summary	Outside but adjoining the settlement boundary. Currently development on this site would contravene policy and therefore the site would not be considered to be suitable. However, from the information available, the site is considered suitable in principle for future housing potential, because of its accessibility to facilities, job opportunities and public transport, and because there are no insurmountable constraints. The site could contribute to the creation of a sustainable, mixed community.
Availability Summary	The site has previously been promoted, and there is a current planning application which is yet to be determined (November 2018). As a consequence, the site is considered to be available in the next 5 years.
Achievability Summary	According to the Arun Local Plan Viability Study 2016 the site is considered to be viable and achievable
Current Status	Deliverable

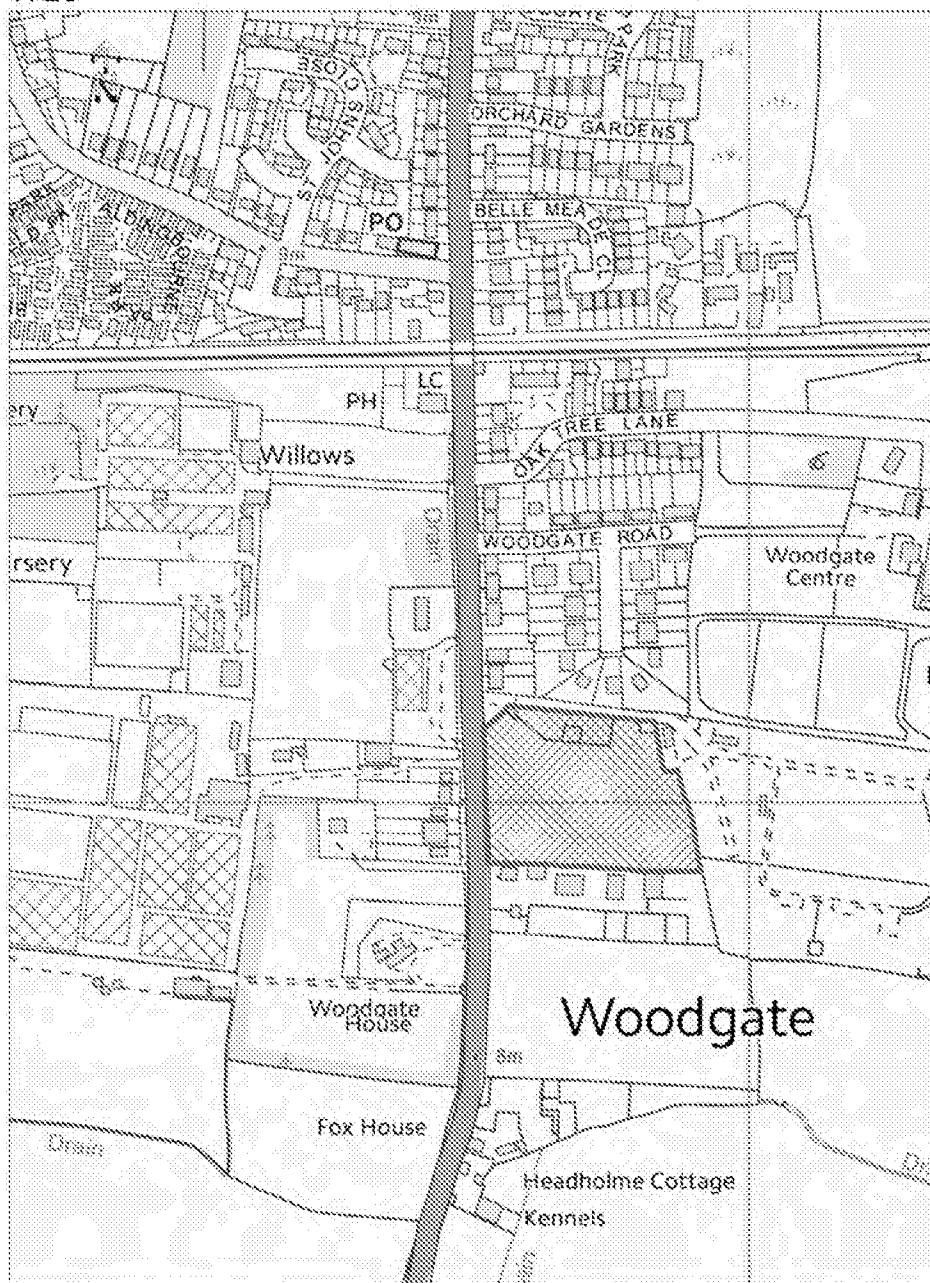
Projected Potential Yields

Suggested Density	Suggested Total Yield	Promoted/Planning Application
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HELAA APPENDIX (005)

						suggested total yield	
30			37				
2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
0	0	0	37	0	0	0	0
2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
0	0	0	0	0	0	0	

WE8



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HELAA Assessment Summary Table - Deliverable - Residential Site

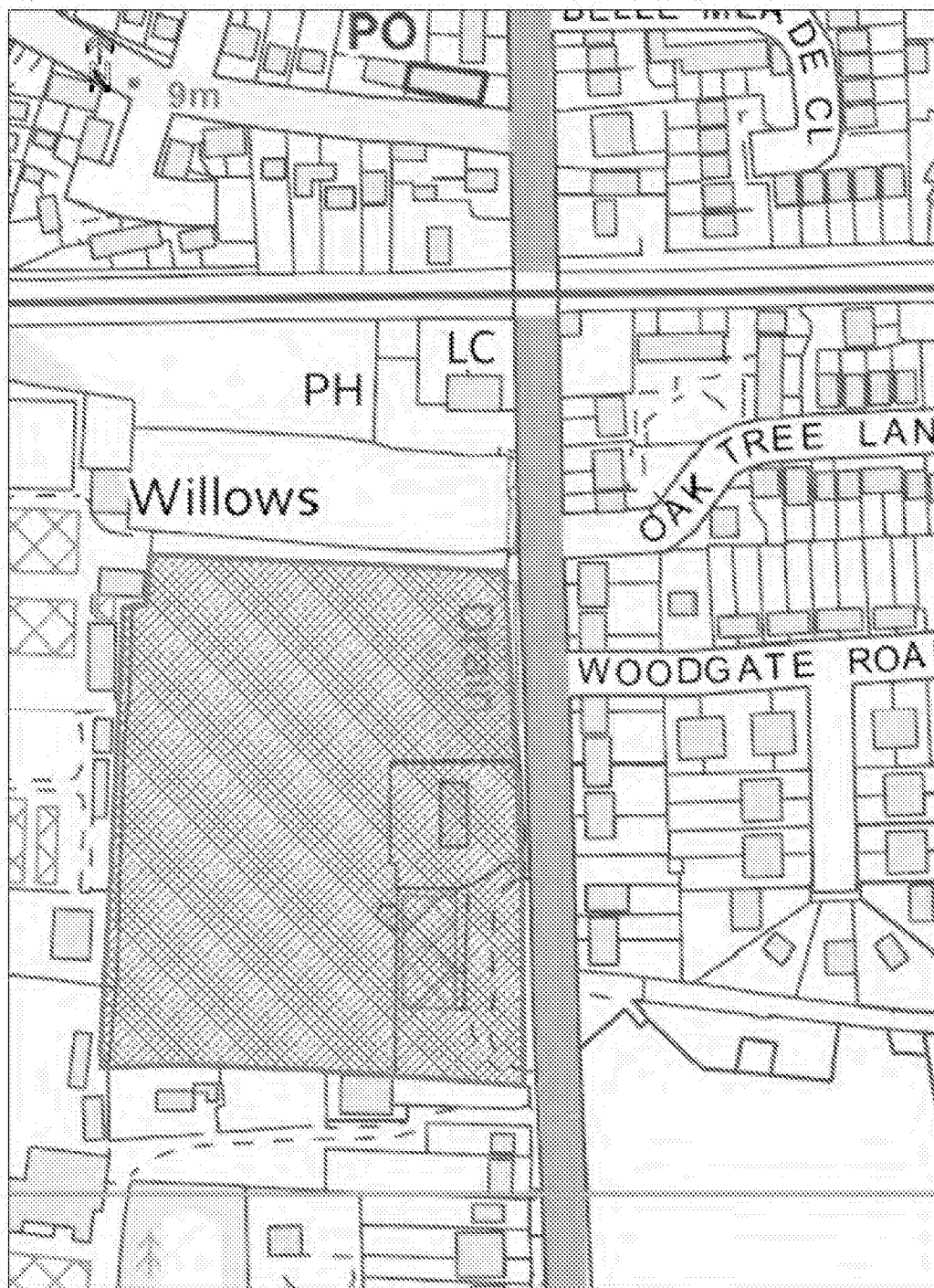
Reference	32
Site Location	Wings Nursery, Lidsey Road
Parish	Aldingbourne
Grid Reference	493715 - 104133
Strategic Allocation Site	No
Neighbourhood Plan Site	No
Site Area	2.6
Net Developable Area	1.82
Viability Typologies	2-LG75
Description of Site and Existing Use	The site consists of a relatively flat plot of land, partly used for grazing with trees on three sides. There is an access road to the north which serves an adjoining HELAA site (ref 113A). Access from this site is directly off Lidsey Road (A29). The site is located on the edge of the urban area. Agriculture / Horticulture
Settlement	Westergate
Local Plan Area	Inland Arun Area
Existing Use	Greenfield
Potential Use for Evaluation	Residential or Commercial
Constraints	There is potential for groundwater flood risk. Archaeology notification area. Lidsey Treatment Catchment.
Suitability Summary	Outside but adjoining the settlement boundary. The site could be considered suitable in principle for future housing potential, because of its accessibility to facilities, job opportunities and public transport, and because there are no insurmountable constraints. The site could contribute to the creation of a sustainable, mixed community. For a commercial use it is within a predominantly residential area at the edge of the village. Would need careful screening which would reduce floorspace capacity of site.
Availability Summary	The site has been actively promoted as available now - there has also been recent planning application on the site.
Achievability Summary	According to the Arun Local Plan Viability Study 2016 the site is considered to be viable and achievable
Current Status	Deliverable

Projected Potential Yields

Suggested Density	Suggested Total Yield	Promoted/Planning Application suggested total yield
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30			60				
2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
0	0	50	10	0	0	0	0
2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
0	0	0	0	0	0	0	

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HELAA Assessment Summary Table - Deliverable - Residential Site

Reference	18AL4
Site Location	Land at Bridge Cottage and The Old Cottage Lidsey Road Lidsey
Parish	Aldingbourne
Grid Reference	493917 - 103171
Strategic Allocation Site	Part
Neighbourhood Plan Site	No
Site Area	1.18 hectares.
Net Developable Area	0.9 hectares.
Viability Typologies	4 - MG25
Site Description/Existing Use	Site consists of residential dwellings and associated outbuildings. Residential.
Settlement	Westergate
Local Plan Area	Inland Arun Area
Existing Use	Residential
Constraints	TPO/AI/2/18, Area Susceptible to Groundwater Flooding
Potential use for evaluation	Residential.
Suitability	The site is considered suitable for development. It is partly covered by the BEW strategic housing site allocation. It also has recent planning application history on the site.
Availability Summary	As at Sept 2019, the site is considered available and to be delivered within the next 5 years.
Achievability Summary	The Arun Local Plan Viability study 2016 identifies that sites such as this are viable and achievable.
Deliverability Summary	Promoter estimates planning application to be submitted in Sept 2019 and completion of last dwelling to be June 2022.
Current Status	Deliverable

Projected Potential Yields

Suggested Density			Suggested Total Yield			Promoted/Planning Application suggested total yield	
30			27				
2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
0	0	27	0	0	0	0	0
2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
0	0	0	0	0	0	0	0



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HELAA Assessment Summary Table - Deliverable - Residential Site

Reference	WE6
Site Location	Ryefield Farm & Woodgate Centre, Oaktree Lane (Part of SD5)
Parish	Aldingbourne
Grid Reference	494130 - 104157
Strategic Allocation Site	Yes
Neighbourhood Plan Site	No
Site Area	7.35ha
Net Developable Area	5.47ha
Viability Typologies	1-LG150
Description of Site and Existing Use	The site consists of a number of horse paddocks, fields and farm buildings. The site is located on the edge of the urban area. Access is off Oaktree Lane. The site lies within the BEW strategic housing allocation (SD5). Agriculture.
Settlement	Eastergate.
Local Plan Area	Inland Arun Area
Existing Use	Greenfield
Potential Use for Evaluation	Residential
Constraints	The eastern part of the site is located within flood zone 2, 3a and 3b (fluvial), flood zone 2 and 3a (tidal) and groundwater flood risk area. There is a Tree Preservation Order, and the site is an archaeological notification area. Within wider conservation area for Singleton to Cocking Tunnels meaning an ecological survey focused on foraging and commuting bats needed PLEASE NOTE: The climate change 100yr flooding contour affects this site and could potentially reduce the final yield for the site. The final yield will be dependent on sequential and exception tests and other relevant mitigation measures. The yield figure in this report does not reflect the climate change impact and therefore the status of this site reflects the yield using the viability study methodology without the climate change 100yr flooding contour. Should this site be taken forward as an allocation within the development plan, then further assessment will be required to address the climate change impact.
Suitability Summary	As the site forms part of the larger strategic housing site SD5 it is considered suitable.
Availability Summary	The site has been given updated trajectories during August 2019 HELAA update process.
Achievability Summary	According to the Arun Local Plan Viability Study 2016 the site is considered to be viable and achievable

Deliverability Summary	Promoter has updated housing trajectories but no timeframes for submission of planning application at this stage (Sept 2019).
Current Status	Deliverable

Projected Potential Yields

Suggested Density			Suggested Total Yield			Promoted/Planning Application suggested total yield	
30			160				
2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
0	0	0	0	50	50	60	0
2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
0	0	0	0	0	0	0	

WE6

