



Project William

Dove Valley Park, Derbyshire

Jubb

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1 Project Information

1.1 Project Information

Client PGFI III

1.2 Project Details

Project Name Project William

Location Dove Valley Park, Derbyshire

Jubb Project Number 19270

1.3 Report Details

Version P03

Status Planning Issue

Date 18th October 2019

1.4 Project Authorisation

ISSUE HISTORY:

Version	Date	Detail
P01	11/10/19	First Issue
P02	17/10/19	Second Issue
P03	18/10/19	Third Issue

AUTHORISATION:

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2 Introduction

2.1 Commission

2.1.1 This Flood Risk Assessment and Drainage Strategy report has been commissioned on behalf of PGFI III to support a planning application for a proposed new production facility on land at Dove Valley Park in Derbyshire.

2.1.2 This report is for the private and confidential use of PGFI III, to whom alone is owed a duty of care and their professional advisors and consultants in connection with the current development proposals for the site.

2.1.3 This report may not be relied upon or reproduced by any third party for any use without the written agreement of Jubb Consulting Engineers Ltd.

2.2 Brief

2.2.1 This Flood Risk Assessment is prepared in accordance with the requirements of the National Planning Policy Framework (NPPF) published by the Department of Communities and Local Government. Section 14 of the NPPF and the associated Planning Practice Guidance sets out the framework for planning decisions made by the local, regional and national government and the Environment Agency (EA). In order for planning authorities to make informed decisions on the development of sites in areas at risk of flood, NPPF requires the developer to carry out an assessment of flood risk.

2.2.2 This report addresses the requirements given in Section 14 of the NPPF and other issues which are deemed relevant to flood risk. These requirements include the following:

- Assessment of the magnitude and severity of flood risk to the site
- Assess suitability of site and development through the use of the Sequential Test & Exception Test (if required)
- Consider flood risk due to overtopping of existing flood defences
- Assess impact of proposed development on flood risk to adjacent developments
- Determine ability of existing and proposed drainage to accommodate development flows with respect to surface flooding
- Demonstrate that appropriate mitigation measures have been taken to prevent flooding
- Demonstrate that appropriate emergency situations have been considered e.g. overland flow paths, evacuation routes

2.2.3 This report also considers the disposal of wastewater generated by the proposed development. Existing infrastructure will be reviewed to identify potential options for the disposal of foul and surface water run-off. A strategy will be presented for the preferred option.

3 Existing Site

3.1 Location

3.1.1 The proposed site is located in the Dove Valley Park, to the west of city of Derby. The site is approximately 12.34ha in area, with a National Grid Reference (NGR) of 420240E, 332560N.

3.1.2 The site is bound by a small country lane to the north, Woodyard Lane to the west and adjacent fields to the East, a Muller Milk production facility is present at the south-east site boundary and Futaba Manufacturing occupy the site to the south.

3.1.3 The land surrounding the site is predominantly occupied for agricultural purposes with scattered residential areas, including the villages of Hatton, Hilton and Foston.

A site location plan is included in Appendix A.

3.2 Current Land Use

3.2.1 The site currently consists mainly of green fields. The remains of a previously decommissioned RAF runway is found to the south west of the site. The fields are currently used for arable and grazing purposes.

3.3 Site Topography

3.3.1 A detailed topographical survey has been undertaken on the proposed site.

3.3.2 The survey shows that the site falls uniformly in a south easterly direction towards the proposed site entrance at the Park Avenue roundabout.

3.3.3 The high point of the site with a level of 75.50mAOD is located to the north-west region of the site. The low point of 70.20mAOD is situated within the south west corner of the site.

A copy of the topographical survey is included in Appendix B.

3.4 Site Geology

Geology

3.4.1 The British Geological Survey (BGS) maps indicate that the site is underlain with Mercia Mudstone Group (Mudstone).

3.4.2 Superficial deposits have been identified on the site by BGS mapping of the Glaciofluvial Terrace Deposits, which compromise of sands, gravels and clays.

3.4.3 A Ground Conditions Assessment Report was carried out by Jubb in May 2019.

- 3.4.4 Made ground was identified in a number of trial pits undertaken during the Ground Investigation. Man-made earth bunds are also evident from visual inspection of the site.

Hydrogeology

- 3.4.5 The British Geological Survey (BGS) hydrogeology maps indicate that the site is underlain with the Mercia Mudstone group which is classified by the Environment Agency as a Secondary B Aquifer.
- 3.4.6 The superficial deposits are identified as a Secondary A Aquifer.
- 3.4.7 Secondary A Aquifers are assigned in cases where the geology exhibits a permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers.
- 3.4.8 Secondary B Aquifers comprise predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering..
- 3.4.9 The site is not located within a groundwater source protection zone.

Hydrology

- 3.4.10 The nearest surface water feature is a fishing pond located immediately north-west of the site, and publicly accessible from Woodyard Lane and Heathtop.
- 3.4.11 An existing surface water attenuation pond, built to serve the first phase of Dove Valley Park lies approximately 330m to the south of the site.
- 3.4.12 The nearest main river is Foston Brook approximately 1.5km to the west, with the River Dove approximately 2.6km to the south. Tributaries to the River Dove lie approximately 1.2km south of the site.

3.5 Existing Drainage

- 3.5.1 The existing site is a greenfield site and is not currently positively drained. Due to the existing site levels rainwater falling within the site currently drains overland with ponding in certain areas in extreme rainfall events. There are no known watercourses located within the site boundary.
- 3.5.2 The existing local public foul and surface water sewer network currently serving the surrounding area is owned and operated by Severn Trent Water. A copy of the Severn Trent Water asset plans is included in Appendix C.
- 3.5.3 Severn Trent Water asset plans have identified that there is no existing drainage infrastructure located within the proposed site boundaries.
- 3.5.4 The nearest public foul sewer networks are located to the south-east of the site within the Park Avenue Roundabout. Here two spurs are already in place to accommodate the site flows. The surface Water Sewer is sized as 675mm diameter and the foul water is a 150mm diameter sewer. The existing surface water sewers will collect and convey flows to the south before discharging into the Dove Valley Phase 1 attenuation pond.

4 Flood Risk to the Existing Site

This section explores the primary sources of flooding to the site.

4.1 Tidal & Fluvial Flooding

- 4.1.1 The proposed site is identified as lying outside of the fluvial and tidal flood risk zone according to the Environment Agency's published floodplain map (refer to Figure 1). This estimate of the extent of flooding is based on the absence or failure of all existing flood defences currently protecting the site.

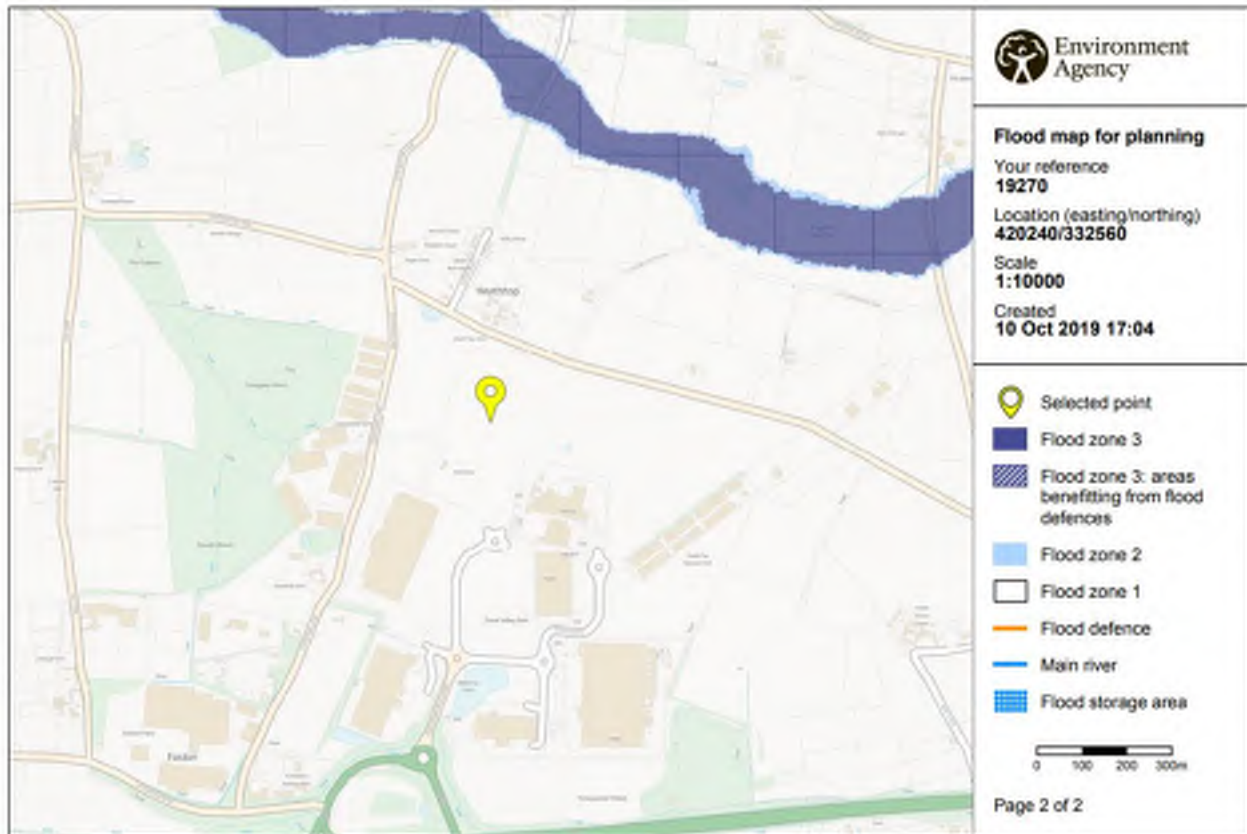


Figure 1 – Extract from Environment Agency Flood Map for Planning

- 4.1.2 The EA floodplain map indicates that the site corresponds to a Flood Zone 1 – Low Probability in Table 1 of the NPPF Planning Practice Guidance.
- 4.1.3 This zone has less than a 1 in 1000-year annual probability of flooding. The NPPF Planning Practice Guidance states that all types of development are suitable for this flood zone.
- 4.1.4 The full extents of the proposed development will be located outside of the fluvial flood zone, within Flood Zone 1.
- 4.1.5 There are no historic records of overland or surface water flooding affecting the proposed site. The local South Derbyshire Strategic Flood Risk Assessment (SFRA) includes a map which identifies recorded historic flooding events. This map shows no previous instances of flooding affecting the subject site.
- 4.1.6 A copy of the Historic Flood Records map is included in Appendix D.
- 4.1.7 A detailed assessment of the risk of fluvial flooding to the subject site and the development proposals has been undertaken, which has concluded that the risk of flooding to the development is low.
- 4.2 Overland / Surface Water Flooding
- 4.2.1 As shown on the EA risk of flooding from surface water map (refer to Figure 2), the majority of the proposed site is identified as an area at very low risk of surface water flooding. However, there are a number of areas that are shown as having a low to high risk of surface water flooding.



Figure 2 – Extract from Environment Agency Risk of Flooding from Surface Water Map

- 4.2.2 The area shows no risk from surface water flooding within the localised site.
- 4.2.3 The proposed site is protected from overland flows due to the topographical profile of the surrounding area, which conveys surface water flows away from the site.
- 4.2.4 There are no historic records of overland or surface water flooding affecting the proposed site. The local South Derbyshire SFRA historic flood events map (refer to Appendix D) shows no previous instances of flooding affecting the subject site.
- 4.2.5 Based on the factors described above, the proposed site is not considered to be at risk from overland and surface water flooding.
- 4.3 Flooding from Sewers
 - 4.3.1 The proposed site is not currently positively drained, with the closest Severn Trent sewer network located to the south west of the site.
 - 4.3.2 Due to the existing levels of the surrounding area, any flows caused by the exceedance of sewers in the surrounding area would be conveyed away from the site and would therefore not impact upon the subject site.
 - 4.3.3 The South Derbyshire SFRA historic flood events map (refer to Appendix D), shows there are no records of historical flooding caused by the local sewer infrastructure in the surrounding area impacting the site.
 - 4.3.4 Consequently, it is not considered that flooding from sewers poses a significant risk of flooding to the proposed development.
- 4.4 Flooding from Groundwater
 - 4.4.1 The underlying geology beneath the proposed site has been identified as Mercia Mudstone Group (Mudstone), which is classified by the Environment Agency as a Secondary B Aquifer. The superficial deposits are identified as a Secondary A Aquifer.
 - 4.4.2 As part of the local SFRA a groundwater flood risk map was produced which shows that the site is identified as being at a low risk of groundwater flooding (25%-50%). A copy of the Ground Water Flood Risk map is included in Appendix D.
 - 4.4.3 As shown on the South Derbyshire SFRA historic flood map, there are no historic records of groundwater flooding events occurring within the site.
 - 4.4.4 On-site geotechnical investigation works have been undertaken on the proposed site. Presence of groundwater showed significant variation across the site, with the majority of strikes identified in borehole records showing a depth greater than 3m. Based on the available information described above, it is considered that flooding from groundwater does not pose a significant risk to the site.
- 4.5 Flooding from Artificial Sources
 - 4.5.1 There are no artificial bodies of water located within or near the proposed site. As a result, it is not considered that flooding from artificial sources poses a risk of flooding to the site.

5 Proposed Development

5.1 Development Description

- 5.1.1 Part single, part two-storey facility for the extraction, processing, bottling and distribution of water based products (combined B2 and B8 use), with associated ancillary office, infrastructure, access, parking and landscaping.

5.2 Development Suitability

- 5.2.1 The NPPF aims to direct developments to suitable areas with low probability of flooding. The table below illustrates the acceptable classification of development within each flood zone.

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1 (<1 in 1000)	✓	✓	✓	✓	✓
Flood Zone 2 (up to 1 in 1000)	✓	✓	Exception Test	✓	✓
Flood Zone 3a (1 in 100 fluvial) (1 in 200 tidal)	Exception Test	✓	X	Exception Test	✓
Flood Zone 3b (functional floodplain)	Exception Test	✓	X	X	X

- 5.2.2 The proposed development type is considered to be classified as a 'less vulnerable' development under Table 2 of the NPPF.
- 5.2.3 As the proposed developable region within the subject site is in Flood Zone 1, all vulnerability classes are suitable and thus the proposed scheme is deemed acceptable.
- 5.2.4 The site will not require to be subjected to a sequential test by the Local Planning Authority (LPA) in respect of its allocation and appropriateness for the proposed development of this location, as the proposals are within flood zone 1.

6 Development Drainage

- 6.1 Refer to Appendix F for the Proposed Drainage Strategy drawing.
- 6.2 Foul Drainage
- 6.2.1 Proposed foul wastewater drainage is split into domestic and trade effluent components.
- 6.3 Domestic Discharge
- 6.3.1 Domestic foul water will discharge via a traditional below ground drainage system to the outfall point into the existing public foul sewer to the south of the site near the existing roundabout.
- 6.3.2 The proposed facility will employ 163 people and a peak 266 vehicles will visit the site in isolated circumstances.
- 6.3.3 Severn Trent Water have advised that 50 litres per person per day should be used for an industrial site with a cafeteria.
- 6.3.4 $163 \times 50 = 8150$ litres per day, equivalent to an average discharge of 0.09 litres per second.
- 6.3.5 Taking a conservative estimate that each vehicle driver will use the toilet when they visit. Based on the peak daily vehicle visits of 266 an additional 0.01 litres per second would be generated.
- 6.3.6 Average domestic flow $= 0.09 + 0.01 = 0.1\text{l/s}$
- 6.3.7 Peak domestic flow $= 0.1 \times 6 = 0.6\text{l/s}$
- 6.4 Trade Effluent Discharge
- 6.4.1 Trade effluent flows from the building will be collected in a drainage sump before being pumped into a buffer tank. The buffer tank will be sized to accept the high peak flows from the facility while maintaining smaller, more consistent outflows discharging to the public sewer
- 6.4.2 A sampling chamber with automatic sampler is proposed to be constructed downstream of the buffer tank. This will facilitate monitoring of the process water discharge against the requirements of the trade effluent agreement.
- 6.4.3 The process drainage designer (ARL) has entered into discussions with the water authority regarding trade effluent discharge. It is understood that the trade effluent discharge component will be limited to 5 litres per second.

6.5 Surface Water Drainage

- 6.5.1 Surface water will be collected via rainwater goods, gullies and channel drains, with separate below ground drainage networks proposed to serve external yard areas and roof areas. Yard, car park and access road areas will drain via oil interceptors.
- 6.5.2 Additionally SuDS benefits will be realised through the provision of a landscaped attenuation basin. The basin will typically be dry, filling when a large storm event is experienced. A flow control positioned in the downstream manhole will restrict the discharge.
- 6.5.3 Due to the topography of the site and the proposed finished levels, a small area of access road at the site entrance will not be able to drain via gravity into the proposed attenuation basin. A separate flow control and storage (oversize pipe) will be provided for this area.
- 6.5.4 Discharge from site will be restricted to mimic greenfield runoff rate. As part of the wider Dove Valley Park (DVP) Phase 2 outline planning application a greenfield runoff rate of 245.8l/s (equivalent to 11l/s/Ha) was established. It is understood that extensive discussions took place between the LPA and the DVP Phase 2 drainage designers to arrive at this figure. As roughly two thirds of the site under consideration is within the DVP Phase 2 outline boundary, it is considered appropriate to follow the example set forth in the outline planning consent.
- 6.5.5 The development site area is 12.3Ha, therefore the total surface water discharge will be limited to 135.3l/s.
- 6.5.6 Under the current design, the main site catchment (draining via the attenuation basin) is restricted to 60.3l/s and the smaller site entrance catchment is restricted to 75l/s. The exact split of catchments, and therefore the exact peak discharge from each area will be subject to detailed design. The detailed design will seek to maximise the catchment area draining via the basin. The total surface water discharge will be in accordance with para 6.5.5 above.
- 6.5.7 A single point of connection is proposed into the existing 675mm diameter public sewer to the south of the site near the existing roundabout. Severn Trent Water record information gives the cover and invert levels of these (refer to Appendices C & F for details).

7 Sustainable Drainage Systems (SuDS) & Water Quality

7.1 Sustainable Drainage Systems

- 7.1.1 The surface water management is proposed to incorporate sustainable drainage techniques to restrict surface water discharge from the site and improve water quality of the run-off. There are a wide range of techniques that can be applied including source control, online systems and outlet controls. Ciria have published a SuDS manual, which details a number of systems along with guidance on their application and design.
- 7.1.2 SuDS systems typically rely on either infiltration or attenuation to reduce peak flows and volume discharge and filtration systems to remove pollutants or solids from the effluent.
- 7.1.3 The existing ground conditions suggest that infiltration methods will not be a viable solution for the discharge of surface water flows from the proposed development.

- 7.1.4 Therefore, it is considered that an attenuation option will be the preferred option for the site. It is proposed to incorporate sustainable drainage techniques as part of the drainage strategy, including an attenuation basin. This basin will incorporate a stone filled low flow channel.
- 7.2 Water Quality
 - 7.2.1 Given the nature of the development, gully and channel drains will be required to drain yards and access roads. Sumped outlets will capture large items of debris close to source.
 - 7.2.2 Petrol interceptors will capture silt as well as intercept oil through baffles/submerged pipes and a coalescer filter will remove emulsified oils.
 - 7.2.3 The proposed SuDS attenuation basin will be landscaped, therefore providing ecological benefits as well as additional water quality benefits through dilution, filtration and the settlement of solid particles. A low flow stone filled channel through the middle of the basin will provide further filtration and settlement benefits.

8 SuDS Management & Maintenance

- 8.1.1 To ensure that the proposed SuDS features operate effectively for its lifetime, a management plan for the operation and maintenance of SuDS will be required, prior to construction, based on Chapter 32 of Ciria C753 guidance.
- 8.1.2 It is anticipated that the proposed surface water and foul drainage networks will be offered to Severn Trent Water for adoption under a section 104 agreement.
- 8.1.3 It is anticipated that the proposed SuDS features will remain under private ownership, with maintenance responsibility remaining with the landowner.
- 8.1.4 Details for the management and maintenance of any SuDS feature within the site will likely need to be agreed with the Local Authority prior to construction.
- 8.1.5 The tables below have been extracted from the CIRIA SuDS Manual and gives an overview of the recommended maintenance activities and frequencies associated with the attenuation basin (Table 22.1) and the oil interceptors (Table 14.2).

TABLE 22.1 Operation and maintenance requirements for detention basins			
	Maintenance schedule	Required action	Typical frequency
Regular maintenance		Remove litter and debris	Monthly
		Cut grass – for spillways and access routes	Monthly (during growing season), or as required
		Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
		Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
		Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
		Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
		Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
		Check any penstocks and other mechanical devices	Annually
		Tidy all dead growth before start of growing season	Annually
		Remove sediment from inlets, outlet and forebay	Annually (or as required)
		Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance		Re-seed areas of poor vegetation growth	As required
		Prune and trim any trees and remove cuttings	Every 2 years, or as required
		Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions		Repair erosion or other damage by re-seeding or re-turfing	As required
		Re-alignment of rip-rap	As required
		Repair/rehabilitation of inlets, outlets and overflows	As required
		Re-level uneven surfaces and reinstatement design levels	As required

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove filter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

9 Development Flood Risk & Mitigation

9.1 Tidal & Fluvial Flooding

- 9.1.1 As shown on the EA flood maps, the full extent of the proposed development will be located within Flood Zone 1 and therefore be at a low risk of fluvial flooding.
- 9.1.2 The development is further protected from potential flooding in this area due to the existing site levels.
- 9.1.3 The proposed development includes a site wide drainage strategy which will collect and discharge flows in a sustainable manner. It is proposed that flows will be discharged to the local sewer connection at a predevelopment rate. This will provide a betterment on the existing site conditions for a range of storm events and will prevent the development from increasing the risk of flooding to the site or the surrounding area.

9.2 Overland / Surface Water Flooding

- 9.2.1 As discussed in section 4.2 the proposed site is at low risk of flooding from overland or surface water flows.
- 9.2.2 The EA flood risk from surface water map shows little to no risk of surface water flooding.
- 9.2.3 It is anticipated that the proposed development will alleviate this risk of flooding by collecting, conveying and discharging flows from the site to the local surface water connection and preventing the ponding of flows within the site.
- 9.2.4 The proposed drainage network will be designed to accommodate surface water flows from the new hardstanding areas of the development. This network will be designed to accommodate flows for a range of storm events without flooding.
- 9.2.5 Consideration has been given to failure of the site drainage system when designing the site finished ground levels. Proposed finished ground levels will direct water away from buildings. An evacuation route would remain available to exit the building via the car park and the access road on the east side of the site.
- 9.2.6 Consequently, the proposed development will not have a significant impact on flood risk to the site or the surrounding area.

9.3 Flooding from Sewers

- 9.3.1 There is no current flood risk to the site from existing sewers.
- 9.3.2 A new surface water drainage network will be constructed to service the proposed development. However, the new sewer network will not pose a risk of flooding to the site or the surrounding area, as the network will be designed to prevent surface flooding in the 1 in 100-year storm event with an allowance for climate change.
- 9.3.3 A new foul drainage network will also be constructed to service the site. This network will be designed to accommodate the anticipated peak flows with no flooding.

- 9.3.4 The proposed drainage strategy will include the design of new surface water and foul sewers which can accommodate flows from the site for a range of storm events and peak flows without flooding. It is therefore considered that the proposed development does not increase the risk of flooding from sewers to the site or the surrounding area.
- 9.4 Groundwater Flooding
 - 9.4.1 The existing site is identified within an area of limited potential for groundwater flooding to occur, with no historic records of flooding across the site.
 - 9.4.2 It is proposed to discharge surface water flows via attenuation solution to the local surface water network. The proposals are not expected to affect the groundwater table and consequently will not increase the risk of flooding from groundwater sources.
- 9.5 Flooding from Artificial Sources
 - 9.5.1 As discussed in Section 4.5 there is no flood risk to the site from artificial sources. The development proposals do not impact the risk posed to the site or the surrounding area.

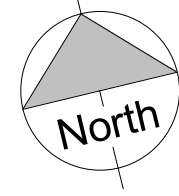
10 Conclusions & Recommendations

It is considered that this assessment represents a comprehensive and robust analysis of the flood impact of the development upon other adjacent properties and of existing flood mechanisms on the development itself. It demonstrates that the proposed development is sustainable in terms of flood risk and can be summarised as follows;

Subject	Conclusions
Tidal and Fluvial Flood Risk	The subject site is located within Flood Zone 1 (low probability) according to the EA published flood maps. Therefore the full extent of the proposed development will be located within Flood Zone 1. Further detailed assessment of the site has determined that the risk of flooding does not pose a significant risk to the development proposals.
Flood Risk from Other Sources	The proposed site is identified at very low risk of surface water flooding. It is anticipated that the risk of surface water flooding within the site will be alleviated by the development proposals and associated drainage strategy. No flood risk to the site from overland flows, existing sewers, groundwater or artificial water bodies was identified.
Development Suitability	The development use is considered suitable for the site, which lies within Flood Zone 1 – low probability under Table 3 of the NPPF Planning Practice Guidance.
Existing Drainage	The existing local public foul and surface water networks are owned and operated by Severn Trent Water. There are no existing public sewers infrastructure located within the site. Existing spur connections to public foul and surface water sewers are located to the south east of the site at the roundabout on Park Avenue.
Proposed Drainage	A proposed Drainage Strategy drawing is included in Appendix F
Surface Water Management	Due to the existing ground conditions it has been determined that the use of infiltration methods will not be feasible for the proposed site. Consequently, it is proposed to discharge surface water run-off from the development via the use of attenuation techniques, with flows discharged to the local surface water network at a restricted greenfield rate. Attenuation basin and oversized pipe will be sized to store the 1 in 100 year plus 40% climate change whilst restricting offsite discharge to the existing greenfield rate. Hydrobrake flow control devices will be placed downstream of the basins to provide flow restriction. The proposed strategy will discharge flows in a sustainable manner, with attenuation features providing additional ecological and water quality benefits.

Foul Water Disposal	Foul drainage comprises domestic and trade effluent discharge. Domestic foul water will discharge via a traditional below ground gravity drainage system to the outfall point into the existing public foul sewer to the south of the site near the existing roundabout. Trade effluent flows from processes within the building will be collected in a drainage sump and pumped into an above ground buffer tank. The buffer tank will be sized to accept the high peak flows from the facility while maintaining smaller, more consistent outflows discharging to the public sewer.
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Appendix A: Site Location Plan



Packerham Blvd

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Appendix B: Topographical Survey

Station	Easting (m)	Northing (m)	Level (m)
AB6	420099.982	332047.279	65.249
B1	420505.799	332330.283	68.294
B2	420261.854	332315.189	70.730
B3	420214.780	332287.664	70.117
B1B	420487.541	332262.361	68.751
B1C	420615.013	332836.869	72.508
B1D	420422.717	332684.549	73.216
B1E	420171.986	332750.159	75.423
B1G	420090.124	332535.904	72.785
BK21	420137.701	331942.623	65.165

Legend:

	Overhead Costs	IC	Inventory class costs	IO	Inventory
	Conversion Costs	PC	Prepaid	IP	Interest paid
	Fixed Costs	FC	Costs	IS	Interest received
	Variable Costs	VC	Costs	IT	Interest tax
	Cost of Sales	CS	Costs	LI	Liabilities
	Interest	INT	Interest	LP	Loan payable
	Cost of Goods Sold	CGS	Cost of goods sold	LT	Long term
	Cost of Production	CP	Cost of production	LT	Long term
	Cost of Materials	CM	Cost of materials	LT	Long term
	Cost of Labor	CL	Cost of labor	LT	Long term
	Cost of Overhead	CO	Cost of overhead	LT	Long term
	Cost of Freight	CF	Cost of freight	LT	Long term
	Cost of Insurance	CI	Cost of insurance	LT	Long term
	Cost of Depreciation	CD	Cost of depreciation	LT	Long term
	Cost of Amortization	CA	Cost of amortization	LT	Long term
	Cost of Interest	CI	Cost of interest	LT	Long term
	Cost of Capital	CC	Cost of capital	LT	Long term
	Cost of Equity	CE	Cost of equity	LT	Long term
	Cost of Debt	CD	Cost of debt	LT	Long term
	Cost of Preferred	CP	Cost of preferred	LT	Long term
	Cost of Common	CC	Cost of common	LT	Long term
	Cost of Retained	CR	Cost of retained	LT	Long term
	Cost of Dividends	CD	Cost of dividends	LT	Long term
	Cost of Cash	CC	Cost of cash	LT	Long term
	Cost of Assets	CA	Cost of assets	LT	Long term
	Cost of Liabilities	CL	Cost of liabilities	LT	Long term
	Cost of Equity	CE	Cost of equity	LT	Long term
	Cost of Debt	CD	Cost of debt	LT	Long term
	Cost of Preferred	CP	Cost of preferred	LT	Long term
	Cost of Common	CC	Cost of common	LT	Long term
	Cost of Retained	CR	Cost of retained	LT	Long term
	Cost of Dividends	CD	Cost of dividends	LT	Long term
	Cost of Cash	CC	Cost of cash	LT	Long term
	Cost of Assets	CA	Cost of assets	LT	Long term
	Cost of Liabilities	CL	Cost of liabilities	LT	Long term
	Cost of Equity	CE	Cost of equity	LT	Long term
	Cost of Debt	CD	Cost of debt	LT	Long term
	Cost of Preferred	CP	Cost of preferred	LT	Long term
	Cost of Common	CC	Cost of common	LT	Long term
	Cost of Retained	CR	Cost of retained	LT	Long term
	Cost of Dividends	CD	Cost of dividends	LT	Long term
	Cost of Cash	CC	Cost of cash	LT	Long term
	Cost of Assets	CA	Cost of assets	LT	Long term
	Cost of Liabilities	CL	Cost of liabilities	LT	Long term
	Cost of Equity	CE	Cost of equity	LT	Long term
	Cost of Debt	CD	Cost of debt	LT	Long term</



greenhatch
group

☐ Topographical Surveys	☐ Measured Building Surveys
☐ Site Engineering	☐ 3D Laser Scanning
☐ Utility / CCTV Surveys	☐ Revit & BIM Models

**Rowan House
Duffield Road
Little Eaton
Derby
DE21 5DR**

Tel (01332) 830044 Fax (01332) 830055
admin@greenhatch-group.co.uk
www.greenhatch-group.co.uk

CLIENT
Clowes Developments Ltd

SCALE	DATE
A0@ 1: 1000	01/10/18
DRAWN	QUALITY REF
BC	GH3801

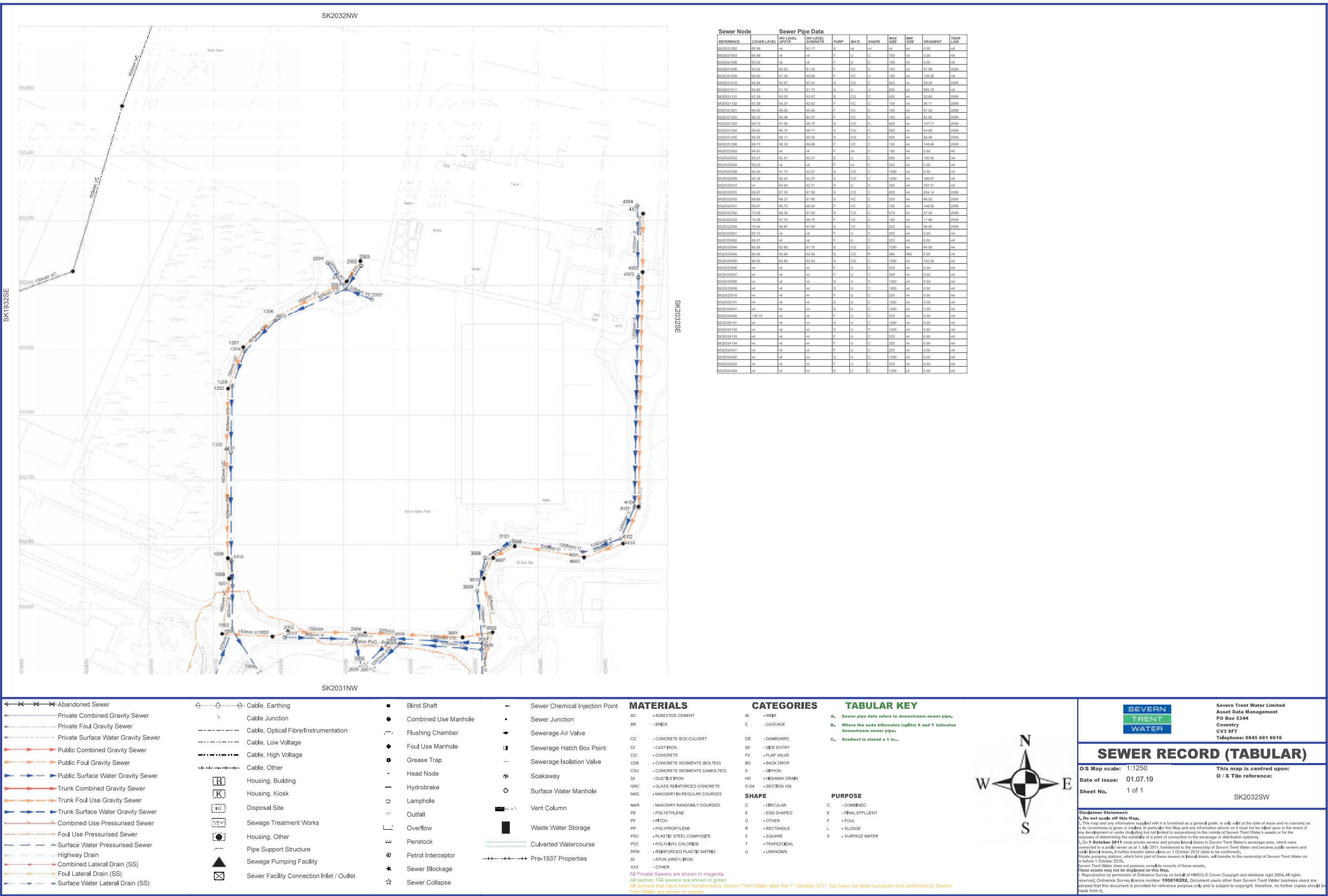
Comments

This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Appendix C: Severn Trent Water Asset Plan



Appendix D: South Derbyshire SFRA Extracts

Historical Flood mapping

Area Susceptibility Information

 	Minerals and Waste Strategic Flood Risk Assessment Level 1	
Issue Date: 01/08/2012	Final Report	Page 95 of 102

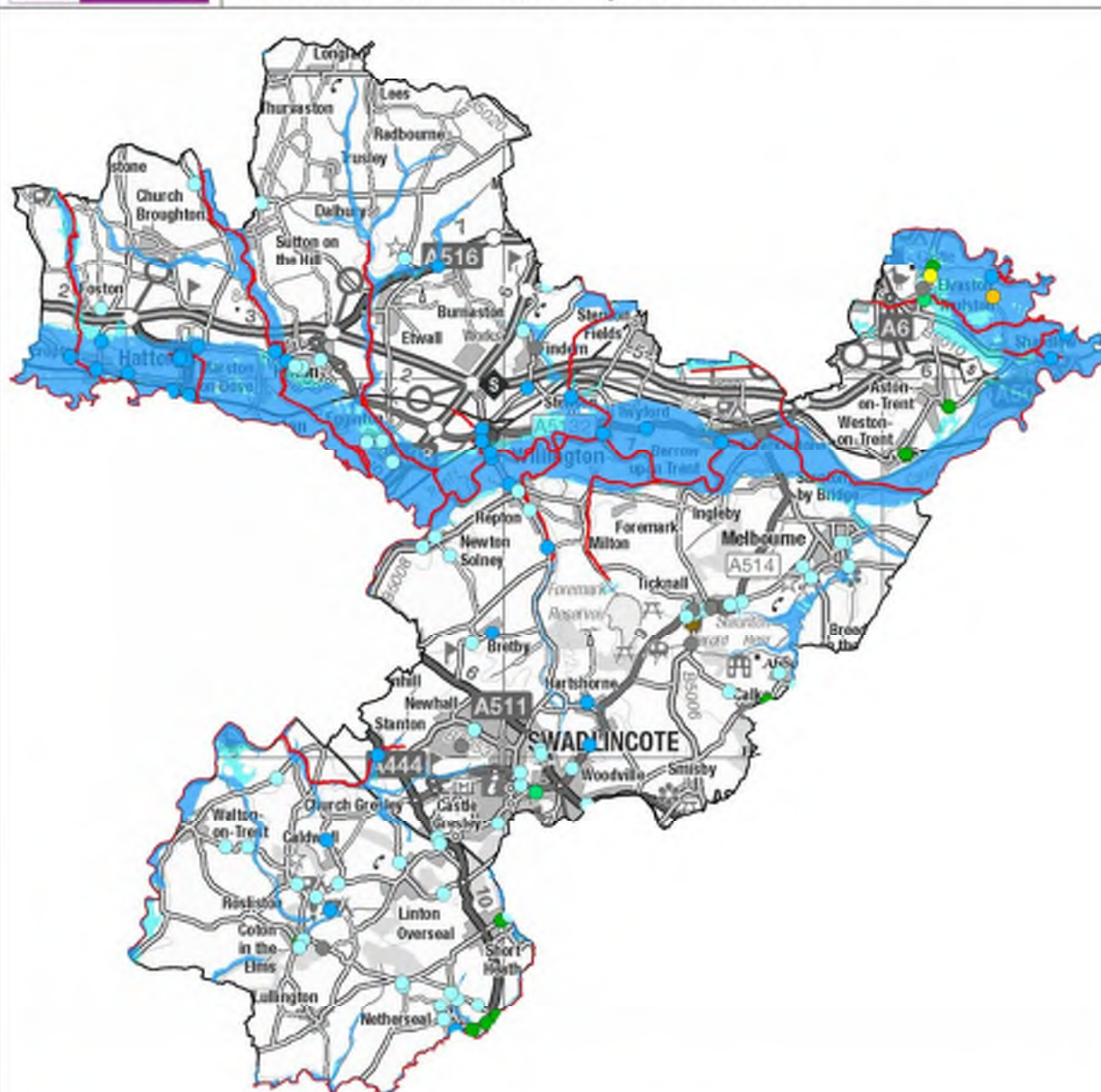
ANNEX 8:

South Derbyshire District Council



Historic Flood Incidence by Source and Floodzones in South Derbyshire District

Drawing No : - SFRA 3.8



Key

- Environment Agency Floodzone 3
- Environment Agency Floodzone 2
- Main River

Historic Flood Incidence by Source

- Artificial
- Fluvial
- Groundwater
- Multiple
- Other
- Sewers
- Surface Water
- Unknown

Drawing No SFRA 3.8

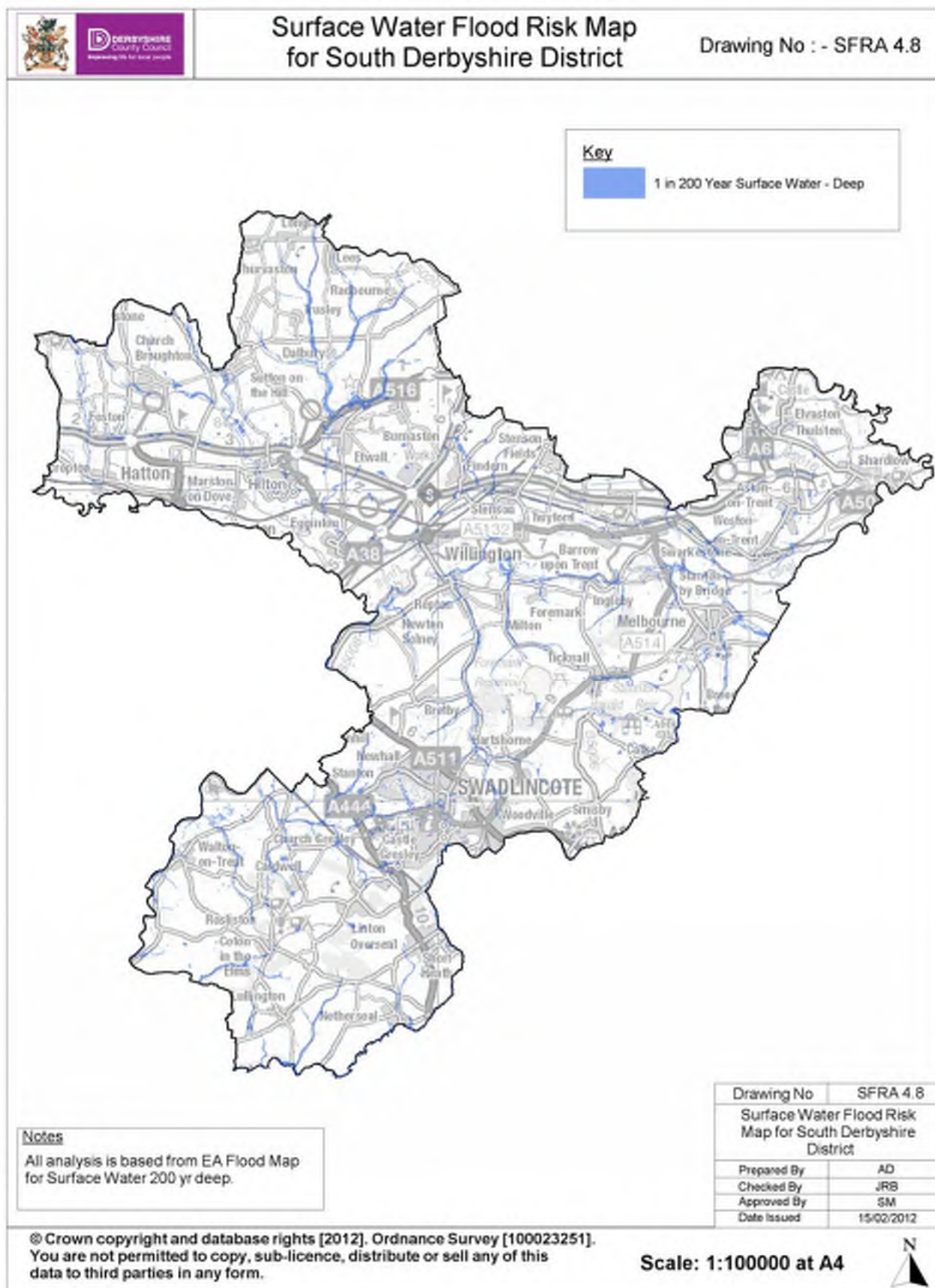
Historic Flood Incidence by
Source and Floodzones in
South Derbyshire District

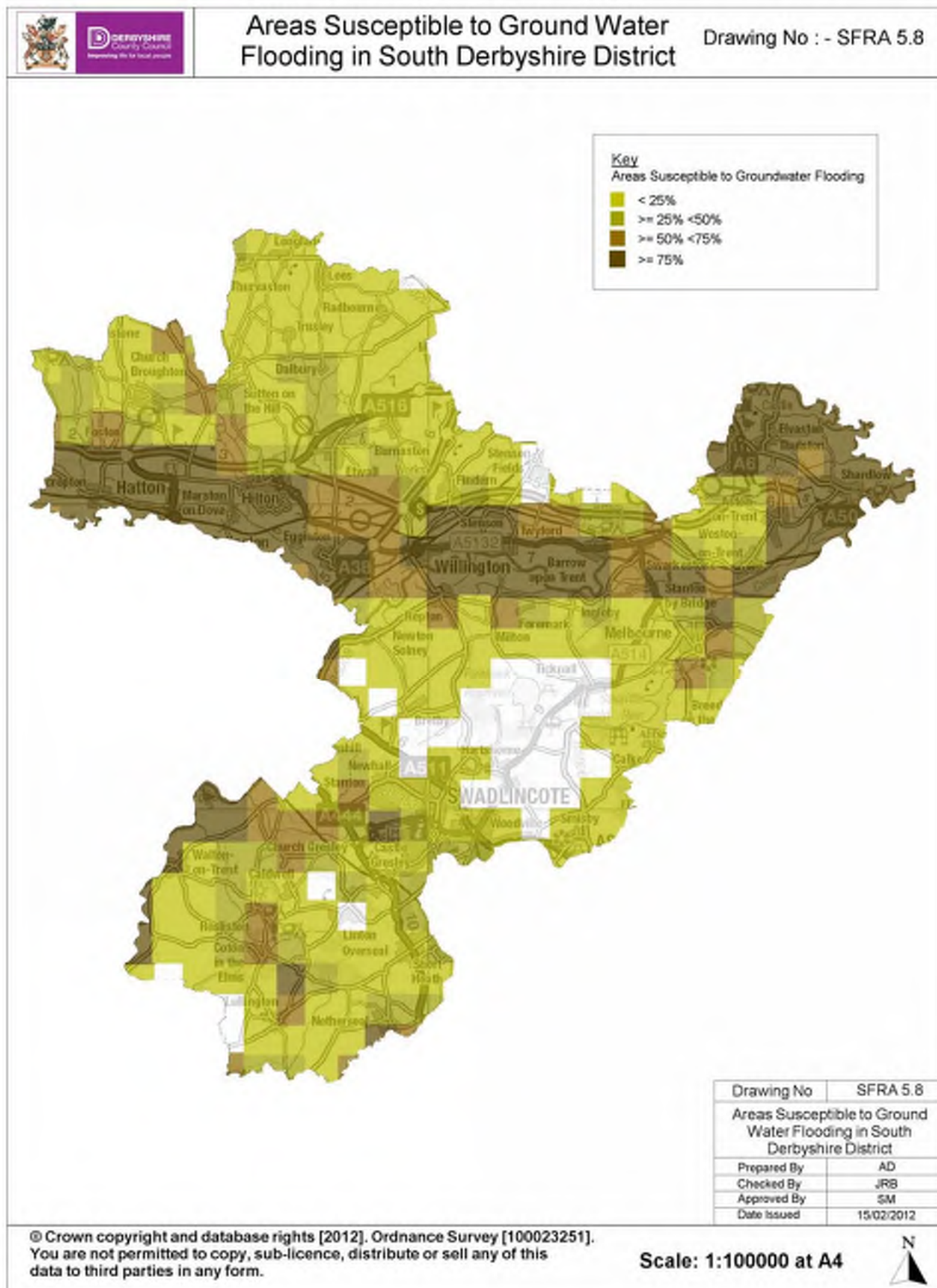
Prepared By	AD
Checked By	JRB
Approved By	SM
Date Issued	02/08/2012

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data to third parties in any form.

Scale: 1:100000 at A4







Appendix E: Flood Map for Planning

Flood map for planning

Your reference
19270

Location (easting/northing)
420127/332481

Created
10 Oct 2019 15:39

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

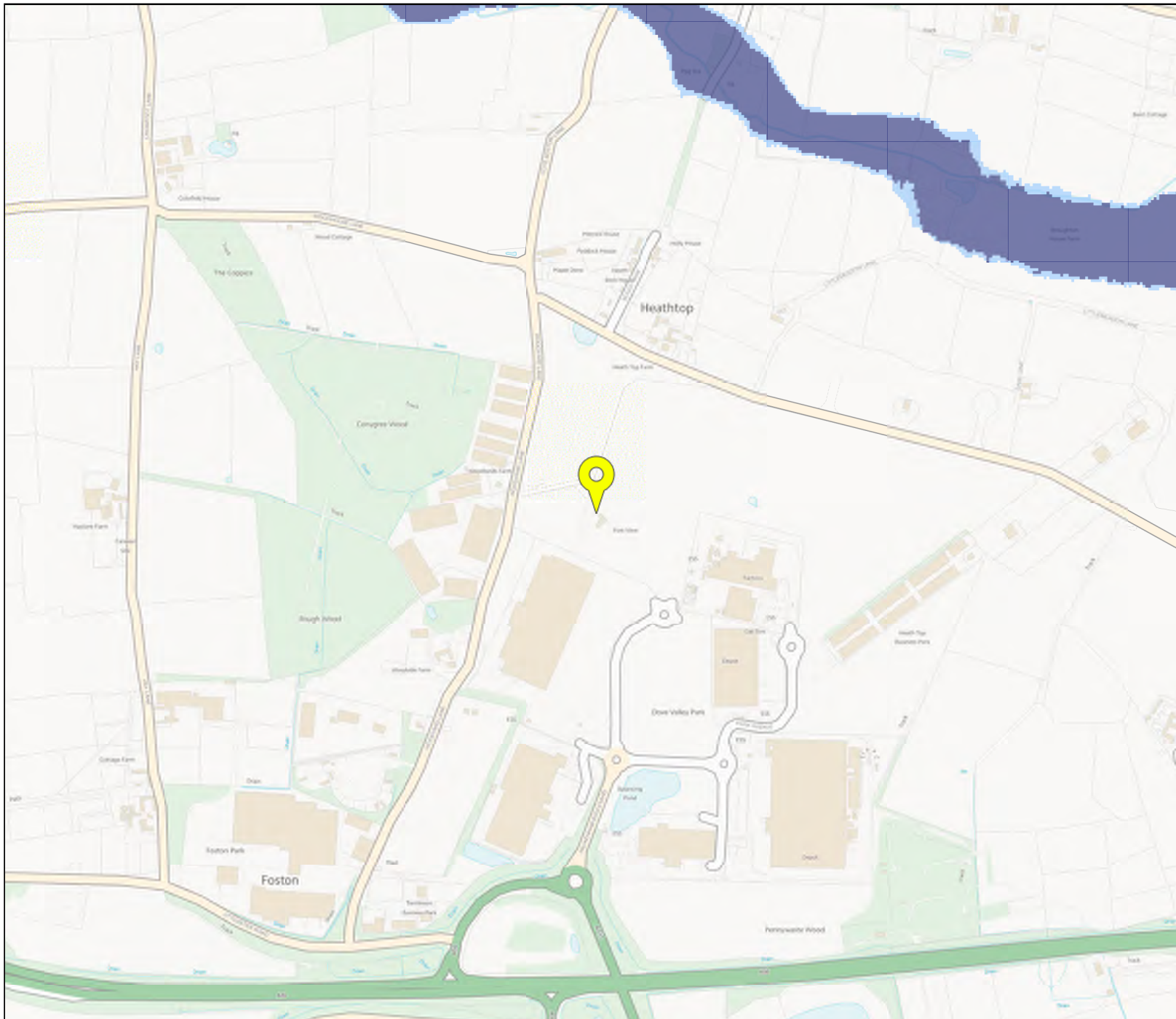
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>



Flood map for planning

Your reference

19270

Location (easting/northing)

420127/332481

Scale

1:10000

Created

10 Oct 2019 15:39

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

0 100 200 300m

Appendix F: Proposed Drainage Strategy Drawing

0mm 50mm 100mm

Legend:

- Proposed surface water sewer - highway
- Proposed Surface water sewer - roof
- Proposed foul water sewer - Domestic
- Proposed foul water sewer - commercial
- Proposed RWP Connection
- Petrol Interceptor
- Landscaped areas

ALL BUILDING
DRAINAGE SHOWN
INDICATIVELY ONLY -
SUBJECT TO DETAIL
DESIGN

Basin positioned 10m from boundary to avoid power cable easement. Exact location of cable to be determined on site prior to construction

TOTAL CATCHMENT
12.Ha total
11.0 Impermeable

s attenuation
ice

Foul water outfall
MH2303 (existing)
CL 70.26
IL 67.75

Flow control limit
discharge from entrance to 7
54cum attenuation storage provided with c
84m of 900mmØ p

Total outfall discharge 135.3l/s to
existing STW public sewer
12.3Ha @ 11l/s/Ha

\\PROJECT FOLDER\19270 Project William\Drawings\Structures\Revit Model\Central Model\19270-S-R17-Central Model.rvt

Appendix G: MicroDrainage Calculations

Jubb Consulting Engineers Ltd					Page 1
Queen Square House Queen Square Bristol BS1 4NH		Project William SW Storage Attenuation Basin			
Date 11/10/2019 File South_Main_Site_Greenfi...		Designed by MJB Checked by			
Micro Drainage		Source Control 2018.1			
<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
15 min Summer	70.791	1.391	60.3	2512.5	O K
30 min Summer	71.053	1.653	60.3	3290.7	O K
60 min Summer	71.283	1.883	60.3	4070.0	O K
120 min Summer	71.475	2.075	60.3	4795.3	O K
180 min Summer	71.562	2.162	60.3	5147.5	O K
240 min Summer	71.609	2.209	60.3	5338.9	O K
360 min Summer	71.644	2.244	60.3	5488.2	O K
480 min Summer	71.649	2.249	60.3	5511.0	O K
600 min Summer	71.636	2.236	60.3	5453.6	O K
720 min Summer	71.610	2.210	60.3	5346.1	O K
960 min Summer	71.555	2.155	60.3	5117.9	O K
1440 min Summer	71.472	2.072	60.3	4783.8	O K
2160 min Summer	71.365	1.965	60.3	4373.8	O K
2880 min Summer	71.259	1.859	60.3	3986.1	O K
4320 min Summer	71.040	1.640	60.3	3251.4	O K
5760 min Summer	70.796	1.396	60.3	2527.2	O K
7200 min Summer	70.483	1.083	60.3	1736.4	O K
8640 min Summer	70.207	0.807	60.3	1156.1	O K
10080 min Summer	69.964	0.564	60.3	728.8	O K
15 min Winter	70.901	1.501	60.3	2825.6	O K
30 min Winter	71.178	1.778	60.3	3704.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	129.908	0.0	2599.6	26	
30 min Summer	85.593	0.0	3425.2	41	
60 min Summer	53.779	0.0	4303.4	70	
120 min Summer	32.679	0.0	5233.2	128	
180 min Summer	24.105	0.0	5784.2	188	
240 min Summer	19.313	0.0	6182.3	246	
360 min Summer	14.038	0.0	6739.3	364	
480 min Summer	11.201	0.0	7170.8	484	
600 min Summer	9.395	0.0	7516.5	602	
720 min Summer	8.135	0.0	7809.2	720	
960 min Summer	6.475	0.0	8288.6	832	
1440 min Summer	4.688	0.0	9001.5	1082	
2160 min Summer	3.388	0.0	9762.0	1480	
2880 min Summer	2.688	0.0	10323.3	1904	
4320 min Summer	1.937	0.0	11163.1	2724	
5760 min Summer	1.533	0.0	11785.7	3520	
7200 min Summer	1.279	0.0	12276.7	4184	
8640 min Summer	1.102	0.0	12702.2	4848	
10080 min Summer	0.971	0.0	13063.0	5456	
15 min Winter	129.908	0.0	2909.7	26	
30 min Winter	85.593	0.0	3836.0	40	
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Jubb Consulting Engineers Ltd					Page 2
Queen Square House Queen Square Bristol BS1 4NH		Project William SW Storage Attenuation Basin			
Date 11/10/2019 File South_Main_Site_Greenfi...		Designed by MJB Checked by			
Micro Drainage		Source Control 2018.1			
<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
60 min Winter	71.423	2.023	60.3	4590.7	O K
120 min Winter	71.631	2.231	60.3	5432.6	O K
180 min Winter	71.729	2.329	60.3	5857.8	Flood Risk
240 min Winter	71.783	2.383	60.3	6100.6	Flood Risk
360 min Winter	71.832	2.432	60.3	6326.3	Flood Risk
480 min Winter	71.850	2.450	60.3	6410.5	Flood Risk
600 min Winter	71.849	2.449	60.3	6405.9	Flood Risk
720 min Winter	71.836	2.436	60.3	6345.9	Flood Risk
960 min Winter	71.789	2.389	60.3	6130.0	Flood Risk
1440 min Winter	71.679	2.279	60.3	5641.0	O K
2160 min Winter	71.546	2.146	60.3	5078.9	O K
2880 min Winter	71.400	2.000	60.3	4504.6	O K
4320 min Winter	71.081	1.681	60.3	3383.3	O K
5760 min Winter	70.655	1.255	60.3	2153.0	O K
7200 min Winter	70.162	0.762	60.3	1071.3	O K
8640 min Winter	69.752	0.352	60.3	413.8	O K
10080 min Winter	69.480	0.080	58.6	82.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	53.779	0.0	4820.0	68	
120 min Winter	32.679	0.0	5856.0	126	
180 min Winter	24.105	0.0	6484.6	184	
240 min Winter	19.313	0.0	6922.1	242	
360 min Winter	14.038	0.0	7551.6	358	
480 min Winter	11.201	0.0	8031.8	472	
600 min Winter	9.395	0.0	8423.2	586	
720 min Winter	8.135	0.0	8746.6	698	
960 min Winter	6.475	0.0	9285.3	912	
1440 min Winter	4.688	0.0	9312.0	1144	
2160 min Winter	3.388	0.0	10929.6	1604	
2880 min Winter	2.688	0.0	11567.5	2056	
4320 min Winter	1.937	0.0	12501.1	2944	
5760 min Winter	1.533	0.0	13191.8	3752	
7200 min Winter	1.279	0.0	13753.2	4320	
8640 min Winter	1.102	0.0	14224.5	4848	
10080 min Winter	0.971	0.0	14628.5	5344	
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Jubb Consulting Engineers Ltd		Page 3
Queen Square House Queen Square Bristol BS1 4NH	Project William SW Storage Attenuation Basin	
Date 11/10/2019 File South_Main_Site_Greenfi...	Designed by MJB Checked by	
Micro Drainage	Source Control 2018.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.394	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 10.670

Time (mins) Area			Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	4.000	4	8	4.000	8	12	2.670

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Queen Square House Queen Square Bristol BS1 4NH	Project William SW Storage Attenuation Basin	
Date 11/10/2019 File South_Main_Site_Greenfi...	Designed by MJB Checked by	
Micro Drainage Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 72.000

Tank or Pond Structure

Invert Level (m) 69.400

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1000.0	2.600	5000.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0291-6030-3000-6030
Design Head (m)	3.000
Design Flow (l/s)	60.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	291
Invert Level (m)	68.900
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.000	60.2
Flush-Flo™	0.871	60.3
Kick-Flo®	1.856	47.8
Mean Flow over Head Range	-	52.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.0	1.200	59.2	3.000	60.2	7.000	90.8
0.200	30.0	1.400	57.5	3.500	64.9	7.500	93.9
0.300	50.0	1.600	54.7	4.000	69.2	8.000	96.9
0.400	54.5	1.800	49.8	4.500	73.3	8.500	99.8
0.500	57.2	2.000	49.5	5.000	77.1	9.000	102.6
0.600	58.8	2.200	51.8	5.500	80.8	9.500	105.4
0.800	60.2	2.400	54.1	6.000	84.3		
1.000	60.1	2.600	56.2	6.500	87.6		

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Queen Square House Queen Square Bristol BS1 4NH		Project William SW Storage Oversize Pipe			
Date 11/10/2019 File South_Entrance_Greenfie...		Designed by MJB Checked by			
Micro Drainage		Source Control 2018.1			
<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
15 min Summer	69.622	0.822	74.9	43.9	O K
30 min Summer	69.631	0.831	74.9	44.5	O K
60 min Summer	69.461	0.661	74.8	32.7	O K
120 min Summer	69.156	0.356	74.9	10.5	O K
180 min Summer	68.901	0.101	74.4	0.6	O K
240 min Summer	68.800	0.000	63.1	0.0	O K
360 min Summer	68.800	0.000	45.9	0.0	O K
480 min Summer	68.800	0.000	36.6	0.0	O K
600 min Summer	68.800	0.000	30.7	0.0	O K
720 min Summer	68.800	0.000	26.6	0.0	O K
960 min Summer	68.800	0.000	21.2	0.0	O K
1440 min Summer	68.800	0.000	15.3	0.0	O K
2160 min Summer	68.800	0.000	11.1	0.0	O K
2880 min Summer	68.800	0.000	8.8	0.0	O K
4320 min Summer	68.800	0.000	6.3	0.0	O K
5760 min Summer	68.800	0.000	5.0	0.0	O K
7200 min Summer	68.800	0.000	4.2	0.0	O K
8640 min Summer	68.800	0.000	3.6	0.0	O K
10080 min Summer	68.800	0.000	3.2	0.0	O K
15 min Winter	69.824	1.024	74.9	53.0	O K
30 min Winter	69.754	0.954	74.9	50.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	129.908	0.0	95.5	13	
30 min Summer	85.593	0.0	130.0	22	
60 min Summer	53.779	0.0	158.6	38	
120 min Summer	32.679	0.0	198.2	68	
180 min Summer	24.105	0.0	217.0	94	
240 min Summer	19.313	0.0	231.8	0	
360 min Summer	14.038	0.0	252.7	0	
480 min Summer	11.201	0.0	268.8	0	
600 min Summer	9.395	0.0	281.9	0	
720 min Summer	8.135	0.0	292.8	0	
960 min Summer	6.475	0.0	310.8	0	
1440 min Summer	4.688	0.0	337.5	0	
2160 min Summer	3.388	0.0	365.9	0	
2880 min Summer	2.688	0.0	387.0	0	
4320 min Summer	1.937	0.0	418.3	0	
5760 min Summer	1.533	0.0	441.6	0	
7200 min Summer	1.279	0.0	460.3	0	
8640 min Summer	1.102	0.0	476.0	0	
10080 min Summer	0.971	0.0	489.6	0	
15 min Winter	129.908	0.0	108.1	14	
30 min Winter	85.593	0.0	145.2	24	
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Queen Square House		Project William			
Queen Square		SW Storage			
Bristol BS1 4NH		Oversize Pipe			
Date 11/10/2019		Designed by MJB			
File South_Entrance_Greenfie...		Checked by			
Micro Drainage		Source Control 2018.1			
<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
60 min Winter	69.422	0.622	74.9	29.7	O K
120 min Winter	68.905	0.105	74.4	0.6	O K
180 min Winter	68.800	0.000	56.8	0.0	O K
240 min Winter	68.800	0.000	45.6	0.0	O K
360 min Winter	68.800	0.000	33.1	0.0	O K
480 min Winter	68.800	0.000	26.4	0.0	O K
600 min Winter	68.800	0.000	22.2	0.0	O K
720 min Winter	68.800	0.000	19.2	0.0	O K
960 min Winter	68.800	0.000	15.3	0.0	O K
1440 min Winter	68.800	0.000	11.1	0.0	O K
2160 min Winter	68.800	0.000	8.0	0.0	O K
2880 min Winter	68.800	0.000	6.3	0.0	O K
4320 min Winter	68.800	0.000	4.6	0.0	O K
5760 min Winter	68.800	0.000	3.6	0.0	O K
7200 min Winter	68.800	0.000	3.0	0.0	O K
8640 min Winter	68.800	0.000	2.6	0.0	O K
10080 min Winter	68.800	0.000	2.3	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	53.779	0.0	183.4	40	
120 min Winter	32.679	0.0	219.6	64	
180 min Winter	24.105	0.0	243.0	0	
240 min Winter	19.313	0.0	259.6	0	
360 min Winter	14.038	0.0	283.0	0	
480 min Winter	11.201	0.0	301.1	0	
600 min Winter	9.395	0.0	315.7	0	
720 min Winter	8.135	0.0	328.0	0	
960 min Winter	6.475	0.0	348.1	0	
1440 min Winter	4.688	0.0	378.0	0	
2160 min Winter	3.388	0.0	409.8	0	
2880 min Winter	2.688	0.0	433.5	0	
4320 min Winter	1.937	0.0	468.5	0	
5760 min Winter	1.533	0.0	494.6	0	
7200 min Winter	1.279	0.0	515.6	0	
8640 min Winter	1.102	0.0	533.2	0	
10080 min Winter	0.971	0.0	548.4	0	
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Jubb Consulting Engineers Ltd		Page 3
Queen Square House Queen Square Bristol BS1 4NH	Project William SW Storage Oversize Pipe	
Date 11/10/2019 File South_Entrance_Greenfie...	Designed by MJB Checked by	
Micro Drainage	Source Control 2018.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.394	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.400

Time (mins)		Area
From:	To:	(ha)
0	4	0.400

Jubb Consulting Engineers Ltd		Page 4
Queen Square House Queen Square Bristol BS1 4NH	Project William SW Storage Oversize Pipe	
Date 11/10/2019 File South_Entrance_Greenfie...	Designed by MJB Checked by	
Micro Drainage Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 70.300

Pipe Structure

Diameter (m) 0.900 Length (m) 84.000
Slope (1:X) 300.000 Invert Level (m) 68.800

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0339-7500-1900-7500
Design Head (m)	1.900
Design Flow (l/s)	75.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	339
Invert Level (m)	68.400
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.900	75.0
Flush-Flo™	0.616	74.9
Kick-Flo®	1.325	63.0
Mean Flow over Head Range	-	63.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.9	1.200	68.3	3.000	93.6	7.000	141.4
0.200	34.4	1.400	64.7	3.500	100.9	7.500	146.3
0.300	62.2	1.600	69.0	4.000	107.6	8.000	150.9
0.400	72.6	1.800	73.0	4.500	114.0	8.500	155.5
0.500	74.4	2.000	76.9	5.000	120.0	9.000	159.9
0.600	74.9	2.200	80.5	5.500	125.7	9.500	164.2
0.800	74.1	2.400	84.0	6.000	131.1		
1.000	72.2	2.600	87.3	6.500	136.4		

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