



Gladman

Land off Arundel Road, Angmering

Flood Risk Assessment & Outline Surface Water Drainage
Strategy

881292-R2(02)-FRA



INVESTORS
IN PEOPLE



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RSK GENERAL NOTES

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This work has been undertaken in accordance with the quality management system of RSK LDE Ltd.

Gladman
 Land off Arundel Road, Angmering
 Flood Risk Assessment & Outline Drainage Strategy
 881292-R2(02)-FRA

EXECUTIVE SUMMARY

RSK has been commissioned to undertake a Flood Risk Assessment and Outline Drainage Strategy in support of the Outline Planning Application for a proposed residential development. The proposals are to remove the existing buildings and hard standing and to construct residential dwellings, vehicular access and soft landscaping. This will be contained within a proposed site totalling 9.10 hectares of land off Arundel Road, Angmering. The majority of site is currently considered as undeveloped from a hydraulic prospective and is used for agricultural purposes. The area of existing hard standing to the south east of the site has a drainage network that includes a storm overflow pipe from a septic tank to the ditch towards the south west of the site.

This site is located within Flood Zone 1 and therefore the proposed development passes the Sequential Test and does not require an Exception Test to be undertaken as part of planning as the development has avoided areas at risk of flooding.



Generally the site is considered to be at low risk from all sources of flooding and will not increase the risk of flooding elsewhere as a result of the development of the site.

Infiltration testing was undertaken across the site to assess the suitability of infiltration based SuDS, it was found following testing that infiltration rates were not favourable. As a result the drainage strategy suggests the surface water runoff should be managed via onsite attenuation and controlled discharge to a nearby watercourse. It is suggested within the strategy that surface water runoff could be safely conveyed towards the western boundary for attenuation within a basin, with controlled discharge into the existing drainage ditch. From this ditch the surface water can be conveyed to a nearby watercourse.

It is recommended that finished floor levels should be set at or above the existing ground levels in order to not increase the risk of flooding to the properties.

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1 INTRODUCTION

RSK Land and Development Engineering Ltd (RSK) was commissioned to carry out a Flood Risk Assessment (FRA) for Gladman (the 'client'). The assessment is in support of the outline planning submission for the land off Arundel Road, Angmering, West Sussex.

The assessment has been prepared in accordance with the National Planning Policy Framework (NPPF)¹ and its accompanying Planning Practice Guidance², the Interim Code of Practice for Sustainable Drainage³, BS 8533-2011 Assessing and Managing Flood Risk in Development Code of Practice⁴ and the Non-statutory technical standards for sustainable drainage systems⁵, with site-specific advice from the Environment Agency (EA), the Lead Local Flood Authority (LLFA), the Local Planning Authority (LPA), the architect and the client.

The NPPF sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

The key definitions within the PPG are:

- "Flood risk" is a combination of the probability and the potential consequences of flooding from all sources – including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources.
- "Areas at risk of flooding" means areas at risk from all sources of flooding. For fluvial (river) and sea flooding, this is principally land within Flood Zones 2 and 3. It can also include an area within Flood Zone 1 which the Environment Agency has notified the local planning authority as having critical drainage problems.

For this site, the key aspects that require the assessment are:

- The Environment Agency's indicative flood zone map shows that the site is located within Flood Zone 1 (**Figure 1.1**), and;
- The site area is 9.10Ha therefore surface water drainage must be considered and sustainable drainage systems (SuDS) utilised where possible.

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

¹ Communities and Local Government, 'National Planning Policy Framework', 2012

² Communities and Local Government, 'Planning Practice Guidance - Flood Risk and Coastal Change, ID 7', May 2014 <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

³ DEFRA, 'Interim Code of Practice for Sustainable Drainage Systems' National SUDS Working Group, July 2004

⁴ BSI, 'BS 8533-2011 Assessing and managing flood risk in development Code of practice', 2011

⁵ DEFRA, 'Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems', May 2015

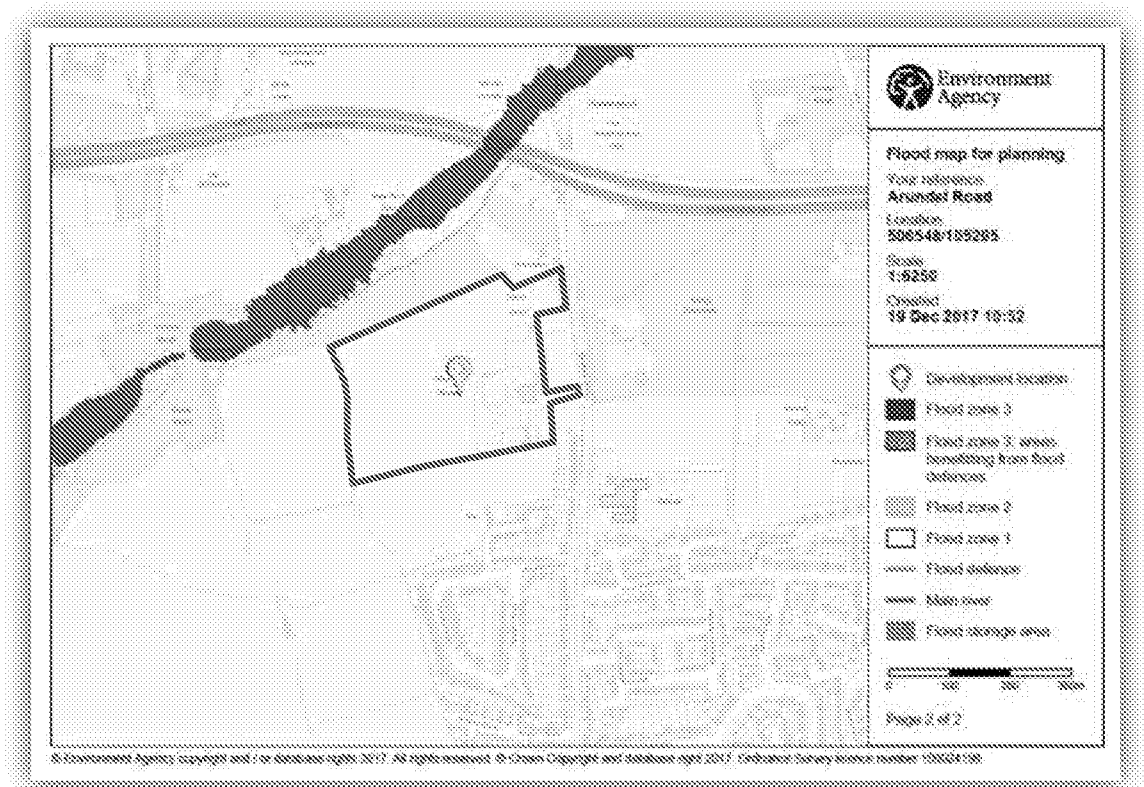


Figure 1.1: Environment Agency Flood Zone Map (accessed December 2017)

2 CONTEXT AND SCOPE OF WORK

A key element of project development is to prepare a Flood Risk Assessment to establish the flood risk associated with the proposed development and to propose suitable mitigation, if required, to reduce the risk to a more acceptable level.

The scope of work relating to a Flood Risk Assessment is based on the guidance provided in Section 10 of the NPPF and its accompanying Planning Practice Guidance.

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. The scope of this assessment therefore comprises the following elements:

- To review development framework plans, planning information and other studies to determine existing site conditions;
- To obtain information on the hydrology and hydrological regime in and around the site;
- To obtain the views of the Lead Local Flood Authority in terms of flood risk and drainage;
- To obtain the views of the Environment Agency including scope, location and impacts;
- To determine the extent of new flooding provision and the influence on the site;
- To assess the impact on the site from climate change effects and anticipated increases in rainfall over a 100 year period for residential uses;
- To review site surface water drainage based on the proposed layout and, if necessary, to determine the extent of infrastructure required; and
- To prepare a report including calculations and summaries of the source information and elements reviewed.

Reliance has been placed on factual and anecdotal data obtained from the sources identified. RSK cannot be held responsible for the scope of work, or any omissions, misrepresentation, errors or inaccuracies with the supplied information. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

3 SITE DESCRIPTION

3.1 Location

Site Name: Land off Arundel Road
 Site Address: Arundel Road,
 Angmering,
 West Sussex

Site National Grid Reference: 506554 E, 105259 N

The site is located to the west of Arundel Road in Angmering; a large village in West Sussex. Angmering is situated approximately 2.4km south east of the larger town of Littlehampton, a coastal town at the mouth of the River Arun. The existing site measures approximately 9.10Ha and comprised of a large field with a developed area on the east boundary. The developed area consists of a residential property, an area for automotive repairs and storage and various other outbuildings used as sales premises. Formal access to the site is from Arundel Road to the south east boundary, there is also gated access from Arundel Road to the north east boundary.

Table 3.1, below, provides a description of the immediate surroundings of the site.

Table 3.1: Site setting

Direction	Characteristic
North	There is an unnamed watercourse approximately 70m from the north boundary flowing parallel to the boundary from north east towards the west. The area between the watercourse and the site boundary is roughly vegetated land. Mapping shows ponds and forested areas starting approximately 90m from the north east boundary corner.
East	The east boundary is partly offset from Arundel Road by approximately 50m where an area of vegetated land exists between the site and the road. There is a main access road to the existing development onsite from Arundel Road. There is also access to the fields from a gated entrance on Arundel Road. The land east of Arundel road is largely agricultural and forest with some residential properties.
South	The south boundary is made up of dense hedgerows and mature trees. The adjacent field on the south boundary is used as recreational sports pitches for a sports and social club.
West	The land adjacent to the west boundary is for agricultural use. There is a dense hedgerow defining the border of the site, within the hedgerow is a ditch that would convey any flows from south to north, the ditch is outside of the site boundary.

Figure 3.1 shows a Site Location Map.



Figure 3.1: Site location plan (provided by Gladman)

3.2 Land use and topography

A topographic survey has been provided for the site by Gladman⁶. Generally the site falls from the east towards the west. The highest elevations on site are located at the eastern boundary; they range from generally 18.00m above ordnance datum (mAOD) in the south east and generally 21.00mAOD. The lowest areas are along the western boundary where ground levels are at approximately 10.90mAOD. The topographic survey did not identify any land drains or ditches on site.

The approximate land use of the site is as follows:

⁶ Gladman September 2017, Project No. 2017-084, Drawing No. Topo_02_2D, Topographical Survey As Of 13.09.17

Table 3.2: Existing site land uses (approximate)

Land use	Area (Ha)	Percentage
Impermeable	0.92	10.1
Permeable	8.18	89.9
Total	9.10	100

Approximately 10.1% of the existing site is currently developed with impermeable land cover, this includes hardstanding, black top surfaces and buildings. As can be seen in **Image 3.1** some of the buildings are drained to below ground drainage features. **Image 3.2** shows that some downpipes are drained onto the hardtop surface and allowed to flow into drain features built into the hardstanding, it is not thought that all of these drainage features are connected to a drainage network. The drainage network conveys flows towards a septic tank in the south western corner of the area of hardstanding. The septic tank has a storm overflow pipe that conveys overflows westwards to the west boundary of the site.



Image 3.1: Downpipe from commercial units



Image 3.2: Surface water drain outside a commercial unit

3.3 Hydrology

As can be seen in **Figure 1.1** the watercourse north of the boundary is not an Environment Agency designated 'Main River', it is an unnamed watercourse that flows from the north east towards the west. **Image 3.3** shows that this watercourse begins on the south side of the A27 main road from a culvert that likely services field drains north of the A27 and possibly a highway drainage system. The Environment Agency have suggested West Sussex County Council undertook a small 'flood' drainage scheme close to this culvert 'some years ago', though no additional information was given (Environment Agency correspondence in **Appendix B**).

The watercourse flows through the forested area north of the site boundary on towards the ponds north east of the site boundary named 'Decoy Ponds' which are privately owned. It is the outflow from these ponds that is then classified by the Environment Agency as a 'Main River' and is formally named on mapping services as 'Black Ditch'.

This watercourse continues in a general westwards direction where it joins the River Arun approximately 4.6km away.



Image 3.3: The culvert south side of the A27.

Image 3.4 shows a large ditch that is adjacent to the site close to the south west boundary, it is thought that this ditch drains westwards towards the watercourse. The topographic survey that details depths of the ditch parallel to the western boundary suggests that flows within this ditch are conveyed south towards a low point at the south west corner of the site which aligns with the ditch shown in **Image 3.4**. It is thought a culvert provides connectivity between the two ditches to allow for drainage in a westwards direction to a nearby watercourse.



Image 3.4: Facing westwards, ditch to the west of the site, likely draining away from the site.

3.4 Geology

Based on published geological records for the area (British Geological Survey online mapping), the site exhibits the following geology:

- Superficial Geology; Head - Clay, Silt, Sand and Gravel. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by subaerial slopes.
- Bedrock Geology; London Clay Formation - Clay, Silt and Sand. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas.

There was no superficial geology shown along the north eastern corner.

Predominantly clay geology was confirmed by RSK's Soakaway Testing Assessment.⁷

3.5 Hydrogeology

Hydrogeological information was obtained from the Environment Agency's online mapping service. These maps indicate that the site is underlain by a Secondary (undifferentiated) superficial aquifer deposits across the site area. This has predominantly lower permeability layers and may have been previously designated as a non-aquifer or minor aquifer. The site is not underlain by a bedrock aquifer. The site is not located within a Groundwater Source Protection Zone; Zones 1, 2 and 3 can be found approximately 750m north of the site.

Onsite Trial Pit testing found no evidence of Groundwater up to the end depths of Trial Pits at 2.50m below ground level (bgl).

3.6 Infiltration

Soakaway testing was conducted by RSK on 10th October 2017. The report concluded the following infiltration rates across the site. Rates are shown in **Table 3.3**, the detailed map of the trial pit locations and infiltration rates can be found in **Appendix C**.

Table 3.3: Summary of trial pit soakaway results

Soakaway pit	Main Geological Unit	Test outcome (m/sec)
SA1	CLAY	No significant drop in water level observed. Unable to calculate infiltration rate.
SA2	Sandy silty CLAY / sandy gravelly CLAY	Test 1: 6.7×10^{-7}
SA3	Sandy gravelly silty CLAY	No significant drop in water level observed. Unable to calculate infiltration rate.
SA4	Sandy gravelly CLAY	No significant drop in water level observed. Unable to calculate infiltration rate.

⁷ RSK Environment Limited October 2017, 301954-R02(00) Soakaway Testing: Arundel Road, Angmering.

4 DEVELOPMENT PROPOSALS

The proposed development is for a residential end use. The current proposed development framework shows that 6.00Ha of the 9.10Ha site will be developed. This area will contain a variety of dwellings, driveways, gardens, access highways, areas of public open space and an area of soft landscaping including a recreational sports pitch. Of this development area an impermeable area of 55% has been assumed. Therefore the approximate land uses of the proposed site are summarised in **Table 4.1** below.

Table 4.1: Proposed site land uses

Land use	Area (Ha)	Percentage of Developable Area (%)	Percentage of Total Site (%)
Impermeable	3.30	55	36.26
Permeable	2.70	45	29.67
Total Developable Area	6.00	100	65.93
Remaining Greenfield Area	3.10	N/A	34.07
Total Site Area	9.10	N/A	100

5 LEGISLATION AND POLICY CONTEXT

5.1 National policy

Table 5.1: National legislation and policy context

Legislation	Key provisions
National Planning Policy Framework (2012)	The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.
Planning Practice Guidance (2014)	The NPPF is supported by an online Planning Practice Guidance, which provide additional guidance on flood risk.
Flood and Water Management Act 2010	The Flood and Water Management Act (FWMA) aims to implement the findings of the 2007 Pitt Review and co-ordinate control of drainage and flood issues. There are a number of increased responsibilities within the Act that affect adoption of SuDS features and the role of the Environment Agency to expand on the mapping data they provide. The implementation of SuDS features has many beneficial impacts on the treatment of surface water during remediation works.
Water Resources Act 1991	Section 24 – The Environment Agency is empowered under this Act to maintain and improve the quality of ‘controlled’ waters Section 85 – It is an offence to cause or knowingly permit pollution of controlled waters Section 88 – Discharge consents are required for discharges to controlled waters
Water Framework Directive (2000)	The Water Framework Directive (WFD) requires all inland and coastal waters to reach ‘good’ chemical and biological status by 2015. Flood risk management is unlikely to have a significant impact on chemical water quality except where maintenance works disturb sediment (such as de-silting) or where pollutants are mobilised from contaminated land by floodwaters. The main impact of the WFD on flood risk management, both now and in the future, relates to the ecological quality of water bodies. Channel works, such as straightening and deepening, or flood risk management schemes that modify geomorphological processes can change river morphology. The WFD aims to protect conservation sites identified by the EC Habitats Directive and Birds Directive that have water-related features, by designating them as ‘protected sites’.

5.2 Local policy

Local policies ensures that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and making development safe without increasing flood risk elsewhere and where possible, reducing flood risk. The existing Local Plan used by the existing Arun District Council covers the period between 1996 to 2011 and was adopted in April 2003. In 2014 the emerging local plan was put forward for review and will cover the period from 2011 to 2031.

Table 5.2: Local policy context

LDF document	Key provisions and policies
Arun District Local Plan 2011-2031 October 2014 (Emerging Local Plan)	Policy H SP1 Strategic housing, parish and town council allocations Water and drainage A comprehensive Sustainable Urban Drainage System (SUDS) will be required which shall include a range of measures including water harvesting and the use of permeable paving. The management of surface water shall be creatively considered in the overall design concept of these lands. A flood risk assessment shall be undertaken and mitigation measures incorporated into any development scheme in line with the approach as set out in the Water Section of the Local Plan.
	Policy ECC SP1 Adapting to climate change The Council will support development which is located and appropriately designed to adapt to impacts arising from climate change such as the increased probability of fluvial and tidal flooding; water stress; health impacts as a result of extreme temperatures and a decline in the quality of habitats and richness of biodiversity. In order to achieve this, development must be designed to take account of the following issues: a) Location (in relation to flood risk and vulnerability to coastal erosion); b) Water efficiency; c) Shade, cooling, ventilation, solar gain; d) Connectivity to the green infrastructure network; e) Layout and massing; f) Resilience of buildings and building materials to extreme weather events; and g) Capacity of drainage systems and incorporation of sustainable urban drainage systems (SuDS).

LDF document	Key provisions and policies
	Policy W DM2 Flood Risk Development in areas at risk from flooding, identified on the latest Environment Agency flood risk maps and the Council's Strategic Flood risk Assessment (SFRA), will only be permitted where all of the following criteria have been satisfied: a) The sequential test in accordance with the National Planning Policy Framework Technical Guidance has been met. b) A site specific Flood risk Assessment demonstrates that the development will be safe, including access and egress, without increasing the flood risk elsewhere and reduce flood risk overall. c) The scheme identifies adaption and mitigation measures. d) Appropriate flood warning and evacuation plans are in place; and e) New site drainage systems are designed to take into account of events which exceed the normal design standard i.e consideration of flood flow routing and utilising temporary storage areas. The reports prepared as part of the criteria above must take into account contingency allowances, taking climate change into account as set out in the NPPF Technical Guidance. All development proposals must take into account of the relevant Surface Water Management Plans, Catchment Flood Management Plans and related Flood Defence Plans and strategies such as the Lower Tidal River Arun Strategy. The council may require financial contributions from development on sites where measures to address flood risk or to improve the environmental quality of watercourses have been identified by these Plans and Strategies.
	Policy W DM3 Sustainable Urban Drainage Systems To increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process. Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design. Proposals for major development must also integrate SUDS within public open spaces and roads, in liaison with West Sussex County Council, (the SUDS Approval Body) or its agent. SUDS must therefore be integrated into the overall design of a development and must: a) Contribute positively to the appearance of the area b) Effectively manage water (including its quality) c) Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets and; d) Provide amenity for local residents (ensuring a safe environment) and;

LDF document	Key provisions and policies
	e) Retain existing open drainage ditches in their current form. In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must: f) Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA. g) Undertake up to six months groundwater monitoring within the winter period. h) Undertake winter percolation testing in accordance with BRE365. i) The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event. j) The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas. k) Flow routes through the development must be demonstrated as a first stage in the design process, demonstrating how water will travel at or near the surface for three types of flow; Low flow routes, overflows and exceedance routes
Arun District Local Plan 1996-2011 April 2003 (Existing Local Plan)	POLICY GEN9 Foul and Surface Water Drainage Planning permission for development which will materially increase foul and/or surface water discharges will be refused unless the Local Planning Authority is satisfied that either adequate drainage capacity exists or appropriate drainage capacity can be provided as part of the development. Consideration should also be given to the use of Sustainable Urban Drainage Systems (SUDS) as alternatives to conventional drainage where appropriate. Reason To prevent adverse harm to the water environment in terms of pollution and flooding, and to minimise the risks to life and property in vulnerable areas. Informatives 1.45 Due to specific flooding problems during the winter of 1993/94 in the Barnham area, a Barnham Rife Catchment Area was defined. Special development control consultation procedures with Southern Water Services and the Environment Agency apply to this area, which is shown on the Proposals Map. 1.46 The Local Planning Authority will promote the use of balancing ponds for the attenuation of surface water run-off where this is required. Proposals for the long-term management of any facility must be included in any

LDF document	Key provisions and policies
	scheme put forward. 1.47 The Local Planning Authority will have regard to the advice of the Environment Agency and the Council's own engineers when considering applications for development which could lead to increased flood risk through the exacerbation of land drainage problems. Developers may be required to carry out detailed technical investigations to ensure proposed development is not at risk of flooding and ensure the safety of proposed development and ensure that flooding problems elsewhere are not exacerbated. 1.48 Sustainable Urban Drainage Systems (SUDS) aim to promote the retention of rainwater within its natural catchment area and natural drainage systems. The protection of rivers from diffuse pollution, the reduction of infrastructure costs, good environmental practice, opportunities for conservation and environmental enhancements and ensuring the risk of flooding is not increased are all vital components of successful SUDS. Developers should consider the use of SUDS at the earliest possible stage, as this can influence the overall layout of development.

6 SOURCES OF INFORMATION

6.1 Environment Agency consultation

6.1.1 Flood zone maps

The Environment Agency Flood Zone mapping study for England and Wales is available on their website at <https://flood-map-for-planning.service.gov.uk/>

The current displayed map is reproduced as **Figure 1.1** and shows the site to lie within Flood Zone 1 showing the site with low risk of fluvial or tidal sources.

Recently, the Environment Agency released an additional form of mapping 'Risk of Flooding from Rivers and Sea', which is available at:

<https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

This map has been reproduced as **Figure 7.1** and shows the Environment Agency's assessment of the likelihood of flooding from rivers and the sea at any location and is based on the presence and effect of all flood defences, predicted flood levels, and ground levels.

The relevant guidance note from the Environment Agency is available online through the following link: <https://www.gov.uk/planning-applications-assessing-flood-risk>

6.1.2 Site specific consultation

The Environment Agency was formally consulted as part of this assessment. Their response, with request for flood related information can be found in **Appendix B**.

The information request provides a link at which information is freely available about the site. It confirms the following points:

- The site is located within Flood Zone 1.
- The site is 25m from Flood Zone 3, therefore fluvial and tidal models were not given.
- Little is known about historic flooding of the site; it is only known that West Sussex County Council have undertaken a small 'flood' drainage scheme within the vicinity of the A27.
- No known issues with Groundwater flooding.
- The Environment Agency have recommended consideration must be given to any discharge to the watercourse. The floodplain downstream of the site is described as being 'on its limit' for accommodating increased drainage capacity.

6.2 West Sussex County Council

The council was formally consulted as part of this assessment. However as of writing the report a response was yet to be received.

6.3 Arun District Council

The council was formally consulted as part of this assessment. However as of writing the report a response was yet to be received.

6.4 Internal Drainage Board

The closest operating Internal Drainage Board (IDB) is the River Arun IDB. The boundary of the IDB maintained area comes within 790m of the site and encompasses Black Ditch, an Environment Agency designated Main River. As the ditches around the site are not maintained by the IDB they were not contacted as part of this assessment.

6.5 Canal & River Trust

There are no known Canal & River Trust maintained assets within the study area.

6.6 Site walkover

A site walkover was undertaken by RSK and the on-site observations have been incorporated below and throughout this assessment along with relevant images where necessary.

The site currently consists of a bungalow, premises for commercial units, an automotive repair workshop, storage for caravans, a caravan park and various outbuildings. The downpipes from buildings were inspected as part of the site walkover, it was found whilst some were drained into a below ground system, others discharged onto the hard top surface where flow was directed towards surface water drains (**Image 3.1** and **Image 3.2**). Manholes were seen across the site however it was not clear what these manholes were servicing or where flow was being directed (**Image 6.1**). The landowner has confirmed that drainage is towards across the south east developed area is towards a septic tank.

The north east of the site is made up of roughly vegetated land with some hardstanding. There was evidence of building rubble left across the site however there was no clear evidence of an existing surface water drainage network.

The remaining area of the site was for agricultural use, there were no field drains observed across the field. The fields were observed to be sloping towards the western boundary where there was a ditch within the hedgerow (**Image 6.2**).

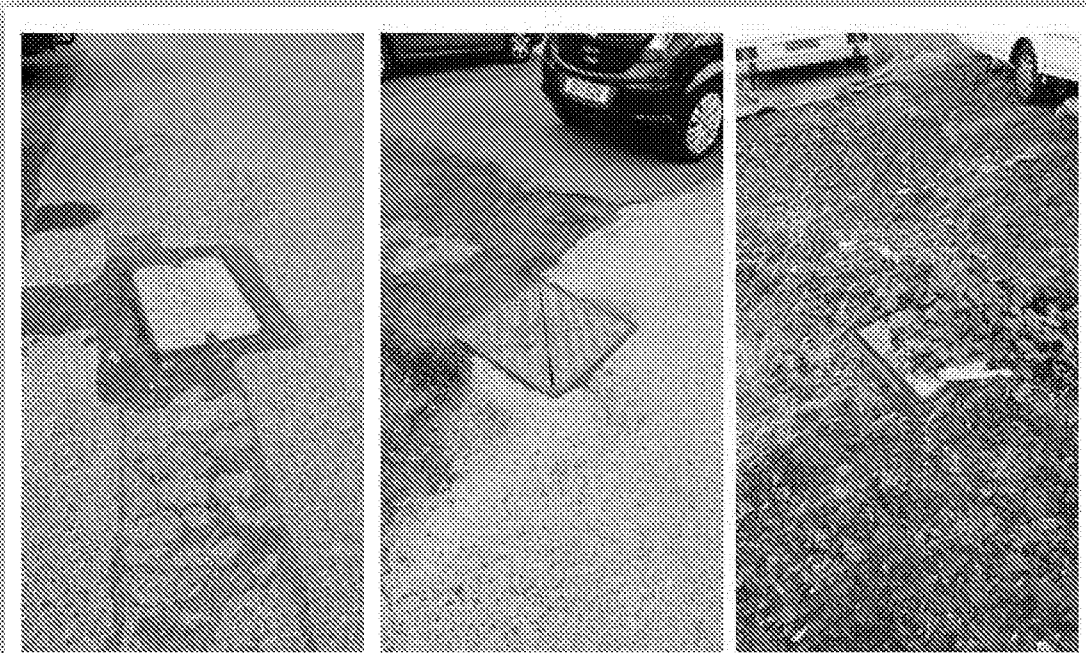


Image 6.1: Various manholes across the site



Image 6.2: Agricultural fields, facing west from the north east corner.

6.7 Relevant studies

Table 6.1: Relevant studies

Study	Comments
Strategic Flood Risk Assessment Arun District Volume II Technical Report February 2008	Arun District Council prepared a strategic Flood Risk Assessment (SFRA) to support their Local Development Framework and Core Strategy. The assessment aims to characterise the flood risk at present and also into the future. The River Arun flows through the Weald and the South Downs, across the coastal plain and discharges into the English Channel. The river has a tidal influence up to its confluence with the Western Rother at Pulborough. The main flood defences on the River Arun are walls and embankments along the tidal extent of the river from Littlehampton to Pulborough; these offer protection from floods with a 3.33% AEP to floods with a 1% AEP. Flooding from rivers can be managed in a number of ways: • Avoidance – developing outside of the floodplain. • Prevention – walls and embankments used to exclude water from a site. • Management/Adaption – flood resilient design, flood warnings and evacuation planning. The low-lying parts of the coastline are at risk of flooding from high tides and storm surges on the English channel. In most instances, sea defences are constructed to offer protection from the 0.5% AEP storm surge. However there is residual risk of flooding behind defences during times of extreme high tides and tidal surges. A significant proportion of land across the north of the district is chalk based geology. Over these areas there are significant proportions of land which are more likely to be affected by Groundwater emergence. The locations of emergence points are difficult to predict and it therefore only possible to identify broad areas at a strategic level. Groundwater flooding is often highly localised and complex, the implications of Groundwater flooding should be considered and managed through development control and building design. Responses to Groundwater flooding include: • Raising property ground or floor levels. • Flood proofing. • Pumping to reduce Groundwater levels locally. The potential for surface water flooding is variable across the district, reflecting the changing geology, soil types and rainfall patterns. Developments which are adjacent to artificial drainage systems or located at the bottom of hillslopes may be more prone to flooding from overland flows. This may be especially true for areas that are downslope of land that increases runoff potential such as agricultural land, impermeable area associated with urban development Management of surface water flooding is highly dependent upon the characteristics of the site. The implications of surface water flooding should be considered and managed through development control and building design. Responses to surface water flooding include: • Sensitive land use management based on policies at a strategic level.

Study	Comments
	• Major ground works. • Appropriate site selection for developments. • Development zoning including the use of green space and planting to manage runoff. • Management of development runoff (such as the inclusion of SuDS). • Pumping.
West Sussex Preliminary Flood Risk Assessment May 2011	This Preliminary Flood Risk Assessment (PFRA) fulfils a number of West Sussex County Council's responsibilities under two sets of new legislation: the Flood Risk Regulations (FRR09), which came into force on the 10th December 2009, and the Flood & Water Management Act (F&WMA) which gained Royal Assent on the 8th April 2010. The aim of this PFRA is to provide an assessment of local flood risk across the study area, including information on past floods and the potential consequences of future floods. The PFRA process for LLFAs highlights flood risk from local sources and not those to be reported by the Environment Agency, i.e. it excludes main river, tidal or large reservoir flooding. Types of flooding include: • Surface Water Flooding - Surface water flooding can be caused by rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and which has not entered a watercourse, drainage system or public sewer. Although flooding from surface water and combined sewers can be considered a form of surface water flooding, sewer flooding for this PFRA has been considered separately where there is sufficient information available to indicate that the flooding was caused wholly or partly by rainwater entering the system. • Groundwater - Groundwater flooding can occur when groundwater rises up from the underlying aquifer to flood subsurface infrastructure or to emerge at the ground surface. Groundwater flooding is generally caused by the rise of groundwater levels to extreme high levels in permeable consolidated aquifers (primarily chalk) in response to prolonged above average rainfall; or from hydraulic continuity with high water levels in adjacent rivers. • Ordinary Watercourse - Flooding can occur from an ordinary watercourse overtopping its bank level. An ordinary watercourse is any watercourse (river, stream, ditch, cut, sluice, dyke or non-public sewer) that is not identified as a Main River on maps held by the Environment Agency.

6.8 Drainage

6.8.1 Public sewer

Sewer details have been referenced from sewer record plans obtained from Severn Trent (**Appendix D**). The plans indicate that there are no public sewers located within the site boundary and there are no public sewers within close proximity of the site such as within Arundel Road. The nearest public sewer is a foul sewer located within Arundel Road approximately 200m south of the site.

6.8.2 Private drainage

Manholes on site indicated the presence of a sewer network below the developed area of the site in the south east. The land owner confirmed that drains convey flows to a septic tank below ground in the south western corner of the developed area. The landowner has stated there is a stormwater overflow pipe from the septic tank to a ditch at the south west boundary of the site.

7 SOURCES OF FLOOD RISK

7.1 Criteria

In accordance with the NPPF and advice from the Environment Agency, a prediction of the flood sources and levels is required along with the effects of climate change from the present for the design life of the development (in this case assumed to be 100 years). To consider these effects of climate change, a 40% climate change factor be used within the calculations.

The flood risk elements that need to be considered for any site are defined in BS 8533 as the "Forms of Flooding" and are listed as:

- Flooding from Rivers (fluvial flood risk);
- Flooding from the Sea (tidal flood risk);
- Flooding from the Land;
- Flooding from Groundwater;
- Flooding from Sewers (sewer and drain exceedance, pumping station failure etc); and
- Flooding from Reservoirs, Canals and other Artificial Structures.

The following section reviews each of these in respect of the subject site.

7.2 Flooding from rivers (fluvial flood risk)

The latest Environment Agency published flood zone map (**Figure 1.1**) shows that the site lies within Flood Zone 1. This means there is a less than 1 in 1000 annual probability of river or sea flooding. The nearest Flood Zone identified is Flood Zone 3 identified by the Environment Agency as approximately 25m from the north west corner site boundary. The flood risk is associated with the unnamed watercourse flowing through the forested area which is located within an area significantly lower than the site itself.

The latest 'Risk of Flooding from Rivers and Sea' flood map (**Figure 7.1**) indicates that the site is considered to at 'very low' risk of fluvial flooding. There is marginal encroachment of 'Low' flood risk across the northern boundary, restricted to the lowest area of the site in the north west corner of the site.

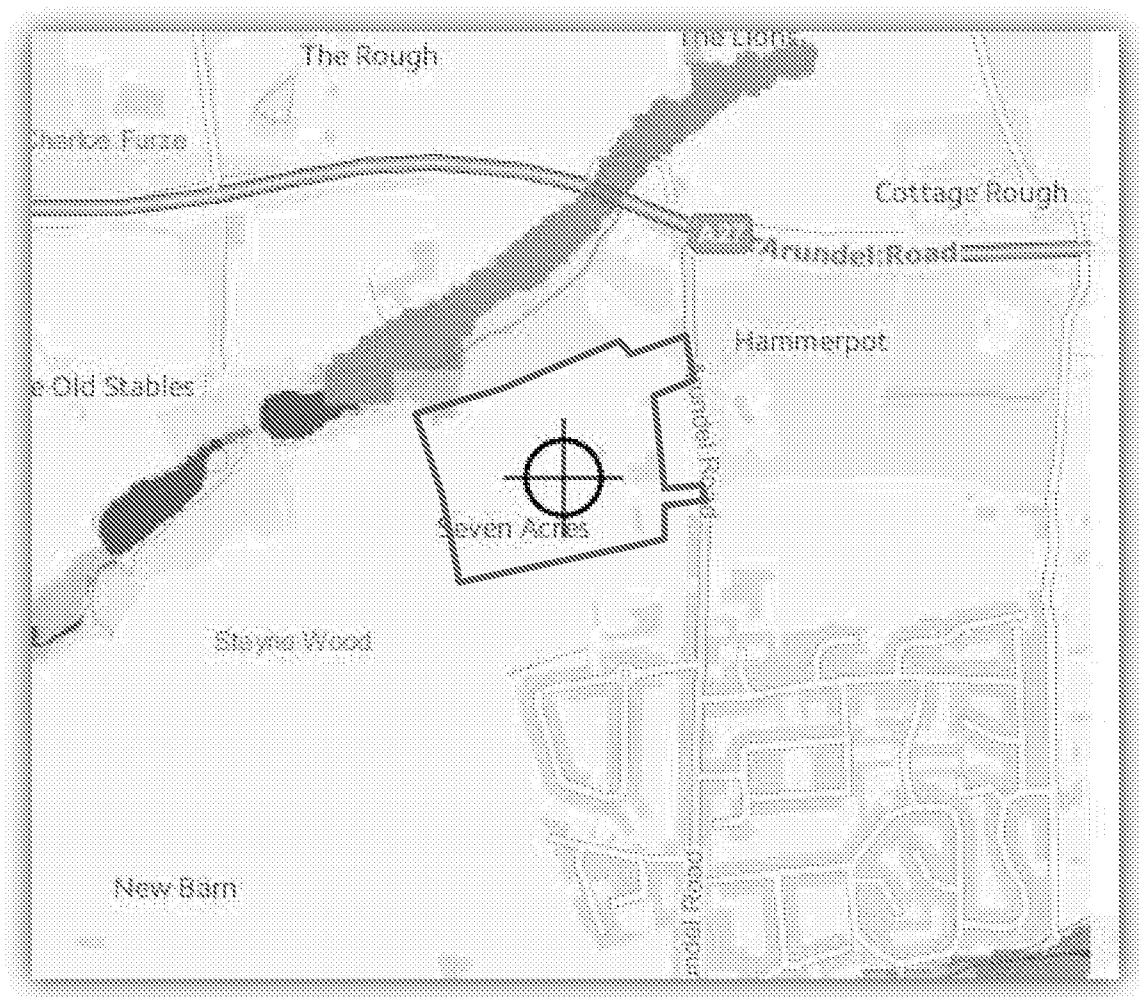


Figure 7.1: Environment Agency fluvial flood risk map

The overall risk of fluvial flooding/resultant fluvial flood risk to the site is considered to be **very low**.

7.2.1 Climate change

Fluvial flooding is likely to increase as a result of climate change. A greater intensity and frequency of precipitation is likely to raise river levels and increase the likelihood of a river overtopping its banks. Modelled flood data was not provided by the Environment Agency as stated within their correspondence; they also noted very little is known about the watercourse (**Appendix B**).

7.3 Flooding from the sea (tidal flood risk)

The site is not considered to be at risk from tidal flooding due to its inland location. The Environment Agency stated the area to the west of the site is considered a floodplain that is tidal locked (**Appendix B**). This is not seen in mapping to be a risk to the site.

7.4 Flooding from the land (overland pluvial flood risk)

If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff will occur. Excess surface water flows from the site are believed to drain naturally to the local water features, either by overland flow or through infiltration.

The Environment Agency's surface water flood map (**Figure 7.2**) shows that the majority of the site is considered at very low risk from this source; there are minor areas of surface water flood risk restricted to the area of the ditch on the western boundary. There is also minor surface water off risk along Arundel Road at the site entrance.

The risk posed to the site in general is considered **low**. However care and consideration should be taken not to worsen conditions along these two roads.

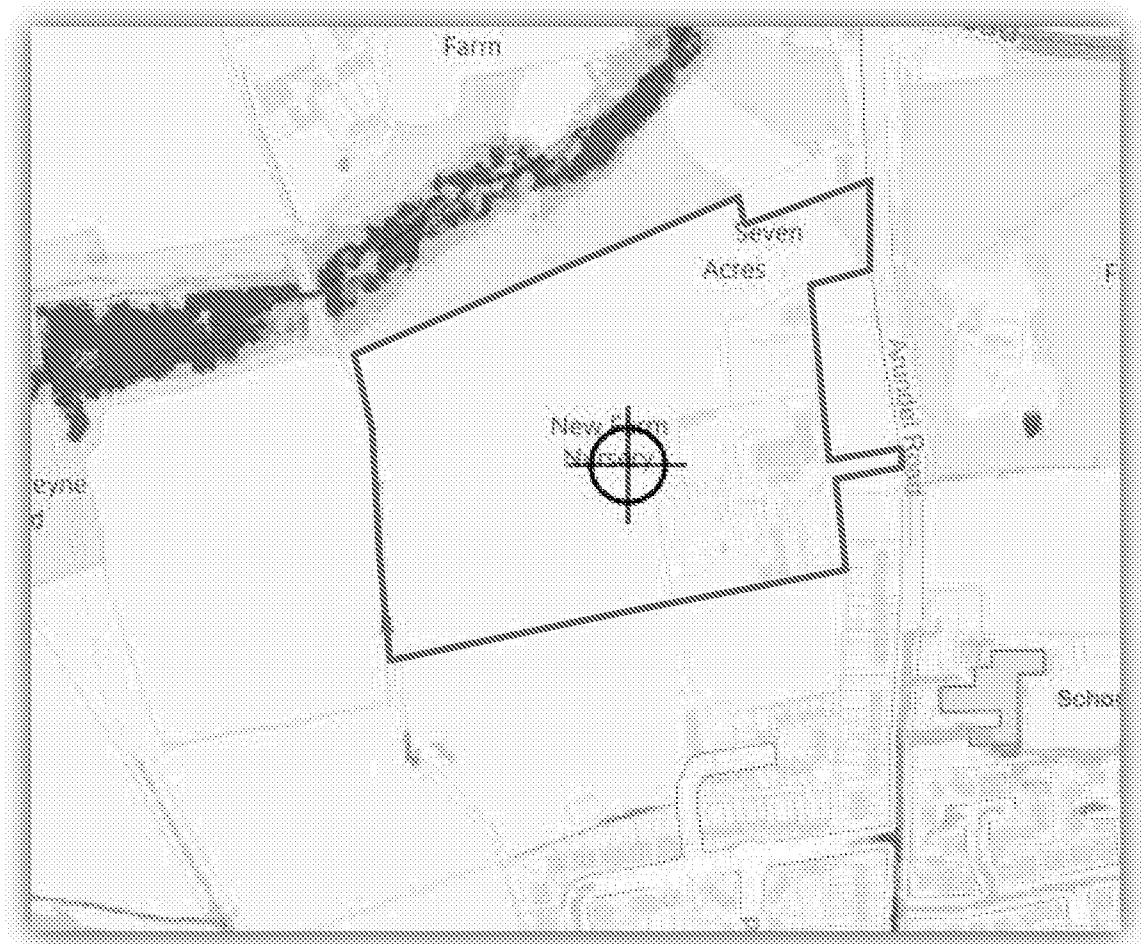


Figure 7.2: Environment Agency surface water flood risk map

7.4.1 Climate change

Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow.

7.5 Flooding from groundwater

Groundwater flooding tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing Groundwater flooding.

Trial pit logs recorded across the site did not strike Groundwater indicating the Groundwater must be below 2.50mbgl. It is considered unlikely that Groundwater will emerge at the surface; however, it is recommended that Groundwater depths are observed and monitored on-site during the groundworks phase. During the operational phase, the absence of basement features within the proposals minimises the potential hazards posed by Groundwater flooding.

The resultant Groundwater flood risk is considered to be **low**.

7.5.1 Climate change

Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. If winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may however be balanced by lower recharge during the predicted hotter and drier summers. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers may be more affected, but these are likely to be isolated. The change in flood risk is likely to be low.

7.6 Flooding from sewers

When exceeded, surcharged pipe work can lead to flooding from backed up manholes and gully connections. This would lead to flooding within the surrounding area. It was found on the site walk over that there are a number of manholes across the site and surface water drains. The private sewer system on this site is not well understood, though the landowner had confirmed the drainage is towards a septic tank in the south west of the developed area at the time of writing the report. Any exceedance from the sewer manholes and septic tank would lead to flood waters following the local topography of the site to the lower areas, in this case water would likely flow to the south boundary and westwards to the lowest area.

7.6.1 Climate change

The impact of climate change is likely to be negative regarding flooding from sewers but not significant in terms of the proposed development.

7.7 Other sources of flooding

7.7.1 Reservoirs

Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures.

The Environment Agency reservoir flood map (reproduced as **Figure 7.3**) shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. As shown the site is not located within an area at risk from reservoir flooding. The resultant flood risk is considered to be **very low**.

Reservoir flooding is extremely unlikely; there has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to ensure reservoirs are maintained. According to the Environment Agency Reservoir flood maps the site is not at risk of flooding from reservoirs.

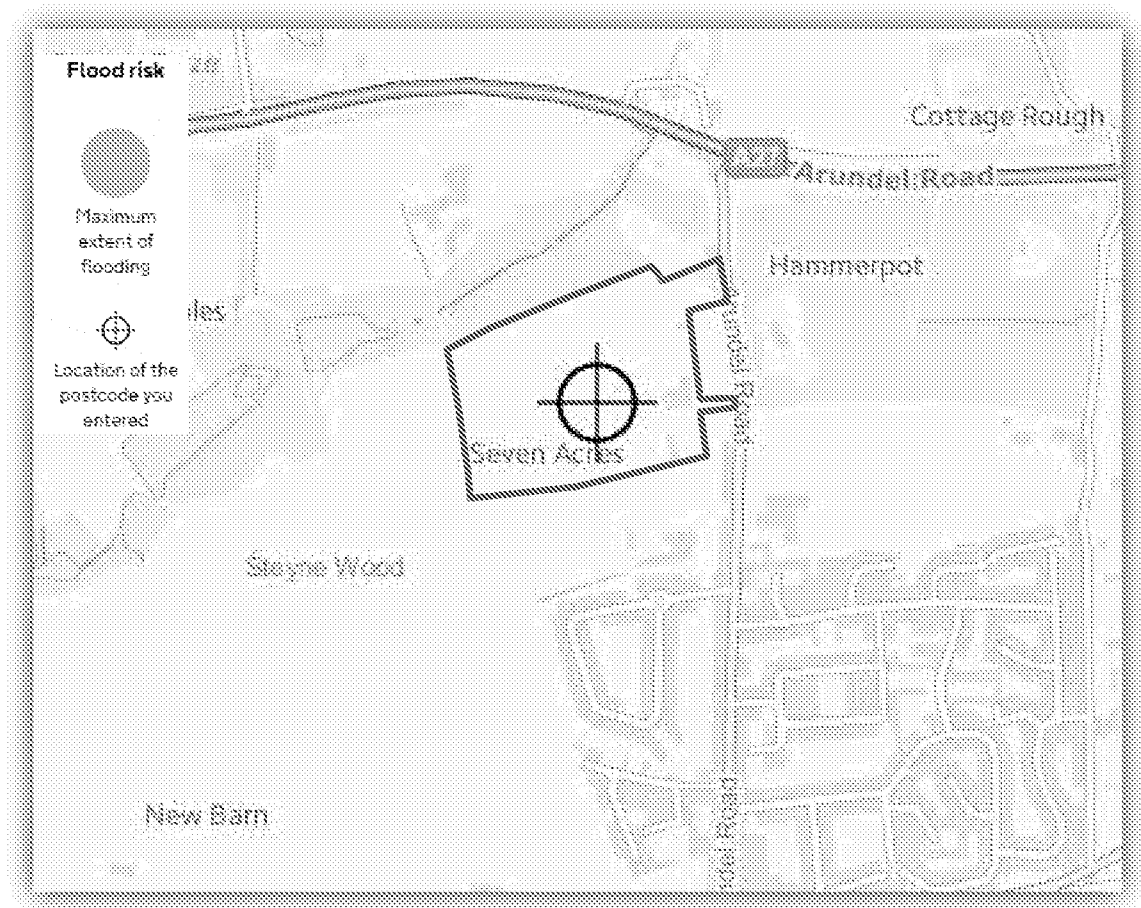


Figure 7.3: Environment Agency reservoir flood risk map (November 2017)

7.7.2 Climate change

Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased rainfall has the potential to increase base flow, but this should be minimal. It is unlikely that there will be a substantial change to the risk of flooding for this site.

7.7.3 Canals

There are no Canal & River Trust owned canals or assets within the study area

7.8 Flood risk resulting from the development

In theory any development can increase flood risk downstream, if it is not designed properly. This potential is much increased where the site is on Greenfield land, as development tends to increase impermeable surfaces, resulting in increased runoff from the site.

The proposed development will use the latest best practice guidance to ensure that flood risk is not increased as a result of the development. This will require the provision of a suitable surface water management plan to ensure that the surface water generated from the site does not increase the risk of flooding to the proposed properties or off-site.

8 PLANNING CONTEXT

8.1 Application of planning policy

Section 10 of the NPPF includes measures specifically dealing with development planning and flood risk using a sequential characterisation of risk based on planning zones and the Environment Agency Flood Map. The main study requirement is to identify the flood zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

8.2 Land use vulnerability

Planning Practice Guidance includes a list of appropriate land uses in each flood zone dependent on vulnerability to flooding. In applying the Sequential Test, reference is made to **Table 8.1** below, reproduced from **Table 3** of Planning Practice Guidance.

Table 8.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

With reference to **Table 2** of the Planning Practice Guidance, the proposed development, based on its residential end use, is classed as 'More Vulnerable'. This classification of development is appropriate for areas within Flood Zone 1.

8.3 Sequential Test

The Sequential Test is required to assess flood risk and the Planning Practice Guidance recommends that the test be applied at all stages of the planning process to direct new development to areas with the lowest probability of flooding (Flood Zone 1).

According to the NPPF, if there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development (see Planning Practice Guidance Table 2) can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3. Within each Flood Zone new development should be directed to sites at the lowest probability of flooding from all sources.

The development proposal is for a 'More Vulnerable' residential use to be developed on the site. With reference to **Table 8.1** above, this development would be appropriate for areas within Flood Zone 1, subject to the implementation of an appropriate surface water drainage strategy. Therefore the Sequential Test has been passed as the development has been situated within the lowest possible designated risk area available and therefore does not require the Exception Test to be satisfied.

9 SURFACE WATER DRAINAGE ASSESSMENT

9.1 Scope

As development is greater than 1Ha in size, the Environment Agency and the LLFA requires such development to focus on the management of surface water run-off. This section discusses the potential quantitative effects of the development on both the risk of surface water flooding on-site and elsewhere within the catchment, as well as the type of potential SuDS features that could be incorporated as part of the framework development plan.

The NPPF states that SuDS should be considered wherever practical. The use of SuDS is also encouraged by regional and local policy (see Section 6.7). In accordance with local and national guidance, the surface water drainage strategy should seek to implement a SuDS hierarchy that aspires to achieve reductions in surface water runoff rates to Greenfield rates (Preferred Standard).

In addition, Building Regulations Part H⁸ requires that the first choice of surface water disposal should be to discharge to an adequate soakaway or infiltration system, where practicable. If this is not reasonably practicable then discharge should be to a watercourse, the least favourable option being to a sewer (surface water before combined). Infiltration techniques should therefore be applied wherever they are appropriate.

9.2 Pre-development situation

The existing site area is 9.10Ha with 89.9% of the site considered as permeable. It is thought that surface water runoff from the site is conveyed towards the west boundary where flow is conveyed into the ditch on the west boundary.

The pro-rata loH 124 method⁹ has been used to estimate the Greenfield surface water runoff for the total site area as well as the existing permeable areas on the site. Calculations are contained in **Appendix E**.

As the existing permeable area on-site is approximately 8.18Ha the Greenfield runoff calculations from this area are shown within the **Table 9.1**.

⁸ HM Government (2010 with 2013 amendments), 'The Building Regulations 2010: Approved Document H - Drainage and Waste Disposal (2002 Edition incorporating 2010 amendments)'

⁹ Institute of Hydrology (IoH), 'Flood Estimation for small catchments - Report 124', 1994.

Table 9.1: ICP SuDS Greenfield surface water runoff (8.18Ha)

Return period	Peak flow (l/s) Total Site Area
QBar	30.0
1 in 1 year	25.5
1 in 30 year	68.1
1 in 100 year	95.8

As a partially developed site, the pre-development surface water runoff from the site has been calculated for a range of return periods using the Modified Rational method. The Modified Rational method uses the following equation to calculate peak runoff rate from the existing impermeable area of the site:

$$Q = 2.78 C_v C_r i A$$

Where:

2.78 = Coefficient which accounts for the differences in units used for the inputs and the outputs of the equation.

C_v = Volumetric Runoff Coefficient - a co-efficient that describes the proportion of rainfall appearing in the surface water drainage system, assumed to be 0.95 for impermeable areas

C_r = Routing Coefficient - a routing co-efficient added to the Rational Method to represent runoff characteristics of a particular site or area in a more accurate manner, assumed to be 1.3 for urban areas

i = Rainfall Intensity (mm/hr) based on a 1 hour rainfall event taken from FEH data

A = Impermeable Area (0.92Ha)

Table 9.2: Modified Rational Method pre-development surface water runoff

Return period	Rainfall Intensity (mm)	Peak flow (l/s)
QBar	16.99	53.67
1 in 1 year	11.56	36.51
1 in 30 year	35.79	113.05
1 in 100 year	45.95	145.14

The total actual runoff from the site is included in **Table 9.3**. As to provide a betterment to the existing surface water runoff a 30% reduction in Brownfield runoff rates should be achieved (**Table 9.4**).

Table 9.3: Total pre development runoff rates (9.10Ha)

Return period	Peak flow (l/s)		Total flow (l/s)	Total Flow per Hectare (l/s)
	Greenfield	Brownfield		
QBar	30.0	53.67	83.67	9.19
1 in 1 year	25.5	36.51	62.01	6.81
1 in 30 year	68.1	113.05	181.15	19.91
1 in 100 year	95.8	145.14	240.94	26.48

Table 9.4: Total development runoff rates with 30% reduction in Brownfield runoff rates (9.10Ha)

Return period	Peak flow (l/s)		Total flow (l/s)	Total Flow per Hectare (l/s)
	Greenfield	Brownfield (30% reduction)		
QBar	30.0	37.57	67.57	7.43
1 in 1 year	25.5	25.56	51.06	5.61
1 in 30 year	68.1	79.14	147.23	16.18
1 in 100 year	95.8	101.60	197.39	21.69

9.3 Limiting discharge for design

Only 6.00Ha of the site is proposed to be developed. As the remaining land will not be developed, it is assumed that surface water runoff from these areas will continue to drain in line with the existing regime. The discharge rate for the developable area will be limited to QBar predevelopment runoff rates with the 30% reduction in Brownfield rates.

Based on 6.00Ha of developable land and using the per hectare calculations in **Table 9.4**, the resulting discharge rate would be calculated at 44.58l/s. In order to not exacerbate the risk of flooding to both the development and others downstream of the site a flow control mechanism should be utilised to limit flows to this rate during all events up to the 1 in 100 year event inclusive of 40% climate change.

This should be reflected within the detailed design of the site and should be agreed by the Lead Local Flood Authority.

9.4 Post-development situation

The proposed development is for a residential end use. As explained within Section 4 of this assessment the proposed developable area will contain approximately 55% impermeable surfacing. This will result in an increase in impermeable area and surface water runoff across the site. It will therefore be necessary to manage surface water on-

site through conveyance towards the proposed point of discharge, whilst providing sufficient attenuation for all events up to the 1 in 100 year event inclusive of 40% climate change factor.

9.4.1 Off site discharge options

9.4.1.1 Infiltration

Infiltration should be considered as the primary option to discharge surface water from the developed site. The effectiveness of infiltration is completely dependent on the physical conditions at the site. Potential obstacles include:

- Local variations in permeability preventing infiltration – The soakaway testing report provided by RSK Environmental Ltd (**Appendix C**) confirmed that the geology onsite is predominately clay with very low permeability. 3 of 4 trial pits showed no significant drop in water level during testing, whilst the remaining trial pit provided infiltration rates considered unsuitable for infiltration based SuDS.
- Shallow groundwater table - For infiltration drainage devices, Building Regulation approved document H2 states that these *"should not be built in ground where the water table reaches the bottom of the device at any time of the year"*. Groundwater levels are unconfirmed but are unlikely to be above 2.50mbgl, it is not likely to limit the use of shallow soakaway systems.
- Source Protection Zones - As discussed above, the site is not located within a Groundwater Source Protection Zone.

From the infiltration rates provided during the soakaway testing, infiltration is not considered a feasible option as part of the drainage strategy.

9.4.1.2 Discharge to watercourse

Discharging surface water to a local watercourse is considered feasible as there is a ditch located at the western boundary. The ditch provides connectivity to a nearby watercourse.

9.4.1.3 Discharge to surface water sewer

There are no public surface water sewers on-site or within Arundel Road.

9.4.2 Storage estimates

To determine the volume of attenuation storage that would be required on the site, the WinDes '4-Stage Design Guide' tool has been used. The WinDes '4-Stage Design Guide' tool allows for an attenuation figure to be calculated based upon pond dimensions, rainfall values and permitted discharge rates. These volumes can be later revised at detail design stage by the introduction of specific flow control methods.

Calculations have been run using discharge rate in accordance with **Table 9.1**, above and a proposed impermeable area of 3.30Ha. No allowance is included in the calculations for infiltration and therefore the results illustrate a worst-case scenario.

The maximum storage required on-site to accommodate the 1 in 100 year plus 40% climate change rainfall event when limited to the QBar (44.58l/s) is approximately **1839.4m³**. The basin should also be designed with slopes of 1:4 to comply with safety and maintenance guidelines as highlighted in the SuDS Manual¹⁰. Additionally the basin

¹⁰ CIRIA, 'The SUDS Manual - C697', 2007

should be lined with an impermeable membrane so as not to allow Groundwater to compromise the capacity of the basin. Calculations for indicative basin dimensions can be found in **Appendix F**, following guidelines the basin covers an area of 2158.40m² and reaches a maximum depth of 1.00m to provide sufficient volume.

This volume is provided to demonstrate the feasibility of a proposed drainage strategy for the development; however, the final attenuation volume will be determined during subsequent detailed design work and should be agreed by the Lead Local Flood Authority.

9.4.3 Proposed drainage strategy

It is considered that infiltration techniques will not be suitable on-site due to the impermeable clay based soils and poor infiltration rates. As a result soakaways or other infiltration based SuDS will not be incorporated into the drainage design.

Therefore the proposed SuDS strategy for the site is to include an attenuation basin towards the south west of the site with controlled discharge to the watercourse. Surface water can be conveyed towards this basin following the natural gradient of the land from the majority of the site; there will be selective remodelling of the ground levels required in the south west area to ensure gravitational falls to the basin. The basin should provide a sufficient volume to attenuate flows for the 1 in 100 plus 40% climate change event, with discharge limited to 46.58 l/s (QBar rate) for the entire developable area. In this case the attenuation volume has been calculated at 1839.40m³ to provide a minimum volume of storage. The controlled discharge from the attenuation basin will be westwards to the watercourse.

The surface water drainage strategy will include the use of gully networks to capture the surface water runoff from the highways and other impermeable areas such as downpipes from roofs into a surface water pipe system. These pipes will allow surface water to be efficiently directed towards the basin at the low point on the west boundary.

The use of surface water pumping is thought to be required to convey flows from the most north western area of the site to the attenuation basin. Surface water pumping may be required due to the shallow gradient of the topography along the western side of the site. The pump station should be placed in the north west of the site and will pump surface water runoff at an unrestricted rate to the attenuation basin in the south west. A localised low area will be provided to retain 125m³ of storage per hectare of impermeable area draining to the pumping station in the case of failure which is in line with the Sewers for Adoption guidance D4.5.4 The SuDS measures are outlined in the Indicative Surface Water Strategy as attached in **Appendix G**, the use of surface pumping should be confirmed at detail design stage.

Permeable paving could be incorporated within private roads, shared surfaces and drive ways that are part of the development. Due to the underlying geology these areas of paving will not allow for infiltration but can be used to collect and store runoff from the houses and surrounding hardstanding areas before joining the on-site surface water network that flows into and basin. Permeable paving reduces the volume of suspended sediment and hydrocarbon pollution associated with residential developments. Adopted roads will not be constructed using permeable paving due to ownership and future maintenance issues, where responsibility will most likely lie with the highway authority. As the surface area available for permeable paving is currently unknown then the storage volume of permeable paving has not been included in the calculations.



The dimensions, volumes and location of the SuDS features will need to be revised as the development framework plan develops and during the detailed planning stage. Indicative dimensions are provided as part of this report to provide an indication of the surface area that would be required for attenuation. Detailed design of individual features is not part of the scope of this report. Preliminary design criteria have been based upon guidance given in the CIRIA publication The SuDS Manual and the information received to date.

10 FLOOD MITIGATION MEASURES

10.1 Overview

The site is currently proposed to be a residential development. As a result, this end use is considered to be More Vulnerable. Provided that the developable area is located within Flood Zone 1 and outside of the risk from surface water it is not proposed that additional mitigation measures should be incorporated into the design. There are elements of best practice which should be considered at an early stage as outlined below.

10.2 Overland flood flow

Existing overland flood flow is predicted to flow to the west from the east boundary following the natural gradient of the site. The surface water flood risk mapping did not identify any risk associated with overland flow on the site or any existing flow paths of surface water runoff.

10.3 Finished floor levels

As the proposed developable area will not be affected by fluvial flooding there is no need to incorporate any freeboard levels into the finished floor levels of the design. Low lying areas that could lead to ponding of surface flows will be avoided by careful design of finished levels.

As a result, it is recommended that the proposed site levels should be set at or above the existing ground levels in the areas of designated Flood Zone 1.

Where site levels are proposed to be locally elevated, to provide gravitational drainage falls, the falls should be maintained away from the properties whilst still tying in to the proposed highways.

10.4 Safe access/egress

As the proposed site access lies outside of the 1 in 1000 year climate change flood extent, safe access and egress will be available up to this storm event. For extreme events above this, it is considered appropriate that site users should be able to safely escape to an area away from the watercourse. In addition, the proposed buildings will be set above the existing ground level and will likely contain an internal access to the first floor.

11 CONCLUSIONS AND RECOMMENDATIONS

This Flood Risk Assessment complies with the NPPF and Planning Practice Guidance and demonstrates that flood risk from all sources has been considered in the proposed development. It is also consistent with the Local Planning Authority requirements with regard to flood risk.

This flood risk assessment demonstrates that the requirements of the NPPF and Sequential Test have been met, with the location of the proposed developable area being within Flood Zone 1 meaning that any form of classification of development is considered to be acceptable. Flood Zone 1 is designated by the Environment Agency as land having a chance of flooding of less than 1 in 1,000 (<0.1%) in any year.

This flood risk assessment has concluded that:

- There is no record of historic flooding on-site.
- The site is located within an area designated as Flood Zone 1. As a result, the risk to the proposed development is considered to be very low from both fluvial and tidal sources.
- Flood risk from surface water is considered very low across the site.
- Flood risk from Groundwater is considered low.
- There is a sewer system associated with the existing development conveying flows to a septic tank. The stormwater overflow pipe is thought to connect to the west ditch.
- The site is not at risk from reservoir flooding.
- There are no Canal & River Trust assets within the study area and therefore the site is not at risk from this source.
- As safe pedestrian and vehicular access, to and from the development, will be achievable under all conditions, a formal evacuation plan is not required.
- Following the SuDS Hierarchy infiltration based drainage should first be assessed; however, based on confirmed infiltration rates, the underlying Ground conditions will not support the use of infiltration.
- The majority of the site of the will drain towards an attenuation basin in the south western area, surface water will be conveyed in a piped network to the basin with the use of gravitational falls.
- A surface water pumping station in the north west of the site will convey flows from the north western developable area to the attenuation basin in the south west.
- By providing onsite attenuation of the surface water runoff and limiting discharge to the watercourse to QBar runoff rates with reduced brownfield runoff, the development will be providing a betterment of the existing drainage regime during high rainfall events.



Overall, taking into account the above points, the development of the site should not be precluded on flood risk grounds as the development will not be at risk from existing sources (provided flow paths and sufficient attenuation is provided) will not result in an increase in flooding downstream.

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APPENDIX A

SERVICE CONSTRAINTS

RSK Group service constraints

1. This report and the Drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Gladman Developments Ltd. (the "client") in accordance with the terms of a contract between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable Civil Engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the

Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX B

ENVIRONMENT AGENCY CORRESPONDENCE

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Ryan Whitfield

From: SSD Enquiries [SSDEnquiries@environment-agency.gov.uk]
Sent: 22 September 2017 17:04
To: Kathryn Olive
Subject: 170922(2) SSD59589 - TB04 Flood Information Request - Land West of Arundel Road, Angmering

Dear Kathryn,

Following the email below sent earlier today, please find further details for the information you have requested:

Regarding your question on information on historic flooding and flood risk, very little is known about this particular site except that we understand that West Sussex County Council undertook a small 'flood' drainage scheme close to the A27 some years ago at the Hammerpot. The next immediate structure downstream of this site is privately owned and operated by the landowner at Decoy Pond. However drainage from this site will eventually drain into a Main River watercourse further to the west (approximately 600m downstream) known as Decoy's Pond Ditch then into the Black Ditch which is a major carrier of water from Angmering itself into a floodplain. This floodplain is tidal locked at its furthest point where it discharges into the River Arun. Consideration must be taken if this land is to be developed with regards to discharge as the area at risk downstream of this enquiry is on its limit to accommodate increased drainage capacity.

Regarding your question on groundwater flooding data, there are no known issues in this specific area.

Regarding your query on management of surface water, amendments to the Development Management Procedure Order (DMPO) came into effect on 15th April 2015. As a result we are no longer a statutory consultee on 'development of land over 1 hectare' (DMPO 2010, Schedule 5) and will therefore not be commenting on the surface water aspects of this proposal. Please be aware that we are still statutory consultee on any development (other than minor development) in Flood Zones 2 and 3. West Sussex as the Lead Local Flood Authority are now statutory consultee for 'Major development with Surface Water Drainage', and recommend that they are consulted.

For any permitted surface water discharges, please visit the online Public Register – link as follows:

<https://environment.data.gov.uk/public-register/view/search-all>

This information is supplied subject to the notice which can be viewed via the following link:

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Please get in touch if you have any further queries or contact us within two months if you would like us to review the information we have sent.

Kind regards

Nick

Customers & Engagement Team | Environmental Planning and Engagement | Solent and South Downs Area |
Environment Agency | Romsey District Office, Canal Walk, Romsey, SO51 7LP

SSDEnquiries@environment-agency.gov.uk
National Contact Call Centre 03708 506506





From: SSD Enquiries

Sent: 22 September 2017 16:12

To: [REDACTED]

Subject: 170922 SSD59589 - TB04 Flood Information Request - Land West of Arundel Road, Angmering

Dear Kathryn,

Thank you for your request of 5th September 2017 to use Environment Agency Product 4 data, for the site West of Arundel Road, Angmering, Littlehampton, BN16 4ET.

The Environment Agency's records indicate that the above site is located in Flood Zone 1 (land assessed as having less than 0.1% (1 in 1,000) chance of flooding in any given year from rivers or the sea). Therefore the likelihood of flooding in this area is estimated as 'very low'.

The above site is approximately 25 m away from Flood Zone 3.

We are therefore unable to provide data from our detailed fluvial or tidal models which is relevant to your site.

Please be aware that in February 2016 the Environment Agency updated its guidance on climate change allowances. The standard allowance of adding 20% to peak flows – as per previous guidance in the National Planning Policy Framework, may not be applicable for the purposes of informing development proposals. It is possible that our current modelling has under estimated flood risk when taking climate change into consideration. This does not however have an effect on Flood Zone 2 or 3.

For further information please visit:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Further details about the Environment Agency information supplied can be found on the GOV.UK website:

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for Flood Risk Assessments:

<https://www.gov.uk/planning-applications-assessing-flood-risk>

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Please get in touch if you have any further queries or contact us within two months if you would like us to review the information we have sent.

Kind regards,

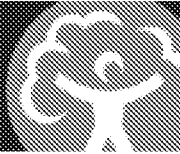
Nick

Customers & Engagement Team | Environmental Planning and Engagement | Solent and South Downs Area |
Environment Agency | Romsey District Office, Canal Walk, Romsey, SO51 7LP

SSDEnquiries@environment-agency.gov.uk



Creating a better place
for people and wildlife



From: [REDACTED]
Sent: 05 September 2017 10:01
To: Enquiries, Unit <[REDACTED]>
Subject: 170906/TB [REDACTED] Road, Angmering

Dear Sir/Madam,

Please could I order information on flooding and drainage for the following site in order to inform a Flood Risk Assessment:

Land West of Arundel Road
Angmering
Littlehampton
BN16 4ET

Grid reference – 506504 E, 105309 N

I would like all the flooding information you have including the following, if available:

- Confirmation of the site's Flood Zone designation, alternatively could you provide the flood flows and levels for a range of return periods including the 1 in 2, 10, 30, 100, 100+CC, 200, 1000,
- Information on the recently published climate change guidance for this area and how this may impact on the data available for the area,
- Information on surface water flood risk including flow pathways and depths,
- Information on historic flooding,
- Information on flood defences in the area, if any,
- Any data on existing surface water discharges to the surrounding watercourses,
- Any data on groundwater flooding,
- Any information on reservoir flooding; and,
- Any information on culverted watercourses or private sewers which you know of which do not show up on the public sewer records.

Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?

We have a relatively quick turn around on this project and would therefore appreciate a quick response.

If you have any queries please don't hesitate to contact me.

Kind regards,

Kathryn

Kathryn Olive
Administrator
Land & Development Engineering

RSK
14 Beecham Court, Pemberton Business Park, Wigan, WN3 6PR, UK

RSK Land & Development Engineering Ltd is registered in England at Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR, UK

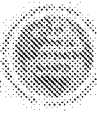
Registered number: 4723837

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Ryan Whitfield

From: SSD Enquiries [REDACTED]
Sent: 22 September 2017 16:12
To: Kathryn Olive
Subject: 170922 SSD59589 - TB04 Flood Information Request - Land West of Arundel Road, Angmering

Dear Kathryn,

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The Environment Agency's records indicate that the above site is located in Flood Zone 1 (land assessed as having less than 0.1% (1 in 1,000) chance of flooding in any given year from rivers or the sea). Therefore the likelihood of flooding in this area is estimated as 'very low'.

The above site is approximately 25 m away from Flood Zone 3.

We are therefore unable to provide data from our detailed fluvial or tidal models which is relevant to your site.

Please be aware that in February 2016 the Environment Agency updated its guidance on climate change allowances. The standard allowance of adding 20% to peak flows – as per previous guidance in the National Planning Policy Framework, may not be applicable for the purposes of informing development proposals. It is possible that our current modelling has under estimated flood risk when taking climate change into consideration. This does not however have an effect on Flood Zone 2 or 3.

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Please get in touch if you have any further queries or contact us within two months if you would like us to review the information we have sent.

Kind regards,

Nick

Customers & Engagement Team | Environmental Planning and Engagement | Solent and South Downs Area |
Environment Agency | Romsey District Office, Canal Walk, Romsey, SO51 7LP

SSDEnquiries@environment-agency.gov.uk

National Contact Call Centre 03708 506506





From: [REDACTED]

Sent: 05 September 2017 10:01

To: Enquiries, Unit <[REDACTED]>

Subject: 170906/TB04 Flood Information Request - Land West of Arundel Road, Angmering

Dear Sir/Madam,

Please could I order information on flooding and drainage for the following site in order to inform a Flood Risk Assessment:

Land West of Arundel Road
Angmering
Littlehampton
BN16 4ET

Grid reference – 506504 E, 105309 N

I would like all the flooding information you have including the following, if available:

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- Information on the recently published climate change guidance for this area and how this may impact on the data available for the area,
- Information on surface water flood risk including flow pathways and depths,
- Information on historic flooding,
- Information on flood defences in the area, if any,
- Any data on existing surface water discharges to the surrounding watercourses,
- Any data on groundwater flooding,
- Any information on reservoir flooding; and,
- Any information on culverted watercourses or private sewers which you know of which do not show up on the public sewer records.

Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?

We have a relatively quick turn around on this project and would therefore appreciate a quick response.

If you have any queries please don't hesitate to contact me.

Kind regards,

Kathryn

Kathryn Olive
Administrator
Land & Development Engineering

RSK
14 Beecham Court, Pemberton Business Park, Wigan, WN3 6PR, UK

Registered office: 14 Beecham Court, Pemberton Business Park, Wigan, WN3 6PR, UK
Registered in England at Spring Lodge, 172 Chester Road, Hekby, Cheshire, WA6 0AR, UK

Registered number: 4726837

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APPENDIX C

INFILTRATION TESTING

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12 Royal Sort Road
Pride Park
Derby
DE24 6AJ
UK

17th October 2017

Our reference: 301954 R02 (00)

Gladman Developments Ltd
Gladman House
Alexandra Way
Congleton
Cheshire
CW12 1LB



For the attention of Steve Barker

Dear Steve,

RE: Arundel Road, Angmering

We are pleased to enclose the results of the soakaway testing which was recently undertaken at the Arundel Road, Angmering site.

1. Project Background

The site is located off Arundel Road, Angmering. The site was predominantly occupied by open fields with mixed residential / commercial premises in the southeastern area of the site. We understand the intended development is for a residential end-use.

It is understood a soakaway drainage solution is being considered for the surface water drainage strategy at the site. Gladman Developments Ltd have commissioned RSK to undertake infiltration testing in the area of open fields in the central and western areas of the site to determine whether soakaways represent a viable form of surface water drainage for the proposed development. This report is subject to the RSK service constraints given in Appendix A.

2. Geology

Published records for the site (BGS Geoindex, available online at <http://mapapps2.bgs.ac.uk/geoindex/home.html>) indicate that the geology of the site comprises Head Deposits (superficial deposits) underlain by London Clay (solid geology).

Exploratory hole logs are provided in Appendix B.



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IN PEOPLE**

RSK Environment Ltd
Registered office
88 Sussex Street • Glasgow • Scotland • G4 1 1DX • UK
Registered in Scotland No. 115500
www.rsk.co.uk

2. Site Works

RSK undertook the soakaway testing works between 10th and 11th October 2017. Service plans for the site were provided by Gladman Developments Ltd and a ground clearance specialist attended the site on 10th October 2017 to clear the soakaway pit locations using a ground penetrating radar (GPR) prior to excavation of the exploratory hole locations. As a further precaution for the avoidance of buried services, each position was scanned with a CAT (cable avoidance tool) and genny by the supervising engineer.

The works comprised the excavation of four trial pits (designated SA1 to SA4) across the site at locations provided by RSK Land & Development and Engineering in their email dated 22nd September 2017. The soakaways pits were excavated to depths ranging between 1.80m and 2.50m below existing ground level (bgl) to facilitate soakage testing. Soakage testing was undertaken within each of the pits in accordance with BRE DG365 (BRE, 2016) as described in Section 2.2.

3. Ground Conditions

Topsoil

In the area of open fields the site was surfaced with sandy gravelly silty clayey topsoil to a depth of 0.30m (bgl).

Natural Strata

The topsoil was underlain by soft to firm yellow brown variable sandy silty frequently gravelly CLAY (gravel is fine to medium flint).

4. Soakage Testing & Results

Soakaway testing was undertaken in general accordance with the method described in BRE DG365 (BRE, 2016). To provide support to the trial pit and for health and safety considerations, the pits were backfilled with approximate 20mm gravel. Within the backfilled materials a full-height, slotted, vertical pipe was temporarily installed to enable the water level to be monitored. Water was added to the soakaway pits and allowed to drain with the water level and time from filling recorded.

The soil infiltration rate was calculated (where possible) from the time taken for the water level to fall from 75% to 25% effective storage depth in the soakage trial pit, using the following calculation:

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

where:

f = soil infiltration rate

V_{p75-25} = the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth

a_{s50} = the internal surface area of the soakage trial pit up to 50% effective storage depth and including the base area

t_{p75-25} = the time for the water to fall from 75% to 25% effective storage depth

No significant drop in water level was observed for soakaway test pits SA1, SA3 and SA4. Consequently, it was not possible to calculate an infiltration rate. A 0.40m fall in water was recorded for SA2 over 24 hours (total effective depth 1.21m). However, this is less than the criteria specified in BRE DG 365 which states *'The soakaway should discharge from full to half-volume (i.e. half volume discharge for SA2 was 0.61m) within 24 h in readiness for subsequent storm inflow'*. Due to the slow or absent drop in water level it was only possible to undertake a single fill in the soakaway test pits.

The soakaway test data, including calculations, are presented in Appendix C.

The results of soakaway testing are summarised in Table 1 below.

Table 1: Trial pit soakaway test results

Soakaway pit	Main Geological unit	Test outcome (m/sec)
SA1	CLAY	No significant drop in water level observed. Unable to calculate infiltration rate.
SA2	Sandy silty CLAY / sandy gravelly CLAY	Test 1: 6.7×10^{-7}
SA3	Sandy gravelly silty CLAY	No significant drop in water level observed. Unable to calculate infiltration rate.
SA4	Sandy gravelly CLAY	No significant drop in water level observed. Unable to calculate infiltration rate.
Exploratory hole logs are presented in Appendix B		

Based upon the above results and the exploratory hole logs it is considered unlikely that soakaway drainage will be feasible at the site and alternative forms of surface water disposal should be investigated. The above results should be assessed by a suitability qualified drainage engineer.

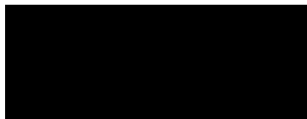
We trust that our comments are adequate for your requirements. However, please do not hesitate to contact either of the undersigned if you require any further information.



Yours sincerely

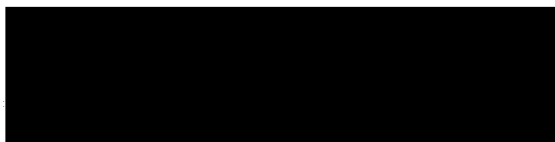
For RSK Environment Ltd

Prepared by:



Gareth Smith
Principal Engineer

Reviewed and approved by:



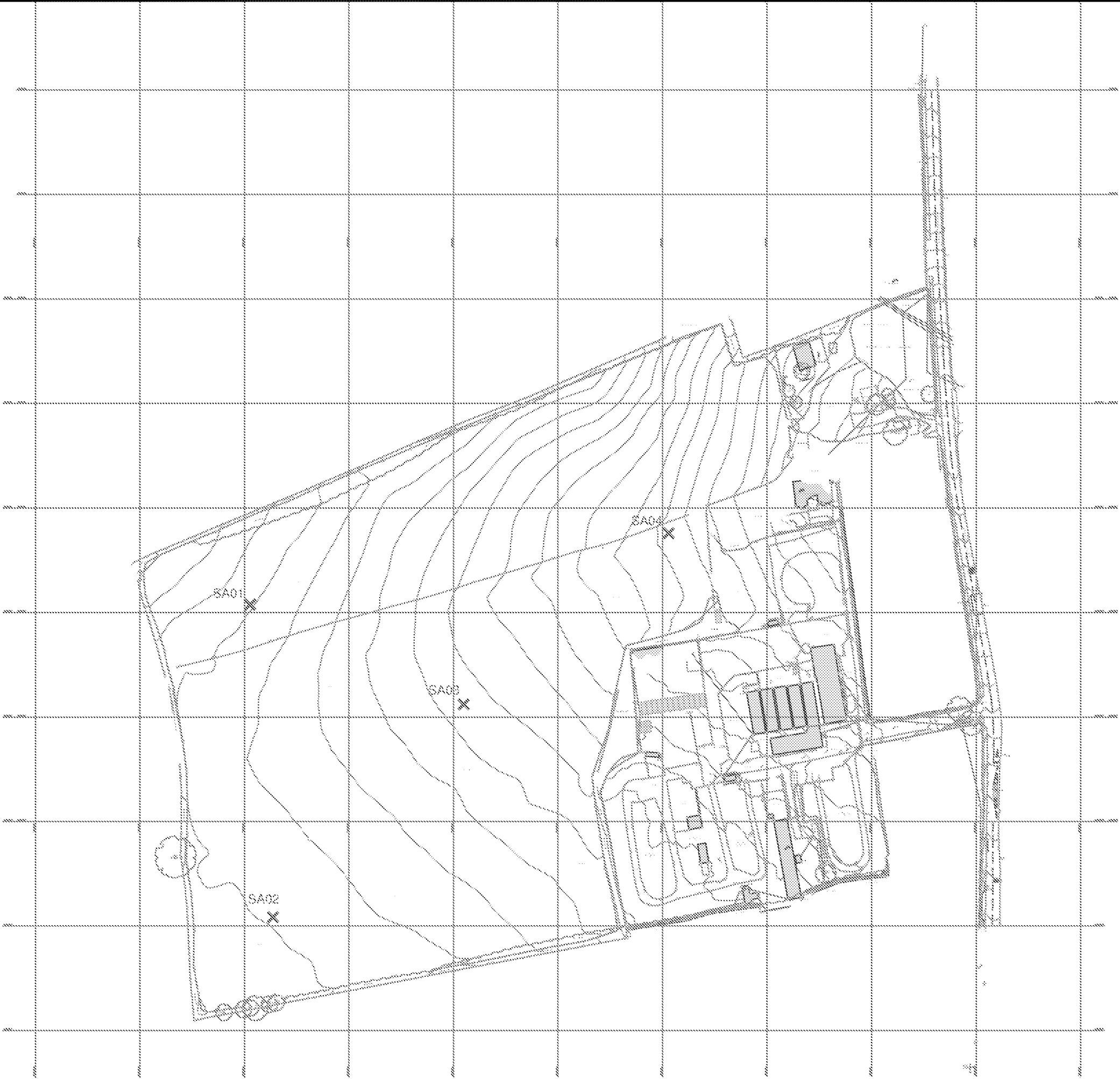
Melanie Rowley
Senior Geo-environmental Engineer

Enclosed:

- Figure 1** Exploratory hole location plan
- Appendix A** Service constraints
- Appendix B** Exploratory hole logs
- Appendix C** Soakage test results

FIGURES

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LEGEND:

SA01 X Soakaway Test Pit

	X	Y
SA01	506402.63	105353.73
SA02	506413.55	105204.19
SA03	506504.88	105306.11
SA04	506602.82	105387.86



A	03.10.17	FIRST ISSUE	HD	GS	GS
REV	DATE	DESCRIPTION	BY	CHD	APR.
Dimensions		Projection	Scale	Orig Size	
m			1:2000	A3	



12 Royal Leam Road
Ride Park
Derby
DE24 5AJ
Telephone: +44 (0)1332 542740
Fax: +44 (0)1332 542760
Web: www.rsk.co.uk

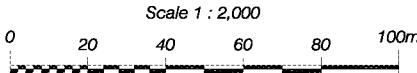
CLIENT
GLADMAN DEVELOPMENTS LIMITED

PROJECT
LAND WEST OF
ARUNDEL ROAD, ANGMERING

TITLE
LOCATION OF SOAKAWAY TESTS

JOB No.: 301954
DRAWING FILE:

BY:	DATE:	CONTRACT NO.	REV:
HD	03.10.17		FIGURE 1 A



APPENDIX A

SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Gladman Developments Ltd (the "client") in accordance with the terms of a contract between RSK and the "client", dated 27/09/2017. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
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4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
8. The intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information.] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (boreholes, trial pits etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

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APPENDIX B

EXPLORATORY HOLE LOGS

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TRIAL PIT LOG

Contract: Arundel Road, Angmering		Client: Gladman Developments Limited		Trial Pit: SA01	
Contract Ref: 301954	Start: 10.10.17 End: 10.10.17	Ground Level: 12.54	National Grid Co-ordinate: E:506403.0 N:105354.0	Sheet: 1 of 1	

Samples and In-situ Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Grass over brown slightly sandy slightly gravelly silty CLAY. (TOPSOIL)	(0.30) 0.30	
						Soft yellow brown slightly sandy slightly gravelly silty CLAY. Gravel is subrounded to subangular fine flint. (HEAD DEPOSITS)	0.55	
						Soft to firm orange brown slightly sandy very gravelly CLAY. Gravel is fine to coarse flint. (HEAD DEPOSITS)	(0.35) 0.90	
						Firm to stiff light grey and orange brown mottled CLAY. (POSSIBLE LONDON CLAY FORMATION).	(1.10) 2.00	
						Trial pit terminated at 2.00m depth.		

Plan (Not to Scale)		General Remarks	
		1. Trial pit sides remained stable. 2. No groundwater seepage encountered. 3. Pit filled with 20mm gravel with 50mm HDPE slotted pipe.	
All dimensions in metres		Scale: 1:25	
Method Machine dug	Plant Used: Unknown	Logged By: JBarron	Checked By: GJS





TRIAL PIT LOG

Contract: Arundel Road, Angmering		Client: Gladman Developments Limited		Trial Pit: SA02	
Contract Ref: 301954	Start: 10.10.17 End: 10.10.17	Ground Level: 12.70	National Grid Co-ordinate: E:506414.0 N:105204.0	Sheet: 1 of 1	

Samples and In-situ Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Grass over lying light brown slightly fine to medium sandy slightly gravelly silty CLAY. (TOPSOIL)	(0.30) 0.30	
						Soft yellowish brown slightly mottled orange slightly sandy CLAY. (HEAD DEPOSITS)	(0.40) 0.70	
						Soft yellowish brown and orange brown mottled slightly sandy silty CLAY. (HEAD DEPOSITS)	(0.70) 1.40	
						Firm yellowish brown and orange brown mottled slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint. (HEAD DEPOSITS)	(0.40) 1.80	
						Trial pit terminated at 1.80m depth.		

Plan (Not to Scale)		General Remarks	
		1. Trial pit sides remained stable. 2. No groundwater seepage encountered. 3. Pit filled with 20mm gravel with 50mm HDPE slotted pipe.	
All dimensions in metres		Scale: 1:25	
Method Machine dug	Plant Used: Unknown	Logged By: JBarron	Checked By: GJS





TRIAL PIT LOG

Contract: Arundel Road, Angmering		Client: Gladman Developments Limited		Trial Pit: SA03	
Contract Ref: 301954	Start: 10.10.17 End: 10.10.17	Ground Level: 14.74	National Grid Co-ordinate: E:506505.0 N:105306.0	Sheet: 1 of 1	

Samples and In-situ Tests				Water	Backfill & Instru-mentation	Description of Strata	Depth (Thick-ness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Grass over lying brown fine to medium sandy slightly gravelly silty CLAY. (TOPSOIL)	(0.30) 0.30	
						Soft yellowish brown slightly fine to medium sandy SILT. (HEAD DEPOSITS)	(0.30) 0.60	
						Soft yellowish brown mottled orange slightly sandy slightly gravelly silty CLAY. Gravel is subrounded to subangular fine to coarse flint. (HEAD DEPOSITS)	(1.40) 2.00	
						... becoming very gravelly below 1.70m.	2.00	
						Firm to stiff brown grey mottled orange brown slightly gravelly silty CLAY. Gravel is subrounded to subangular fine to coarse flint. (POSSIBLE LONDON CLAY FORMATION).	(0.30) 2.30	
						Trial pit terminated at 2.30m depth.		

Plan (Not to Scale)		General Remarks	
		1. Slight pit side collapse below 1.70m bgl. 2. No groundwater was encountered. 3. Pit filled with 20mm gravel with 50mm HDPE slotted pipe.	
All dimensions in metres		Scale: 1:25	
Method Machine dug	Plant Used: Unknown	Logged By: JBarron	Checked By: GJS



TRIAL PIT LOG

Contract: Arundel Road, Angmering		Client: Gladman Developments Limited		Trial Pit: SA04	
Contract Ref: 301954	Start: 10.10.17 End: 10.10.17	Ground Level: 17.71	National Grid Co-ordinate: E:506604.0 N:105383.0	Sheet: 1 of 1	

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						Grass over lying brown slightly sandy slightly gravelly silty CLAY. Gravel is subrounded to subangular fine to medium of mixed lithologies. (TOPSOIL)	(0.30) 0.30	
						Firm to stiff light brown mottled orange slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to medium of mixed lithologies. (HEAD DEPOSITS)	(0.30) 0.60	
						Firm to stiff brown mottled orange brown slightly sandy gravelly CLAY. Gravel is subrounded to subangular fine to coarse flint. (HEAD DEPOSITS)	(1.90) 2.50	
						Trial pit terminated at 2.50m depth.		

Plan (Not to Scale)		General Remarks	
		1. Trial pit sides remained stable. 2. No groundwater seepage encountered. 3. Pit filled with 20mm gravel with 50mm HDPE slotted pipe.	
All dimensions in metres		Scale: 1:25	
Method Machine dug	Plant Used: JCB-3CX	Logged By: JBarron	Checked By: QJS

APPENDIX C

SOAKAGE TEST RESULTS

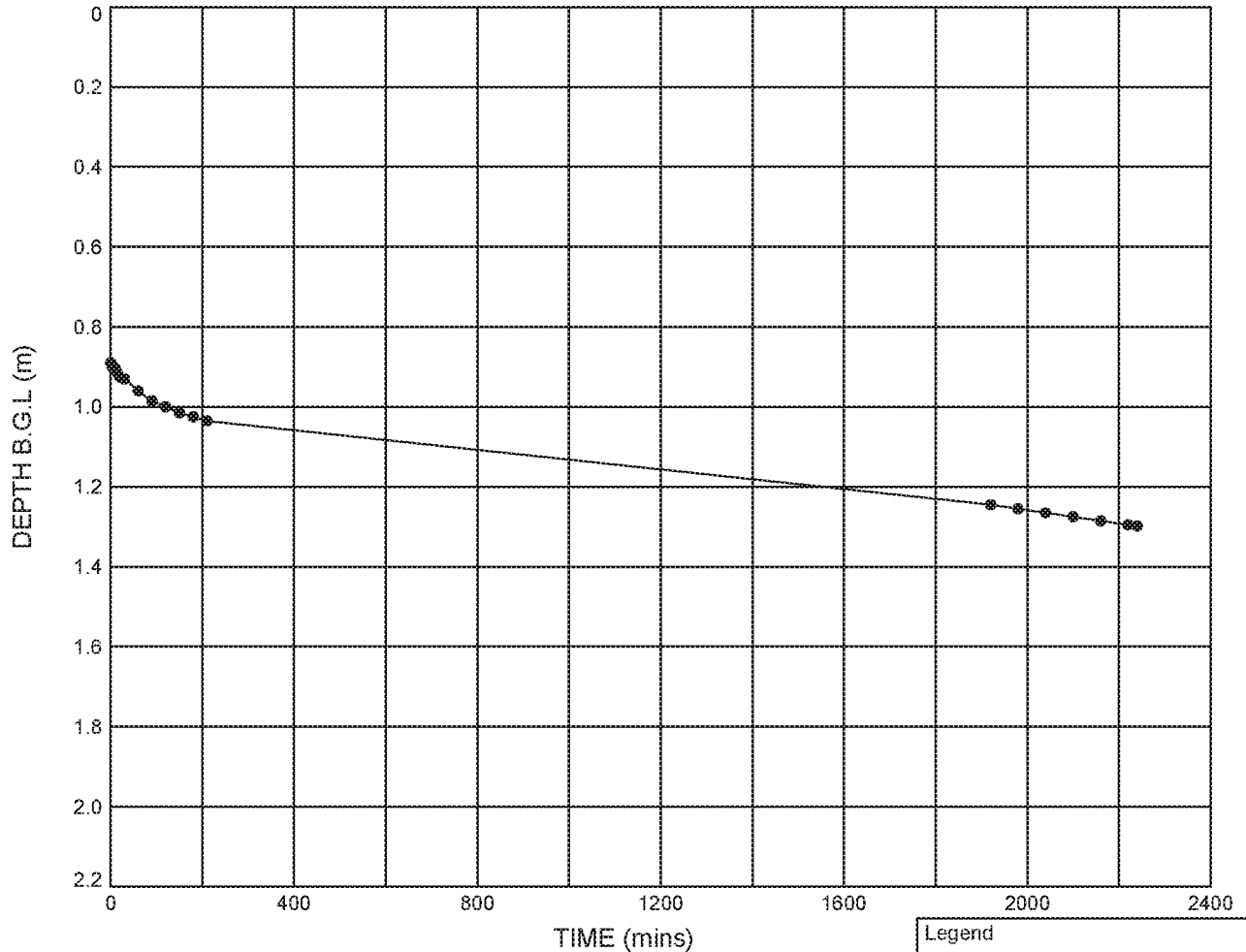
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FULL SCALE SOAKAWAY TEST

Non-standard test

Soakaway Test - Position ID : SA2

PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



Test 1

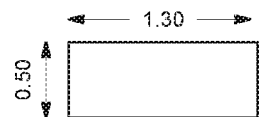
Pit start depth: = 2.10 m
 Pit final depth: = 2.10 m
 Effective depth, D_e = 1.21 m
 Effective storage volume, V_{p75-25} = 0.3933 m³
 Surface area, a_{p50} = 2.8280 m²
 Time, t_{p75-25} = 207429 secs
 Infiltration rate, f = 6.70×10^{-7} m/s

Please note test data was extrapolated to obtain tp75-tp25.

Legend

● Test 1 (10.10.17)

Plan (Not to scale)



No Bearing Taken



STRUCTURAL SOILS
 1a Princess Street
 Bedminster
 Bristol
 BS3 4AG

Compiled By

Date

Checked By

Date

12/10/17

10/10/17

Contract

Angmering

Contract Ref:

747640

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APPENDIX D

SEWER RECORDS

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Drainage and water enquiry

Commercial

Order reference: LS/U1308354

Your reference: SF25471037000 LKS/Angmering
2017-84

Search address:

**Land West Of Arundel Road
Littlehampton
West Sussex
BN16 4ET**

Ordered by:

**Searchflow
42 Kings Hill Avenue
West Malling
Kent
ME19 4AJ**

For enquiries regarding the information provided in this report, please contact the LandSearch team:

LandSearch
Southern Water Services
Southern House
Capstone Road
Chatham
Kent
ME5 7QA

Web: www.southernwater.co.uk

What you need to know about...

Private sewer transfer

On 1 October 2011, ownership of private sewers and lateral drains changed in accordance with The Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The contents of this search may not reflect these changes.

For further information please visit our website: www.southernwater.co.uk/sewer-ownership-changes.

Records searched

The following records were searched in compiling this report: the Map of Public Sewers, the Map of Waterworks, water and sewerage records, the Register of Properties subject to Internal Foul Flooding, the Register of Properties subject to Poor Water Pressure and the Drinking Water Register. Should the property not fall entirely within Southern Water's region, a copy of the records held by the relevant water company was searched.

Competition in the non-household retail market

From April 2017 non-household customers in England can choose their retailer. 'Retail' refers to the way in which customers are billed for their water and sewerage as well as customer services including meter reading.

The 'wholesale' part of the water industry was not opened for competition in April 2017. This means Southern Water continues to look after the pipes and infrastructure for all its customers across Kent, Sussex, Hampshire and the Isle of Wight.

Moving

There can be a lot to do and remember when you're moving. Whether you are moving within our area, moving into our area or moving out of the area please let your retailer know.

Your order summary

Maps		
1.1	Where relevant, please include a copy of an extract from the public sewer map.	Map provided
1.2	Where relevant, please include a copy of an extract from the map of waterworks.	Map provided
Drainage		
2.1	Does foul water from the property drain to a public sewer?	No
2.2	Does surface water from the property drain to a public sewer?	No
2.3	Is a surface water drainage charge payable?	See answer
2.4	Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?	No
2.4.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?	No
2.5	Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?	No
2.5.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within 50 metres of any buildings within the property?	No
2.6	Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
2.7	Has any sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?	No
2.8	Is the building which is or forms part of the property at risk of internal flooding due to overloaded public sewers?	No
2.9	Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.	See answer
Water		
3.1	Is the property connected to mains water supply?	No
3.2	Are there any water mains, resource mains or discharge pipes within the boundaries of the property?	No
3.3	Is any water main or service pipe serving, or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
3.4	Is the property at risk of receiving low water pressure or flow?	No
3.5	What is the classification of the water supply for the property?	See answer
3.6	Is there a meter installed at this property?	See answer
Charging		
4.1.1	Who is responsible for providing the sewerage services for the property?	Southern Water
4.1.2	Who is responsible for providing the water services for the property?	Southern Water
4.2	Who bills the property for sewerage services?	See answer
4.3	Who bills the property for water services?	See answer
Trade effluent information		
4.4	Is there a consent on this property to discharge trade effluent under Section 118 of the Water Industry Act (1991) into the public sewerage system?	No

Maps

Public sewer map

Q. 1.1: Where relevant, please include a copy of an extract from the public sewer map.

A.: A copy of an extract from the public sewer map is provided.

Guidance Notes:

The Water Industry Act 1991 defines public sewers as those which the Company has responsibility for. Other assets and rivers, watercourses, ponds, culverts or highway drains may be shown for information purpose only.

Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an "as constructed" record. It is recommended these details be checked with the developer.

Map of waterworks

Q. 1.2: Where relevant, please include a copy of an extract from the map of waterworks.

A.: A copy of an extract of the map of waterworks is provided.

Guidance Notes:

Assets other than vested water mains may be shown on the plan for information only.

The Company is not responsible for private supply pipes connecting the property to the public water main and does not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Drainage

Foul water

Q. 2.1: Does foul water from the property drain to a public sewer?

A.: The Company's records indicate that foul water from the property does not drain to the public sewerage system.

Guidance Notes:

The Company is not responsible for private drains and sewers that connect the property to the public sewerage system and does not hold details of these.

The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility, with other users, if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

The copy extract will show known public sewers in the vicinity of the property. It should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

If foul water does not drain to the public sewerage system the property may have private facilities in the form of a cesspit, septic tank or other type of treatment plant.

Surface water

Q. 2.2: Does surface water from the property drain to a public sewer?

A.: The Company's records indicate that surface water from the property does not drain to the public sewerage system. If the property was constructed after 6 April 2015 the surface water drainage may be served by a Sustainable Drainage System. Further information may be available from the developer.

Guidance Notes:

The Company is not responsible for private drains and sewers that connect the property to the public sewerage system and does not hold details of these.

The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility, with other users, if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

The copy extract will show known public sewers in the vicinity of the property. It should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

In some cases company records do not distinguish between foul and surface water connections to the public sewerage system. If on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for a rebate of the surface water drainage charge. Details can be obtained from the Company.

If surface water does not drain to the public sewerage system the property may have private facilities in the form of a soakaway or private connection to a watercourse.

Surface water drainage charge

Q. 2.3: Is a surface water drainage charge payable?

A.: Records confirm that a surface water drainage charge is not applicable at this property. If the property was constructed after 6 April 2015 the surface water drainage may be served by a Sustainable Drainage System. Further information may be available from the developer.

Guidance Notes:

Where surface water from a property does not drain to the public sewerage system no surface water drainage charges are applicable.

If on inspection the buyer finds that the property is not connected for surface water drainage, the buyer should contact their retailer.

Public sewers within the boundary of the property

Q. 2.4: Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?

A.: The public sewer map indicates that there are no public sewers, disposal mains or lateral drains within the boundaries of the property. However, from 1 October 2011 there may be additional public sewers, disposal mains or lateral drains which are not recorded on the public sewer map but which may further prevent or restrict development of the property. It is therefore recommended that investigations are made into the drainage arrangements of the property as the owner may be liable for repairs to the drainage system.

Guidance Notes:

The approximate boundary of the property has been determined by reference to the Ordnance Survey record or the map supplied.

The presence of a public sewer within the boundary of the property may restrict further development within it.

Southern Water Services has a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of Southern Water Services or its contractors needing to enter the property to carry out work.

Please note if the property was constructed after 1 July 2011 any sewers and/or lateral drain within the boundary of the property are the responsibility of the householder.

Public pumping station within the boundary of the property

Q. 2.4.1: Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?

A.: The public sewer map included indicates that there is no public pumping station within the boundaries of the property. Any other ancillary apparatus is shown on the public sewer map and referenced on the legend.

Guidance Notes:

The approximate boundary of the property has been determined by reference to the Ordnance Survey record or the map supplied.

The presence of a pumping station within the boundary of the property may restrict further development within it.

Southern Water Services has a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of Southern Water Services or its contractors needing to enter the property to carry out work.

It should be noted that only private pumping stations installed before 1 July 2011 will be transferred into the ownership of Southern Water Services.

Public sewers near to the property

Q. 2.5: Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?

A.: The public sewer map indicates that there are no public sewers within 30.48 metres (100 feet) of a building within the property.

Guidance Notes:

From 1 October 2011 there may be additional lateral drains and/or public sewers which are not recorded on the public sewer map but are also within 30.48 metres (100 feet) of a building within the property.

The presence of a public sewer within 30.48 metres (100 feet) of a building within the property can result in the local authority requiring a property to be connected to the public sewer.

The measure is estimated from the Ordnance Survey record, between a building within the boundary of the property and the nearest public sewer.

Public pumping station near to the property

Q. 2.5.1: Does the public sewer map indicate any public pumping station or any other ancillary apparatus within 50 metres of any buildings within the property?

A.: The public sewer map included indicates that there is no public pumping station within 50 metres of any buildings within the property. Any other ancillary apparatus is shown on the public sewer map and referenced on the legend.

Guidance Notes:

The measure is estimated from the Ordnance Survey record, between a building within the boundary of the property and the nearest pumping station.

It should be noted that only private pumping stations installed before 1 July 2011 will be transferred into the ownership of Southern Water Services.

Public adoption of sewers and lateral drains

Q. 2.6: Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?

A.: Records indicate that the sewers serving the development, of which this property forms part, are not the subject of an application for adoption under Section 104 of the Water Industry Act 1991. Where the property is part of an established development it would not normally be subject to an adoption agreement under Section 104 of the Water Industry Act 1991.

Guidance Notes:

This enquiry is of interest to purchasers of new homes who will want to know whether or not the property will be linked to a public sewer.

Where the property is part of a very recent or ongoing development and the sewers are not the subject of an adoption application, buyers should consult with the developer to ascertain the extent of private drains and sewers for which they will hold maintenance and renewal liabilities.

Final adoption is subject to the developer complying with the terms of the adoption agreement under Section 104 of the Water Industry Act 1991.

Any sewers and/or lateral drains within the boundary of the property are not the subject of an adoption agreement and remain the responsibility of the householder. Adoptable sewers are normally those situated in the public highway.

Building over a public sewer, disposal main or drain

Q. 2.7: Has the sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?

A.: There are no records in relation to any approval or consultation about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain. However, the sewerage undertaker might not be aware of a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain.

Guidance Notes:

Buildings or extensions erected over a sewer in contravention of Building Control may have to be removed or altered.

From 1 October 2011 private sewers, disposal mains and lateral drains were transferred into public ownership and the sewerage undertaker may not have approved or been consulted about any plans to erect a building or extension on the property or in the vicinity of these.

Risk of flooding due to overloading public sewers

Q. 2.8: Is the building which is or forms part of the property at risk of internal flooding due to overloaded public sewers?

A.: The building is not recorded as being at risk of internal flooding due to overloaded public sewers. From 1 October 2011 private sewers, disposal mains and lateral drains were transferred into public ownership. It is therefore possible that a building may be at risk of internal flooding due to an overloaded public sewer which the sewerage undertaker is not aware of. For further information it is recommended that enquiries are made of the vendor.

Guidance Notes:

A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.

"Internal flooding" from the public sewers is defined as flooding, which enters a building or passes below a suspended floor.

For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.

"At Risk" properties are defined as properties that have suffered or are likely to suffer internal flooding from the public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the sewerage undertaker's reporting procedure.

Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included.

Buildings may be at risk of flooding but not identified where flooding incidents have not been reported to the sewerage undertaker.

Public sewers are defined as those for which the sewerage undertaker holds statutory responsibility under the Water Industry Act 1991.

It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the sewerage undertaker. This report excludes flooding from the private sewers and drains and the sewerage undertaker makes no comment upon this matter.

Sewage treatment works

Q. 2.9: Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.

A.: The nearest sewage treatment works is 1.88 kilometres East of the property. The name of the sewage treatment works is CLAPHAM WTW, which is the responsibility of Southern Water Services, Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX.

Guidance Notes:

The nearest sewage treatment works will not always be the sewage treatment works serving the catchment within which the property is situated.

The sewerage undertaker's records were inspected to determine the nearest sewage treatment works.

It should be noted that there may be a private sewage treatment works closer than the one detailed above that have not been identified.

Water

Connection to mains water supply

Q. 3.1: Is the property connected to mains water supply?

A.: Records indicate that the property is not connected to mains water supply and water is therefore likely to be provided by virtue of a private supply.

Guidance Notes:

The situation should be checked with the current owner of the property.

Details of private supplies are not kept by the water undertaker.

Water mains, resource mains or discharge pipes

Q. 3.2: Are there any water mains, resource mains or discharge pipes within the boundaries of the property?

A.: The map of waterworks does not indicate any water mains, resource mains or discharge pipes within the boundaries of the property.

Guidance Notes:

The boundary of the property has been determined by reference to the Ordnance Survey record or the map supplied.

The presence of a public water main within the boundary of the property may restrict further development within it.

Water undertakers have a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of the water undertaker or its contractors needing to enter the property to carry out work.

Adoption of water mains and services pipes

Q. 3.3: Is any water main or service pipe serving, or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?

A.: Records confirm that water mains or service pipes serving the property are not the subject of an existing adoption agreement or an application for such an agreement.

Guidance Notes:

This enquiry is of interest to purchasers of new homes who will want to know whether or not the property will be linked to the mains water supply.

Risk of low water pressure or flow

Q. 3.4: Is the property at risk of receiving low water pressure or flow?

A.: Records confirm that the property is not recorded by the water undertaker as being at risk of receiving low water pressure or flow.

Guidance Notes:

"Low water pressure" means water pressure below the regulatory reference level which is the minimum pressure when demand on the system is not abnormal.

The reference level of service is a flow of 9 litres/minute at a pressure of 10 metres head on the customer's side of the main stop tap (mst). The reference level of service must be applied on the customer's side of a meter or any other company fittings that are on the customer's side of the main stop tap.

The reference level applies to a single property. Where more than one property is served by a common service pipe, the flow assumed in the reference level must be appropriately increased to take account of the total number of properties served.

For two properties, a flow of 18 litres/minute at a pressure of 10 metres head on the customers side of the mst is appropriate. For three or more properties the appropriate flow should be calculated from the standard loadings provided in BS6700 or Institute of Plumbing handbook.

Water companies include properties receiving pressure below the reference level, provided that allowable exclusions do not apply (i.e. events which can cause pressure to temporarily fall below the reference level). Refer to list below:

Abnormal demand: This exclusion is intended to cover abnormal peaks in demand and not the daily, weekly or monthly peaks in demand which are normally expected. Companies exclude properties which are affected by low pressure only on those days with the highest peak demands. During the year companies may exclude, for each property, up to five days of low pressure caused by peak demand.

Planned maintenance: Companies exclude low pressures caused by planned maintenance. It is not intended that companies identify the number of properties affected in each instance. However, companies must maintain sufficiently accurate records to verify that low pressure incidents that are excluded because of planned maintenance are actually caused by maintenance.

One-off incidents: This exclusion covers a number of causes of low pressure; mains bursts; failures of company equipment (such as PRVs or booster pumps); firefighting; and action by a third party. However, if problems of this type affect a property frequently, they cannot be classed as one-off events and further investigation will be required before they can be excluded.

Low pressure incidents of short duration: Properties affected by low pressures which only occur for a short period, and for which there is evidence that incidents of a longer duration would not occur during the course of the year, may be excluded.

Water hardness

Q. 3.5: What is the classification of the water supply for the property?

A.: The water supplied to the property has an average water hardness of 295 mg/l calcium carbonate which is defined as "Hard" by Southern Water.

Guidance Notes:

The hardness of water depends on the amount of calcium in it – the more it contains, the harder the water is.

There is no UK or European standard set for the hardness of drinking water. More information on water hardness can be found on the Drinking Water Inspectorates' website: <http://www.dwi.gov.uk/>

Water hardness can be expressed in various indices for example the hardness settings for dishwashers are commonly expressed in Clark's degrees, but check with the manufacturer as there are also other units. The following table explains how to convert mg/l calcium and mg/l calcium carbonate classifications.

To Convert from:	To Clark degrees	To French degrees	To German degrees
mg/l calcium	multiply by 0.18	multiply by 0.25	multiply by 0.14
mg/l calcium carbonate	multiply by 0.07	multiply by 0.10	multiply by 0.056

Water meters

Q. 3.6: Is there a meter installed at this property?

A.: Records indicate that the property is not served by a water meter.

Guidance Notes:

Where the property is not served by a water meter and the customer wishes to consider this method of charging they should contact their water retailer.

If a property is measured (metered) upon change of occupation this property will retain the meter.

Charging

Sewerage undertaker

Q. 4.1.1: Who is responsible for providing the sewerage services for the property?

A.: Southern Water is responsible for providing the sewerage services for the property.

Guidance Notes:

The 'wholesale' part of the water industry did not open for competition in April 2017. This means that Southern Water continues to operate the network of pipes, mains and treatment works.

As a wholesaler, Southern Water sells sewerage services to the companies who enter the retail market. In some instances, wholesalers will still need to interact directly with customers. For example, customers will still contact Southern Water to report internal sewer flooding.

Water undertakers

Q. 4.1.2: Who is responsible for providing the water services for the property?

A.: Southern Water is responsible for providing the water services for the property.

Guidance Notes:

The 'wholesale' part of the water industry did not open for competition in April 2017. This means that water undertakers continue to operate the network of pipes, mains and treatment works.

As a wholesaler, water undertakers sell water services to the companies who enter the retail market. In some instances, wholesalers will still need to interact directly with customers. For example, customers will still contact water undertakers to report leaks.

Sewerage bills

Q. 4.2: Who bills the property for sewerage services?

A.: If you wish to know who bills the sewerage services for this property then you will need to contact the current owner. For a list of all potential retailers of sewerage services for the property please visit www.open-water.org.uk.

Guidance Notes:

From April 2017 non-household customers in England can choose their retailer.

'Retail' refers to the way in which customers are billed for their water and sewerage as well as customer services including meter reading.

Water bills

Q. 4.3: Who bills the property for water services?

A.: If you wish to know who bills the water services for this property then you will need to contact the current owner. For a list of all potential retailers of water services for the property please visit www.open-water.org.uk.

Guidance Notes:

From April 2017 non-household customers in England can choose their retailer.

'Retail' refers to the way in which customers are billed for their water and sewerage as well as customer services including meter reading.

Trade effluent information

Q. 4.4: Is there a consent on this property to discharge trade effluent under Section 118 of the Water Industry Act (1991) into the public sewerage system?

A.: The trader operating at this commercial property does not hold either a Trade Effluent Consent, or an acknowledgement of a trade effluent discharge, as issued by Southern Water.

Guidance Notes:

Please note, any existing consent is dependent on the business being carried out at the property and will not transfer automatically upon change of ownership.

Any change of ownership from the current incumbent of a property will require the negotiation of a new trade effluent consent or a new acknowledgement between the new incumbent and Southern Water.

Where consent or acknowledgement details have been provided, this does not represent a direct copy of the original.

Other Information

Additional meter information

No further information.

DISCLAIMER: These replies and information, including that shown on the enclosed plan(s), are given on the distinct understanding that neither the Company nor any of its representatives is legally liable for its accuracy or for any action or omission to act whatsoever by anyone on the strength of that information, save as to obvious error. In particular, any person proposing to construct or excavate on land on the basis of information hereby provided should carry out all necessary on-site investigations.

Appendix one: Terms and expressions

- "the 1991 Act" means the Water Industry Act 1991(i);
"the 2000 Regulations" means the Water Supply (Water Quality) Regulations 2000(ii);
"the 2001 Regulations" means the Water Supply (Water Quality) Regulations 2001(iii);
"adoption agreement" means an agreement made or to be made under Section 51A(1) or 104(1) of the 1991 Act(iv);
"bond" means a surety granted by a developer who is a party to an adoption agreement;
"bond waiver" means an agreement with a developer for the provision of a form of financial security as a substitute for a bond;
"calendar year" means the twelve months ending with 31 December;
"discharge pipe" means a pipe from which discharges are made or are to be made under Section 165(1) of the 1991 Act;
"disposal main" means (subject to Section 219(2) of the 1991 Act) any outfall pipe or other pipe which:
(a) is a pipe for the conveyance of effluent to or from any sewage disposal works, whether of a sewerage undertaker or of any other person; and
(b) is not a publicsewer;
"drain" means (subject to Section 219(2) of the 1991 Act) a drain used for the drainage of one building or any buildings or yards appurtenant to buildings within the same curtilage;
"effluent" means any liquid, including particles of matter and other substances in suspension in the liquid;
"financial year" means the twelve months ending with 31 March;
"lateral drain" means:
(a) that part of a drain which runs from the curtilage of a building (or buildings or yards within the same curtilage) to the sewer with which the drain communicates or is to communicate; or
(b) (if different and the context so requires) the part of a drain identified in a declaration of vesting made under Section 102 of the 1991 Act or in an agreement made under Section 104 of that Act(v);
"licensed water supplier" means a company which is the holder for the time being of a water supply licence under Section 17A(1) of the 1991 Act(vi);
"maintenance period" means the period so specified in an adoption agreement as a period of time:
(a) from the date of issue of a certificate by a sewerage undertaker to the effect that a developer has built (or substantially built) a private sewer or lateral drain to that undertaker's satisfaction; and
(b) until the date that private sewer or lateral drain is vested in the sewerage undertaker;
"map of waterworks" means the map made available under section 198(3) of the 1991 Act(vii) in relation to the information specified in subsection (1A);
"private sewer" means a pipe or pipes which drain foul or surface water, or both, from premises, and are not vested in a sewerage undertaker;
"public sewer" means, subject to Section 106(1A) of the 1991 Act(viii), a sewer for the time being vested in a sewerage undertaker in its capacity as such, whether vested in that undertaker:
(a) by virtue of a scheme under Schedule 2 to the Water Act 1989(ix);
(b) by virtue of a scheme under Schedule 2 to the 1991 Act(x);
(c) under Section 179 of the 1991 Act(xi); or
(d) otherwise;
"public sewer map" means the map made available under Section 199(5) of the 1991 Act(xii);
"resource main" means (subject to Section 219(2) of the 1991 Act) any pipe, not being a trunk main, which is or is to be used for the purpose of:
(a) conveying water from one source of supply to another, from a source of supply to a regulating reservoir or from a regulating reservoir to a source of supply; or
(b) giving or taking a supply of water inbulk;
"sewerage services" includes the collection and disposal of foul and surface water and any other services which are required to be provided by a sewerage undertaker for the purpose of carrying out its functions;
"sewerage undertaker" means the company appointed to be the sewerage undertaker under Section 6(1) of the 1991 Act for the area in which the property is or will be situated;
"surface water" includes water from roofs and other impermeable surfaces within the curtilage of the property;
"water main" means (subject to Section 219(2) of the 1991 Act) any pipe, not being a pipe for the time being vested in a person other than the water undertaker, which is used or to be used by a water undertaker or licensed water supplier for the purpose of making a general supply of water available to customers or potential customers of the undertaker or supplier, as distinct from for the purpose of providing a supply to particular customers;
"water meter" means any apparatus for measuring or showing the volume of water supplied to, or of effluent discharged from any premises;
"water supplier" means the company supplying water in the water supply zone, whether a water undertaker or licensed water supplier;
"water supply zone" means the names and areas designated by a water undertaker within its area of supply that are to be its water supply zones for that year; and
"water undertaker" means the company appointed to be the water undertaker under Section 6(1) of the 1991 Act for the area in which the property is or will be situated.

In this report, references to a pipe, including references to a main, a drain or a sewer, shall include references to a tunnel or conduit which serves or is to serve as the pipe in question and to any accessories for the pipe.

- (i) 1991 c.56.
(ii) S.I. 2000/3184. These Regulations apply in relation to England.
(iii) S.I. 2001/3911. These Regulations apply in relation to Wales.
(iv) Section 51A was inserted by Section 92(2) of the Water Act 2003 (c. 37). Section 104(1) was amended by Section 96(4) of that Act.
(v) Various amendments have been made to Sections 102 and 104 by section 96 of the Water Act 2003.
(vi) Inserted by Section 56 of and Schedule 4 to the Water Act 2003.
(vii) Subsection (1A) was inserted by Section 92(5) of the Water Act 2003.
(viii) Section 106(1A) was inserted by Section 99 of the Water Act 2003.
(ix) 1989 c.15.
(x) To which there are various amendments made by Section 101(1) of and Schedule 8 to the Water Act 2003.
(xi) To which there are various amendments made by Section 101(1) of and Schedule 8 to the Water Act 2003.
(xii) Section 199 was amended by Section 97(1) and (8) of the Water Act 2003.

Appendix two: A guide to new development

The information contained below is for general guidance only. It is recommended that Southern Water's Developer Services department be contacted for further details concerning new infrastructure development.

Wastewater information

Sewer requisitions

It may be necessary for a developer to request that Southern Water provides a public sewer to connect a development site to the existing public system. The developer is responsible for the cost of the work, although a discount will be applied based on the future predicted income from the development served by the new sewer.

Sewer diversions

If a public sewer crosses private land, it may be possible for the landowner/developer to request the sewer be diverted. In the majority of cases Southern Water will allow the developer to undertake this work under close supervision. Whether Southern Water or the developer undertakes the diversionary works the costs are the responsibility of the developer.

Building-over sewers

Public sewers are afforded statutory protection and consequently there is no right to build over or in close proximity to a public sewer. If an existing public sewer either crosses a development site or is located in close proximity to a development site it is essential that a developer contact Southern Water.

Sewer connections

A developer can serve notice on Southern Water that it wishes to make a connection to the public sewerage system. The developer must provide 21 days' notice and the work will be supervised by Southern Water.

Water information

Water requisitions

It may be necessary for a developer to request that Southern Water provides both:

- (a) a public water main to connect a development site to the existing public system and,
- (b) on-site public water mains to serve the individual properties.

In both cases the developer is responsible for the cost of the work, although a discount will be applied based on the future predicted income from the development.

It is possible for the developer to lay the on-site mains themselves under a Self-Lay Agreement. Further details are available from Southern Water.

Water main diversions

The building over or in close proximity to public water mains is not permitted. A developer must request that Southern Water undertakes a diversion of a water main that is affected by a development.

Water connections

A developer can request a new connection to a public water main. This work will be undertaken by Southern Water.

Contact us

For specific information on Southern Water's Developer Services service, including details on how to contact the right person, please visit our website: www.southernwater.co.uk/developers-and-builders-overview.

Appendix three: Terms and conditions

The Customer the Client and the Purchaser are asked to note these terms, which govern the basis on which this drainage and water report is supplied.

Definitions

"The Company" means the water service company operating within the Southern Water drainage area that provides information to Southern Water for this commercial search Report.

"Order" means any request completed by the Customer requesting the Report.

"Report" means the drainage and/or water report prepared by The Company in respect of the Property.

"Property" means the address or location supplied by the Customer in the Order.

"Customer" means the person, company, firm or other legal body placing the Order, either on their own behalf as Client, or, as an agent for a Client.

"Client" means the person, company or body who is the intended recipient of the Report with an actual or potential interest in the Property.

"Purchaser" means the actual or potential purchaser of the Property including their mortgage lender.

1.0 Agreement

1.1 Southern Water agrees to supply the Report subject to these terms. The scope and limitations of the Report are described in paragraph 2 of these terms. Where the Customer is acting as an agent for the Client then the Customer shall be responsible for bringing these terms to the attention of the Client.

1.2 The Customer and Client agree that the placing of an Order for a Report indicates their acceptance of these terms.

2.0 The Report

Whilst Southern Water will use reasonable care and skill in producing the Report, it is provided to the Client on the basis that they acknowledge and agree to the following:

2.1 The information contained in the Report can change on a regular basis so Southern Water cannot be responsible to the Client for any change in the information contained in the Report after the date on which the Report was produced and sent to the Client.

2.2 The Report does not give details about the actual state or condition of the Property nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the Property for any particular purpose, or relied upon for determining saleability or value, or used as a substitute for any physical investigation or inspection. Further advice and information from appropriate experts and professionals should always be obtained.

2.3 The information contained in the Report is based upon the accuracy of the address supplied by the Customer or Client.

2.4 The Report provides information as to the location and connection of existing services, and details of trade effluent consents. It should not be relied upon for any other purpose. The Report may contain opinions or general advice to the Customer and the Client and Southern Water cannot ensure that any such opinion or general advice is accurate, complete or valid and accepts no liability therefore.

2.5 The position and depth of apparatus shown on any maps attached to the Report are approximate, and are furnished as a general guide only, and no warranty as to its correctness is given or implied. The exact positions and depths should be obtained by excavation trial holes.

3.0 Liability

3.1 Southern Water shall not be liable to the Client for any failure defect or non-performance of its obligations arising from any failure of or defect in any machine, processing system or transmission link or anything beyond Southern Water's reasonable control or the acts or omissions of any party for whom Southern Water is not responsible.

3.2 Where a Report is requested for an address falling within a geographical area where Southern Water and another Company separately provide water and sewerage services, then it shall be deemed that liability for the information given by Southern Water or the Company as the case may be will remain with Southern Water or the Company as the case may be in respect of the accuracy of the information supplied. Where Southern Water is supplying information which has been provided to it by another Company for the purposes outlined in this agreement, Southern Water will therefore not be liable in any way for the accuracy of that information.

3.3 Where the Customer sells this Report to a Client (other than in the case of a bona fide legal adviser recharging the cost of the Report as a disbursement) Southern Water or the Company as the case may be shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss or damage whatsoever (save to the extent provided by clause 3.4) and the Customer shall indemnify Southern Water in respect of any claim (other than a claim covered by clause 3.4) by the Client.

3.4 Southern Water shall accept liability for death or personal injury arising from its negligence.

3.5 The entire liability of Southern Water or the Company as the case may be in respect of all causes of action arising under or in connection with the Report (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) shall not exceed £2,000,000 (two million pounds); and Southern Water or the Company as the case may be shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss of profit, loss of goodwill, loss of reputation, loss of business or any indirect, special or consequential loss, damage or other claims, costs or expenses.

4.0 Copyright and confidentiality

4.1 The Customer and the Client acknowledge that the Report is confidential and is intended for the personal use of the Client. The copyright and any other intellectual property rights in the Report shall remain the property of Southern Water. No intellectual or other property rights are transferred or licensed to the Customer or the Client except to the extent expressly provided.

4.2 The Customer or Client is entitled to make copies of the Report (other than any maps contained in the, or attached to the Report, where no copying is permitted).

4.3 The Customer and Client agree (in respect of both the original and any copies made) to respect and not to alter any trademark, copyright notice or other property marking which appears on the Report.

4.4 The maps contained in the Report are protected by Crown Copyright and must not be used for any purpose outside the context of the Report.

4.5 The Customer and the Client agree to indemnify Southern Water or the Company as the case may be against any losses, costs, claims and damage suffered by Southern Water or the Company as the case may be, as a result of any breach by either of them of the terms of paragraphs 4.1 to 4.4 inclusive.

5.0 Payment

5.1 Unless otherwise stated all prices are inclusive of VAT. The Customer shall pay for the price of the Report specified by Southern Water, without any set off, deduction or counterclaim. Unless the Customer or Client has an account with Southern Water for payment for Reports, payments for Reports must be received in full by Southern Water before the Report is produced. For Customers or Clients with accounts, payment terms will be as agreed with Southern Water.

6.0 General

6.1 If any provision of these terms is or becomes invalid or unenforceable, it will be taken to be removed from the rest of these terms to the extent that it is invalid or unenforceable. No other provision of these terms shall be affected.

6.2 These terms shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts.

6.3 Nothing in this notice shall in any way restrict your statutory or any other rights of access to the information contained in the Report.

These Terms and conditions are available in larger print for those with impaired vision.

Appendix four: Complaints procedure

When we get it wrong

You deserve the highest standard of service from us, but sometimes we make mistakes. If we do, please let us know and we will investigate and review your concerns.

Whilst we always try to resolve all complaints straight away, if this is not possible and you are not happy with the course of action taken by us, you can ask us to escalate the issue internally or take your complaint to an independent third party.

How you contact us

Firstly please call us and we will try to sort out your problem straight away.

You can call us between 8am and 5pm, Monday to Friday on 0845 270 0212 or 0330 303 0276 (individual consumers);

Email us at searches@southernwater.co.uk; or

Write to us at LandSearch, Southern Water Services, Southern House, Capstone Road, Chatham, Kent, ME5 7QA.

What you can expect

You will receive a full, fair and courteous response from someone who can effectively deal with your problem.

If we can remedy the problem straight away we will do it but if we cannot immediately resolve your problem we will keep you informed of actions being taken.

The process

We will try to resolve any telephone contact or complaint at the time of the call, however, if that isn't possible, we will take the details of your complaint and we will investigate and get back to you within 10 working days.

We will respond to written complaints within 10 working days of the date received, but we will always aim to respond more quickly. Depending on the scale of investigation required, we will keep you informed of the progress and update you with new timescales if necessary.

If you are still not satisfied with our response or action we will refer the matter to a Senior Manager for resolution. At your request we will liaise with a third party representative acting on your behalf.

Our commitment to you

If we do not respond to your complaint within 10 working days of receipt of your contact, we will compensate you in line with Southern Water's Customer services — Guaranteed standards of service for business customers.

If we find your complaint to be justified, or we have made any errors that substantially change the outcome in your search result, we will refund the search fee. We will also provide you with a revised search and undertake the necessary action to put things right as soon as practically possible. You will be kept informed of the progress of any action required.

If you remain dissatisfied

While we aim to resolve your complaint first time, in the event that we are unable to resolve the issue to your satisfaction, ultimately you can contact a third party. Please make sure that you have followed the process above first, if not, your complaint will be passed back to us.

SEWER RECORDS PAGE 1 OF 2

105627



105049

O.S. REF.

TQ0605SE

506094

Drawn by:

mailkra

Scale:

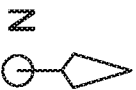
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Title: Land West Of Arundel Road

Date:

06/09/2017

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.
The actual positions should be determined on site.
WARNING: 80% of pipes are constructed of broken pottery. Do not walk on them. Use a probe to locate them. Do not dig them out. Do not use them for anything other than their intended purpose.
Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved
Licence No. WU 298530.



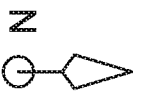
507037

SEWER RECORDS PAGE 2 OF 2

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Date: 06/09/2017	

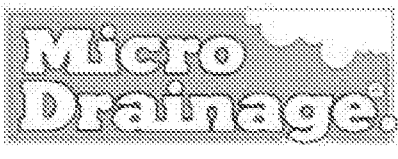
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Date:	06/09/2017	
The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd. accept no responsibility in the event of inaccuracy. The actual positions of pipes should be determined on site.		 
Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.		

APPENDIX E

GREENFIELD RUNOFF RATES

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RSK LDE Ltd		Page 1
18 Frogmore Road Hemel Hempstead Herts, HP3 9RT		
Date 05/01/2018 10:59 File 4 stage 20.12.201...	Designed By RWhitfield Checked By	
Elstree Computing Ltd	Source Control W.12.5	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.400
Area (ha)	8.180	Urban	0.000
SAAR (mm)	747	Region Number	Region 7

Results l/s

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QBAR Urban	30.0
Q1 year	25.5
Q1 year	25.5
Q30 years	68.1
Q100 years	95.8

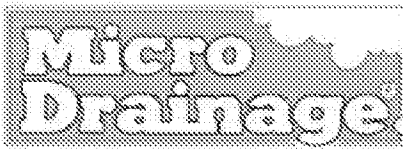
©1982-2010 Micro Drainage Ltd

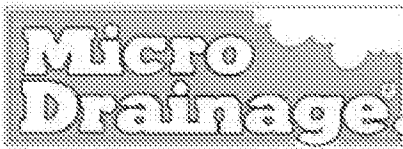
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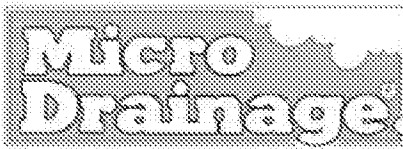
APPENDIX F

INDICATIVE BASIN DESIGN CALCULATIONS

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18 Frogmore Road Hemel Hempstead Herts, HP3 9RT	Arundel Road Angmering				
Date 20.12.2017 File 4 stage 22.02.201...	Designed By RB Checked By				
Elstree Computing Ltd	Source Control W.12.5				
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Summer	11.651	0.251	30.8	408.8	O K
10080 min Summer	11.629	0.229	27.9	370.3	O K
15 min Winter	11.900	0.500	43.9	850.5	O K
30 min Winter	12.047	0.647	44.1	1131.1	O K
60 min Winter	12.191	0.791	44.1	1416.9	Flood Risk
120 min Winter	12.315	0.915	44.1	1673.2	Flood Risk
180 min Winter	12.366	0.966	44.2	1781.5	Flood Risk
240 min Winter	12.386	0.986	44.3	1823.8	Flood Risk
360 min Winter	12.398	0.993	44.4	1839.4	Flood Risk
480 min Winter	12.382	0.982	44.3	1815.1	Flood Risk
600 min Winter	12.368	0.968	44.2	1785.9	Flood Risk
720 min Winter	12.349	0.949	44.1	1745.0	Flood Risk
960 min Winter	12.301	0.901	44.1	1642.9	Flood Risk
1440 min Winter	12.187	0.787	44.1	1408.9	Flood Risk
2160 min Winter	12.017	0.617	44.1	1071.6	O K
2880 min Winter	11.881	0.481	43.7	816.6	O K
4320 min Winter	11.731	0.331	38.3	546.0	O K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
8640 min Summer	1.260	4488			
10080 min Summer	1.115	5152			
15 min Winter	128.238	25			
30 min Winter	86.178	39			
60 min Winter	55.250	68			
120 min Winter	34.177	124			
180 min Winter	25.410	180			
240 min Winter	20.436	236			
360 min Winter	15.037	344			
480 min Winter	12.081	392			
600 min Winter	10.185	466			
720 min Winter	8.854	542			
960 min Winter	7.093	694			
1440 min Winter	5.178	982			
2160 min Winter	3.772	1368			
2880 min Winter	3.009	1712			
4320 min Winter	2.184	2384			
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Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
5760 min Winter	11.664	0.264	32.2	429.6	○ K
7200 min Winter	11.625	0.225	27.5	364.8	○ K
8640 min Winter	11.600	0.200	24.0	322.6	○ K
10080 min Winter	11.582	0.182	21.4	291.9	○ K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
5760 min Winter	1.738	3064			
7200 min Winter	1.455	3760			
8640 min Winter	1.260	4496			
10080 min Winter	1.115	5240			
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18 Frogmore Road Hemel Hempstead Herts, HP3 9RT	Arundel Road Angmering	
Date 20.12.2017 File 4 stage 22.02.201...	Designed By RB Checked By	
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Model Details

Storage is Online Cover Level (m) 12.400

Tank or Pond Structure

Invert Level (m) 11.400

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1550.0	1.000	2158.5

Hydro-Brake® Outflow Control

Design Head (m) 1.000 Hydro-Brake® Type Md5 SW Only Invert Level (m) 11.400
Design Flow (l/s) 44.6 Diameter (mm) 262

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.4	1.200	46.7	3.000	71.6	7.000	109.3
0.200	24.0	1.400	49.5	3.500	77.3	7.500	113.1
0.300	35.9	1.600	52.6	4.000	82.6	8.000	116.9
0.400	41.7	1.800	55.6	4.500	87.6	8.500	120.4
0.500	43.9	2.000	58.5	5.000	92.4	9.000	123.9
0.600	44.1	2.200	61.3	5.500	96.9	9.500	127.3
0.800	43.5	2.400	64.0	6.000	101.2		
1.000	44.5	2.600	66.6	6.500	105.3		

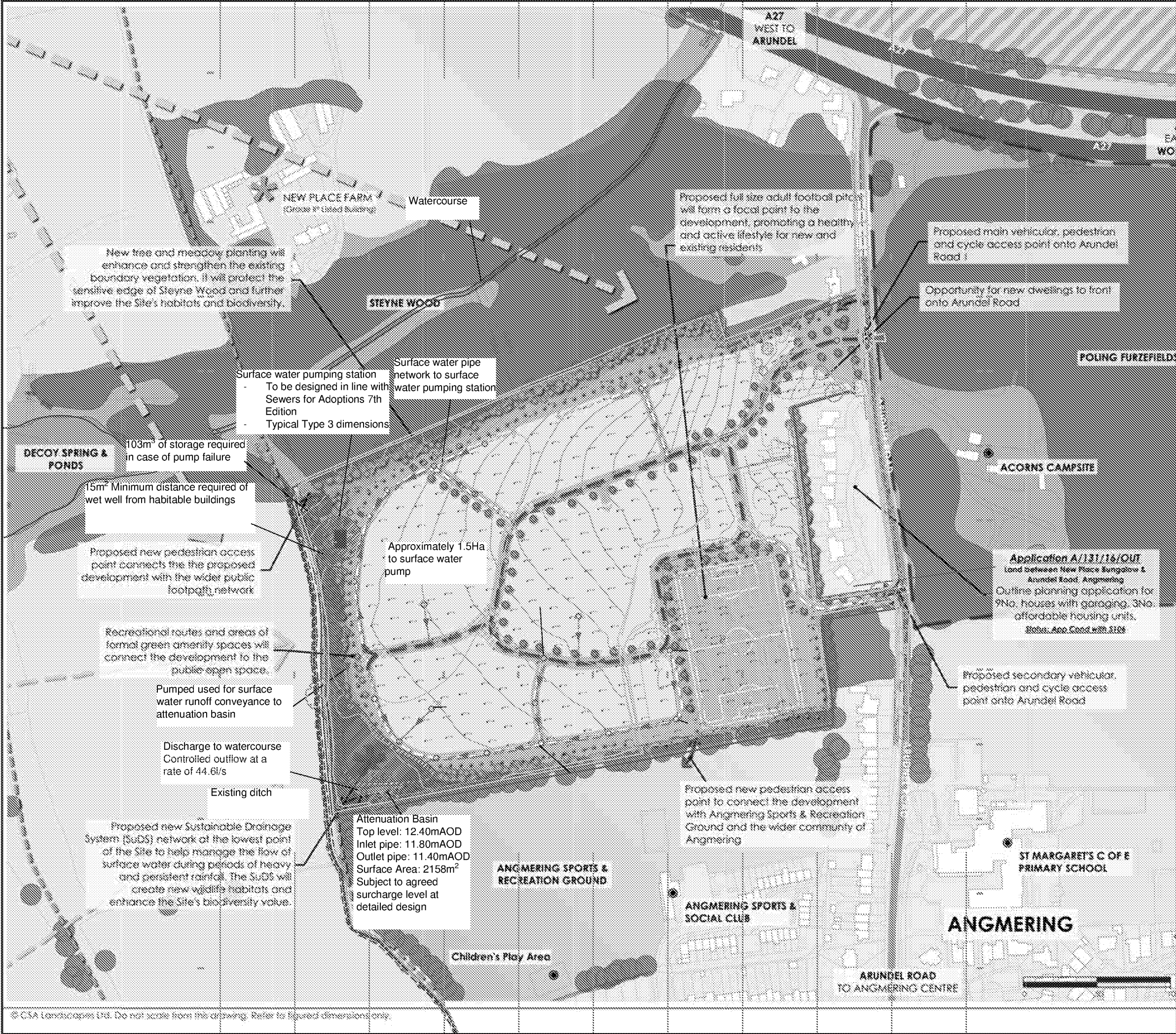
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APPENDIX G

INDICATIVE SURFACE WATER DRAINAGE STRATEGY

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File Location: L:\001 JOBS LIVE WIGAN\881292 - ARUNDEL ROAD, ANGMERING GLADMAN\GRAPH\FLOOD RISK\881292 10-01 (P4) INDICITIVE SURFACE WATER DRAINAGE STRATEGY.DWG



Notes

Do not scale from this drawing

Layout provided by CSA Environmental is indicative and subject to change following layout revisions

Key

- Area of Assessment
- Proposed Surface Water Drainage System
- Proposed Attenuation Basin
- Existing Surface Water Features
- Existing Site Levels
- Existing Site Contours

P2	28.02.18	Final Drawing	RW	CW	CW
P1	22.12.17	Issued for Discussion	RW	CW	CW
Rev.	Date	Amendment	Drawn	Chkd.	Appd.

RSK

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Fax: +44 (0) 1928 725623
Email: info@rsk.co.uk
Web: www.rsk.co.uk

Client

Gladman

Project Title

Arundel Road
Angmering

Status

Final Drawing

Drawing Title

Indicitive Surface Water
Drainage Strategy

Drawn	Date	Checked	Date	Approved	Date
RW	Feb 18	CW	Feb 18	CW	Feb 18

Scale	Orig Size	Dimensions
1:2500	A3	m

Project No.	Drawing File
881292	

Drawing No.	Rev.
10-01	P2

Scale

0 50 100 150 200m

RSK

