



Land off Hulbert Road, Havant, Hampshire

Flood Risk & Drainage Assessment

A096474

April 2020

Prepared on behalf of

The Trustees of The GHM Jackson 1972 Children's Settlement

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1.0 Introduction

1.1 Purpose of this Report

WYG Engineering Ltd (WYG) have been appointed by The GHM Jackson 1972 Children's Settlement to prepare a Flood Risk & Drainage Assessment (FRDA) in support of an outline planning application for residential development on land off Hulbert Road in Havant, Hampshire.

1.2 Proposed Development

The proposed development is for up to 120 residential units with access and soft landscaping. The proposed conceptual masterplan is included in Appendix A.

1.3 Requirement for this Report

1.3.1 Requirement for the Flood Risk Assessment

The application site covers an area of approximately 3.3 ha and is located within Flood Zone 1 (i.e. land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding ($<0.1\%$ AEP¹) in any one year. In accordance with the National Planning Policy Framework (NPPF) (Chapter 14)² a Flood Risk Assessment is required to support planning where a development located within Flood Zone 1 is greater than 1 ha³.

1.3.2 Requirement for the Drainage Assessment

The NPPF aims to prevent inappropriate development in areas at risk of flooding and to ensure that, where development is necessary in areas at risk of flooding, it is safe from flooding, does not increase flood risk elsewhere and reduces flood risk where possible⁴.

To this end, surface water runoff from a developed site should be managed to avoid increasing the risk of surface water flooding and, as far as it is practicable, reduce the risk to the site itself and areas elsewhere. Major developments should incorporate sustainable drainage systems (SuDS) unless there is clear evidence that this would be inappropriate⁵.

¹ The Annual Exceedance Probability (AEP) is the probability, expressed as a %, of a flood event occurring in any year. A large flood which may be calculated to have a 1% chance of occurring in any one year is described as 1% AEP.

² Ministry of Housing, Communities and Local Government (June 2019), *National Planning Policy Framework*

³ NPPF paragraph 163 Note 50

⁴ NPPF paragraph 155

⁵ NPPF paragraph 165

1.4 Scope of this Report

1.4.1 Scope of the Flood Risk Assessment

The FRA will be undertaken in accordance with the national policy and guidance from the NPPF, Planning Practice Guidance (PPG) (Flood Risk and Coastal Change)⁶ and Environment Agency⁷ as well as in accordance with local policy and guidance from Havant Borough Council (HBC) as Local Planning Authority (LPA) and Hampshire County Council (HCC) as Lead Local Flood Authority (LLFA).

The FRA will consider all potential sources of flood risk including Main Rivers, Ordinary Watercourses (not shown on the Environment Agency's flood maps), surface water and overland flow routes, groundwater, sewers, reservoirs and canals.

1.4.2 Scope of the Drainage Assessment

The drainage assessment will be undertaken to inform an outline drainage strategy for the site such that surface water runoff and foul drainage from the development site is managed appropriately. The strategy must ensure that the flood risk to areas elsewhere is not exacerbated by the introduction of new impermeable surfaces, as required by the NPPF⁸, and SuDS are incorporated into the proposed development site where possible.

1.5 Limitations of this Report

This report has been prepared by WYG Engineering Ltd on behalf of The Trustees of The GHM Jackson 1972 Children's Settlement in connection with the scope of the report as described in Section 1.4 above and takes into account the particular instructions and requirements set out in our fee proposal and the acceptance. It is not intended for and should not be relied on by any third party and no responsibility is undertaken to any third party.

WYG accepts no duty or responsibility (including in negligence) to any party other than The Trustees of The GHM Jackson 1972 Children's Settlement and disclaims all liability of any nature whatsoever to any such party in respect of this report.

This report cannot be reproduced without WYG's written consent.

⁶ Ministry of Housing, Communities and Local Government (March 2014), *Flood risk and coastal change*

⁷ Environment Agency (February 2017), *Flood risk assessment in flood zone 1 and critical drainage areas*

⁸ NPPF paragraph 155

2.0 Site Description

2.1 Existing Site

The application site is located between Hulbert Road and the A3(M) to the west of Havant in Hampshire. The nearest postcode is PO7 8EX and the site's central grid reference is SU 69437 08151. A site location plan is shown as Figure 1 below.

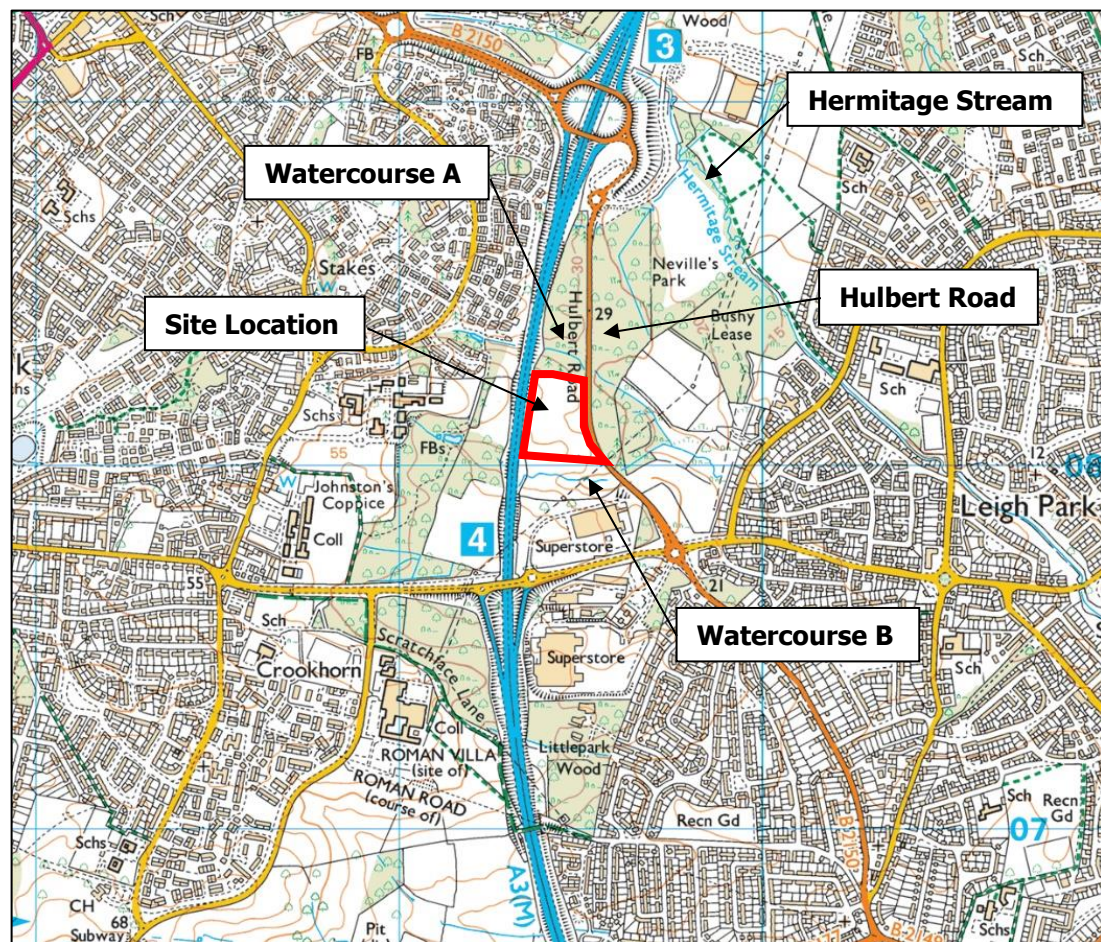


Figure 1 – Site Location⁹

The site comprises a levelled area of gravel in the south west corner, measuring approximately 6,000m², associated with a former temporary hydrocarbon exploration site. A vehicular access track leads from Hulbert Road along the northern and western perimeter of the site to the gravel platform. The remainder of the site is open green space. The site is bounded by woodland to the north and south, Hulbert Road to the east and the A3(M) to the west.

⁹ ©Crown copyright and database rights [2020] Ordnance Survey 0100031673

The topographical survey¹⁰ of the site indicates that the land falls to the east towards Hulbert Road. The north west and south west of the site are located at high points of circa 34.5m AOD and 36.5m AOD, respectively, and fall to the eastern boundary of the site at circa 27m AOD. A copy of the topographical survey is included in Appendix B.

2.2 Existing Drainage

2.2.1 Main Rivers

The nearest Main River to the site is the Hermitage Stream, which flows from west to east beneath the A3(M) at Junction 3 to the north of the site and continues in a south west direction through Havant, as shown in Figure 1 above. At its closest point it is 550m to the north east of the site.

2.2.2 Ordinary & Manmade Watercourses

There are two Ordinary Watercourses close to the site; one 20m to the north ('Watercourse A') and one 50m to the south ('Watercourse B'). These are shown in Figure 1 above.

Both watercourses issue on the western side of the A3(M), flow eastwards in culvert beneath the A3(M) and then in open channel through woodland to the north and south of the site. Watercourse A flows into Watercourse B to the east of Hulbert Road and the single watercourse then flows in culvert beneath the urban area of Havant and into the Hermitage Stream.

2.2.3 Drains and Sewers

Public Sewers

Sewer records obtained from Southern Water do not show the presence of any public sewers within the site boundary but do show the following sewers within close proximity of the site:

- A foul rising main runs along the length of the eastern site boundary. The rising main runs from the rear of the B&Q superstore (to the south of Watercourse B) to a 375mm diameter foul sewer in Hulbert Road to the north of Watercourse A.
- The 375mm diameter foul sewer to the north of Watercourse A runs from west to east. Manholes 5301 and 5302 are located on the western and eastern sides, respectively, of Hulbert Road.

¹⁰ WYG (November 2019), *Topographical Survey, Havant, Portsmouth, A096474 Dwg. No. WYG004*

- A 1125mm diameter surface water sewer runs in parallel to the foul sewer, on the north side of the foul sewer.

Sewer records obtained from Southern Water are contained within Appendix C.

Highway Drainage

An assumed highway ditch runs along the western side of Hulbert Road adjacent to the site.

Private Drainage

The topographical survey shows an attenuation ditch around the gravelled platform, with an outfall pipe on the eastern side of the platform. It is not clear where this pipe goes but is assumed that it conveys surface water via an overland flow route to the highway ditch on Hulbert Road.

A drainage channel is located across the vehicular site entrance. It is presumed that that this connects to the highway ditch.

2.3 Ground Conditions

2.3.1 Geology

A review of the British Geological Survey (BGS) online mapping¹¹ indicates that the site is underlain directly by the London Clay Formation comprising clay, silt and sand. There are no superficial deposits underlying the site.

A BGS borehole record (ref. SU60NE27) on the site reports a sequence of topsoil, firm silty clay, and clay. There is no log of groundwater levels. The nearest BGS borehole record with recorded groundwater is borehole ref. SU60NE191 to the west of the A3(M), where the standing water level was recorded as 5m below ground level (bgl).

2.3.2 Hydrogeology

DEFRA's 'Magic' mapping¹² indicates that the London Clay Formation is not a designated aquifer.

The site is located within a groundwater Source Protection Zone (SPZ) designated as Zone 1 (sub-surface activity). This is where there is protective geology cover, such as clay, below

¹¹ British Geological Survey (2019), *Geology of Britain viewer*

¹² DEFRA (2019), *Magic*

which activities, such as deep drilling, could create pathways for pollutants to enter the groundwater.

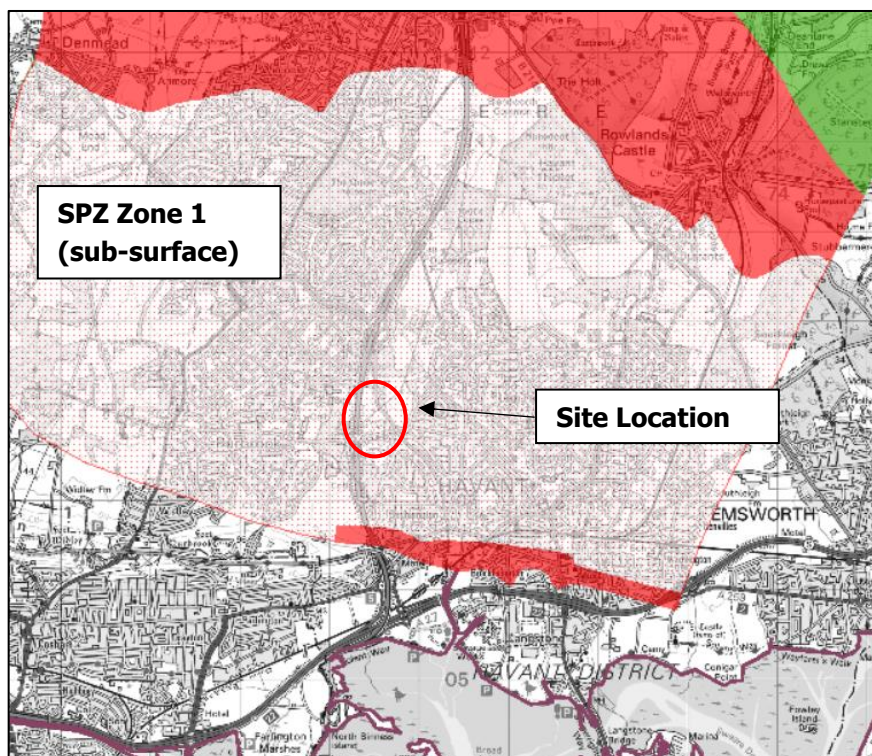


Figure 2 – Groundwater SPZ (DEFRA, January 2020)

3.0 Flood Risk

3.1 Fluvial Flood Risk

Fluvial flood risk is the risk arising from Main Rivers and Ordinary Watercourses.

3.1.1 Main Rivers

A floodplain is the area that would naturally be affected by flooding if a river rises above its banks. In England, floodplains are divided into flood zones for planning purposes. These show the extent of the natural floodplain area at risk of inundation if there were no flood defences or certain other manmade structures and channel improvements. They are divided as follows:

- Flood Zone 3 shows land having a 1 in 100 year or greater annual probability ($>1\%$ AEP) of river flooding. This is the extreme flood.
- Flood Zone 2 shows land having between a 1 in 1,000 year annual probability (0.1% AEP) and 1 in 100 year annual probability (1% AEP) of river flooding.
- Flood Zone 1 shows land having a less than 1 in 1,000 year annual probability of river flooding ($<0.1\%$ AEP), i.e. where flooding from rivers and the sea is very unlikely.

The Environment Agency's Flood Map for Planning, shown in Figure 3 below, indicates that the site lies entirely within Flood Zone 1 and is therefore at low risk of fluvial flooding from Main Rivers.

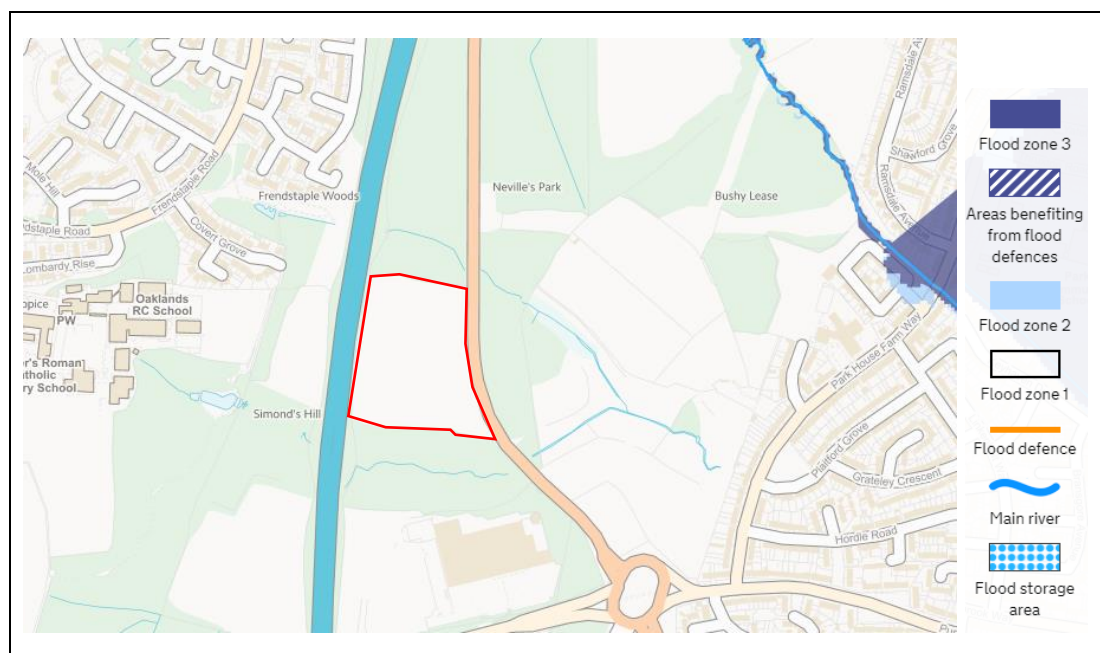


Figure 3 – Flood Map for Planning (Environment Agency, January 2020)

Given the small catchment sizes (<3km²) of many Ordinary Watercourses, Watercourse A and Watercourse B will not have been modelled by the Environment Agency and therefore are not shown on the Flood Map for Planning. In such instances, the Environment Agency's Flood Risk from Surface Water map¹³ can often be used to infer the fluvial flood risk from Ordinary Watercourses. As inferred from Figure 4 in Section 3.2 below, the risk of fluvial flooding from these watercourses is low, with the extent of flooding limited to the land immediately adjacent to the channels. There is no risk of flooding to the site.

Overall, the risk of flooding from fluvial sources is considered to be low.

3.1.2 Climate Change

In accordance with Table 2 of the PPG (Flood Risk and Coastal Change), the proposed residential development is classed as 'more vulnerable'. In line with the latest guidance provided by the Environment Agency¹⁴, for more vulnerable development within Flood Zone 1 the 'central' climate change allowance is to be used. The lifetime of the proposed residential development is at least 100 years, which corresponds to the 2080's epoch. The central allowance for peak river flow in the South East River Basin District in the 2080's epoch is 35%.

3.2 Surface Water & Overland Flows

Surface water flooding occurs where high rainfall events exceed the drainage capacity in an area (i.e. sewer system and/or watercourse), leading to flooding.

The Environment Agency's Flood Risk from Surface Water map, shown in Figure 4 below, indicates that there are no significant flow paths on the site. There are small areas of low risk around the existing attenuation ditch and in lower land in the centre-east of the site adjacent to Hulbert Road.

¹³ Environment Agency (2019), *Long term flood risk information*

¹⁴ Environment Agency (February 2019), *Flood risk assessments climate change allowances*

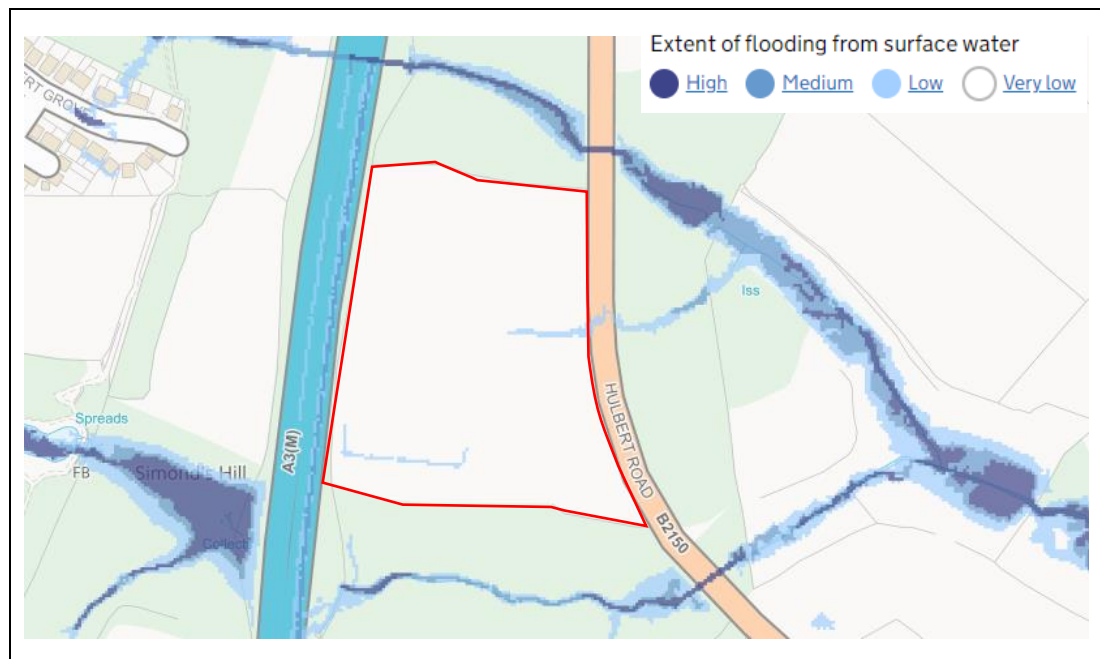


Figure 4 – Flood Risk from Surface Water (Environment Agency, January 2020)

Overall, the risk of flooding from surface water and overland flow is considered to be low.

3.2.1 Climate Change

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

In line with the latest guidance provided by the Environment Agency¹⁴, the 'upper end' allowance for peak rainfall intensity in small catchments (less than 5 km²) across all of England for the 2080s epoch is 40%. The proposed development's drainage system must ensure that there is no increase in the rate of runoff discharged from the site for the upper end allowance. This is taken into account in Section 4 below.

3.3 Groundwater Flooding

Groundwater flooding occurs when groundwater emerges at the surface under conditions where the 'normal' range of groundwater levels and groundwater flows is exceeded.

The Groundwater Management Plan¹⁵ for Hampshire was produced by HCC in response to a history of groundwater flooding within Hampshire. The report indicates that the areas at

¹⁵ Hampshire County Council (October 2013), *Hampshire Groundwater Management Plan*

greatest risk are located within areas underlain by chalk. Given that the site is underlain by London Clay, the site is considered to be within an area of low risk of flooding from groundwater.

A review of the Partnership for Urban South Hampshire (PUSH) Strategic Flood Risk Assessment (SFRA)¹⁶ did not identify any groundwater flooding issues relevant to the site.

Overall, the risk of flooding from groundwater is considered to be low.

3.4 Sewer Flooding

Sewer flooding occurs when intense rainfall overloads the sewer system capacity and/or when sewers cannot discharge properly to watercourses due to high water levels. Sewer flooding can also be caused when problems such as blockages, collapses or equipment failure occur in the sewerage system.

There are no sewers within the site, and therefore the site is not at risk of flooding from sewers. In the unlikely event of flooding from the sewers in Hulbert Road, water is likely to follow the local topography and drains southwards along Hulbert Road and away from the site.

3.5 Reservoir Flooding

A review of the Environment Agency's Flood Risk from Reservoirs map¹³ indicates that the site is not at risk of flooding as a result of reservoir failure.

3.6 Canal Flooding

There are no canals in the wider area, therefore no flood risk from this source.

3.7 Summary of Flood Risk

Based on the above assessment, the site is at low risk of flooding from all sources.

¹⁶ Havant Borough Council (November 2018), *Strategic Flood Risk Assessment (Local Plan Sites)*

4.0 Development Proposals

4.1 Proposed Development

The proposed development is for up to 120 residential units with access and soft landscaping. The proposed conceptual masterplan is included in Appendix A.

4.2 Sequential & Exception Tests

More vulnerable development is acceptable within Flood Zone 1, therefore the proposed development site passes the Sequential Test and the Exception Test is not required.

4.3 Local Policy & Guidance

Policy CS15 (Flood and Coastal Erosion Risk) of the Havant Borough Core Strategy¹⁷ accords with the NPPF (Chapter 14) and the PPG (Flood Risk & Coastal Change).

4.4 Development & Flood Risk

4.4.1 Flood Risk to the Development

As indicated in Section 3, the site is at low risk of flooding from all sources. Nevertheless, it is recommended that the finished floor levels of the proposed units should be set 150mm above surrounding ground levels to mitigate the risk of overland flows.

4.4.2 Flood Risk Arising from the Development

It is a requirement of the NPPF and Policy CS15 of the Havant Borough Core Strategy that flood risk elsewhere does not increase as a result of the proposals. Sections 4.4 to 4.7 below outline the proposed method to manage surface water runoff arising from the proposed development site as a result of an increase in impermeable area on the site.

4.5 Surface Water Management

4.5.1 Drainage Hierarchy

In order to ensure that surface water runoff from the site does not increase the risk of flooding elsewhere, the management of runoff should be considered via a sequential approach, in line

¹⁷ Havant Borough Council (March 2011), *Havant Borough Core Strategy*

with Building Regulations¹⁸. The following options for the disposal of runoff have been considered, in order of preference:

- Discharge to an adequate soakaway or some other adequate infiltration system (i.e. to ground);
- Discharge to a watercourse; and
- Discharge to a sewer (surface water before combined).

Discharge to Ground

The site is underlain by London Clay, which indicates that the potential for infiltration is low. On this basis, discharge to ground is not considered part of the drainage strategy.

The use of soakaways or other infiltration device may be reviewed and incorporated into the detailed drainage design in accordance with BRE 365 should future in-situ infiltration testing indicate suitable infiltration rates.

Should soakaway drainage be utilised on site, it is recommended that the Environment Agency and Havant Borough Council are consulted, given that the site is underlain by a Zone 1 (sub-surface activity) SPZ.

Discharge to Watercourse

Watercourse A is located 20m to the north east of the site whilst Watercourse B is located 50m to the south east of the site. It is understood that the site applicant also owns the woodland through which both watercourses flow. It would therefore be possible to drain to either watercourse, subject to land drainage consent from HBC and taking in to account the results of future ecological and arboricultural surveys to avoid any protected habitats and Tree Preservation Orders (TPOs).

Discharge to Sewer

Southern Water's sewer records do not indicate the presence of any surface water or combined sewers on or in the vicinity of the site. It is not a preferred option to requisition new sewers.

4.5.2 Existing & Proposed Development Areas

The existing site comprises mostly permeable surfaces, apart from the gravel platform associated with the former hydrocarbon exploration area.

¹⁸ HM Government (2010), *The Building Regulations 2010, Approved Document H (Part H3)*

It is expected that approximately 60% of the proposed developable site area, will be impermeable, with the remainder being landscaping and open green space. Table 1 below summarises the existing and proposed development areas.

Table 1 – Existing and Proposed Areas

Scenario	Permeable Areas (ha)	Impermeable Areas (ha)
Existing	2.7	0.6
Proposed	1.9	1.4

4.5.3 Existing & Proposed Discharge Rates

There is an aspiration to achieve greenfield runoff rates from the developed site, therefore greenfield runoff rates have been calculated for the whole site (taking the existing gravel platform to be permeable). Greenfield runoff calculations have been obtained using the online UK SuDS Tool. The results are shown in Table 2 below, with full calculations contained within Appendix D. The greenfield Qbar runoff rate per hectare of the site is 5.32 l/s/ha.

The DEFRA Non-Statutory Technical Standards for Sustainable Drainage¹⁹ requires that the rate of surface water runoff from greenfield sites must not exceed the runoff rate from the pre-developed greenfield site.

A 10% allowance for urban creep has been added to the proposed development impermeable area, as taken from The SuDS Manual²⁰, taking the post-development impermeable area to 1.5 ha. The greenfield runoff rate for this impermeable area is 8 l/s (5.32 l/s/ha*1.5 ha).

Table 2 – Existing and Proposed Runoff Rates

Situation	Impermeable Area (ha)	Runoff Rates (l/s)			
		Qbar	1 in 1 year	1 in 30 year	1 in 100 year
Existing (greenfield)	0	17.57	14.93	40.41	56.04
Proposed	1.5	8	8	8	8

4.5.4 Attenuation Required

In order to restrict the discharge rate from the site, it is necessary to provide some form of on-site attenuation within the new surface water drainage system. The post-development

¹⁹ DEFRA (March 2015), *Non-statutory technical standards for sustainable drainage systems*

²⁰ CIRIA (2015), *The SuDS Manual, C753, paragraph 24.7.2*

attenuation volumes have been calculated using Micro Drainage Quick Storage Estimates. The results are shown in Table 3, with full calculations contained within Appendix E.

Table 3 – Quick Storage Estimates

Catchment	Impermeable Area (ha)	Discharge Rate (l/s)	Attenuation Volume (m ³)		
			1 in 30 year	1 in 100 year	1 in 100 year + 40% CC
Whole site	1.5	8	560	769	1,187

In order to minimise any flooding of the site, it is proposed to attenuate runoff on site up to and including the 1 in 100 year event plus 40% allowance for climate change. The climate change allowance is based on the latest guidance provided by the Environment Agency, as outlined in Section 3.2.1.

4.5.5 Proposed Surface Water Drainage Strategy

A review of SuDS applicable to the site is undertaken in Section 5 below. In summary, it is proposed to drain surface water from the developed site to detention basins located in open space in the centre and south east of the site. The remainder of the 1 in 100 year event plus 40% allowance for climate change volume is stored in attenuation tanks beneath the central open space within the south eastern housing plot. Permeable paving is proposed in private roads and parking areas to provide additional storage and water quality treatment. A filter drain could be incorporated along the eastern site boundary (the lower point) to receive lateral flow from the road and footpath.

Based on the above assessment of options in line with the drainage hierarchy, it is proposed to discharge surface water runoff to watercourse, specifically to Watercourse B. Discharge to Watercourse B over Watercourse A has been selected, despite the greater distance from the site, due to the location of the detention basin in the south east of the site, itself located in the south east as there is a visual need to have dwellings located at the site entrance off Hulbert Road. It is proposed to restrict discharge into Watercourse B to the greenfield Qbar rate of 8 l/s.

A preliminary drainage plan is contained within Appendix F. It should be noted that, as the final site layout will be subject to a future reserved matters application, the specifics of the proposed drainage plan will be finalised at the later detailed design stage. At this outline stage, it has been demonstrated that the site can be drained in accordance with sustainable drainage

principles and is able to effectively mitigate potential adverse effects from surface water runoff and flooding on people, property and the ecological value of the local environment.

The completed HCC pro-forma to accompany the HCC's Surface Water Checklist Guidance²¹ is contained within Appendix G.

4.6 Residual Flood Risk & Overland Flow Routes

In setting the final external levels for the development it is important to ensure that, if flows in exceedance of the 1 in 100 year plus 40% allowance for climate change event occur or a failure of the site surface water drainage system occurs, suitable overland flood routes are provided within the development to ensure that no localised flooding of the buildings occurs within the development.

The roads and open space levels should be set such that the main overland flood route will reflect the current scenario in that runoff will drain towards Hulbert Road, following the natural contours of the ground and away from the buildings.

It is recommended that the finished floor levels of the residential units are set 150mm above the external ground level to offer some protection against overland flow routes during an exceedance event above the 1 in 100 year plus 40% allowance for climate change event.

²¹ Hampshire County Council (online accessed March 2020), *Surface Water Checklist Guidance*

5.0 Sustainable Drainage

5.1 Review of SuDS options

In order to comply with the national policies and guidelines set by the NPPF, the Non-Statutory Technical Standards for Sustainable Drainage and Policy CS15 of the Havant Borough Local Plan, the surface water drainage system should seek to maximise the use of SuDS. This section reviews the suitability of different SuDS features available for the proposed development site.

5.2 The SuDS Management Train

The main purpose of a SuDS system is to manage the surface water runoff generated by a development within the site, attenuating the additional runoff whilst providing water quality treatment to the runoff and amenity and landscape benefits to the community. The different SuDS features can be categorised as follows:

- Source Control: manage runoff at its source
 - Water butts, green/brown roofs, permeable pavements, rainwater harvesting systems, bio-retention systems.
- Site Control: manage runoff generated by a wider area
 - Swales, ponds, infiltration devices, filter strip, French drains.
- Regional Control: manage runoff generated by several sites
 - Basins, ponds and wetlands

The following is an illustration of the SuDS principles and how they may be applied to a development via a SuDS Management Train.

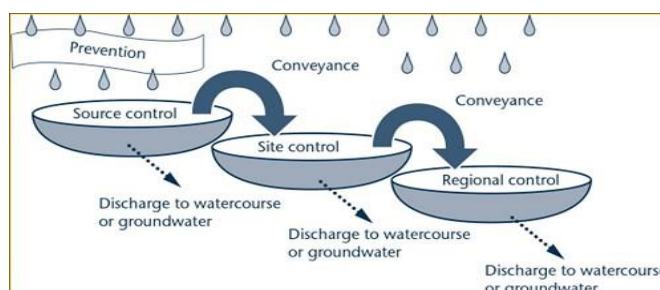


Figure 5 – SuDS Management Train

Table 6 below summarises the suitability of the different SuDS features for the proposed development site.

Table 6 – Review of SuDS Features

SuDS Feature		Description	Applicability to the Site
Source Control	Water butts	Small storage tanks on each individual housing plot	May be appropriate for use on individual dwellings or apartment blocks, subject to detailed design.
	Rainwater harvesting	Recycling of water from roofs and impermeable areas.	
	Green roofs	Vegetated roofs that reduce runoff and remove pollutants.	
	Pervious surfaces	Type of paving that enables run off to seep into its internal structure; runoff can be discharged to sewer, or infiltrate into the ground.	May be appropriate on private drives and non-adoptable roads and car parking areas.
	Rain Gardens	Shallow depressions with free draining soil and planted with vegetation that withstands occasional flooding	May be appropriate within landscaped areas.
Site & Regional Control	Filter drains	Linear drains or trenches filled with granular material that allow infiltration to the surrounding ground.	May be appropriate along the eastern site boundary (low point), with a lined sub-base and connectivity to other SuDS.
	Swales	Vegetated channels to convey store and treat runoff.	May be appropriate for the site, subject to space.
	Basins and ponds	Shallow areas of open space that temporarily hold water and collect silt.	May be appropriate for the site in open space.
	Infiltration basin	Shallow depression that stores runoff before it infiltrates into the subsoil.	Unlikely to be appropriate for the site given the underlying London Clay.
	Infiltration devices	Generally granular trenches or soakaways that store water and allow infiltration to the surrounding ground.	

5.3 SuDS Principles

As indicated in Table 6 above, a number of SuDS features could be implemented as part of the proposals. These are reviewed below in more detail.

5.3.1 Water Butts & Rainwater Harvesting

The use of water butts and rainwater recycling in individual dwellings could be promoted in order to reduce runoff and to minimise water consumption.

5.3.2 Green Roofs

Green roofs are areas of living vegetation installed on top of buildings for a range of benefits including reducing surface water runoff, visual benefit and ecological value.

Green roof could be considered on the roofs of the apartment blocks and/or housing.

5.3.3 Pervious Surfaces

Permeable Paving is a type of paving designed to allow run off to seep into its internal structure, and thus can provide an element of water attenuation and water quality benefits.

On this site permeable paving could be designed to discharge surface water to an on-site sewer system, with an impermeable surround. The implementation of permeable paving could be considered in low traffic areas of the site that are not offered for adoption such as private roads, footways and driveways.

5.3.4 Rain Gardens & Bioretention Areas

Bioretention areas are shallow landscaped depressions that are typically under-drained and rely on engineered soils, enhanced vegetation and filtration to remove pollution and reduce runoff. They are aimed at managing and treating runoff from frequent rainfall events.

Rain gardens and bioretention systems could be incorporated into landscaped areas and open green spaces.

5.3.5 Swales

Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat and often attenuate surface water runoff. When incorporated into site design, they can enhance the natural landscape and provide aesthetic and biodiversity benefits. They are often used to drain roads, paths, or car parks, where it is convenient to collect distributed inflows of runoff, or as a means of conveying runoff on the surface whilst enhancing access corridors or other open space.

Sufficient areas of green space in the east of the site (the lower points) are limited, therefore the use of swales is not considered at this stage.

5.3.6 Filter Drains

Filter drains are shallow trenches filled with stone/gravel that create temporary sub-surface storage for surface water runoff. The stone may be contained in a trench lined with an impermeable liner and discharge to another SuDS feature.

A filter drain could be incorporated along the eastern site boundary (the lower point) to receive lateral flow from the road and footpath.

5.3.7 Basins & Ponds

Detention basins are dry depressions that attenuate storm water runoff by providing temporary storage and controlled release of detained runoff. They are normally vegetated depressions (i.e. grass) that remain mainly dry, except during and immediately after storm events.

It is proposed to incorporate detention basins in the open space in the centre and south east of the site.

5.3.8 Attenuation Tanks

Stormwater attenuation tanks provide a storage system for rainwater and surface water. The stored water inside the attenuation tank is released via a flow-control chamber and either pumped via a pumping chamber or run-off through a gravity stormwater pipe system.

Below ground attenuation tanks could be used on site to store large volumes of surface water where space for surface SuDS features is constrained. The stored water would be released via gravity to the detention basin in the south east of the site.

5.4 Water Quality

The SuDS design should seek to provide an appropriate management train of SuDS features to effectively mitigate the pollution risks associated with the different site users.

Within this development, the key drivers in respect of pollutant risks to the receiving downstream sewer systems, is pollution from vehicle parking areas and roads.

In accordance with Table 26.2 of The SuDS Manual, the pollution hazard level is considered to be 'Low' for private drives and the access road to the site. Therefore, the requirements for

discharge to surface waters state that the 'Simple index approach' should be used. Step 1 of the simple index approach is to identify the pollution hazard indices for the proposed land use as set out in Table 7 below, which is an extract of Table 26.2.

Table 7 – SuDS Manual Simple Index Approach

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Individual property driveways, low traffic roads.	Low	0.5	0.4	0.4

Step 2 of the simple index approach is to select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index. The detailed drainage design will provide a combination of SuDS elements that provides sufficient treatment to the surface water runoff.

Table 26.3 of The SuDS Manual states the various mitigation indices for discharges to surface waters. The mitigation indices for the proposed SuDS features are shown in Table 8.

Table 8 – SuDS Mitigation Indices

Type of SuDS component	TSS	Metals	Hydrocarbons
Detention basin	0.5	0.5	0.6
Permeable pavement	0.7	0.6	0.7
Filter drain	0.4	0.4	0.4

It can be seen in Table 8 above that the proposed drainage system provides the required level of treatment to mitigate the impact of the proposed land use.

5.5 SuDS Maintenance

In the event that the SuDS features on the site are not adopted, it is anticipated that a management company would undertake the maintenance of the non-adoptable SuDS that are not within individual property boundaries. Table 9 below shows the maintenance requirements of each of the proposed SuDS features within the scheme.

Table 9 - Maintenance tasks and frequency required

SuDS element	Maintenance Task	Recommended Frequency
Permeable Paving	- Brushing and vacuuming - Weed removal - Rehabilitation of surface and upper substructure - Remediation of depressions and cracked blocks - Remediation of landscaping.	- Every 12 months - Every 12 months - As required - As required - As required
Detention Basin	- Remove litter and debris - Cut grass & vegetation management - Remove sediments from main basin - Repair erosion and other damages - Wash and/or replace filter medium	- Monthly - Monthly in Spring and Summer or as required - Every 12 months - As required - As required
Underground Attenuation Tank	- Remove debris from catchment surface - Remove sediment from pre-treatment structures - Inspect inlets and outlets - Survey inside of the tank	- Every 12 months - Every 12 months - Every 12 months - Every 5 years
Filter Drains	- Inspect surface and remove litter - Inspect pre – treatment systems, inlets and perforated pipe - Remove silt and sediment - Wash and/or replace filter medium - Clear blockages	- Monthly - Every 6 months - Every 12 months - Every 5 years - As Required

6.0 Foul Drainage Assessment

6.1 Existing Foul Drainage

There are no foul drains within the site. As mentioned in Section 2 above, the nearest foul gravity sewer is the 375mm diameter foul sewer to the north of Watercourse A.

6.2 Proposed Foul Flows

The total peak foul flow rate from the proposed development of 120 residential units is calculated as 5.6 l/s, based on the Sewers for Adoption 7th Edition²² criteria of an average foul flow rate of 0.046 l/s per residential unit.

6.3 Proposed Foul Drainage

It is proposed to drain foul flows from the proposed development by gravity to MH 5301 on the 375mm diameter public foul sewer to the north of Watercourse A.

Southern Water have confirmed that their network has sufficient capacity to accommodate foul flow from the proposed development. Their response to the pre-development enquiry is contained within Appendix H.

²² Water UK/WRc plc (August 2012), *Sewers for Adoption – 7th Edition*

7.0 Consent Required

7.1 Land Drainage Consent

Where a new discharge is to be made to Watercourse B, an application will be required to HCC, as LLFA, for the new outfall and connection under Section 23 of the Land Drainage Act 1991.

7.2 Section 106

Where a new connection is to be made to the public sewer network, an application will be required to Southern Water for the new outfall and connection under Section 106 of the Water Industry Act 1991.

7.3 Section 104

If any sewers on the proposed development site are to be adopted, an application will be required to Southern Water under Section 104 of the Water Industry Act 1991. The application should be made following completion of the detailed drainage design.

8.0 Conclusions and Recommendations

This FRDA has been produced in support of an outline planning application for development of up to 120 residential units on land off Hulbert Road in Havant, Hampshire.

The FRDA has been undertaken in accordance with the NPPF (Chapter 14), PPG (Flood Risk and Coastal Change) and Environment Agency guidance as well as guidance from HBC and HCC.

This assessment has identified that the proposed development can be implemented in accordance with the relevant flood risk and drainage national and local planning policies.

This report has identified the following conclusions:

1. The site is shown on the Environment Agency's Flood Map for Planning as being within Flood Zone 1.
2. The topographical survey of the site indicates that the contours fall to the east towards Hulbert Road.
3. The nearest watercourses to the site are Ordinary Watercourses known as Watercourse A (20m to the north) and Watercourse B (50m to the south).
4. The existing site drains via overland low to a highway ditch on Hulbert Road.
5. There are no surface water or foul sewers on the site. The nearest sewers are a public foul rising main in Hulbert Road and public foul and surface water gravity sewers to the north of Watercourse A.
6. The site is underlain by the London Clay Formation and lies within a groundwater SPZ (Zone 1).
7. The site is considered to be at low risk of flooding from fluvial sources, surface water, groundwater, sewers and reservoir failure.
8. As the site lies within Flood Zone 1, the proposed development is acceptable and passes the Sequential Test.
9. It is proposed to discharge surface water runoff from the proposed development site to Watercourse B at the greenfield Qbar rate of 8 l/s.

10. It is proposed to attenuate surface water runoff on site up to and including the 1 in 100 year storm plus 40% allowance for climate change in detention basins and below ground attenuation tanks. Permeable paving and a filter drain could provide additional storage and water quality treatment.
11. It is proposed to discharge the peak foul flow of 5.6 l/s from the developed site to the public foul sewer to the north of Watercourse A.

Based on the above conclusions, the following recommendations are made:

1. Finished floor levels of the proposed units should be set 150mm above surrounding ground levels to mitigate the risk of overland flows.
2. The detailed surface water drainage design shall review the use of different SuDS features on the site.
3. Where a new discharge is to be made to Watercourse B, an application will be required to HCC, as LLFA, for the new outfall and connection under Section 23 of the Land Drainage Act 1991.
4. Where a new connection is to be made to the public sewer network, an application will be required to Southern Water for the new outfall and connection under Section 106 of the Water Industry Act 1991.
5. If any sewers on the proposed development site are to be adopted, an application will be required to Southern Water under Section 104 of the Water Industry Act 1991.
6. It is recommended that the exact location of the foul rising main close to the eastern site boundary is surveyed before construction works commence.



Appendices

Appendix A –Conceptual Masterplan



NOTES

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Based upon Ordnance Survey data with the permission of Ordnance Survey on behalf of the controller of Her Majesty's Stationary Office, © Crown Copyright. License No: AR 100012563. Contractors, Sub-contractors and suppliers are to check all relevant dimensions and levels of the site and building before commencing any shop drawings or building work. Any discrepancies should be recorded to the Architect. Where applicable this drawing is to be read in conjunction with the Consultants' drawings.

REV	DESCRIPTION	DATE	AUTHOR	CHECKED
A	Masterplan updated	03/04/20	BA	-
B	Masterplan updated	08/04/20	BA	-
C	Annotations updated	09/04/20	BA	-

KEY

Indicative Site Boundary



0 50m 100m
(1:1000)



Urban & Landscape Design

Southampton Office
The Pavilion, Botleigh Grange Office Campus, Hedge End, Southampton, SO30 2AF
T: 02382 022 800 W: www.wyg.com

PROJECT
Hulbert Road
Havant
For: Alison Jackson

DRAWING
Concept Masterplan - 01

SCALE	DATE	AUTHOR	CHECK'D
1:1000 @ A2	11/03/19	BA	CL
JOB NO.	DRAWING NO.	REV	
A096474	CMP-01	C	



Appendix B – Topographical Survey

© WYG Group Ltd.

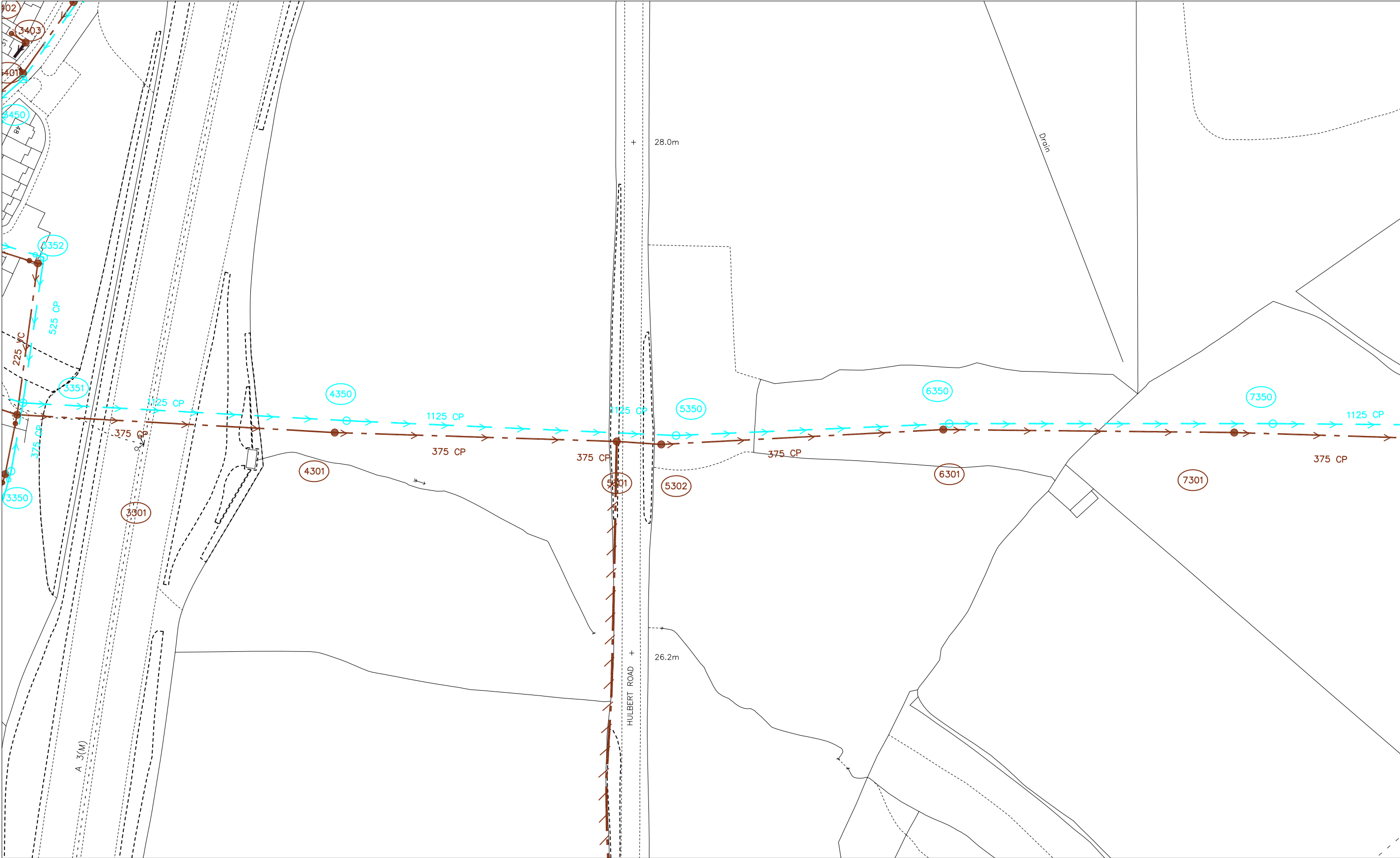
© WYG Group Ltd.



Appendix C – Southern Water Sewer Records

SEWER RECORDS PAGE 1 OF 2

108477



108189

469311	O.S. REF. SU6908SE	Drawn by: rogersc	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: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may Include Bonded Asbestos Cement Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.		469782
		Scale: 1:1250			
	Title: 368391 -Hulbert Road	Date: 30/01/2020			

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape
3301X	27.77	23.42	375	CP	CIRC
3302X	33.65	28.6	225	VC	CIRC
3303X	30.75	27.26	150	VC	CIRC
3350X	30.51	27.16	375	CP	CIRC
3351X	27.8	24.22	1125	CP	CIRC
3352X	33.6	29.55	525	CP	CIRC
3401X	34.67	32.85	225	VC	CIRC
3402X	34.94	33.15	225	VC	CIRC
3403X			UNK	UNK	CIRC
340DX			UNK	UNK	CIRC
3450X	34.68	32.85	450	CP	CIRC
4301X	26.45	22.99	375	CP	CIRC
4350X	26.65	23.88	1125	CP	CIRC
5301X	27.23	22.71	375	CP	CIRC
5302X	28.17	22.6	375	CP	CIRC
5350X	28.28	23.47	1125	CP	CIRC
6301X	27.45	22.17	375	CP	CIRC
6350X	27.09	23.11	1125	CP	CIRC
7301X	23.69	20.31	375	CP	CIRC
7350X	23.07	20.35	1125	CP	CIRC

Drawn by: rogersc	
Title: 368391 -Hulbert Road	
Date: 30/01/2020	



Appendix D – Greenfield Runoff Calculations

Calculated by:	Ross Armstrong
Site name:	Hulbert Road
Site location:	Havant

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.86849° N
Longitude:	1.01472° W
Reference:	2320179097
Date:	Mar 27 2020 08:35

Runoff estimation approach**Site characteristics**

Total site area (ha):	1
-----------------------	--------------------------------

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	761	761
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes**(1) Is $Q_{BAR} < 2.0$ l/s/ha?**

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	5.32	5.32
1 in 1 year (l/s):	4.53	4.53
1 in 30 years (l/s):	12.24	12.24
1 in 100 year (l/s):	16.98	16.98
1 in 200 years (l/s):	19.91	19.91

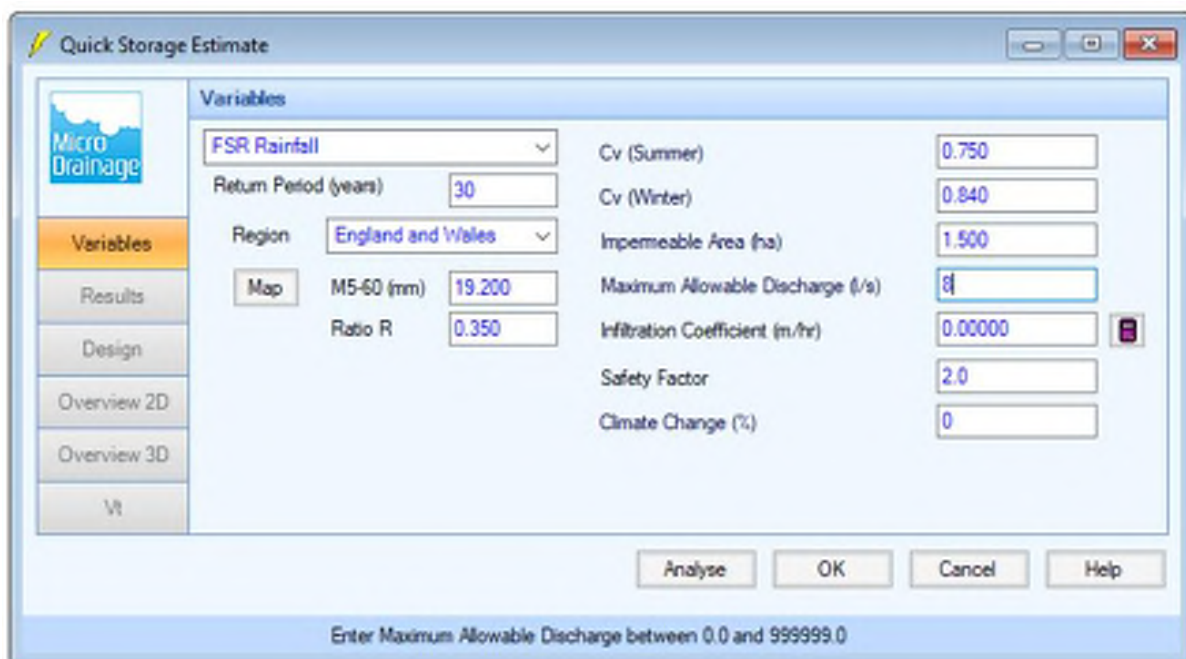
This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



Appendix E – Quick Storage Estimates

Micro Drainage Quick Storage Estimates

1 in 30 year event



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years) 30

Region England and Wales

Map

M5-60 (mm) 19.200

Ratio R 0.350

Cv (Summer) 0.750

Cv (Winter) 0.840

Impervious Area (ha) 1.500

Maximum Allowable Discharge (l/s) 8

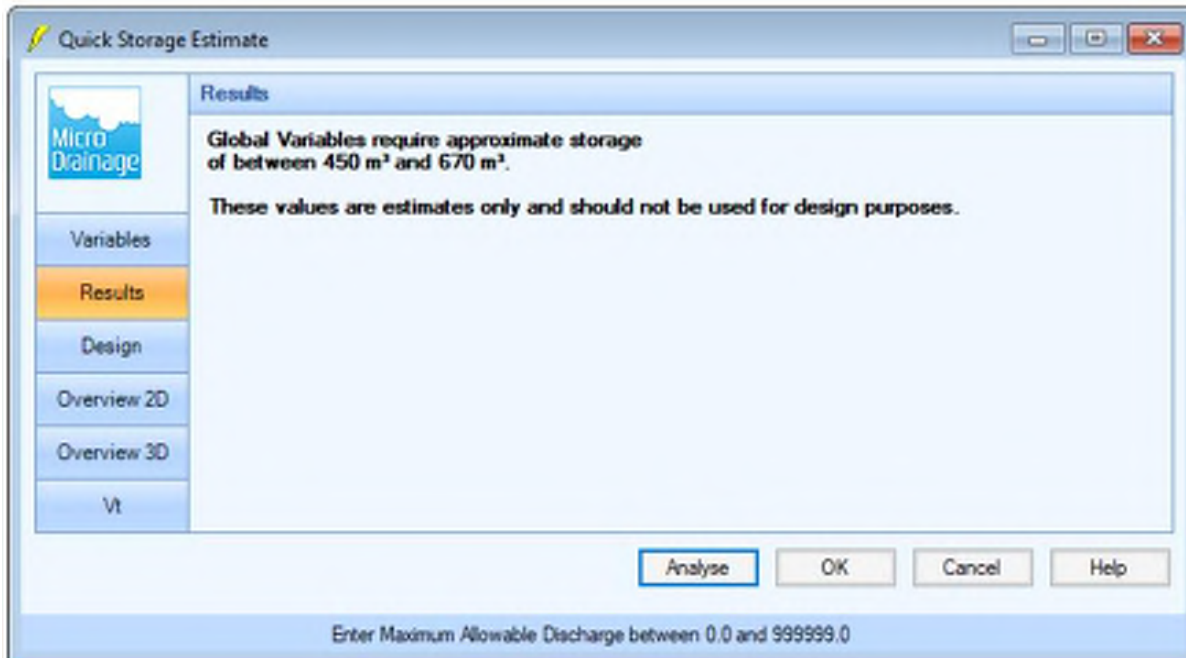
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 0

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 450 m³ and 670 m³.

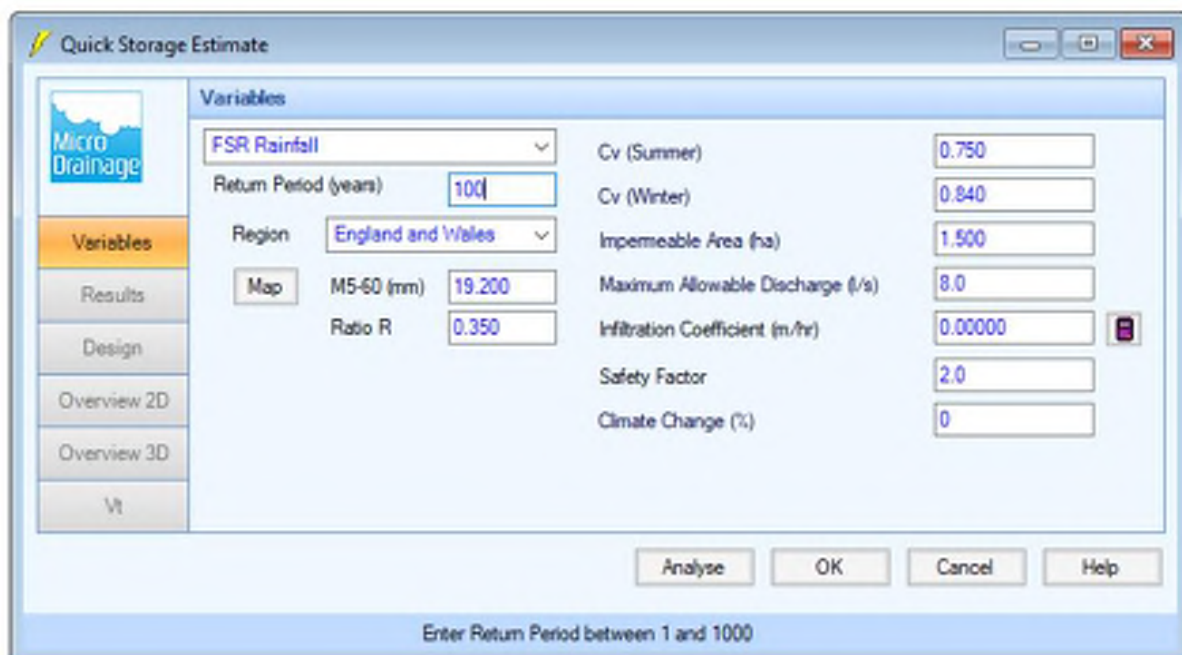
These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Micro Drainage Quick Storage Estimates

1 in 100 year event



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years) 100

Region England and Wales

Map

M5-60 (mm) 19.200

Ratio R 0.350

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 1.500

Maximum Allowable Discharge (l/s) 8.0

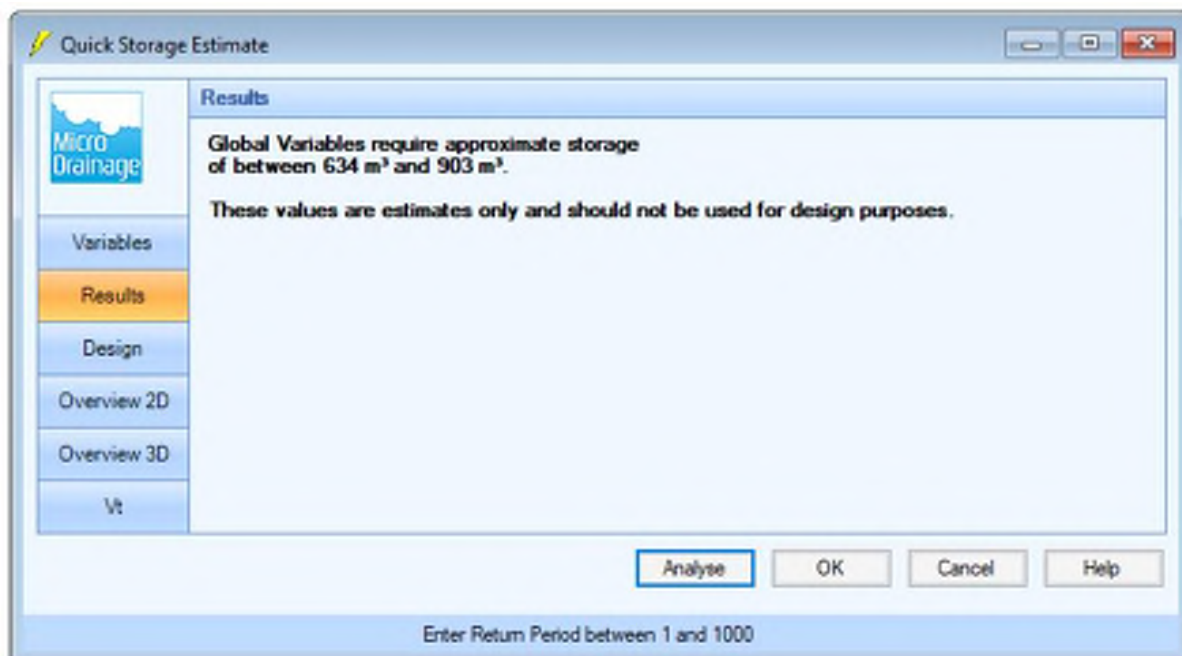
Infiltration Coefficient (m/tr) 0.00000

Safety Factor 2.0

Climate Change (%) 0

Analyse OK Cancel Help

Enter Return Period between 1 and 1000



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 634 m³ and 903 m³.

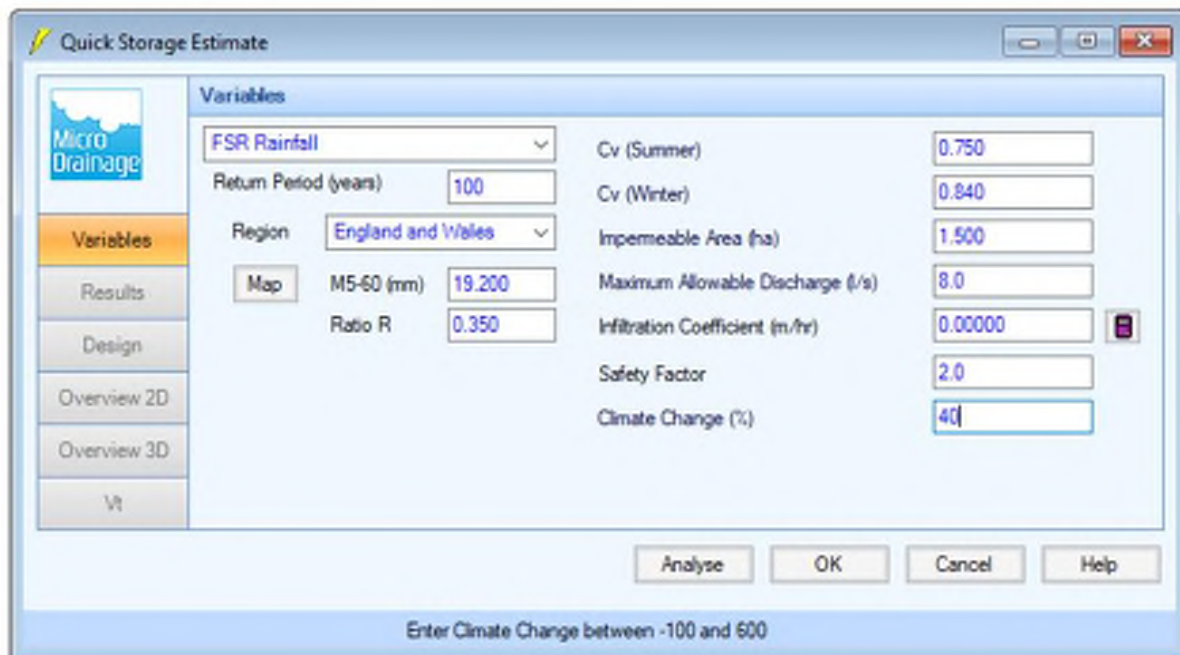
These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Return Period between 1 and 1000

Micro Drainage Quick Storage Estimates

1 in 100 year event plus 40% allowance for climate change



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years) 100

Region England and Wales

Map M5-60 (mm) 19.200

Ratio R 0.350

Cv (Summer) 0.750

Cv (Winter) 0.840

Impervious Area (ha) 1.500

Maximum Allowable Discharge (l/s) 8.0

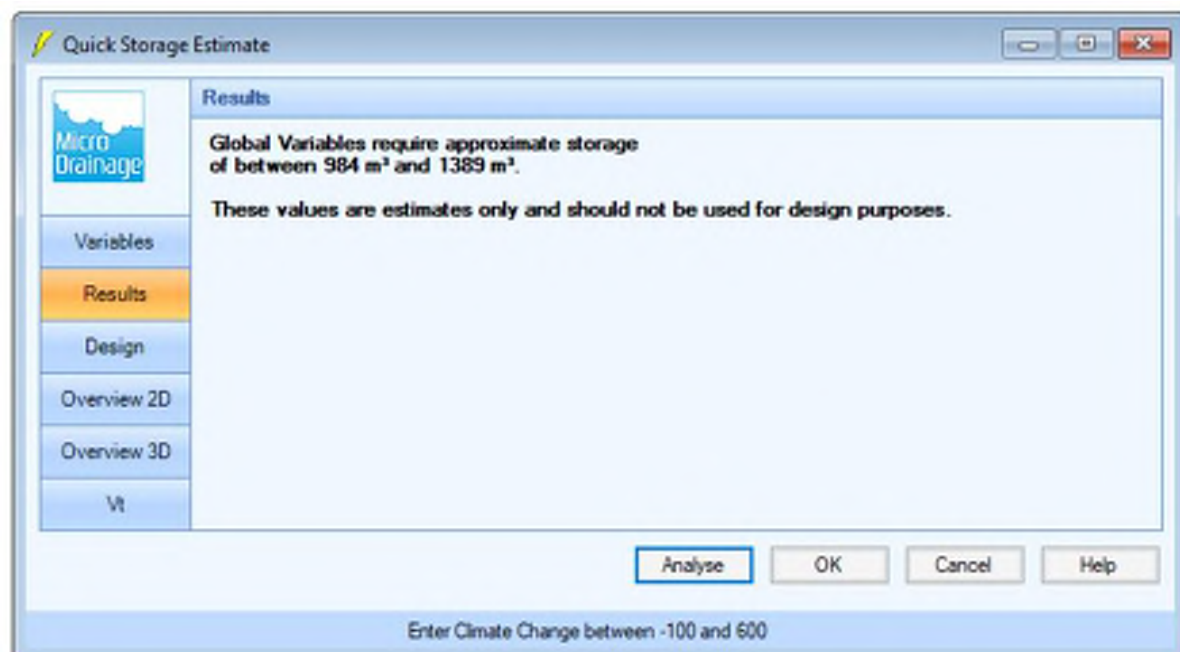
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 40

Analyse OK Cancel Help

Enter Climate Change between -100 and 600



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 984 m³ and 1389 m³.

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

Analyse OK Cancel Help

Enter Climate Change between -100 and 600



Appendix F – Preliminary Drainage Plan



PRELIMINARY ISSUE

NOTES

1. ALL LEVELS IN METRES AOD
2. TOPOGRAPHICAL SURVEY BY WYG, REF
A096474-15-01-WYG001, DATED 05/11/19
3. CONCEPTUAL MASTERPLAN 01 BY WYG, REF
A096474-CMP-01 REV C, DATED 11/03/19
4. SEWER RECORDS PROVIDED BY SOUTHERN WATER

KEY

-  EXISTING WATERCOURSE
 PROPOSED FILTER DRAIN
 PROPOSED SURFACE WATER DRAINAGE
 PROPOSED FOUL SEWER
 EXISTING SW FOUL SEWER
 EXISTING SW FOUL RISING MAIN

THIS DRAWING IS FOR OUTLINE
PLANNING PURPOSES ONLY AND SUBJECT
TO FURTHER DETAILED DESIGN

3 SOVEREIGN SQUARE
SOVEREIGN STREET
LEEDS
LS1 4ER



TEL: +44 (0)113 278 7111
FAX: +44 (0)113 278 3487
e-mail: leeds@wyg.com

Project: LAND OFF HULBERT ROAD,
HAVANT

Drawing Title:
INDICATIVE DRAINAGE PLAN

REV	DESCRIPTION				BY	CHK	APP	DATE
Scale @ 1:500	A1	Drawn FA	Date MAR 20	Checked RA	Date MAR 20	Approved RA	Date MAR 20	
Project No. A096474		Office 21	Type C	Drawing No. SK001			Revision P2	



Appendix G – HCC Pro-Forma

This document should be read in conjunction with the Surface Water Checklist Guidance document located on our website

SURFACE WATER SUBMITTED INFORMATION

Some applications have a considerable number of documents associated with them. To make sure we are reviewing the correct documentation, please ensure the following table is completed.

Document / Drawing Title	Document / Drawing Reference (and revision)
Flood Risk & Drainage Assessment and appendices contained within, inc.	A096474, First Issue, April 2020
Indicative Drainage Plan	A096474-21-C-SK001-P2

PRE-APPLICATION / PREVIOUS PLANNING APPLICATIONS

If this site was subject to a previous planning application i.e. an outline application in relation to a wider strategic site, pre-application enquiry or if you are reliant on information previously submitted, please provide the relevant reference numbers below.

Planning / Pre-app Titles	Reference Number

ORDINARY WATERCOURSE CONSENTING – to be completed and signed by the applicant

~~I confirm that I have reviewed the site and there are no watercourses / ditches / flow routes that will be affected or amended by the works. I understand that works to any of these features without consent constitutes a criminal offence and breaches the Land Drainage Act 1991.~~

~~Or (delete as appropriate).~~

I confirm that I have reviewed the site and there are watercourses / ditches / flow routes that will be affected or amended by the works. I understand that these works require Ordinary Watercourse Consent under the Land Drainage Act 1991 and confirm that applications will be made for these works prior to works starting on site.

Name:...Ross Armstrong **Job Title:...**Senior Engineer (Consultant)

Signature:...Ross Armstrong

15/01/2020

SURFACE WATER CHECKLIST

Site Name		Planning ref			
Ref	SURFACE WATER REQUIREMENTS	PLANNING STAGE		SUBMISSION CHECKLIST	
		OUTLINE PLANNING	DETAILED PLANNING	Included Yes/Not	DOCUMENT Ref
	EXISTING INFORMATION	X	X		
1	Topographical Survey.	X	X	Yes	Flood Risk & Drainage Assessment: Appendix B
2	Existing Drainage	X	X	Yes	Flood Risk & Drainage Assessment: Appendix B
3	Discharge Rates and Volumes	X	X	Yes	Flood Risk & Drainage Assessment: Appendices D & E
4	Existing Overland Flow Paths	X	X	Yes	Flood Risk & Drainage Assessment: Section 3.2
5	Site Investigations	X	X	No	None available
	OUTLINE DRAINAGE STRATEGY				
6	Confirmation of a discharge location	X	X	Yes	Flood Risk & Drainage Assessment: Section 4
7	Outline Surface Water Calculations	X		Yes	Flood Risk & Drainage Assessment: Section 4
8	Flood Risk Assessment / Drainage Strategy	X	X	Yes	Flood Risk & Drainage Assessment
9	Potential Flood Risk	X	X	Yes	Flood Risk & Drainage Assessment: Section 3
10	Outline Drainage Layout Plan	X		Yes	Flood Risk & Drainage Assessment: Appendix F
	DETAILED DRAINAGE STRATEGY		X		
11	Detailed Drainage Assessment		X	n/a	n/a
12	Detailed Drainage Layout Drawings		X	n/a	n/a
13	Detailed Hydraulic Calculations		X	n/a	n/a
14	Water Treatment		X	Yes	Brief reference in Flood Risk & Drainage Assessment: Section 5
15	Exceedance Flows		X	Yes	Brief reference in Flood Risk & Drainage Assessment: Section 4
16	Urban Creep		X	Yes	Brief reference in Flood Risk & Drainage Assessment: Section 4
17	Maintenance		X	n/a	Brief reference in Flood Risk & Drainage Assessment: Section 5



Appendix H – Southern Water Pre-Development Enquiry



Ross Armstrong
WYG Engineering Ltd
33 Gledhow Park Grove
Leeds
West Yorkshire
LS7 4JW

Your ref

Our ref
DS_CC_PDE-116531

Date
09 April 2020

Contact

Tel 0330 303 0119

Dear Mr Armstrong,

Site: Oil Exploration Site, Waterloooville Bypass, Leigh Park, Bedhampton, Havant, Hampshire, PO7 8EX.

We have completed the capacity check for the above development site and the results are as follows:

Foul Water

Following initial investigations, there is currently adequate capacity in the local sewerage network to accommodate a foul flow for the above development at/downstream of manhole reference SU6908**5301**. Please note that no surface water flows (existing or proposed) can be accommodated within the existing foul sewerage system.

It should be noted that this information is only a hydraulic assessment of the existing sewerage network and does not grant approval for a connection to the public sewerage system. A formal S106 connection application is required to be completed and approved by Southern Water Services. Please see the link below:

southernwater.co.uk/ConnectiontoPublicSewer/ApplicationForm

Should you require any further information, please contact us at the above mentioned phone number or address shown in the footer.

Yours sincerely,

Joff Edevane
Growth Planning Lead
Business Channels

Please note: - The information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

Southern Water, Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX
southernwater.co.uk

Southern Water Services Ltd, Registered Office: Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX Registered in England No. 2366670