TECHNICAL NOTE

RIDGE

PROJECT	DATE	BY	REFERENCE
5017396 – Bicester Motion- Hotel Pre-commencement conditions: Surface Water Drainage	09/06/2022	TC	5017396 - TN-0001

TITLE	REV
Update to Flood Risk Assessment and Drainage Strategy	A

1. INTRODUCTION

Ridge have been asked to prepare an update to the previous FRA & DS to provide additional information for the discharge of conditions. RAB Consultants prepared a flood risk assessment report and AKS Ward prepared a Surface Water Drainage Strategy, and water quality management report to accompany a planning application for a new hotel located within Bicester Motion. The development includes a new hotel building, car park and associated external areas. The site is bounded by hangar units to the east and south, by the A4421 road to the west and by the Bicester Airfield to the north.

2. SUMMARY OF FLOOD RISK ASSESMENT REPORT

The Flood Risk Assessment prepared by RAB Consultants highlights that the development site lies within Flood Zone 1. There is no recorded history of flooding within the site. The nearest brook, Langford brook is located over 1km east and the hotel ground elevation is roughly at 10m higher than the brook.

Flooding Types	Summary
Fluvial Flooding	Distance from the nearest river is over 1km and at a higher elevation. Hence, **low** risk of fluvial flooding.
Tidal Flooding	Due to its inland location, the risk of tidal or coastal flooding is **minimal.**
Surface Water Flooding	The surface water map identifies that there is a **very low** risk of flooding for the majority of the application boundary. However, there is a **low** risk of surface water flooding the southern part of the site.
Artificial Water Bodies	The site is quite far from any canal and the risk of reservoir flooding within the site area is **minimal** based on the information extracted from the Environmental Agency Reservoir Flood Map.
Ground Water	The risk of groundwater flooding is **very low** based on the information provided on the Environmental Agency Map. However, the north and south of the proposed sites are within a 'Minor aquifer high', increasing the possibility of flooding. It's been suggested that the development floor level be raised to 150mm above the ground level in order to provide protection against this type of flooding.

Refer to the appendices for the complete Flood Risk Assessment report prepared by RAB Consultants

3. DRAINAGE STRATEGY

The drainage strategy and water quality management report prepared by AKS Ward highlights the strategy to manage the surface water and foul water from the proposed development. The report prepared by AKS Ward is to be read in conjunction with the report prepared by RAB Consultants- Flood Risk Assessment. The site currently drains towards the watercourse located further southeast outside of Bicester Heritage. However, the surface water and foul water generated from the new development will be discharged in a suitable sustainable manner.

The drainage strategy is as follows:

3.1. Foul Water Drainage Strategy

In line with the AKS Ward report, the foul water from the proposed development will be discharged to the nearest public sewer located in the A4421 which is owned by Thames Water. A S106 application will be submitted to connect the new sewer connection to the public sewer. Should the swimming pool not be provided free for visitors then a trade effluent license will need to be agreed with Thames Water.

The Swimming pool will be connected to the foul sewer. Prior to release of the water from the swimming pool in to the foul network, the water will be stored in a settling tank such that the chemicals can settle, and the flow released slowly over a prolonged period.

The foul drainage from the hotel will require a pumping station in order to connect to the public sewer. The pump station will require a to store a minimum of 24 hours' worth of foul flow from the hotel.

Capacity issues within the public sewer network is the responsibility of the sewerage undertaker. However, it is not considered that capacity concerns will be an issue for the development as, if necessary, the foul flows can be timed and restricted to accord with low flows within the public foul sewer network as a pump station is proposed.

3.2. Surface Water Drainage Strategy

Drainage hierarchy

- Current guidance states that a hierarchy of potential methods for discharging surface water from development must be followed:
  - i. A soakaway or another adequate infiltration system; or where this is not practical
  - ii. A watercourse or where this is not practicable
  - iii. A sewer.

- The Environment Agency and relevant Government Legislation requires that the surface water strategies for new developments are in line with sustainable development through the use of Sustainable Drainage Systems (SuDS).

- Without mitigation and consideration, the proposed redevelopment of the site could lead to an unacceptable increase in the rate and volume of surface water generated from the site and a degradation in water quality.

- To comply with current guidance and best practice, sustainable drainage systems (SuDS) will be required to be implemented in order to manage the volume, rate and quality of surface water discharged off-site.

SuDS Management Train

- In accordance with the discharge hierarchy, the surface water generated by the proposed development will be discharged utilising infiltration methods.
- Infiltration tests carried out in line with BRE 365 within the site shows that the surface water can be discharged via infiltration. Please refer to the appendices for the full results of the infiltration tests. The values used for the design are 1.18×10^{-4} m/s for the main car park area and 3.19×10^{-5} m/s for the other infiltration devices.

- Groundwater monitoring has also been undertaken for the site. See results table below. Based on the below results a conservative assumption has been made that all infiltration devices must have their base a maximum of 300mm below the existing ground level to allow for a minimum of 1m between the base of the infiltration feature and the groundwater level.

Date	time	Borehole location	Depth to water (M)
17/03/22	16:25	RO101	1.80
17/03/22	15:19	RO102	1.35
17/03/22	16:15	RO103	1.44
21/03/22	11:04	BHHRO101	1.72
21/03/22	11:13	BHHRO102	1.40
21/03/22	11:08	BHHRO103	1.46
28/03/22	11:37	BHHRO101	1.84
28/03/22	11:52	BHHRO102	1.51
28/03/22	11:31	BHHRO103	1.51

Figure 1- Ground Water monitoring Log (Hydrock 2022)

Contributing Areas

- There is significant increase in impermeable across the site compared to the existing site. The total site area is 4.55ha. out of which, the impermeable area is 1.59ha.

Table 1 – Catchment Area Summary

	PERMEABLE SURFACE	IMPERMEABLE SURFACE
Existing	4.55ha (100%)	0 (0%)
Proposed	2.96ha (65%)	1.59(35%)
Change	- 1.59 (-35%)	-1.59 (35%)

- As can be seen within the previous table, the permeable area has decreased by 35%. Therefore, the risk of surface water flooding is higher than when compared to the existing condition.

Allowance for Climate Change

- Table 2 (Peak Rainfall Intensity Allowance in Small and Urban Catchments) of Environment Agency (2019) Flood Risk Assessments: Climate Change Allowances confirms the climate change allowance of 40% should be adopted for the Application Site, assuming a lifespan of 100 years.

Proposed Drainage

As the proposal will increase the impermeable area on the site a drainage strategy as described below is required to mitigate the above issues. A drainage strategy inline with the above drainage hierarchy is proposed and detailed out below.

Main Building

- The proposed surface water strategy for the new development is to utilise infiltration through the use of geo-cellular tanks. The new attenuation will have an effective storage of 287m^3 will be designed for the 1 in 100-year event plus 40 % allowance for climate change.
- Rainwater collected through the roof using rainwater pipes will be stored in the storage tank.

- Levels have been increased at the location of geo-cellular crates to provide minimum cover whilst maintaining a 1m offset between the base of the crate and ground water level.
- Roof drainage will be conveyed above ground to the eastern side of the building where it will be connected via a very short network of shallow pipes.

Main Car Park

- The proposed surface water strategy for the new development is to utilise infiltration through the use of permeable paving. Throughout the car park, different permeable surfaces are proposed as indicated to tie in with the ecology proposals. The subbase will a depth of 300mm and provide an effective storage of 450m^3. During the 100year plus 40% CC storm event, the short duration intense rain fall is causing minor above ground flooding equating to 42m3 which is over the total area of the parking is only 6mm of depth. This will quickly dissipate after the storm has passed.
- Permeable paving will provide adequate treatment to the surface water flows leaving the parking areas.

Other Car Park areas

- The proposed surface water strategy for the new development is to utilise infiltration through the use of permeable paving. The subbase will at a depth of 300mm. During the extreme events up to and including the 1 in 100 yr. plus 40% CC storm event, the short duration intense rain falls is causing minor above ground flooding equating to less than 10mm of depth. This will quickly dissipate after the storm has passed.

Roads

- The proposed surface water strategy for the new development is to utilise infiltration through the use of swales. Flow from roads will flow through gaps in the kerb lines in to the Swales to remove the need for gulley's which would make the system too deep. The swales will be at a depth of 300mm with the side slopes of 1in 3. The swales have been sized to accommodate and treat the flows up to and including 1 in 100 yr. plus 40% CC storm event.

Summary

- The surface water drainage layout and detailed drainage calculations utilising Infodrainage (Innovyze updated product to Microdrainage) is provided in Appendices, at the rear of this report.
- It should be noted that the design of the drainage system is reliant on above ground conveyance to the infiltration features. As such, there is very limited piped network conveying the surface water.

Designing for Exceedance

- The proposed site levels are to provide a slope away from the proposed building. The proposed site levels are also to be designed in such a way that any exceedance flows across the site into the soft areas or to mimic existing flow paths. This will not cause an increase in risk to people or property.

3.3. SuDS Maintenance management & Maintenance plan

To ensure the long-term performance of the proposed DS, the on-site drainage system will be owned and maintained by the site operator or a maintenance company (MC) in accordance with the indicative schedule below:

ELEMENT / DRAINAGE COMPONENT	OWNERSHIP	MAINTENANCE REQUIREMENTS
Geocellular Infiltration Tank	Site Operator / MC	To be monitored for silt build-up and cleaned as required using suction methods, ensuring no solid material passes through outlet. Monitored for general condition of the tank and system generally, to suit manufacturer's guidance, check for leaks and displacement of cells. Inspection annually and before / after extreme storm events.
Catchpit Manholes	Site Operator / MC	To be monitored for silt build-up and cleaned as required using suction methods. Inspection annually and before / after extreme storm events.
Swales	Site Operator / MC	Clearance of litter and trash. Inlet and outlet clearing. Vegetation management as required to ensure weeds and invasive plants are controlled. Inspection annually and before / after extreme storm events.
Water Butts	Site Operator/MC	Clearance of leaves / debris from guttering and hopper inlets. Inspection annually and before / after extreme storm events.
Permeable paving	Site Operator / MC	Non-aggressive brushing of the whole surface (avoiding disruption of the jointing material, with suction rates adjusted, based on a trial), either manually or mechanically carried out annually. Top up of the gritstone may be required after cleaning. Weed control – excessive weed growth can be managed by localised spot-treatment with weed killers, in accordance with suppliers' recommendations. Inspection annually.
Rain Water Pipes	Site Operator / MC	Clearance of leaves / debris from guttering and hopper inlets. Rodding points provided to clear blockages via conventional rodding methods. Inspection annually and before / after extreme storm events.
Soil Vent Piles / "Stub Stacks"	Site Operator / MC	Rodding points to be provided to clear blockages via conventional rodding methods.

		Inspection annually.
Gullies (Internal & External)	Site Operator / MC	To be monitored for silt build-up and cleaned as required. Where provided, ensure air traps are primed and sealed to prevent smells. Inspection quarterly.
Surface Water Drainage Channels	Site Operator / MC	To be monitored and cleaned via jetting when any debris / silt reduces the cross-sectional area by 25% or more. Inspection to include both the channel and silt trap / gulley outlets. Inspection annually and before / after extreme storm events.
Below Ground Pipework Generally	Site Operator / MC	To be inspected for reduction in cross-sectional area (i.e. due to blockage, silt or debris build-up, root ingress etc) general condition of materials, pipe displacement and the like. Inspection annually and where appropriate before / after extreme storm events.
Manholes / Inspection Chambers Generally	Site Operator / MC	To be inspected for debris and integrity of chambers and covers generally. Inspection annually and where appropriate before / after extreme storm events.

APPENDIX A
Flood Risk Assessment

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Bicester Airfield, Bicester, OX26 5HA

FLOOD RISK ASSESSMENT

14/12/2016
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Revision History

Version	Date	Amendments	Issued to
1.0	Dec 16		Oliver Bannister

Quality Control

Action	Signature	Date
Prepared	Alex Cartwright BSc (Hons) Msc Matt Tandy AMInsLM	09/12/2016
Checked	Matt Tandy AMInsLM	12/12/2016
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Disclaimer

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Contents

1.0 Introduction

RAB Consultants has prepared this Flood Risk Assessment (FRA) in support of the proposed hotel with associated corporate and leisure facilities at Bicester Airfield, Bicester, OX26 5HA.

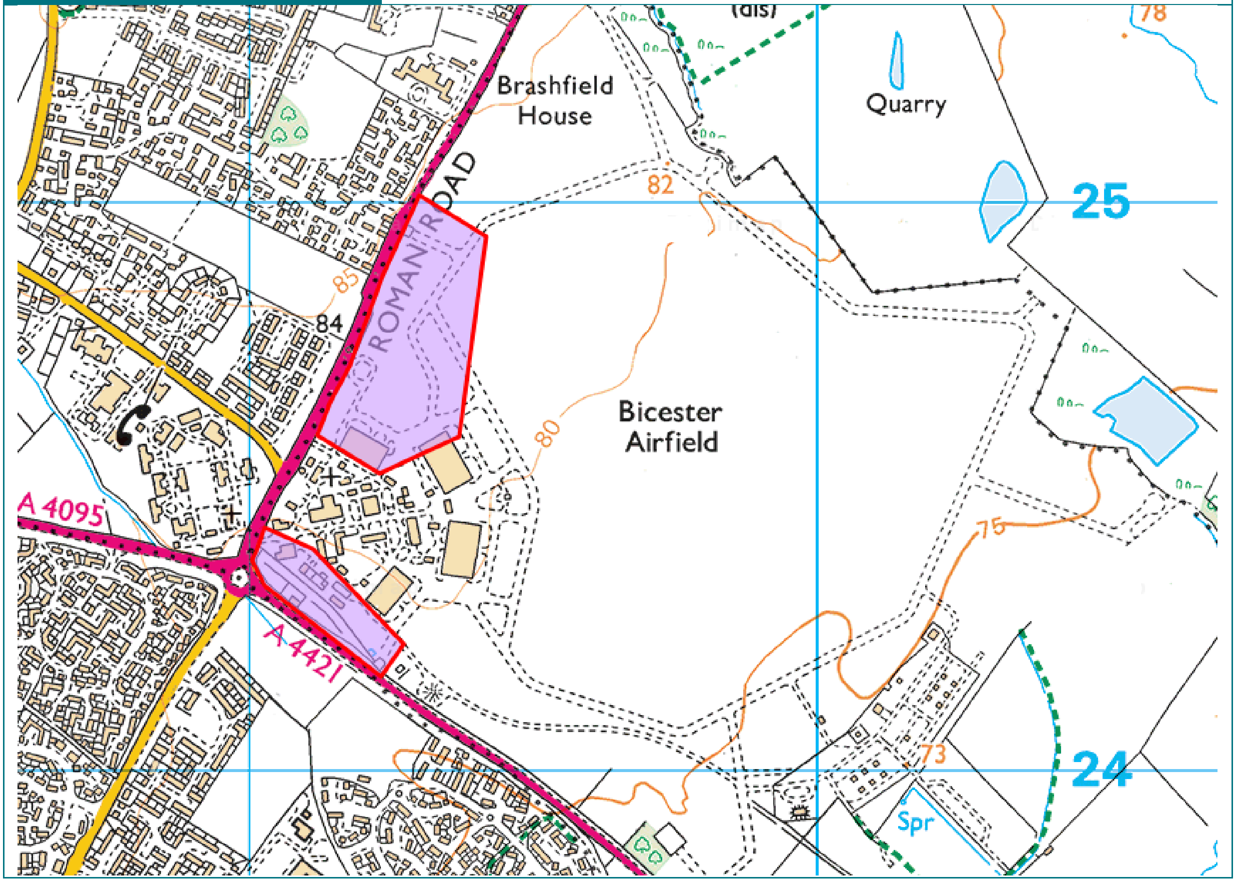
The development site is located in Flood Zone 1 according to the Environment Agency's Flood Map for Planning. The Planning Practice Guidance (PPG) for the National Planning Policy Framework (NPPF) requires a site specific FRA to be carried out for developments located in Flood Zones 2 & 3 and for those which are 1 hectare (ha) or greater in size. A site specific FRA is required to ensure that the development is safe from flooding and will not increase the risk of flooding elsewhere.

2.0 Site Details

2.1 Site Location

TABLE 1: SITE LOCATION

Site Address:	Bicester Airfield, Bicester, OX26 5HA
Existing land use:	Airfield
OS NGR:	459240, 224181
Local Planning Authority:	Cherwell District Council



2.2 Site Description

A site visit was undertaken by RAB Consultants on 12th August 2016, involving a photographic survey and visual assessment of the existing site and surrounding area, on a clear and sunny day. The site is located within Bicester Airfield which is an old RAF airbase situated in the north of Bicester. It shares its western and southern boundary with the A4421 (Figure 1, Figure 2) and the site benefits from three clear access points (Figure 3). The developable area to the west consists of a large grassed area along with sections of the taxiway, currently used as a recreational motorsport track (Figure 4), and an airfield hanger.

The smaller developable area to the south has some grassed areas (Figure 5) and a number of existing buildings (Figure 6). There is a historic carriageway running perpendicular to the A4421 for approximately 200m, which has become unused and overgrown (Figure 7).

The operations manager for Bicester Heritage explained the site benefits from good infiltration and the majority of the airfield is drained to ground. This is supported by the Elm Farm Quarry to the north which is thought to have mined limestone previously. The operations manager also explained that the Ministry of Defence included a combined sewer network within the site which is thought to be utilised by the existing buildings. An access lid for a Klargester was noted within the airfield although not within the proposed developable areas (Figure 10). A well-defined ditch was observed along the southern boundary of the airfield (Figure 9). This is thought to eventually discharge to Langford Brook approximately 1.35km downstream. The upstream channel was grassed and showing signs of having not received fluvial water for some time (Figure 8).

FIGURE 1: SOUTHERN BOUNDARY OF THE SITE

FIGURE 2: WESTERN BOUNDARY OF THE SITE

FIGURE 3: EXISTING ACCESS TO BICESTER AIRFIELD

FIGURE 4: VIEW OF THE DEVELOPABLE AREA TO THE WEST

FIGURE 5: VIEW OF THE DEVELOPABLE AREA TO THE SOUTH

FIGURE 6: AN EXAMPLE OF THE EXISTING BUILDINGS

FIGURE 7: VIEW OF THE HISTORIC CARRIAGEWAY ALONG THE SOUTHERN BOUNDARY

FIGURE 8: UPSTREAM CHANNEL AND CULVERT HEADWALL

FIGURE 9: VIEW OF THE WELL-DEFINED CHANNEL ALONG THE SOUTHERN BOUNDARY

FIGURE 10: EXISTING KLARGESTER UTILISED FOR FOUL WATER

2.3 Development Proposal

The proposed development comprises of a 300-room hotel with associated restaurant, kitchen, lounge, bar and reception areas. This will be complemented with a circa 2,800m^2 conference centre and circa 1,000m^2 leisure facilities. The external grounds will include car parking, utility plant rooms and outbuildings.

3.0 Flood Risk

3.1 Sequential Test

According to the Environment Agency's Flood Map for Planning the site lies in Flood Zone 1; which is land assessed as having less than 0.1% AEP (1 in 1,000 year) of fluvial or tidal flooding.

The NPPF follows a sequential risk-based approach in determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas. NPPF PPG Table 2 confirms the 'Flood risk vulnerability classification' of a site, depending upon the proposed usage. This classification is subsequently applied to Table 3 'Flood risk vulnerability and flood zone compatibility' to determine whether:

- The proposed development is suitable for the flood zone in which it is located; and
- Whether an Exception Test is required for the proposed development.

The proposed development is classed as a *'more vulnerable'* development in accordance with NPPF PPG; therefore, it is appropriate for the Flood Zone.

3.2 Flooding History

No historic flooding has been recorded within the Cherwell District Council Strategic Flood Risk Assessment (SFRA) for the site or surrounding area of northeast Bicester (SFRA, 2009: Appendix B-7). A robust internet search has revealed that flooding has been limited to the southern reaches of the Langford Brook floodplain within Bicester. The Langford Brook is located over 1km east of the site, and roughly 10m lower.

Sewer flooding is often caused by excess surface water entering the drainage network causing sewers to surcharge. Thames Water, who are responsible for the management of urban drainage and sewerage within the Borough, maintain a DG5 register of sites affected by sewer flood incidents on a post code basis. According to the Cherwell SFRA, the site has not been affected by sewer flooding due to failure or capacity issues. It is important to note that previous sewer flood incidents, or the lack thereof, do not indicate the current or future risk to the site. Upgrade work could have been carried out to alleviate any issues or conversely, in areas that have not experienced sewer flooding incidents, the local drainage infrastructure could deteriorate leading to future flooding.

3.3 Fluvial (Rivers)

The Environment Agency online Flood Map identifies the site outside the 0.1% AEP flood extent associated with the Langford Brook. Furthermore, according to the contours from the OS mapping, the site is approximately 10m above the Langford Brook. This natural topography provides protection to the airfield and the majority of Bicester and surrounding land would flood before the proposed development sites.

On the basis of these findings it can be determined the site is not at risk of fluvial flooding.

3.4 Coastal/Tidal

The site is a considerable distance from the sea and therefore is not currently identified at risk of coastal or tidal flooding.

3.5 Pluvial (Surface water)

When the infiltration capacity of land or the drainage capacity of a local sewer network is exceeded, excess rainwater flows overland. This water will collect in topographic depressions and at obstructions, which can inundate development in low lying areas. The severity of the rainfall event, the degree of saturation of the soil before the event, the permeability of soils and geology, and the gradient of the surrounding land and it's use; all contribute to and affect the severity of overland flow.

The Environment Agency Flood Map for Surface Water (Figure 11), can be used to see the approximate areas that would experience surface water flooding from a range of AEPs, which is used to categorise the risk (Table 2).

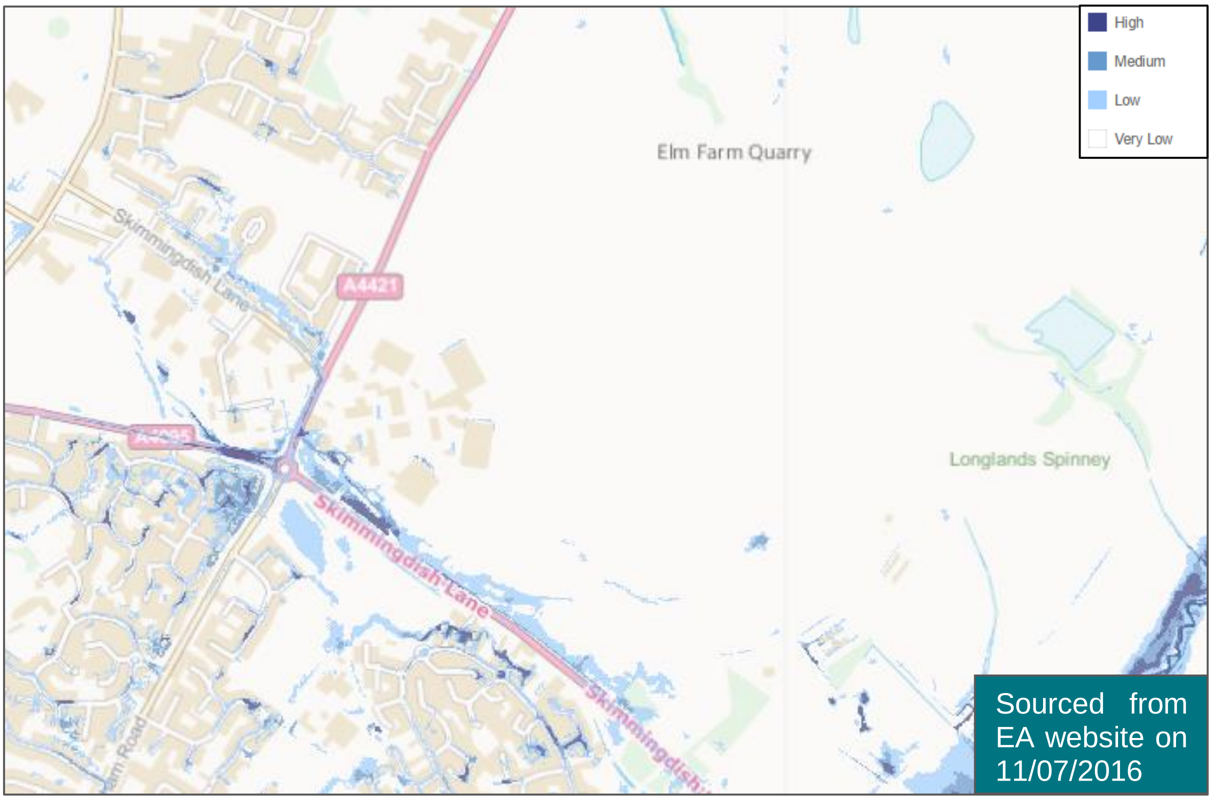


FIGURE 11: ENVIRONMENT AGENCY SURFACE WATER MAP

TABLE 2: ENVIRONMENT AGENCY SURFACE WATER RISK CATEGORIES

Surface Water Risk Category	Surface water flooding Annual Exceedance Probability
Very Low	< 0.1%
Low	Between 1% and 0.1% (1 in 100 years and 1 in 1000 years)
Medium	Between 1% and 3.3% (1 in 100 years and 1 in 30 years)
High	> 3.3% (1 in 30 years)

The surface water maps identify that there is a very low risk of surface water flooding for the majority of the airfield. The northern side of Skimmingdish Lane has been identified as medium to high risk, which is within the boundary of the proposed south site (Figure 12). Within this area is a well-defined ditch which probably provides conveyance for upstream catchments to the west. This water is likely to be making its way towards the Langford Brook. There is also a flowpath identified from the A4421 to the north west, through the site towards the ditch along the southern boundary. It appears to use the historic carriageway as the flow path. The south site is at medium to high risk of surface water flooding.

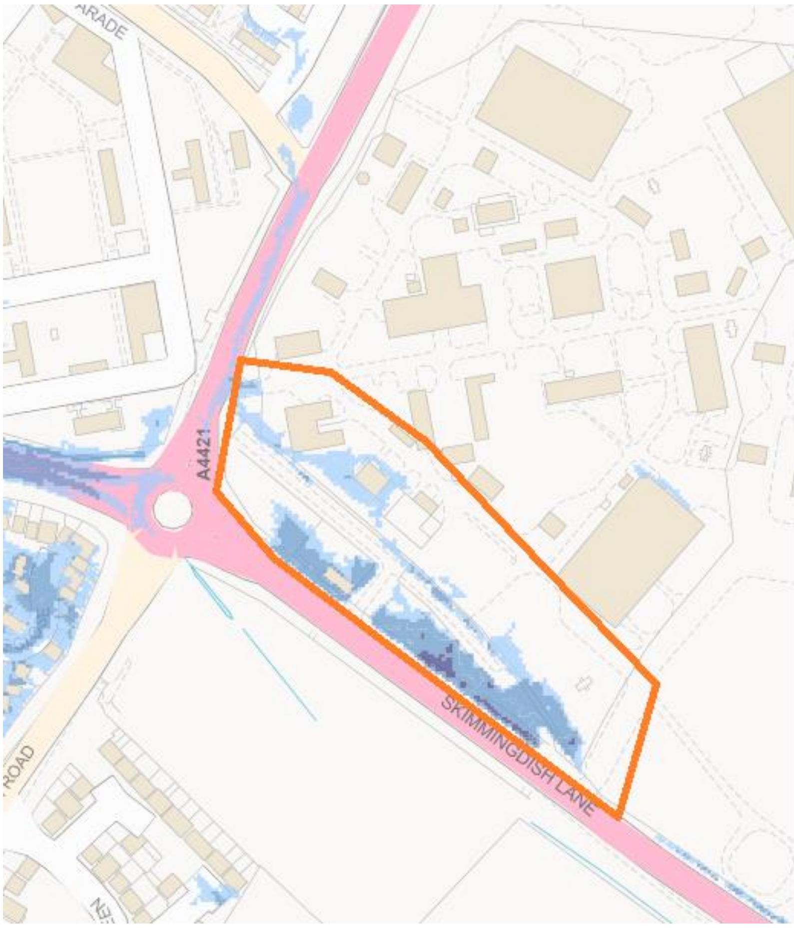


FIGURE 12: ENVIRONMENT AGENCY 1% AEP SURFACE WATER MAP FOR THE SOUTHERN AREA

3.6 Artificial Water Bodies

The site is not identified as being at risk of reservoir flooding from the Environment Agency Reservoir Flood Map. The site is located a considerable distance from any canal and therefore not currently at risk from flooding from this source.

3.7 Groundwater

British Geological Survey (BGS) records indicate that the majority of the proposed development site overlies bedrock composed of Cornbrash Formation – Limestone. The south eastern corner of the site is composed of Forest Marble Formation - Limestone and Mudstone. The BGS does not hold a record of superficial deposits in this area.

According to the Cherwell SFRA (2009), the northeast quadrant of Bicester, which includes the site and surrounding area, is not considered at risk from groundwater flooding. Owners of the site, along with other local members of the public did not mention issues associated with standing water during the winter months. Furthermore, from visiting the site there were no signs of water loving fauna indicative with land exposed to water for prolonged periods. The site is located within the wider slope of the valley, and as such any emerging groundwater would flow under gravity to the east, resulting in minimal flood levels if groundwater did emerge. Both the north and south proposed sites are within a 'Minor aquifer high' according to the Environment Agency's groundwater vulnerability zone mapping.

Groundwater flooding usually occurs following a prolonged period of low intensity rainfall and although the risk is low, it is still a possibility. The future risk from this source is uncertain as climate change predictions indicate that although sea levels will rise, thus possibly raising groundwater levels, and overall summer rainfall will decrease, thus having a long-term effect of lowering the groundwater levels. Long periods of wet weather however are predicted to increase: these are the type of weather patterns that can cause groundwater flooding to occur. On the basis of these findings, the risk of groundwater flooding is understood to be low.

4.0 Mitigation Measures

4.1 Risk to Buildings

4.1.1. Finished Floor Levels

In accordance with BS8533:2011 *'Assessing and managing flood risk in development – code of practice'*, in order to afford a level of protection against flooding it is recommended that finished floor levels should be set at a nominal 300mm above either the 1% AEP of fluvial flooding or the 0.5% AEP of tidal flooding depending on which is greater (both including climate change).

The site is located outside of the 0.1% AEP of fluvial and tidal flooding, with a low risk associated with groundwater. As such surface water risk and infrastructure failure is considered most notable risk to mitigate from. The surface water risk is largely constrained to the topographic low area along the southern boundary where a well-defined, existing ditch is present. The remainder of the two proposed sites areas appear to be largely unaffected.

Industry best practice suggests setting floor levels 150mm above ground level to offer a level of protection against these sources of flooding.

4.2 Risk to Occupiers

4.2.1. Safe Access/Egress

According to PPG NPPF, safe access and egress should be contemplated at this stage in order to ensure that the occupants will be able to leave the property safely in the event of extreme flooding. The site is located outside the area at risk from fluvial flooding and has a low risk associated with groundwater and surface water flooding for the majority of the. During all flood events safe access and egress can be achieved from A4421, in accordance with BS 8533:2011. Access and egress routes would be restricted along the southern boundary due to the surface water risk identified.

4.3 Risk to Others

The proposed development is outside of the 0.1% AEP therefore does not reduce the available floodplain volume. Furthermore, any increase in impermeable area will be mitigated through the surface water drainage strategy.

4.3.1. Existing Flow Path

There is a surface water flow path identified within the site boundary, north of Skimmerdish Lane. The development proposals will need to include an opportunity for this flow path to pass through the site. An option could include its collection and the conveyance along the site's boundary before discharging to the existing ditch.

4.3.2. Surface Water Storage

The site currently provides storage for surface water between the southern boundary and the historic carriageway, as identified by the Environment Agency's Flood Map for Surface Water (Figure 12). Constructing buildings or raising land levels within this flood extent could reduce the available surface water storage and increase the risk of flooding off-site. Development should be steered away from this area unless a scheme to mitigate any impact is incorporated into the final design.

5.0 Surface Water Drainage Strategy

5.1 Existing Surface Water Drainage Arrangements

The operations manager for Bicester Heritage explained the site benefits from good infiltration and the majority of the airfield is drained to ground. The operations manager also explained that the Ministry of Defence included a combined sewer network within the site which is thought to be utilised by the existing buildings for surface and foul water discharge. An access lid for a Klargester was noted within the airfield although not within the proposed development areas.

The existing flow paths for the two proposed development sites generally fall from north west to south east (Figure 13, Figure 14

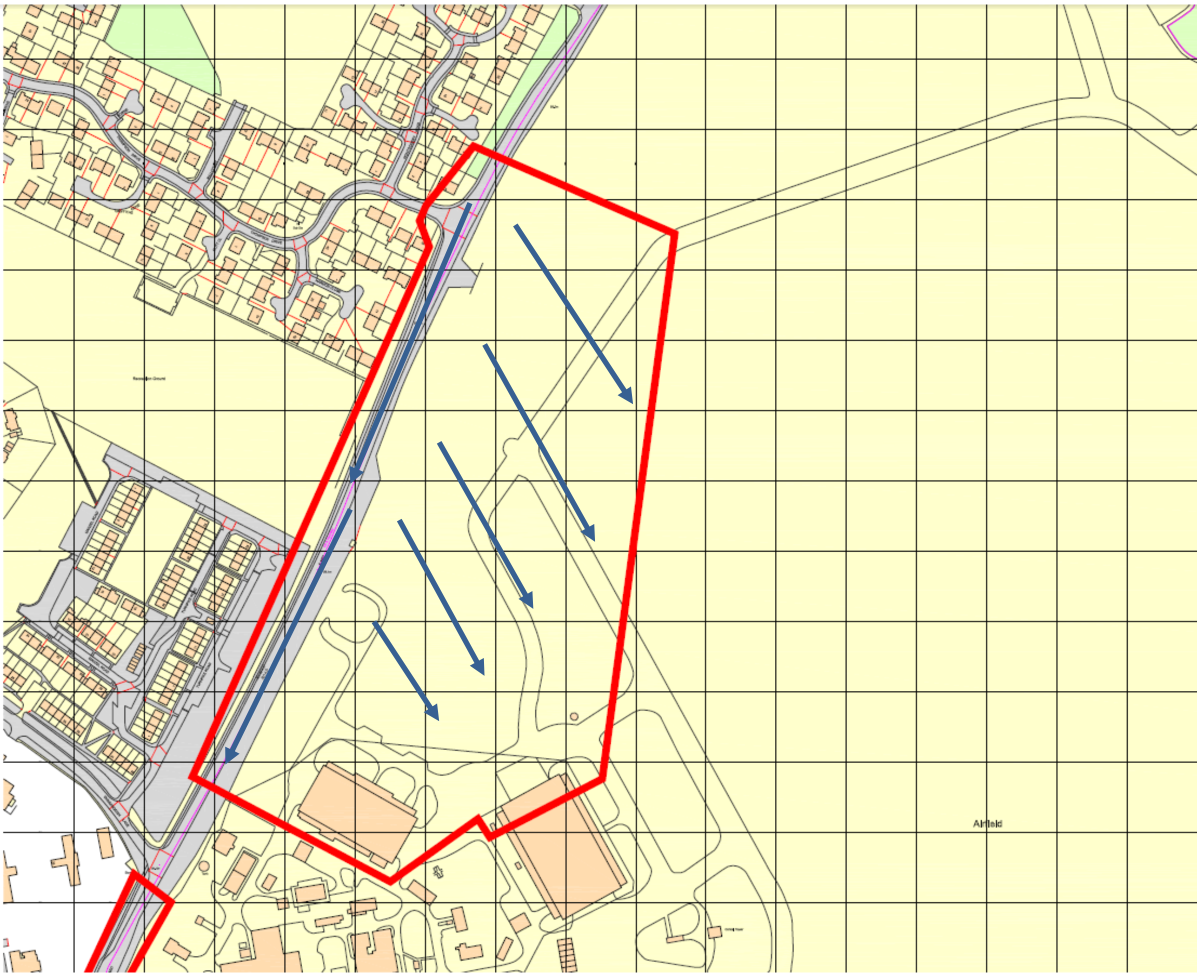


FIGURE 13: EXISTING FLOW PATHS OF WESTERN DEVELOPMENT SITE

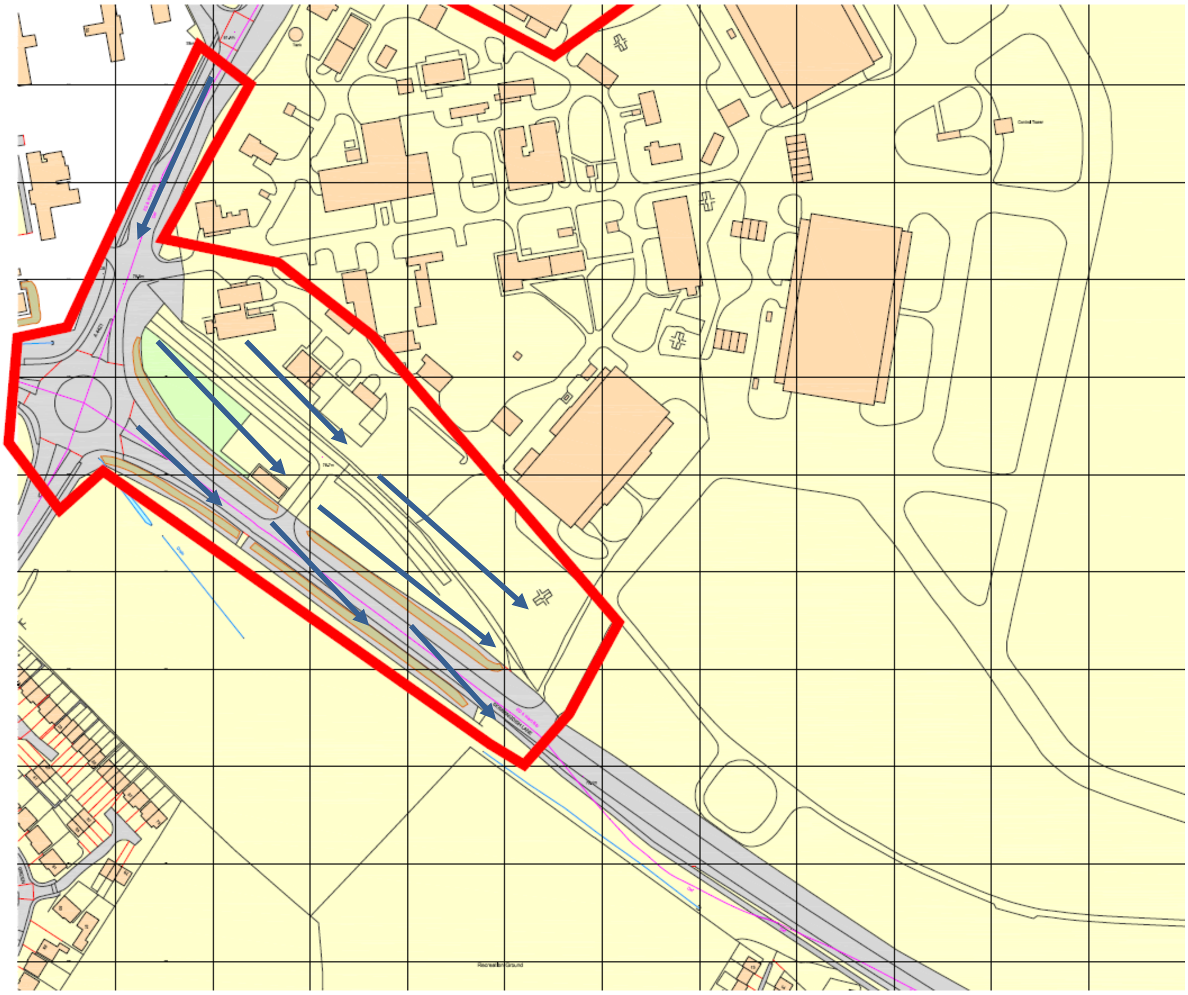


FIGURE 14: EXISTING FLOW PATHS FOR THE SOUTHERN DEVELOPMENT SITE

5.2 Local Policy

Cherwell District Council's local plan for 2011-2031 details their requirements in relations to Sustainable Drainage Systems (SuDS). Policy ESD 7 states;

"All development will be required to use sustainable drainage systems (SuDS) for the management of surface water run-off. Where site specific Flood Risk Assessments are required in association with development proposals, they should be used to determine how SuDS can be used on particular sites and to design appropriate systems. In considering SuDS solutions, the need to protect groundwater quality must be taken into account, especially where infiltration techniques are proposed."

"SuDS seek to manage surface water as close to its source as possible, mimicking surface water flows arising from the site prior to the proposed development."

"In considering SuDS solutions, the need to protect ground water quality must be taken into account, especially where infiltration techniques are proposed."

"Highways SuDS will be adopted by Oxfordshire County Council but must be located on the most appropriate land, requiring consideration of the need to provide access for maintenance purposes, and topographical factors."

5.3 SuDS Feasibility

The development provides an opportunity to incorporate Sustainable Drainage Systems (SuDS) to ensure there is no increased flood risk off-site to third parties as a result of the development.

The SuDS Manual (2015), discusses the SuDS approach to managing surface water runoff which is intended to mimic the natural catchment process as closely as is possible. The approach sets out the design objectives in respect of SuDS:

- Use of surface water runoff as a resource;
- Manage rainwater close to where it falls (at source);
- Manage runoff on the surface (above ground);
- Allow rainwater to soak into the ground (infiltration);
- Promote evapotranspiration;
- Slow and store runoff to mimic natural runoff rates and volumes;
- Reduce contamination of runoff through pollution prevention and by controlling the runoff at source; and
- Treat runoff to reduce the risk of urban contaminants causing environmental pollution

Depending on the characteristics of the site and local requirements, these may be used in conjunction and varying degrees. Table 3 present the functions of the SuDS components (management train) and their feasibility in respect of the site.

TABLE 3: FEASIBILITY OF SUDS TECHNIQUES AT THE DEVELOPMENT SITE

Technique	Description	Feasibility Y / N / M (Maybe)
Good building design and rainwater harvesting	Components that capture rainwater and facilitate its use within the building or local environment.	Yes.
Porous and pervious surface materials	Structural surfaces that allow water to penetrate, thus reducing the proportion of runoff that is conveyed to the drainage system (green roofs, pervious paving).	Yes, green/biodiversity roofs are dependent upon a non-pitched roof design. Pervious surfaces may suitable for the car parks and access roads where their use is low.
Infiltration Systems	Components that facilitate the infiltration of water into the ground. These often include temporary storage zones to accommodate runoff volumes before slow release to the soil.	Maybe. Local reports and BGS geology map suggests the site is underlay by limestone. Infiltration tests need to be undertaken to confirm the rate of infiltration.
Conveyance Systems	Components that convey flows to downstream storage systems (e.g. swales, watercourses).	Yes.
Storage Systems	Components that control the flows and, where possible, volumes of runoff being discharged from the site, by storing water and releasing it slowly (attenuation). These systems may also provide further treatment of the runoff (eg ponds, wetlands, and detention basins).	Yes, above ground storage should be promoted where possible.
Treatment Systems	Components that remove or facilitate the degradation of contaminants present in the runoff.	Yes, surface water should receive multiple treatments, in line with the SuDS Manual 2015, particularly where infiltration systems are to be used.

5.4 Conceptual Surface Water Drainage Strategy

It would appear that infiltration is likely to be feasible as the BGS geology map identifies the site being underlay by limestone, which typically provides good drainage properties. An infiltration test to BRE 365 should be undertaken to ensure the rate of infiltration is a minimum of 10^{-6}m/s. A storage system should be designed based on the infiltration rate identified. This could include infiltration ponds, wetlands or storage within a soakaway sub-base. Above ground storage will need to consider the wider use of the airfield. Permanent waterbodies can invite birds to the area which may present a risk to aviation vehicles and tier users.

Access roads and carpark areas could have an elevated surface towards a filter strip and then a filter drain before infiltrating to ground. The buildings roofs could incorporate a green/biodiversity roof to reduce annual average runoff or a rainwater harvesting system to use the collected water as a resource.

SuDS features designed for managing ground level surface runoff, will need to include appropriate mitigation of the pollution associated with the proposed land use, before infiltrating. This will present an opportunity to promote improved water quality.

Should infiltration be found unfeasible, the surface water could be discharged to the ditch along the southern boundary of the airfield. This should be at a controlled rate, as identified in Section 5.4.1, to ensure the risk from flooding off-site is not increased. This can be achieved by using a control structure such as an orifice plate or hydro-brake. Above ground conveyance systems, such as swales and ditches, should be considered before below ground (piped) systems.

5.4.1. Greenfield Runoff Rate and Volume

In accordance with the NPPF, the development must not increase the risk from flooding to others. The Greenfield runoff rate and volume is calculated to identify the existing discharge characteristics, which the development proposal must mimic to ensure this risk is adequately managed. The pre-development runoff rate was calculated (Appendix C) on a 1ha basis. Using the IH124 method for determining Greenfield runoff rate built into Microdrainage WinDes 2013.1 (including the modification given in the *Interim Code of Practice for SUDS, Chapter 6)*:

- AREA = 1ha
- SAAR = 678mm (obtained from WinDes 2013.1 built in FSR map)
- SPR = 30
- Soil = 0.15
- Pre-development QBAR = 0.4 l/s/ha
- Pre-development peak flow with 100% AEP (1 in 1 year) = 0.3 l/s/ha
- Pre-development Peak flow with 3.33% AEP (1 in 30 year) = 0.8 l/s/ha
- Pre-development Peak flow with 1% AEP (1 in 100 year) = 1 l/s/ha

- Pre-development Peak flow with 1% AEP (1 in 100 year) plus 40% climate change = 1.4 l/s/ha

Using the FSR method to determine rainfall and FSSR 16 fixed percentage runoff model for volume (Greenfield runoff volume analysis module built into Microdrainage WinDes 2013.1; Appendix B):

- M5_60 = 20.000mm
- Ratio R = 0.409
- CWI = 101
- Return period = 1% AEP (1 in 100 year)
- Storm duration = 360 minutes
- Area = 1ha
- PR% = 7.92%
- Pre-development Greenfield runoff volume = 49.09m^3/ha

The QBAR runoff rate for this site is low due to the soil characteristics and the potential for infiltration. Based on a controlled discharge rate of 0.4l/s/ha, between 753m^3 and 906m^3 of storage will be required per hectare of impermeable area. This has been estimated using the quick storage estimate function within Microdrainage (Appendix B).

Depending on the final site choice and developable area, 0.4l/s/ha may not be achievable due to feasibility of incorporating such a flow control device. Should this be the case and infiltration also proven unfeasible, the minimum recommended discharge rate for the whole site is 5l/s due to the risk of blockage to pipework associated with lower rates.

6.0 Conclusion

The proposed development at Bicester Airfield, Bicester, OX26 5HA; is located in Flood Zone 1 as defined in the NPPF. The proposal includes the development of a 300-room hotel with associated restaurant, kitchen, lounge, bar and reception areas. This will be complemented with a circa 2,800m^2 conference centre and circa 1,000m^2 leisure facilities.

On the basis of the available information from the Environment Agency and Cherwell District Council, the site is not identified at risk of flooding associated with fluvial, tidal or groundwater. There is a surface water risk within the south site and development should either be steered away from this area or use it as an opportunity to better manage the risk. Given the level of flood risk to the other areas, industry best practice suggests setting floor levels 150mm above the existing external level to offer a level of protection against these sources.

The proposed development can provide safe, dry access and egress during an extreme flood event. Access and egress along the southern boundary would be challenged due to the surface water risk.

There is a surface water flowpath within the south site which will need to be maintained. Incorporating a conveyance channel along the south west boundary before discharging to the existing ditch would provide this opportunity.

Surface water runoff from the proposed development should be managed using techniques outlined in the conceptual drainage strategy and feasible SuDS identified in Section 0. The local geology suggests there is a high potential for infiltration however this will need to be confirmed with an infiltration test to BRE 365. Should the results of this test be unfavourable, there is a ditch along the southern boundary which could be used to discharge the surface water from the proposed development. The mean greenfield annual runoff rate for the site is 0.4l/s/ha. Based on a controlled discharge rate of 0.4l/s, between 753m^3 and 906m^3 of storage will be required per hectare of impermeable area.

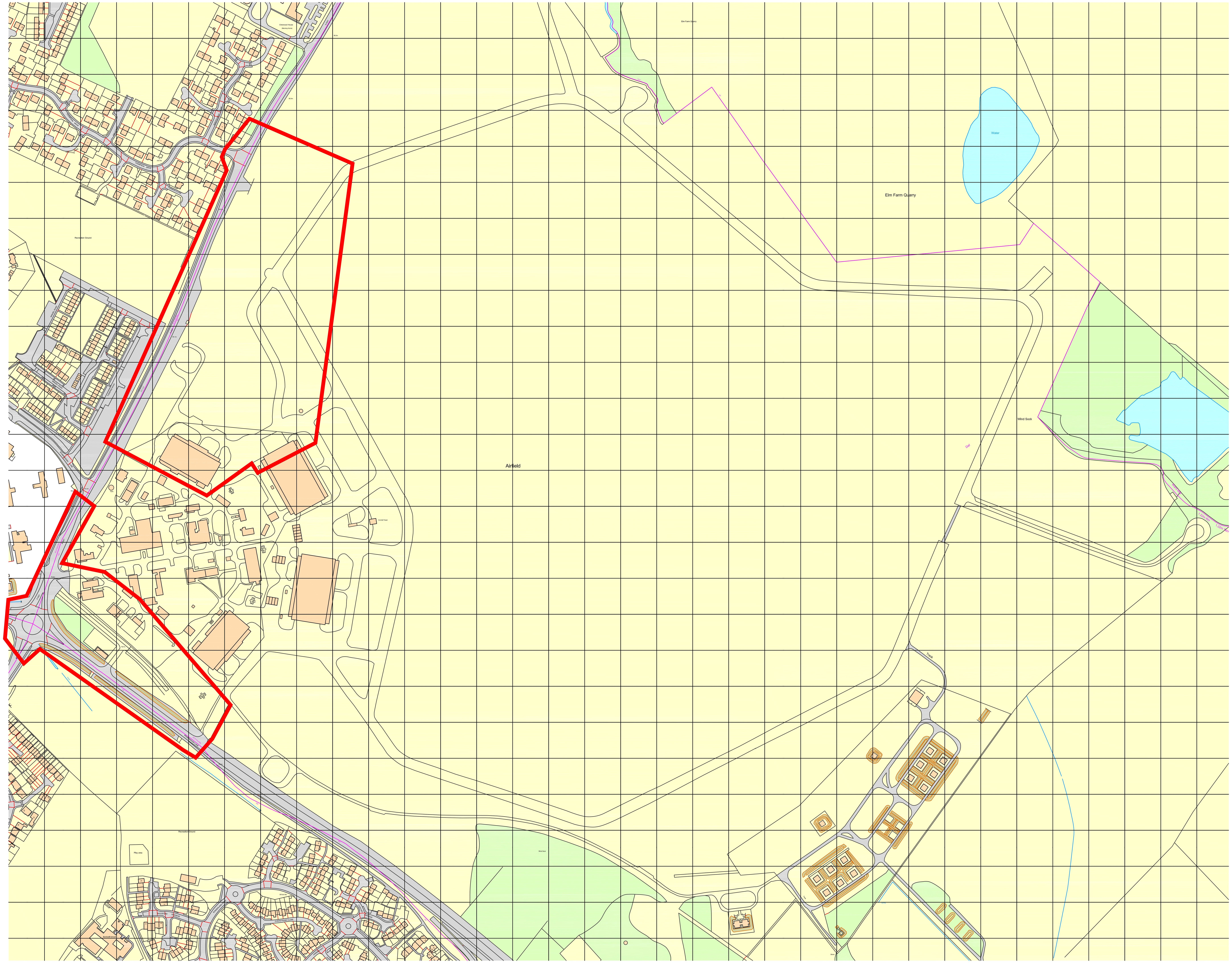
Depending on the final site choice and developable area, 0.4l/s/ha may not be achievable due to feasibility of incorporating such a flow control device. Should this be the case and infiltration also proven unfeasible, the minimum recommended discharge rate for the whole site is 5l/s due to the risk of blockage to pipework associated with lower rates.

It can be concluded that, providing the recommendations in this assessment are adhered to, the proposed residential property will be safe from flooding hazards, not impede the path of flood water, and it will remain safe for its lifetime while not increasing flood risk elsewhere.

7.0 Recommendations

- It is recommended that finished ground floor levels are set 150mm above the external ground level.
- The risk of surface water flooding to the south site will need to be addressed within the design of the scheme. Development should either be steered away from this area or use this as an opportunity to reduce the risk of surface water flooding by providing more efficient drainage features and ensuring that any new proposals do not increase the risk of flooding to others. It is therefore recommended that a detailed study to manage surface water is undertaken.
- A detailed drainage strategy should be developed alongside the proposals for the site. This should be informed by this conceptual strategy and incorporate SuDS identified in Section 5.0.
- Prior to detailed design and submission of a planning application, infiltration tests to BRE Digest 365 must be undertaken to ascertain the infiltration rate of the soil to determine the suitability of infiltration SuDS and inform the design of SuDS features.

Appendix A – Development Proposals



1:2500
0 20 40 60 80 100M

NOTES:

1. DO NOT SCALE
2. DRAWINGS TO BE READ IN CONJUNCTION WITH ALL SERVICES AND STRUCTURAL ENGINEERS DRAWINGS & SPECIFICATIONS.
3. © COPYRIGHT. DRAWINGS NOT TO BE REPRODUCED OR USED WITHOUT PRIOR WRITTEN CONSENT.

REF	DATE	REVISION	DRAWN	CHECKED
-	-	-	-	-

SCALE @A1	DATE	DRAWN BY	CHECKED BY
1:2500	FEB 14	TH	RT

DRAWING

LOCATION PLAN

PROJECT

CLIENT

RIDGE

THE COWYARDS
BLENHEIM PARK
OXFORD ROAD
WOODSTOCK
OX20 1QR

TEL: 01993 815000
FAX: 01993 815001
www.ridge.co.uk

DRG NO
122063-A-001

REV

FILE REFERENCE:

XREF FILE REFERENCE:

Design Brief
Project Heritage

50 x 4 star deluxe rooms

Parking immediately outside (of at least ½ of the rooms)
Parking to include electric supply for trickle charging and EV's
Covered canopies to bays – could be retractable

4 x Suites with en-suite, c60sqm in total
Remainder to be feature rooms i.e. airfield view, balcony/patio etc. all en-suite, c36sqm in total
Of which 10 to be twin (but can zip link Queen size double) and 36 to be Queen size double

Welcome/check in area
Public area toilets
Small bar, cellar, bar area c40 covers
Car feature – may be workshop, small museum etc. TBC
Linen room and storage
Connected to the main hotel if possible
3 story inc. ground.
Relevant % of accessible rooms from total bed stock

50 x 3star, lodge rooms

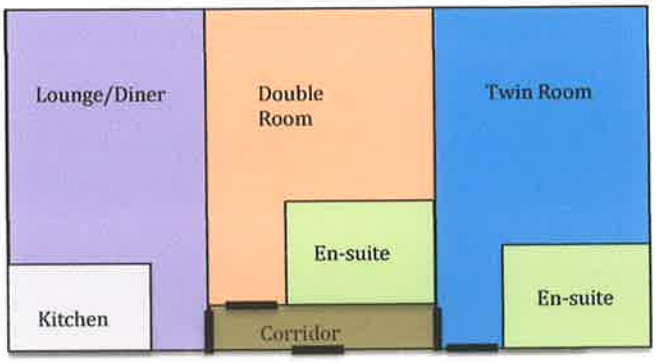
c26sqm in total
50 x King size double, plus single bed and en-suite
Parking close by if possible
Linen room and storage
No bars, food service or public toilets
No requirement to be connected to the hotel
3 story inc. ground
Relevant % of accessible rooms from total bed stock

50 x Self-catering apartment rooms

25 x 2 bedroomed apartments
Each apartment to be:

- 1 x lounge/kitchen/diner, c28sqm
- King size double room with en-suite c24sqm
- Twin room with en-suite c28sqm
- Corridor 4sqm
- Relevant % of accessible rooms from total
- All double and twin bedrooms accessible individually and as part of the apartment so they can be sold separately

Parking nearby
Linen room and storage
No requirement to be connected to the hotel
No bars, food service or public toilets
3 story inc. ground or as individual/cluster units of 4/6 apartments



150 x 4 star hotel rooms

Min 28sqm in total
30 x zip/link twin c30sqm
120 x King size double c28sqm
Relevant % of accessible rooms from total

Parking nearby
Linen room and storage
Connected to the core hotel
3 story inc. ground

Core hotel

Reception front desk, reception area, back office, concierge, toilets c150sqm
Lounge and Bar (could be connected to Reception) c150sqm
Restaurant c500sqm
Kitchen, cellar, staff areas c700sqm

Conference centre

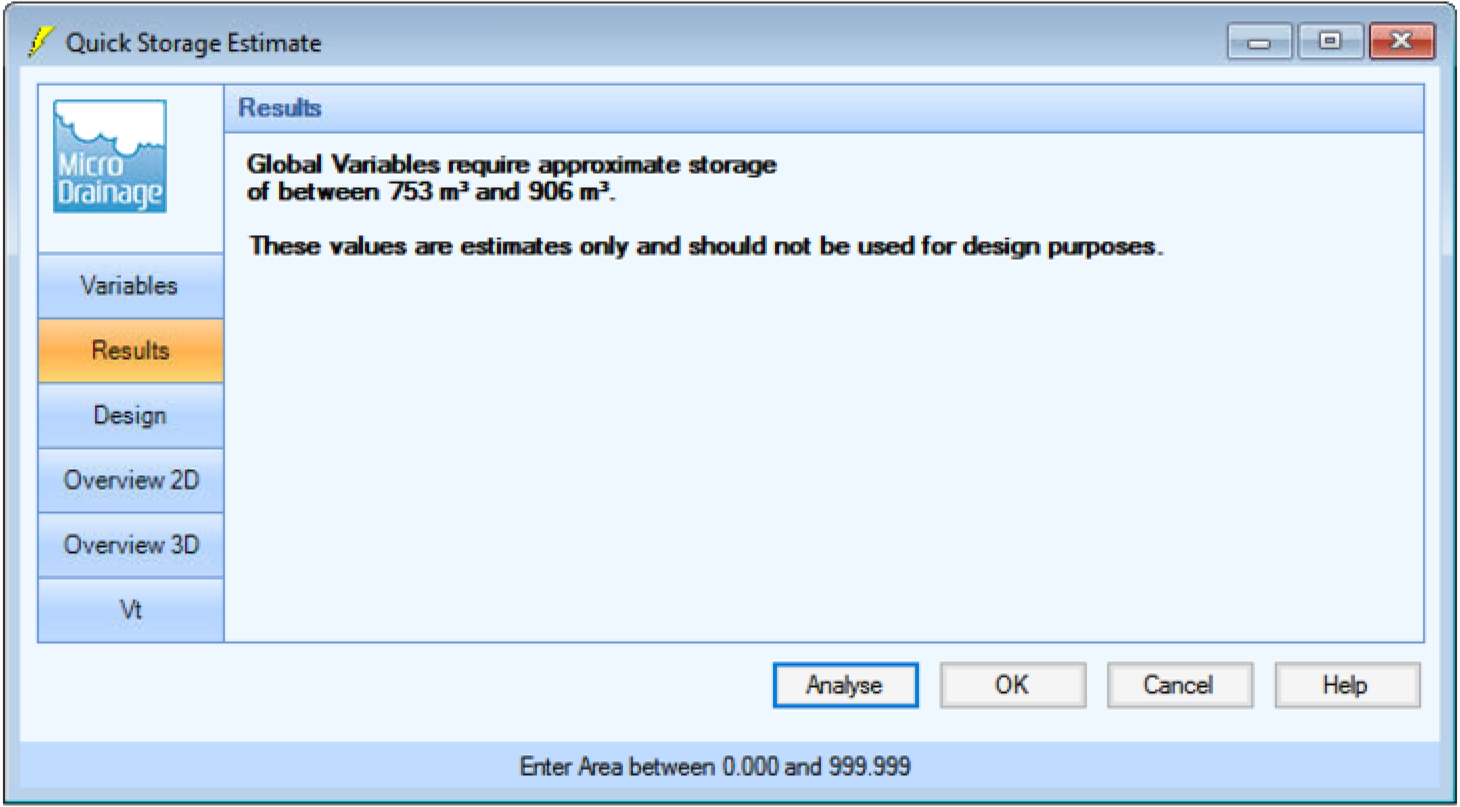
Main suite c500sqm. Sub dividable by 3 or 4
Bar, bar area, storage and welcome c300sqm
Second suite c300sqm. Sub dividable by 2 or 3
Bar, bar area, storage c200sqm
Further c1200sqm of meeting rooms ranging from 20sqm upwards
Corridors, public toilets c300sqm

Spa and leisure
Gym c200sqm

Changing areas, reception desk, storage c120sqm
Pool hall c200sqm (pool c120sqm)
Pool plant c30sqm
10 x treatment rooms, relax lounge, waiting area, nail bar c200sqm

External
Grounds, parking x 500 spaces, utility supplies, outbuildings

Appendix B – MicroDrainage Calculations


Quick Storage Estimate
Micro Drainage
Results
Global Variables require approximate storage
of between 753 m³ and 906 m³.
These values are estimates only and should not be used for design purposes.
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Analyse
OK
Cancel
Help
Enter Area between 0.000 and 999.999

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.150
Area (ha)	1.000	Urban	0.000
SAAR (mm)	678	Region Number	Region 4

Results	**l/s**
QBAR Rural	0.4
QBAR Urban	0.4
Q100 years	1.0
Q1 year	0.3
Q30 years	0.8
Q100 years	1.0

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.409
Areal Reduction Factor	1.00
Area (ha)	1.000
SAAR (mm)	678
CWI	101.040
Urban	0.000
SPR	10.000

APPENDIX B

Drainage Strategy

AKSWard²

CONSTRUCTION CONSULTANTS

Bicester Heritage Hotel

Drainage Strategy and Water Quality Management Report

BHH-AKSW-XX-XX-RP-C-0003

Prepared for

Bicester Heritage

July 2018

Job №: X162034

Seacourt Tower West Way Oxford OX2 0JJ
Tel: 01865 240071 Fax: 01865 248006
consult@aksward.com www.aksward.com

LONDON • HITCHIN • OXFORD • POOLE • SOUTHAMPTON

Contents

Appendices

Revision	Amendments	Prepared By	Checked	Date
P01	Preliminary Issue	NJ	GT	29.06.18
P02	Western car park removed. Entrance updated	NJ	GT	11.07.18

1.0 Introduction

1.1 AKS Ward have been commissioned to undertake a Drainage Strategy and Water Quality Management to support the planning application for a new hotel located within Bicester Heritage land.

1.2 The development includes a new hotel building, car parking and associated external areas.

1.3 The site is in Flood Zone 1 (low risk of fluvial flooding) and is 3.34 Hectares in area with approximately 1.80 Ha served by drainage. The site is located in Bicester and is currently a greenfield site.

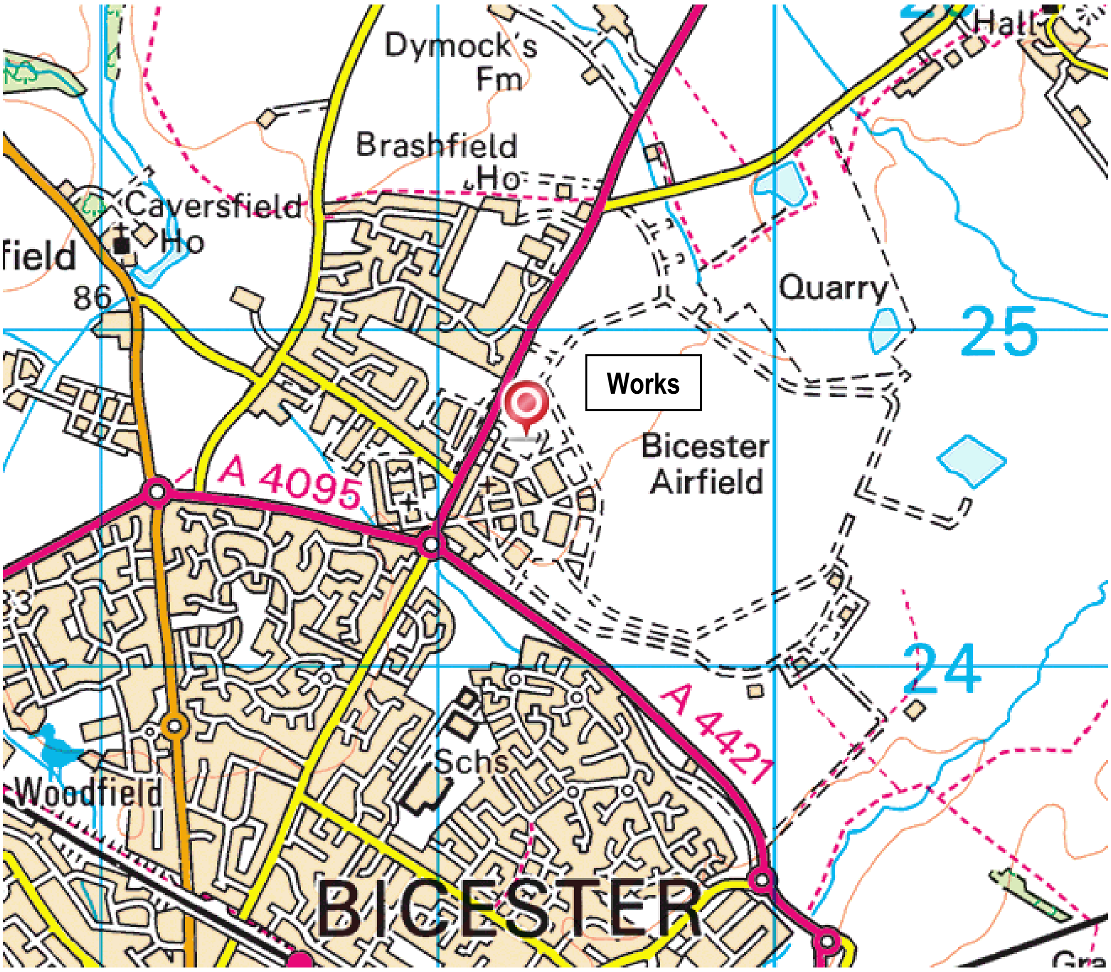
1.4 The site is bounded by hangar units to the east and south, by the A4421 road to the west and by the Bicester Airfield to the north.

1.5 This Drainage Strategy must be read in conjunction with the Flood Risk Assessment prepared for the site by RAB Consultants.

2.0 Development Site Details

2.1 Development Description & Location
The site is located at NGR SP 59258 24680.

The plans of the development are contained within Appendix C.



3.0 Site Drainage Strategy

3.1 Existing Surface Water

The site currently drains towards the southeast and infiltrates into the ground. During exceedance events when the ground is saturated, it is understood that the runoff volume would drain towards the watercourse located further southeast outside of Bicester Heritage

British Geological Survey indicates that the site is underlaid by Cornbrash Formation – Limestone. Infiltration tests were carried out within Bicester Heritage area and the results obtained were 1.43×10^{-6} m/s and 1.81×10^{-6} m/s.

Greenfield runoff rates and volumes have been calculated as follows:

Qbar:	0.7 l/s
Greenfield volume:	92.734 l/s

Existing drainage drawings are contained in Appendix A. Microdrainage calculations are contained in Appendix B

3.2 Proposed Surface Water

Surface system will be designed to agree with the National Standards for Sustainable Drainage.

Refer to drainage drawings and Microdrainage calculations in Appendix C and D. A Surface Water Pro-forma has been completed with a copy contained in Appendix E to ensure that the design is in accordance with the current SuDS requirements.

3.2.1 Runoff Destination

Due to ground conditions obtained, existing soil is considered permeable therefore infiltration as means of disposal is feasible.

Surface water drainage from the building and adjacent hard paving areas will be attenuated using a new cellular soakaway with a volume of 729.6 m^3. Soakaway has been designed using the lowest infiltration rate obtained (1.43×10^{-6} m/s)

New parking areas will be drained using permeable paving. The new access road to the hotel will be drained via gullies into new swales located to both sides of the road.

3.2.2 Peak flow control

SuDS will be utilised on site in the form of permeable paving, swale and cellular soakaway. There will be no discharge flow rate from the site therefore peak runoff will not exceed the current flow rates for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event with an allowance for climate change.

3.2.3 Volume control

There is no additional discharged volume as the proposed hard paving areas and building will be drained into the permeable paving, cellular soakaway and swales therefore it will not exceed the current volume form each storm.

3.2.4 Flood risk within the development

The system has been designed in accordance with CIRIA SuDS manual with no flooding in the 30 year event and no flood water leaving the site for the 100 year + 40% climate change critical storm event.

3.2.5 Exceedance Events

In storm events exceeding the designed storm events above the 100 year + climate change the flow of water would run towards the southeast of the site and ultimately discharge into the existing watercourse. This path is as per the existing situation

3.2.6 Structural integrity and construction
Surface system will be designed and constructed using approved materials in line with Building Regulation's and current British Standards appropriate for the location and proposed use.

3.2.7 Maintenance and operation
The drainage system will be CCTV surveyed on completion to ensure that the system is fully operational and maintenance schedules provided in the O&M manual for the owner to maintain the cellular tanks, permeable paving and swales.

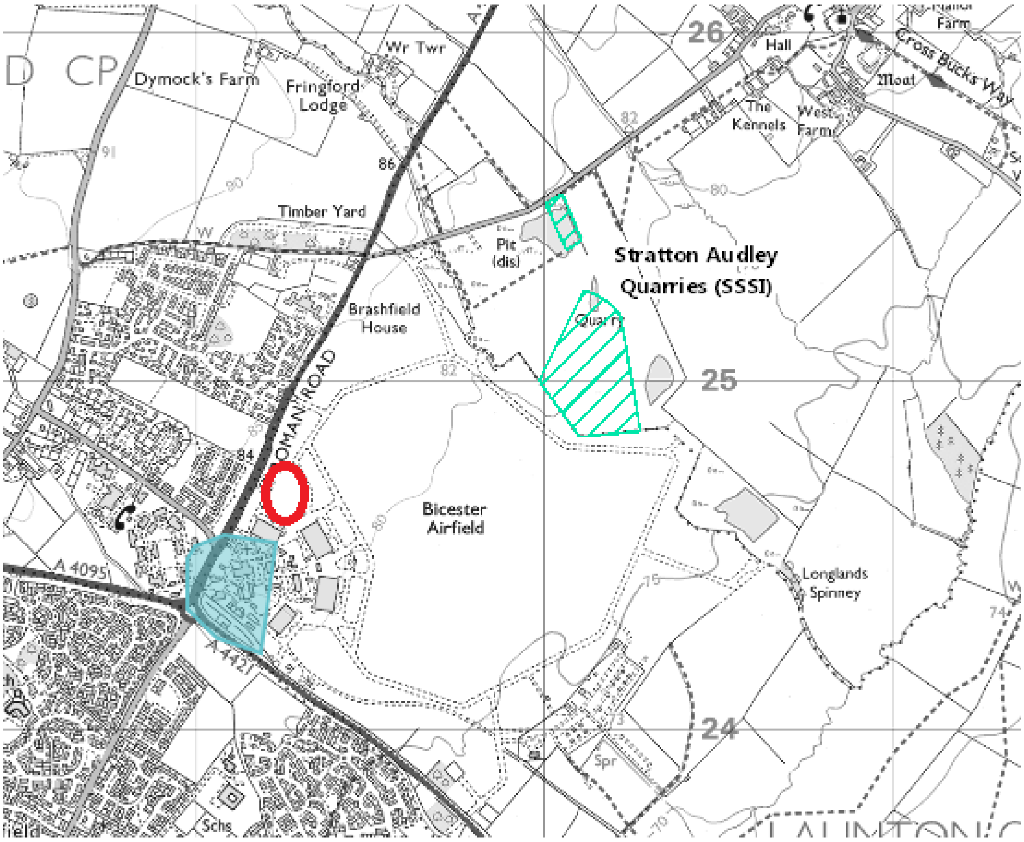
Maintenance schedules have been provided in Appendix F for the SuDS. The owner of the site will be responsible for maintaining the SuDS on site.

3.3 Existing and Proposed Foul Water.
Foul water will discharge via private pumping chamber into the existing public sewer located within the site. Connection will be on site and via direct connection to the existing public drainage system.

A Pre-development Enquiry will be submitted to Thames Water to agree the discharge flow rates from the new development.

Any new foul drainage will be connected to the public system and S106 connection applications made to Thames Water.

3.4 Stratton Audley Quarries Site of Special Scientific Interest
The proposed development is located approximately 800m from Stratton Audley Quarries, and area declared 'Site of Special Scientific Interest'.



The proposed site falls from northwest to southeast therefore it does not contribute to the hydrology of the SSSI.

4.0 Water Quality Management

The surface system will be designed in order to not affect the water quality of the receiving watercourse.

CIRIA SuDS Manual 2015 Chapter 26 assigns pollution hazard indices for different land use types and SuDS mitigation index for every SuDS component depending on where the discharge is, surface or ground water.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater			
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates[1]	**TSS**	**Metals**	**Hydrocarbons**
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.6[4]	0.5	0.6
A soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.8[4]	0.8	0.8
Proprietary treatment systems[5, 6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

CIRIA SuDS Manual states that *'To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index that equals or exceeds the pollution hazard index'*

Total SuDS mitigation index ≥ pollution hazard index
(for each contaminant type) (for each contaminant type)

Pollution hazard indices for land use are as follows:

Roof:	TTS 0.2	Metals 0.2	Hydrocarbons 0.05
Access road & car park:	TTS 0.5	Metals 0.4	Hydrocarbons 0.4

SuDS mitigation indices are determined by the type of SuDS utilised on site. The proposal for this site a cellular tank and proprietary treatment system (vortex separator):

Permeable pavement:	TTS 0.7	Metals 0.6	Hydrocarbons 0.7
Swale:	TTS 0.5	Metals 0.6	Hydrocarbons 0.6

Catchpit manholes will be installed prior to connecting into the new cellular soakaway therefore providing additional treatment for the surface water drained from the roof which will improve the water quality further.

Appendix A

Surveys & Historic Information

Asset location search

Thames Water Property Searches

AKS Ward
Seacourt Tower
West WaySeacourt Tower
OXFORD
OX2 0JJ

Search address supplied	Royal Air Force Buckingham Road Bicester OX26 5HA
Your reference	X162034 - Bicester Heritage
Our reference	ALS/ALS Standard/2018_3816510
Search date	19 June 2018

Keeping you up-to-date

Knowledge of features below the surface is essential in every development. The benefits of this not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility for any commercial or residential project.

An asset location search provides information on the location of known Thames Water clean and/or wastewater assets, including details of pipe sizes, direction of flow and depth. Please note that information on cover and invert levels will only be provided where the data is available.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

searchcode

Search address supplied: Royal Air Force, Buckingham Road, Bicester, OX26 5HA

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

SP5824SE
SP5824NE
SP5924SW
SP5924NW

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

The following quartiles have been printed as they fall within Thames' water area:

SP5824SE
SP5824NE

SP5924SW
SP5924NW

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2018_3816510	SP5824SE

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 458750,224250

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
531K	n/a	n/a
521C	n/a	n/a
621A	n/a	n/a
711A	n/a	n/a
721C	n/a	n/a
721D	n/a	n/a
6101	n/a	80.4
601B	n/a	n/a
7003	n/a	79.8
7001	n/a	79.38
701B	n/a	n/a
701C	n/a	n/a
7102	n/a	78.6
7002	n/a	77.75
7005	n/a	n/a
7006	n/a	n/a
7004	n/a	79.1
701A	n/a	n/a
7110	n/a	77.94
7104	n/a	78.83
7111	n/a	77.48
8103	n/a	78.66
8051	81.08	80.26
8001	81.12	77.24
8050	81.22	80.29
8052	80.23	78.35
8055	n/a	n/a
8053	80.1	78.55
8054	n/a	n/a
5205	83.41	80.91
5305	83.43	81.48
521B	n/a	n/a
531A	n/a	n/a
5207	83.36	81.12
5206	83.4	80.6
531I	n/a	n/a
521A	n/a	n/a
531E	n/a	n/a
5201	83.06	81.38
531J	n/a	n/a
531B	n/a	n/a
531H	n/a	n/a
531C	n/a	n/a
5101	83.15	80.18
5310	82.8	80.51
5110	83.01	80.34
5309	82.8	81.18
5209	83.05	79.75
5208	83.01	80.41
5102	83.05	80.39
5109	83.04	80.94
5311	82.77	81.07
6201	82.47	80.18
6202	82.49	79.54
6206	82.57	80.88
6207	82.59	80.63
5202	83.66	81
5203	83.65	81.7
5302	83.8	81.15
5301	83.81	81.71
5304	83.57	81.57
5303	83.8	81.15
5204	83.41	81.55
5010	82.5	80.05
5004	82.52	79.75
5005	82.75	79.69
5009	82.76	80.15
5003	82.95	79.75
5008	83	80.4
501A	n/a	n/a
501B	n/a	n/a
501C	n/a	n/a
5001	82.97	81.31
5002	82.97	81.81
601A	n/a	n/a
5105	83.14	81
5106	83.11	81.53
611B	n/a	n/a
611A	n/a	n/a
611C	n/a	n/a
5107	83.31	81.36
5104	83.37	80.76
5108	83.11	81.12
5103	83.13	80.5
5306	83.42	80.74
5307	83.17	81.26
5308	83.21	81.65
6302	82.8	80.77
6301	82.83	80.09
631A	n/a	n/a
9401	79.54	78.59

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7204	n/a	79.25
7208	81.4	80.02
7207	n/a	n/a
6210	81.97	79.7
6203	81.93	80.21
6209	81.88	79.94
6204	81.9	80.42
7209	n/a	n/a
721B	n/a	n/a
721A	n/a	n/a
6208	82.24	80.17
6205	82.22	80.55
7310	n/a	n/a
6305	82.01	80.57
7309	81.47	79.41
7308	81.45	79.79
7311	81.44	79.15
7306	80.99	79.37
7301	81.03	78.32
6304	82.16	80.36
7305	81.33	79.65
7302	81.38	78.78
6303	82.15	79.68
7304	81.77	79.97
7303	81.77	79.19
6306	82.41	80.53
6307	82.46	79.8
8101	80.65	77.43
8104	n/a	78.05
8110	80.56	77.53
8108	n/a	77.03
8105	n/a	78.26
8107	n/a	77.85
8106	n/a	78.41
7201	n/a	78.13
8212	n/a	n/a
8210	n/a	78.67
8213	n/a	n/a
8211	80.56	78.76
8214	80.27	77.56
8204	n/a	79.18
8202	n/a	78.88
8206	n/a	77.63
8203	n/a	78.98
8205	n/a	77.7
8216	80.57	78.89
8215	80.55	77.85
8303	80.4	79.05
8301	80.36	78.04
7307	80.66	79.17
8302	80.67	78.14
8306	80.47	79.04
8304	80.43	79.2
8305	80.48	78.81
831A	n/a	n/a
831B	n/a	n/a
831C	n/a	n/a
8102	80.5	78.02
8207	n/a	76.54
8201	n/a	78.72
8109	n/a	n/a
9204	n/a	78.47
9203	n/a	78.92
9303	n/a	78.75
9302	n/a	79.19
9104	n/a	n/a
9205	n/a	n/a
9201	79.59	77.75
9101	n/a	n/a
9207	n/a	n/a
9102	n/a	n/a
9208	n/a	n/a
9202	79.54	77.72
9103	n/a	n/a
9301	79.62	77.9
9106	n/a	n/a
6103	n/a	79.98
611D	n/a	n/a
7109	n/a	78.07
7105	n/a	78.96
7101	n/a	78.38
7108	n/a	78.16
7106	n/a	79.05
7103	n/a	79.28
6104	n/a	78.72
6102	n/a	79.56
6107	n/a	79.73
6110	n/a	78.89
7121	n/a	79.23
7118	n/a	79.65
6108	n/a	80.01
6111	n/a	79.56
7120	n/a	79.43

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7117	n/a	79.85
6109	n/a	79.93
6112	82.48	79.32
7112	n/a	78
7107	n/a	78.54
7119	n/a	80.15
7206	n/a	79.73
7202	n/a	78.68
7205	n/a	79.09
7203	n/a	78.83
9006	n/a	n/a
9001	79.47	77.16
9002	n/a	n/a
9007	n/a	n/a
9008	n/a	n/a
9004	n/a	n/a
9009	n/a	n/a
9005	n/a	n/a
9105	n/a	n/a

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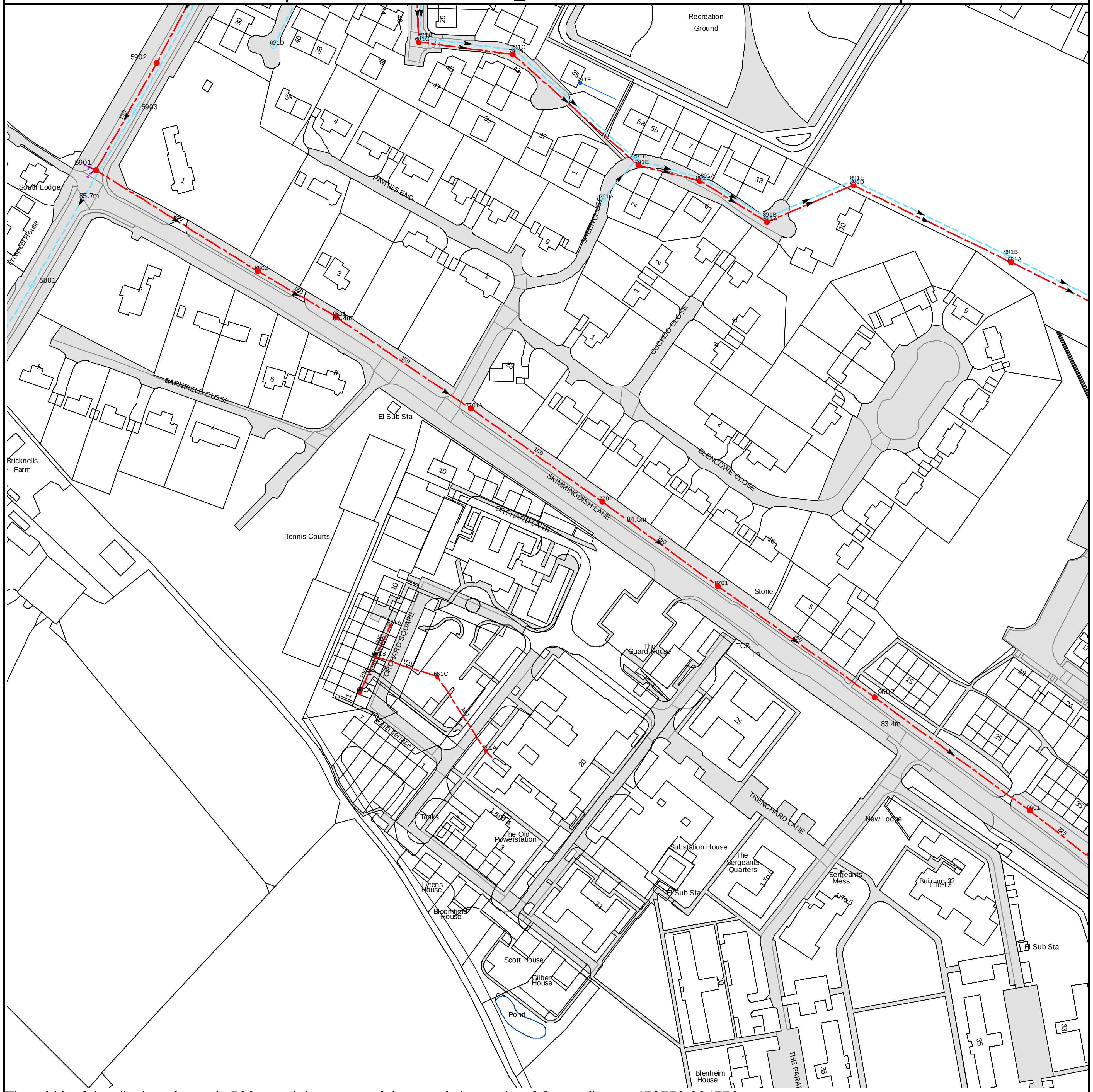
Asset Location Search Sewer Map - ALS/ALS Standard/2018_3816510

SP5824NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 458750,224750

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Manhole Reference	Manhole Cover Level	Manhole Invert Level
661A	n/a	n/a
661B	n/a	n/a
671A	n/a	n/a
661C	n/a	n/a
761A	n/a	n/a
791F	n/a	n/a
5801	n/a	n/a
6802	85.62	83.47
5901	85.75	83.93
5903	n/a	n/a
5902	86.19	84.32
691D	n/a	n/a
691C	n/a	n/a
691B	n/a	n/a
791C	n/a	n/a
6801	85.368	83.078
7701A	85.025	82.595
791D	n/a	n/a
7701	84.35	82.18
791A	n/a	n/a
791B	n/a	n/a
791E	n/a	n/a
891C	n/a	n/a
891A	n/a	n/a
8701	84.05	81.75
891B	n/a	n/a
881A	n/a	n/a
891D	n/a	n/a
891E	n/a	n/a
9602	n/a	n/a
981B	n/a	n/a
981A	n/a	n/a
9601	82.4	80.59
0601	82.161	80.421

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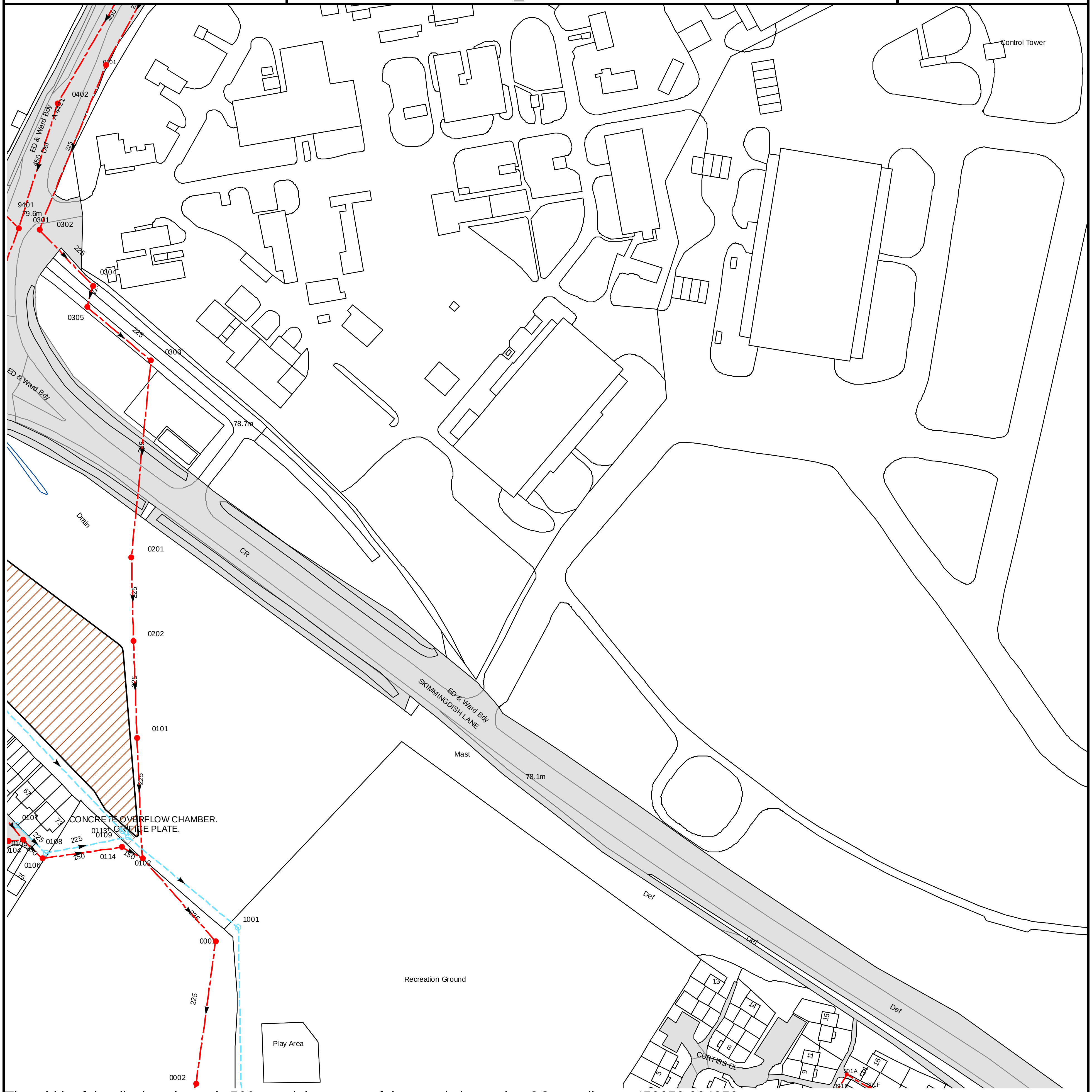
Asset Location Search Sewer Map - ALS/ALS Standard/2018_3816510	SP5924SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 459250,224250

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Manhole Reference	Manhole Cover Level	Manhole Invert Level
0301	79.67	78.03
0302	79.52	78.48
0402	80.37	78.27
0401	80.61	79.04
0107	n/a	n/a
0305	n/a	n/a
0304	79.42	78.28
0113	n/a	n/a
0201	n/a	n/a
0202	n/a	n/a
0101	n/a	n/a
0303	n/a	n/a
0002	n/a	n/a
0001	77.72	76.44
1001	n/a	n/a
0106	n/a	n/a
0102	77.87	76.65
0108	n/a	n/a
0114	n/a	n/a
0104	n/a	n/a
0105	n/a	n/a
0109	n/a	n/a
301A	n/a	n/a

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Asset Location Search Sewer Map - ALS/ALS Standard/2018_3816510	SP5924NW

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
191S	n/a	n/a
091C	n/a	n/a
091B	n/a	n/a
091A	n/a	n/a
091G	n/a	n/a
091D	n/a	n/a
191J	n/a	n/a
191B	n/a	n/a
191A	n/a	n/a
191G	n/a	n/a
291D	n/a	n/a
291B	n/a	n/a
291C	n/a	n/a
0502	81.079	79.379
0501	81.22	79.22
1601	82.73	79.52
1701	83.87	79.67
1702	84.44	79.84
1703	84.17	80.85
1704	84.41	80.21
171A	n/a	n/a
2801	n/a	n/a
081A	n/a	n/a
191N	n/a	n/a
181C	n/a	n/a
181A	n/a	n/a
191Q	n/a	n/a
191R	n/a	n/a
181B	n/a	n/a
191L	n/a	n/a
191M	n/a	n/a
191K	n/a	n/a
191F	n/a	n/a
191P	n/a	n/a
091H	n/a	n/a
191I	n/a	n/a
091E	n/a	n/a
191C	n/a	n/a
091F	n/a	n/a
191O	n/a	n/a
191H	n/a	n/a
0504	82.09	80.06
0503	81.4	79.78
291A	n/a	n/a
2802	n/a	n/a
2901	n/a	n/a

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ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2018_3816510	SP5824SE

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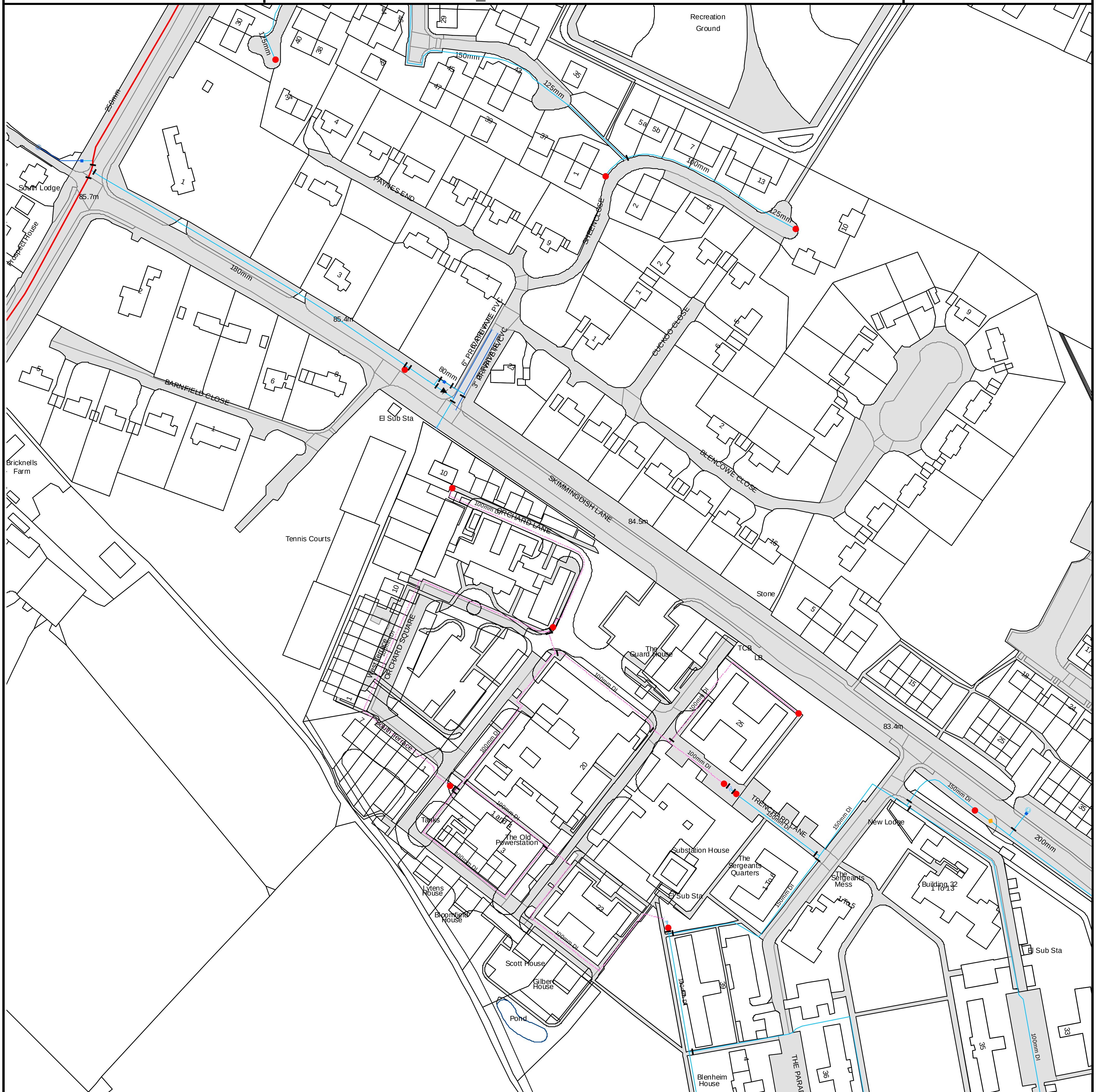
Asset Location Search Water Map - ALS/ALS Standard/2018_3816510	SP5824NE



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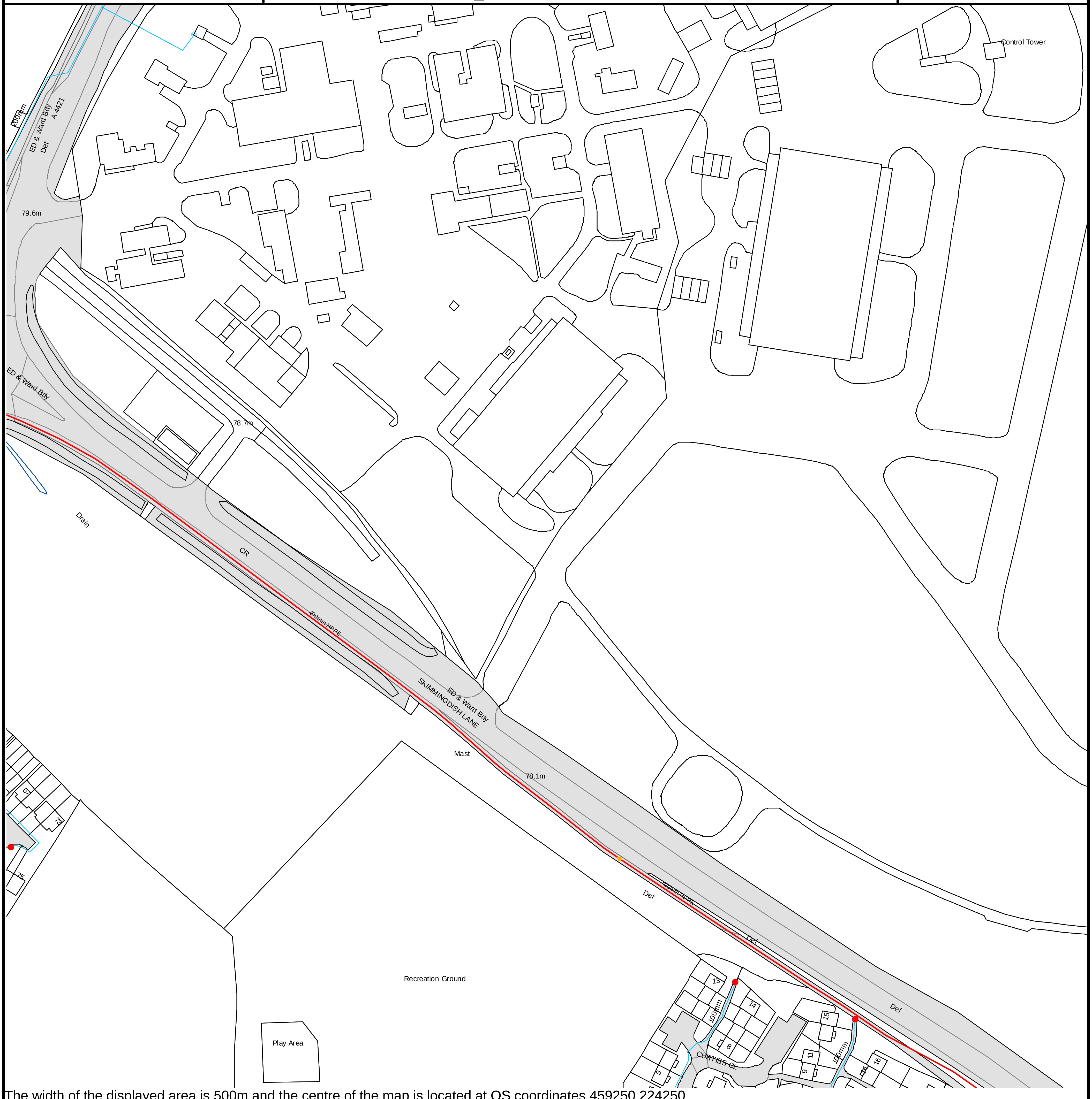
Asset Location Search Water Map - ALS/ALS Standard/2018_3816510	SP5924SW



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Asset Location Search Water Map - ALS/ALS Standard/2018_3816510	SP5924NW

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ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"
Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"
Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY
Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE
Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED
Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

SOAKAWAY TEST - BRE DIGEST 365

PROJECT: Bicester Heritage
JOB REF: N16218
DATE: 01/02/2018
TEST REF: ST1 - SW Corner

Length of trial pit	=	L_{TP}	=	0.90	m
Width of trial pit	=	W_{TP}	=	0.90	m
Depth of trial pit	=	D	=	1.00	m
Pit Voids	=	PV	=	100	%

(Note - for open pits, PV = 100%. For stone filled pits, PV = 30%)

Water Depth at Start of Test, D_{TP}	=	0.850	m
75% Effective Depth, D_{75}	=	0.888	m
50% Effective Depth, D_{50}	=	0.926	m
25% Effective Depth, D_{25}	=	0.963	m

Time from 75% to 25% effective depth, T_L = 655 mins

Volume of water escaping during this test between D_{75} and D_{25}

= $V_{tp75-25}$

= $(L_{TP} \times W_{TP} \times (D_{25} - D_{75}) \times PV)$ = 0.061 m^3

Mean surface area through which the above volume escapes, is the wetted area.
Only 50% of the effective depth is allowed in the calculation:

Hence:

A_{P50} = Wet Base Area + Wet Sides Area (from D_{50} to base of pit)

$A_{P50} = (L_{TP} \times W_{TP}) + (2L_{TP}+2W_{TP}) \times (D-D_{50})$

A_{P50} = 0.81 + 0.268

A_{P50} = 1.08 m^2

Soil Infiltration Rate = f = $\frac{V_{TP75-25}}{A_{P50} \times 60 \times T_L}$ m/s

f = $\frac{0.06}{1.08 \times 60 \times 655}$ m/s

Soil Infiltration Rate f = 1.43E-06 m/s

SOAKAWAY TEST - BRE DIGEST 365

PROJECT: Bicester Heritage
JOB REF: N16218
DATE: 01/02/2018
TEST REF: ST2 - Mid way along S elevation

Length of trial pit	=	L_{TP}	=	1.10	m
Width of trial pit	=	W_{TP}	=	0.90	m
Depth of trial pit	=	D	=	1.00	m
Pit Voids	=	PV	=	100	%

(Note - for open pits, PV = 100%. For stone filled pits, PV = 30%)

Water Depth at Start of Test, D_{TP}	=	0.800	m
75% Effective Depth, D_{75}	=	0.850	m
50% Effective Depth, D_{50}	=	0.900	m
25% Effective Depth, D_{25}	=	0.950	m

Time from 75% to 25% effective depth, T_L = 655 mins

Volume of water escaping during this test between D_{75} and D_{25}

= $V_{tp75-25}$

= (L_{TP} x W_{TP} x (D_{25} - D_{75}) x PV) = 0.099 m^3

Mean surface area through which the above volume escapes, is the wetted area.
Only 50% of the effective depth is allowed in the calculation:

Hence: A_{P50} = Wet Base Area + Wet Sides Area (from D_{50} to base of pit)

A_{P50} = (L_{TP} x W_{TP}) + ($2L_{TP}$+$2W_{TP}$) x (D-D_{50})

A_{P50} = 0.99 + 0.400

A_{P50} = 1.39 m^2

Soil Infiltration Rate = f = $\frac{V_{TP75-25}}{A_{P50} \times 60 \times T_L}$ m/s

f = $\frac{0.10}{1.39 \times 60 \times 655}$ m/s

Soil Infiltration Rate f = 1.81E-06 m/s

Appendix B

Existing Drainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	30	Soil	0.150
Area (ha)	1.800	Urban	0.000
SAAR (mm)	682	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.7
QBAR Urban	0.7
Q30 years	1.6
Q1 year	0.6
Q30 years	1.6
Q100 years	2.3

Greenfield Runoff Volume

FSR Data

Return Period (years)	1
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.404
Areal Reduction Factor	1.00
Area (ha)	1.800
SAAR (mm)	685
CWI	102.300
Urban	0.000
SPR	10.000

Results

Percentage Runoff (%)	4.33
Greenfield Runoff Volume (m^3)	16.946

Greenfield Runoff Volume

FSR Data

Return Period (years)	30
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.404
Areal Reduction Factor	1.00
Area (ha)	1.800
SAAR (mm)	685
CWI	102.300
Urban	0.000
SPR	10.000

Results

Percentage Runoff (%)	6.26
Greenfield Runoff Volume (m³)	54.053

Greenfield Runoff Volume

FSR Data

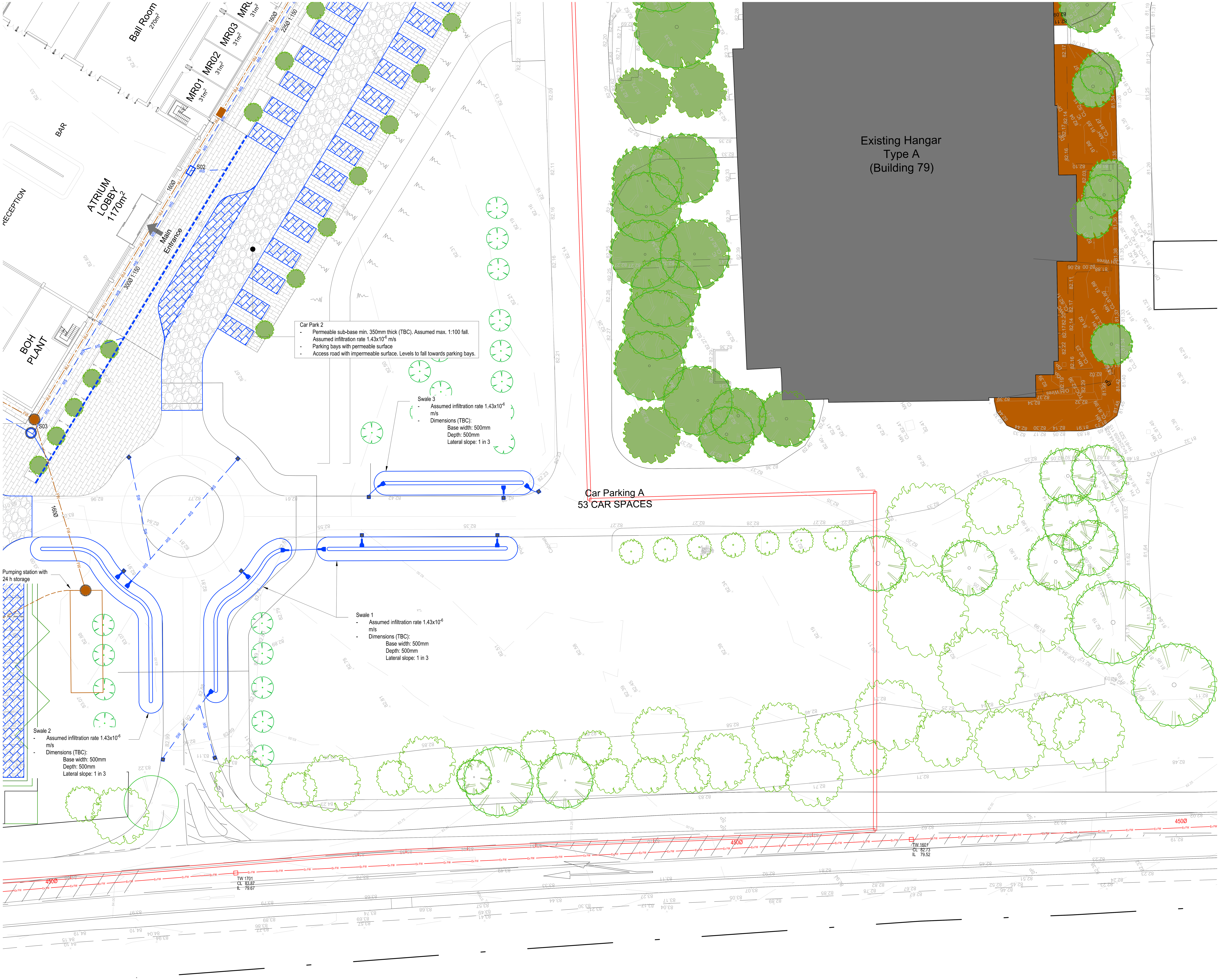
Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.404
Areal Reduction Factor	1.00
Area (ha)	1.800
SAAR (mm)	685
CWI	102.300
Urban	0.000
SPR	10.000

Results

Percentage Runoff (%)	8.27
Greenfield Runoff Volume (m^3)	92.734

Appendix C

Proposed Site Plans



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NOTE: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, residual or unexpected to a competent contractor carrying out the works. These notes relate to risks which we have been unable to design out.

Key

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- Permeable Paving
- Grasscrete Paving
- Foul Polypropylene Inspection Chamber
- Foul Concrete Inspection Chamber
- Foul Concrete Manhole
- FW New Foul Sewer
- New Foul Rising Main
- SW New Surface Water Sewer
- New Linear Drainage System

Existing Drainage

- Existing Manholes
- Ex FW Existing Foul Sewer
- Ex SW Existing Surface Water Sewer
- Ex FW / Ex SW Existing Sewers to be abandoned and grouted up either end

Rev.	Amendment	Drn	Chkd	Date
P03	Drainage updated to suit revised entrance	NJ	GT	11.07.18
P02	Preliminary Issue	NJ	GT	29.06.18
P01	Preliminary Issue	NJ	GT	21.06.18

Drg. Status: Preliminary
Suitability

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web: www.aksward.com

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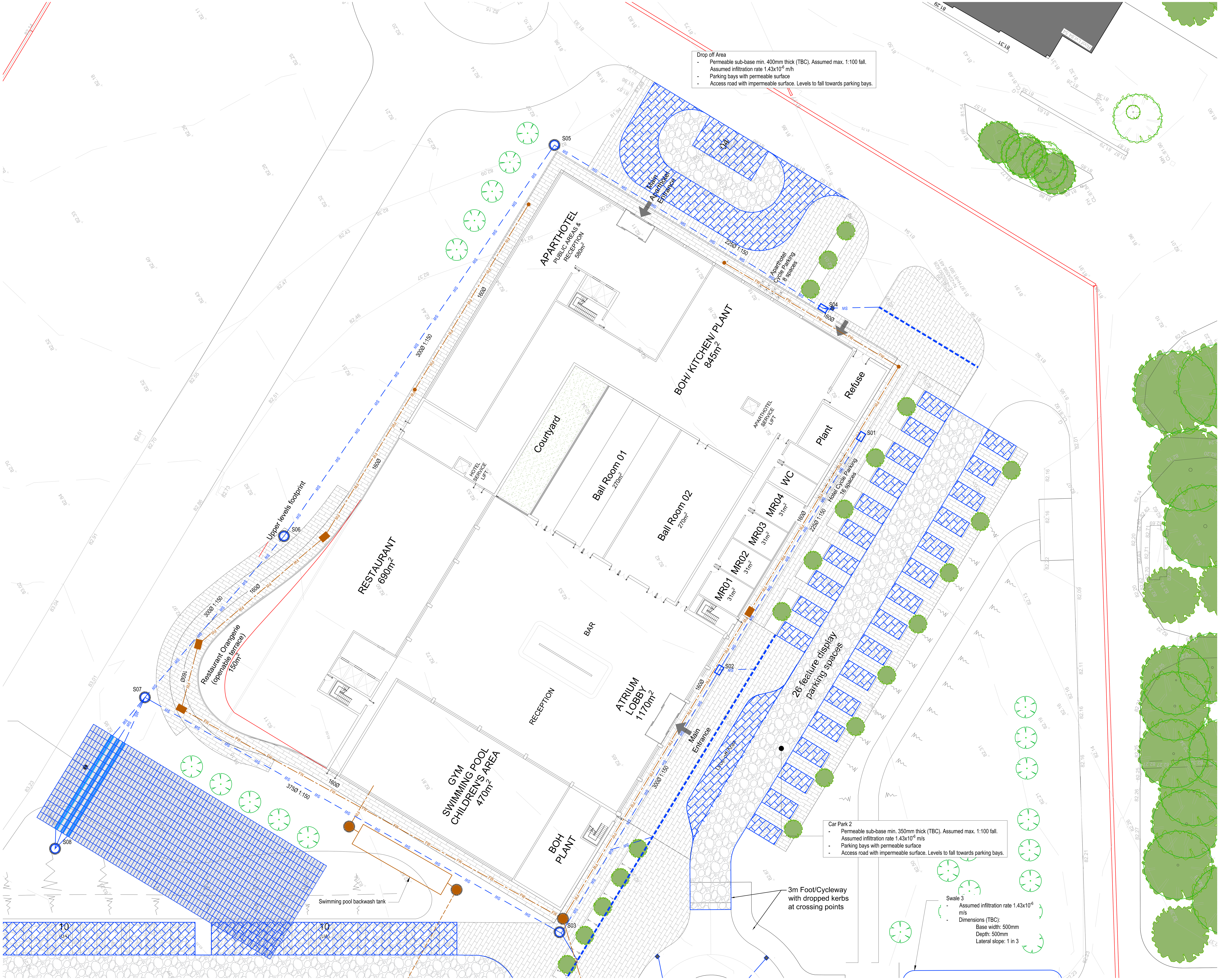
Client: Bicester Heritage Ltd.

Project: Bicester Heritage Hotel

Title: Drainage Layout
Sheet 1 of 3

Reviewed Scheme: GT — Date: 21.06.18
Reviewed Final — Date:
Scales at A1: 1:250 — Project No.: X162034

Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
BHH	AKSW	XX	GF	DR	C	9201	P03



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- New Surface Water Sewer
- New Linear Drainage System

Existing Drainage
- Existing Manholes
- Existing Foul Sewer
- Existing Surface Water Sewer
- Existing Sewers to be abandoned and grouted up either end

Rev.	Amendment	Drn	Chkd	Date
P03	Drainage updated to suit revised entrance	NJ	GT	11.07.18
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P01	Preliminary Issue	NJ	GT	21.06.18

Drg. Status: Preliminary
Suitability

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web: www.aksward.com

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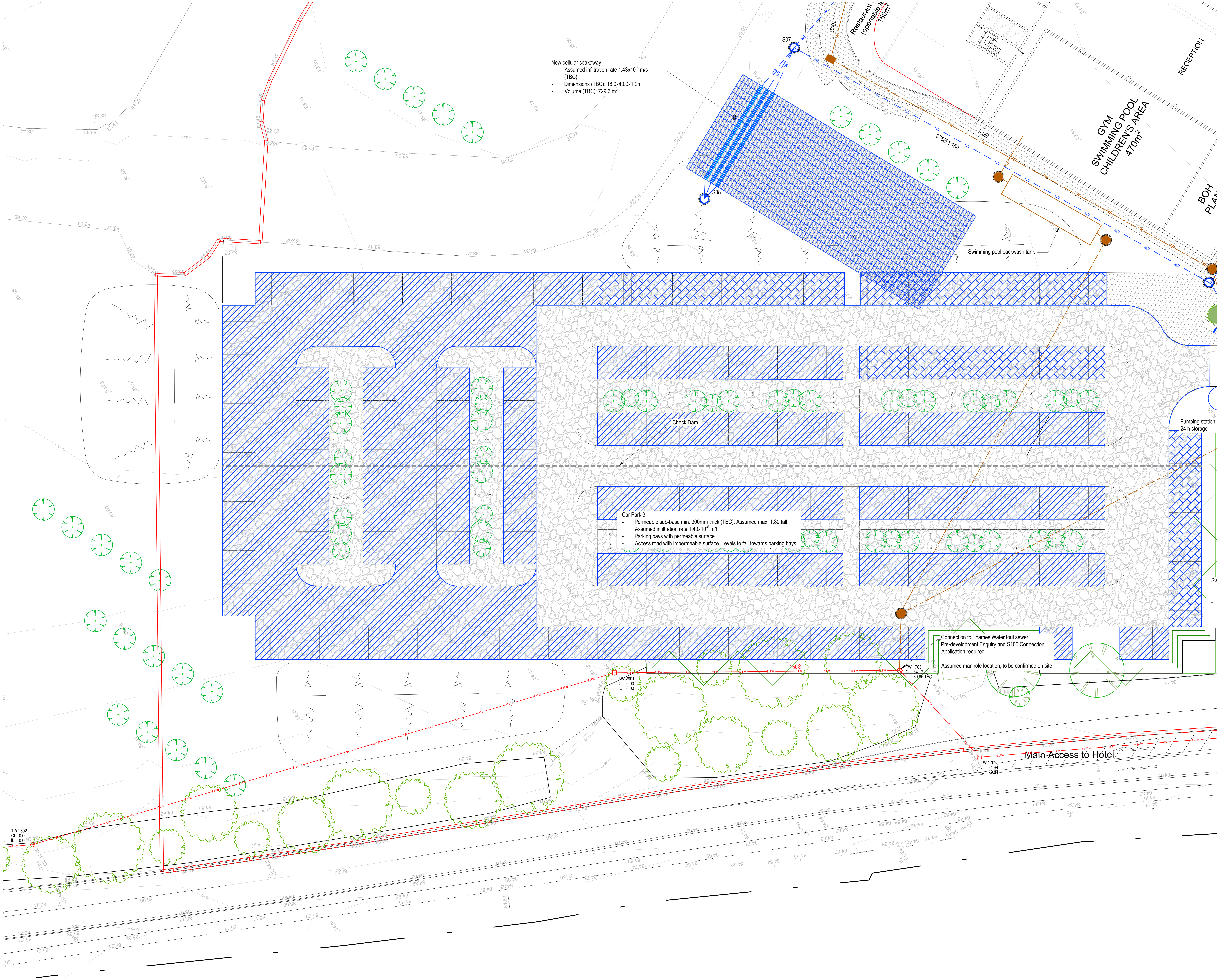
Client: Bicester Heritage Ltd.

Project: Bicester Heritage Hotel

Title: Drainage Layout Sheet 2 of 3

Reviewed Scheme: GT — Date: 21.06.18
Reviewed Final — Date:
Scales at A1: 1:250 — Project No.: X162034

Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
BHH	AKSW	XX	GF	DR	C	9202	P03



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Client: Bicester Heritage Ltd.

Project: Bicester Heritage Hotel

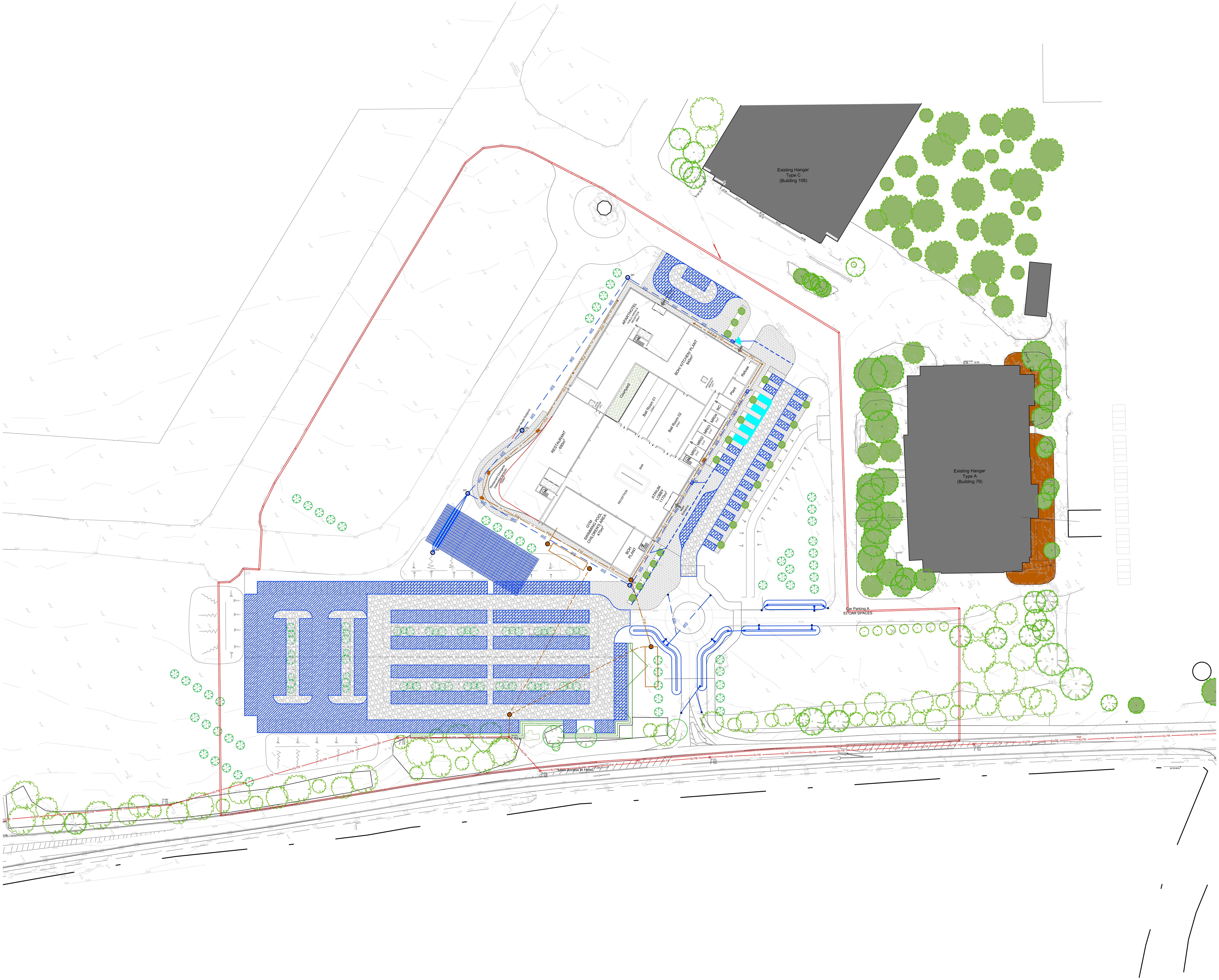
Title: Drainage Layout Sheet 3 of 3

Reviewed Scheme: GT Date: 21.06.18

Reviewed Final: Date:

Scales at A1: 1:250 Project No.: X162034

Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
BHH	AKSW	XX	GF	DR	C	9203	P03



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Flooded Area max. 50mm deep.

Rev.	Amendment	Drn	Chkd	Date
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Client: Bicester Heritage Ltd.

Project: Bicester Heritage Hotel

Title: Flooded Areas
1 in 100 Year + 40% CC
Critical Storm

Reviewed Scheme: GT Date: 21.06.18
Reviewed Final: Date:
Scales at A1: 1:250 Project No. X162034

Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
BHH	AKSW	XX	GF	DR	C	9209	P03

Appendix D

Proposed Drainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.404	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.404		

Online Controls for Storm

Pump Manhole: S08_Soakaway, DS/PN: S1.009, Volume (m³): 4.6

Invert Level (m) 80.722

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.0000	0.900	0.0000	1.700	0.0000	2.500	0.0000
0.200	0.0000	1.000	0.0000	1.800	0.0000	2.600	0.0000
0.300	0.0000	1.100	0.0000	1.900	0.0000	2.700	0.0000
0.400	0.0000	1.200	0.0000	2.000	0.0000	2.800	0.0000
0.500	0.0000	1.300	0.0000	2.100	0.0000	2.900	0.0000
0.600	0.0000	1.400	0.0000	2.200	0.0000	3.000	0.0000
0.700	0.0000	1.500	0.0000	2.300	0.0000		
0.800	0.0000	1.600	0.0000	2.400	0.0000		

Storage Structures for Storm

Cellular Storage Manhole: S08_Soakaway, DS/PN: S1.009

Invert Level (m) 79.750 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00515 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00515

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	640.0	640.0	1.201	0.0	774.4
1.200	640.0	774.4			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.404
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	S01	15 Winter	1	+0%	30/15 Winter	100/15 Summer	
S1.001	S0JT	15 Winter	1	+0%			
S1.002	S0JT	15 Winter	1	+0%			
S1.003	S0JT	15 Winter	1	+0%			
S1.004	S02	15 Winter	1	+0%	30/15 Winter		
S1.005	S0JT	15 Winter	1	+0%			
S1.006	S0JT	15 Winter	1	+0%			
S1.007	S03	15 Winter	1	+0%	100/15 Summer		
S2.000	S04	15 Winter	1	+0%	100/15 Summer	100/15 Winter	
S2.001	S05	15 Winter	1	+0%	100/15 Summer		
S2.002	S0JT	15 Winter	1	+0%			
S2.003	S06	15 Winter	1	+0%	30/15 Summer		
S1.008	S07	15 Winter	1	+0%	30/15 Summer		
S1.009	S08_Soakaway	2880 Winter	1	+0%	100/2880 Winter		

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S01		82.056	-0.169	0.000	0.14		4.9	OK
S1.001	S0JT		82.006	-0.152	0.000	0.23		8.3	OK*
S1.002	S0JT		81.955	-0.136	0.000	0.33		12.0	OK*
S1.003	S0JT		81.905	-0.119	0.000	0.45		16.4	OK*
S1.004	S02		81.780	-0.177	0.000	0.35		24.3	OK
S1.005	S0JT		81.715	-0.167	0.000	0.41		28.0	OK*
S1.006	S0JT		81.633	-0.174	0.000	0.36		32.9	OK*
S1.007	S03		81.416	-0.241	0.000	0.27		41.2	OK
S2.000	S04		82.053	-0.172	0.000	0.12		4.9	OK
S2.001	S05		81.719	-0.199	0.000	0.25		20.4	OK
S2.002	S0JT		81.501	-0.191	0.000	0.28		25.6	OK*
S2.003	S06		81.300	-0.166	0.000	0.40		34.3	OK
S1.008	S07		81.049	-0.139	0.000	0.71		83.8	OK
S1.009	S08_Soakaway		80.035	-1.062	0.000	0.00		0.0	OK

PN	US/MH Name	Level Exceeded
S1.000	S01	2
S1.001	S0JT	
S1.002	S0JT	
S1.003	S0JT	
S1.004	S02	
S1.005	S0JT	
S1.006	S0JT	
S1.007	S03	
S2.000	S04	1
S2.001	S05	
S2.002	S0JT	
S2.003	S06	
S1.008	S07	
S1.009	S08_Soakaway	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.404
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	S01	15 Winter	30	+0%	30/15 Winter	100/15 Summer	
S1.001	S0JT	15 Winter	30	+0%			
S1.002	S0JT	15 Winter	30	+0%			
S1.003	S0JT	15 Winter	30	+0%			
S1.004	S02	15 Winter	30	+0%	30/15 Winter		
S1.005	S0JT	15 Winter	30	+0%			
S1.006	S0JT	15 Winter	30	+0%			
S1.007	S03	15 Winter	30	+0%	100/15 Summer		
S2.000	S04	15 Winter	30	+0%	100/15 Summer	100/15 Winter	
S2.001	S05	15 Winter	30	+0%	100/15 Summer		
S2.002	S0JT	15 Winter	30	+0%			
S2.003	S06	15 Winter	30	+0%	30/15 Summer		
S1.008	S07	15 Winter	30	+0%	30/15 Summer		
S1.009	S08_Soakaway	4320 Winter	30	+0%	100/2880 Winter		

<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S01		82.225	0.000	0.000	0.31		10.9	SURCHARGED
S1.001	S0JT		82.158	0.000	0.000	0.53		19.4	SURCHARGED*
S1.002	S0JT		82.091	0.000	0.000	0.76		27.6	SURCHARGED*
S1.003	S0JT		82.024	0.000	0.000	1.04		37.9	SURCHARGED*
S1.004	S02		81.972	0.015	0.000	0.85		58.6	SURCHARGED
S1.005	S0JT		81.879	-0.003	0.000	1.00		68.6	OK*
S1.006	S0JT		81.737	-0.070	0.000	0.94		84.9	OK*
S1.007	S03		81.601	-0.056	0.000	0.68		105.3	OK
S2.000	S04		82.085	-0.140	0.000	0.29		11.9	OK
S2.001	S05		81.808	-0.110	0.000	0.70		58.4	OK
S2.002	S0JT		81.692	0.000	0.000	0.73		65.7	SURCHARGED*
S2.003	S06		81.612	0.146	0.000	0.99		83.9	SURCHARGED
S1.008	S07		81.377	0.189	0.000	1.80		212.4	SURCHARGED
S1.009	S08_Soakaway		80.406	-0.691	0.000	0.00		0.0	OK

PN	US/MH Name	Level Exceeded
S1.000	S01	2
S1.001	S0JT	
S1.002	S0JT	
S1.003	S0JT	
S1.004	S02	
S1.005	S0JT	
S1.006	S0JT	
S1.007	S03	
S2.000	S04	1
S2.001	S05	
S2.002	S0JT	
S2.003	S06	
S1.008	S07	
S1.009	S08_Soakaway	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.404
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S01	15 Winter	100	+0%	100/15 Summer			
S1.001	SOJT	30 Winter	100	+0%				
S1.002	SOJT	30 Winter	100	+0%				
S1.003	SOJT	30 Winter	100	+0%				
S1.004	S02	15 Winter	100	+0%	100/15 Summer			
S1.005	SOJT	30 Winter	100	+0%				
S1.006	SOJT	15 Winter	100	+0%				
S1.007	S03	15 Winter	100	+0%	100/15 Summer			
S2.000	S04	15 Winter	100	+0%				
S2.001	S05	15 Winter	100	+0%	100/15 Summer			
S2.002	SOJT	30 Winter	100	+0%				
S2.003	S06	15 Winter	100	+0%	100/15 Summer			
S1.008	S07	15 Winter	100	+0%	100/15 Summer			
S1.009	S08_Soakaway	4320 Winter	100	+0%				

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S01	82.506	0.281	0.000	0.40		14.0	SURCHARGED	
S1.001	S0JT	82.158	0.000	0.000	0.56		20.5	SURCHARGED*	
S1.002	S0JT	82.091	0.000	0.000	0.82		30.0	SURCHARGED*	
S1.003	S0JT	82.024	0.000	0.000	1.14		41.7	SURCHARGED*	
S1.004	S02	82.238	0.281	0.000	1.04		71.6	SURCHARGED	
S1.005	S0JT	81.882	0.000	0.000	1.08		74.1	SURCHARGED*	
S1.006	S0JT	81.807	0.000	0.000	1.09		99.0	SURCHARGED*	
S1.007	S03	81.858	0.201	0.000	0.82		126.6	SURCHARGED	
S2.000	S04	82.156	-0.069	0.000	0.37		14.9	OK	
S2.001	S05	82.118	0.200	0.000	0.80		66.1	SURCHARGED	
S2.002	S0JT	81.692	0.000	0.000	0.73		65.7	SURCHARGED*	
S2.003	S06	81.854	0.388	0.000	1.18		100.0	SURCHARGED	
S1.008	S07	81.524	0.336	0.000	2.18		257.4	SURCHARGED	
S1.009	S08_Soakaway	80.602	-0.495	0.000	0.00		0.0	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.404
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	S01	15 Winter	100	+40%	30/15 Winter	100/15 Summer	
S1.001	S0JT	15 Winter	100	+40%			
S1.002	S0JT	15 Winter	100	+40%			
S1.003	S0JT	15 Winter	100	+40%			
S1.004	S02	15 Winter	100	+40%	30/15 Winter		
S1.005	S0JT	5760 Winter	100	+40%			
S1.006	S0JT	5760 Winter	100	+40%			
S1.007	S03	15 Winter	100	+40%	100/15 Summer		
S2.000	S04	15 Winter	100	+40%	100/15 Summer	100/15 Winter	
S2.001	S05	15 Winter	100	+40%	100/15 Summer		
S2.002	S0JT	4320 Winter	100	+40%			
S2.003	S06	15 Winter	100	+40%	30/15 Summer		
S1.008	S07	5760 Winter	100	+40%	30/15 Summer		
S1.009	S08_Soakaway	5760 Winter	100	+40%	100/2880 Winter		

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S01		83.003	0.778	3.544	1.20		42.2	FLOOD
S1.001	S0JT		82.158	0.000	0.000	1.31		47.8	SURCHARGED*
S1.002	S0JT		82.091	0.000	0.000	1.55		56.5	SURCHARGED*
S1.003	S0JT		82.024	0.000	0.000	1.79		65.2	SURCHARGED*
S1.004	S02		82.916	0.959	0.000	1.20		82.0	FLOOD RISK
S1.005	S0JT		81.882	0.000	0.000	0.03		2.1	SURCHARGED*
S1.006	S0JT		81.807	0.000	0.000	0.03		2.6	SURCHARGED*
S1.007	S03		82.388	0.731	0.000	1.04		159.9	SURCHARGED
S2.000	S04		83.000	0.775	0.120	0.53		21.4	FLOOD
S2.001	S05		82.971	1.053	0.000	0.95		78.7	FLOOD RISK
S2.002	S0JT		81.692	0.000	0.000	0.03		2.5	SURCHARGED*
S2.003	S06		82.477	1.011	0.000	1.63		137.7	SURCHARGED
S1.008	S07		82.218	1.030	0.000	0.06		6.8	SURCHARGED
S1.009	S08_Soakaway		82.218	1.121	0.000	0.00		0.0	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S01	2
S1.001	S0JT	
S1.002	S0JT	
S1.003	S0JT	
S1.004	S02	
S1.005	S0JT	
S1.006	S0JT	
S1.007	S03	
S2.000	S04	1
S2.001	S05	
S2.002	S0JT	
S2.003	S06	
S1.008	S07	
S1.009	S08_Soakaway	

Summary of Results for 1 year Return Period

Half Drain Time : 220 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.052	0.052	0.3	3.3	O K
30 min Summer	0.066	0.066	0.4	5.4	O K
60 min Summer	0.078	0.078	0.5	7.5	O K
120 min Summer	0.087	0.087	0.5	9.3	O K
180 min Summer	0.091	0.091	0.5	10.1	O K
240 min Summer	0.093	0.093	0.5	10.6	O K
360 min Summer	0.095	0.095	0.6	11.2	O K
480 min Summer	0.097	0.097	0.6	11.5	O K
600 min Summer	0.097	0.097	0.6	11.6	O K
720 min Summer	0.097	0.097	0.6	11.6	O K
960 min Summer	0.096	0.096	0.6	11.3	O K
1440 min Summer	0.093	0.093	0.5	10.6	O K
2160 min Summer	0.087	0.087	0.5	9.3	O K
2880 min Summer	0.081	0.081	0.5	8.1	O K
4320 min Summer	0.071	0.071	0.4	6.2	O K
5760 min Summer	0.064	0.064	0.4	5.0	O K
7200 min Summer	0.058	0.058	0.3	4.1	O K
8640 min Summer	0.053	0.053	0.3	3.4	O K
10080 min Summer	0.050	0.050	0.3	3.0	O K
15 min Winter	0.058	0.058	0.3	4.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	31.093	0.0	19
30 min Summer	20.252	0.0	33
60 min Summer	12.800	0.0	62
120 min Summer	7.926	0.0	120
180 min Summer	5.960	0.0	172
240 min Summer	4.862	0.0	198
360 min Summer	3.628	0.0	260
480 min Summer	2.939	0.0	328
600 min Summer	2.495	0.0	398
720 min Summer	2.183	0.0	464
960 min Summer	1.768	0.0	600
1440 min Summer	1.314	0.0	866
2160 min Summer	0.977	0.0	1252
2880 min Summer	0.791	0.0	1616
4320 min Summer	0.588	0.0	2336
5760 min Summer	0.476	0.0	3056
7200 min Summer	0.405	0.0	3752
8640 min Summer	0.354	0.0	4488
10080 min Summer	0.317	0.0	5144
15 min Winter	31.093	0.0	18

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.073	0.073	0.4	6.5	O K
60 min Winter	0.085	0.085	0.5	8.9	O K
120 min Winter	0.095	0.095	0.6	11.1	O K
180 min Winter	0.099	0.099	0.6	12.0	O K
240 min Winter	0.101	0.101	0.6	12.5	O K
360 min Winter	0.103	0.103	0.6	13.0	O K
480 min Winter	0.103	0.103	0.6	13.1	O K
600 min Winter	0.103	0.103	0.6	13.0	O K
720 min Winter	0.102	0.102	0.6	12.8	O K
960 min Winter	0.100	0.100	0.6	12.2	O K
1440 min Winter	0.094	0.094	0.5	10.8	O K
2160 min Winter	0.084	0.084	0.5	8.8	O K
2880 min Winter	0.076	0.076	0.4	7.1	O K
4320 min Winter	0.063	0.063	0.4	4.9	O K
5760 min Winter	0.054	0.054	0.3	3.6	O K
7200 min Winter	0.048	0.048	0.3	2.9	O K
8640 min Winter	0.045	0.045	0.2	2.5	O K
10080 min Winter	0.043	0.043	0.2	2.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	20.252	0.0	33
60 min Winter	12.800	0.0	62
120 min Winter	7.926	0.0	118
180 min Winter	5.960	0.0	174
240 min Winter	4.862	0.0	224
360 min Winter	3.628	0.0	278
480 min Winter	2.939	0.0	356
600 min Winter	2.495	0.0	432
720 min Winter	2.183	0.0	506
960 min Winter	1.768	0.0	646
1440 min Winter	1.314	0.0	922
2160 min Winter	0.977	0.0	1316
2880 min Winter	0.791	0.0	1676
4320 min Winter	0.588	0.0	2416
5760 min Winter	0.476	0.0	3112
7200 min Winter	0.405	0.0	3752
8640 min Winter	0.354	0.0	4416
10080 min Winter	0.317	0.0	5240

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.130

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.130

Model Details

Storage is Online Cover Level (m) 0.450

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	82.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	227.8	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Cap Volume Depth (m)	0.350

Summary of Results for 30 year Return Period

Half Drain Time : 567 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.107	0.107	0.6	14.1	O K
30 min Summer	0.129	0.129	0.6	19.4	O K
60 min Summer	0.150	0.150	0.6	24.5	O K
120 min Summer	0.169	0.169	0.6	29.3	Flood Risk
180 min Summer	0.178	0.178	0.6	31.6	Flood Risk
240 min Summer	0.184	0.184	0.6	32.8	Flood Risk
360 min Summer	0.188	0.188	0.6	33.9	Flood Risk
480 min Summer	0.188	0.188	0.6	34.0	Flood Risk
600 min Summer	0.188	0.188	0.6	33.9	Flood Risk
720 min Summer	0.187	0.187	0.6	33.7	Flood Risk
960 min Summer	0.184	0.184	0.6	33.0	Flood Risk
1440 min Summer	0.176	0.176	0.6	31.1	Flood Risk
2160 min Summer	0.163	0.163	0.6	27.7	Flood Risk
2880 min Summer	0.149	0.149	0.6	24.4	O K
4320 min Summer	0.126	0.126	0.6	18.6	O K
5760 min Summer	0.108	0.108	0.6	14.2	O K
7200 min Summer	0.096	0.096	0.6	11.4	O K
8640 min Summer	0.088	0.088	0.5	9.6	O K
10080 min Summer	0.081	0.081	0.5	8.1	O K
15 min Winter	0.116	0.116	0.6	16.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	19
30 min Summer	49.584	0.0	33
60 min Summer	30.811	0.0	64
120 min Summer	18.584	0.0	122
180 min Summer	13.680	0.0	182
240 min Summer	10.960	0.0	242
360 min Summer	8.001	0.0	360
480 min Summer	6.397	0.0	448
600 min Summer	5.375	0.0	502
720 min Summer	4.661	0.0	562
960 min Summer	3.719	0.0	686
1440 min Summer	2.704	0.0	964
2160 min Summer	1.963	0.0	1364
2880 min Summer	1.563	0.0	1760
4320 min Summer	1.133	0.0	2508
5760 min Summer	0.901	0.0	3176
7200 min Summer	0.754	0.0	3888
8640 min Summer	0.652	0.0	4584
10080 min Summer	0.576	0.0	5344
15 min Winter	76.290	0.0	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.140	0.140	0.6	22.2	O K
60 min Winter	0.164	0.164	0.6	28.1	Flood Risk
120 min Winter	0.186	0.186	0.6	33.5	Flood Risk
180 min Winter	0.197	0.197	0.6	36.3	Flood Risk
240 min Winter	0.204	0.204	0.6	37.8	Flood Risk
360 min Winter	0.210	0.210	0.6	39.3	Flood Risk
480 min Winter	0.211	0.211	0.6	39.7	Flood Risk
600 min Winter	0.211	0.211	0.6	39.5	Flood Risk
720 min Winter	0.208	0.208	0.6	38.9	Flood Risk
960 min Winter	0.204	0.204	0.6	37.9	Flood Risk
1440 min Winter	0.192	0.192	0.6	35.0	Flood Risk
2160 min Winter	0.171	0.171	0.6	29.8	Flood Risk
2880 min Winter	0.151	0.151	0.6	24.7	Flood Risk
4320 min Winter	0.116	0.116	0.6	16.2	O K
5760 min Winter	0.096	0.096	0.6	11.3	O K
7200 min Winter	0.084	0.084	0.5	8.7	O K
8640 min Winter	0.074	0.074	0.4	6.8	O K
10080 min Winter	0.067	0.067	0.4	5.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	33
60 min Winter	30.811	0.0	62
120 min Winter	18.584	0.0	120
180 min Winter	13.680	0.0	178
240 min Winter	10.960	0.0	236
360 min Winter	8.001	0.0	350
480 min Winter	6.397	0.0	460
600 min Winter	5.375	0.0	566
720 min Winter	4.661	0.0	656
960 min Winter	3.719	0.0	742
1440 min Winter	2.704	0.0	1050
2160 min Winter	1.963	0.0	1476
2880 min Winter	1.563	0.0	1876
4320 min Winter	1.133	0.0	2596
5760 min Winter	0.901	0.0	3240
7200 min Winter	0.754	0.0	3968
8640 min Winter	0.652	0.0	4672
10080 min Winter	0.576	0.0	5352

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.130

Time From:	(mins) To:	Area (ha)
0	4	0.130

Model Details

Storage is Online Cover Level (m) 0.450

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	82.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	227.8	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Cap Volume Depth (m)	0.350

Summary of Results for 100 year Return Period

Half Drain Time : 803 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.130	0.130	0.6	19.6	O K
30 min Summer	0.159	0.159	0.6	26.8	Flood Risk
60 min Summer	0.188	0.188	0.6	33.9	Flood Risk
120 min Summer	0.215	0.215	0.6	40.5	Flood Risk
180 min Summer	0.228	0.228	0.6	43.7	Flood Risk
240 min Summer	0.235	0.235	0.6	45.5	Flood Risk
360 min Summer	0.242	0.242	0.6	47.2	Flood Risk
480 min Summer	0.244	0.244	0.6	47.8	Flood Risk
600 min Summer	0.243	0.243	0.6	47.6	Flood Risk
720 min Summer	0.242	0.242	0.6	47.1	Flood Risk
960 min Summer	0.238	0.238	0.6	46.1	Flood Risk
1440 min Summer	0.228	0.228	0.6	43.7	Flood Risk
2160 min Summer	0.211	0.211	0.6	39.7	Flood Risk
2880 min Summer	0.195	0.195	0.6	35.6	Flood Risk
4320 min Summer	0.165	0.165	0.6	28.3	Flood Risk
5760 min Summer	0.140	0.140	0.6	22.2	O K
7200 min Summer	0.121	0.121	0.6	17.4	O K
8640 min Summer	0.106	0.106	0.6	13.8	O K
10080 min Summer	0.097	0.097	0.6	11.5	O K
15 min Winter	0.142	0.142	0.6	22.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	19
30 min Summer	64.904	0.0	34
60 min Summer	40.510	0.0	64
120 min Summer	24.421	0.0	122
180 min Summer	17.920	0.0	182
240 min Summer	14.300	0.0	242
360 min Summer	10.377	0.0	362
480 min Summer	8.265	0.0	480
600 min Summer	6.922	0.0	594
720 min Summer	5.986	0.0	640
960 min Summer	4.756	0.0	758
1440 min Summer	3.434	0.0	1010
2160 min Summer	2.475	0.0	1408
2880 min Summer	1.960	0.0	1816
4320 min Summer	1.409	0.0	2592
5760 min Summer	1.114	0.0	3344
7200 min Summer	0.927	0.0	4032
8640 min Summer	0.798	0.0	4672
10080 min Summer	0.703	0.0	5344
15 min Winter	99.025	0.0	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.174	0.174	0.6	30.6	Flood Risk
60 min Winter	0.207	0.207	0.6	38.6	Flood Risk
120 min Winter	0.237	0.237	0.6	46.1	Flood Risk
180 min Winter	0.253	0.253	0.6	49.9	Flood Risk
240 min Winter	0.261	0.261	0.6	52.0	Flood Risk
360 min Winter	0.271	0.271	0.6	54.3	Flood Risk
480 min Winter	0.274	0.274	0.6	55.2	Flood Risk
600 min Winter	0.275	0.275	0.6	55.4	Flood Risk
720 min Winter	0.274	0.274	0.6	55.0	Flood Risk
960 min Winter	0.267	0.267	0.6	53.5	Flood Risk
1440 min Winter	0.254	0.254	0.6	50.2	Flood Risk
2160 min Winter	0.230	0.230	0.6	44.4	Flood Risk
2880 min Winter	0.206	0.206	0.6	38.3	Flood Risk
4320 min Winter	0.161	0.161	0.6	27.3	Flood Risk
5760 min Winter	0.126	0.126	0.6	18.6	O K
7200 min Winter	0.102	0.102	0.6	12.7	O K
8640 min Winter	0.090	0.090	0.5	10.0	O K
10080 min Winter	0.081	0.081	0.5	8.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	64.904	0.0	33
60 min Winter	40.510	0.0	62
120 min Winter	24.421	0.0	122
180 min Winter	17.920	0.0	180
240 min Winter	14.300	0.0	238
360 min Winter	10.377	0.0	354
480 min Winter	8.265	0.0	468
600 min Winter	6.922	0.0	578
720 min Winter	5.986	0.0	686
960 min Winter	4.756	0.0	884
1440 min Winter	3.434	0.0	1096
2160 min Winter	2.475	0.0	1540
2880 min Winter	1.960	0.0	1964
4320 min Winter	1.409	0.0	2768
5760 min Winter	1.114	0.0	3464
7200 min Winter	0.927	0.0	4040
8640 min Winter	0.798	0.0	4752
10080 min Winter	0.703	0.0	5440

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.130

Time From:	(mins) To:	Area (ha)
0	4	0.130

Model Details

Storage is Online Cover Level (m) 0.450

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	82.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	227.8	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Cap Volume Depth (m)	0.350

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1213 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.169	0.169	0.6	29.3	Flood Risk
30 min Summer	0.210	0.210	0.6	39.4	Flood Risk
60 min Summer	0.252	0.252	0.6	49.6	Flood Risk
120 min Summer	0.291	0.291	0.6	59.3	Flood Risk
180 min Summer	0.311	0.311	0.6	64.3	Flood Risk
240 min Summer	0.324	0.324	0.6	67.3	Flood Risk
360 min Summer	0.338	0.338	0.6	70.7	Flood Risk
480 min Summer	0.345	0.345	0.6	72.5	Flood Risk
600 min Summer	0.348	0.348	0.6	73.3	Flood Risk
720 min Summer	0.348	0.348	0.6	73.4	Flood Risk
960 min Summer	0.344	0.344	0.6	72.4	Flood Risk
1440 min Summer	0.333	0.333	0.6	69.5	Flood Risk
2160 min Summer	0.314	0.314	0.6	65.0	Flood Risk
2880 min Summer	0.295	0.295	0.6	60.3	Flood Risk
4320 min Summer	0.260	0.260	0.6	51.6	Flood Risk
5760 min Summer	0.228	0.228	0.6	43.7	Flood Risk
7200 min Summer	0.199	0.199	0.6	36.7	Flood Risk
8640 min Summer	0.174	0.174	0.6	30.6	Flood Risk
10080 min Summer	0.153	0.153	0.6	25.3	Flood Risk
15 min Winter	0.185	0.185	0.6	33.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	19
30 min Summer	90.866	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	34.190	0.0	124
180 min Summer	25.088	0.0	182
240 min Summer	20.020	0.0	242
360 min Summer	14.528	0.0	362
480 min Summer	11.570	0.0	482
600 min Summer	9.690	0.0	602
720 min Summer	8.380	0.0	720
960 min Summer	6.658	0.0	916
1440 min Summer	4.807	0.0	1140
2160 min Summer	3.465	0.0	1516
2880 min Summer	2.744	0.0	1928
4320 min Summer	1.973	0.0	2724
5760 min Summer	1.559	0.0	3512
7200 min Summer	1.298	0.0	4256
8640 min Summer	1.118	0.0	5008
10080 min Summer	0.985	0.0	5656
15 min Winter	138.634	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.232	0.232	0.6	44.7	Flood Risk
60 min Winter	0.278	0.278	0.6	56.1	Flood Risk
120 min Winter	0.323	0.323	0.6	67.2	Flood Risk
180 min Winter	0.347	0.347	0.6	73.0	Flood Risk
240 min Winter	0.362	0.362	0.6	76.5	Flood Risk
360 min Winter	0.384	0.384	0.6	80.8	Flood Risk
480 min Winter	0.401	0.401	0.6	83.2	Flood Risk
600 min Winter	0.412	0.412	0.6	84.4	Flood Risk
720 min Winter	0.418	0.418	0.6	84.9	Flood Risk
960 min Winter	0.414	0.414	0.6	84.6	Flood Risk
1440 min Winter	0.385	0.385	0.6	81.0	Flood Risk
2160 min Winter	0.355	0.355	0.6	75.0	Flood Risk
2880 min Winter	0.329	0.329	0.6	68.5	Flood Risk
4320 min Winter	0.276	0.276	0.6	55.6	Flood Risk
5760 min Winter	0.228	0.228	0.6	43.7	Flood Risk
7200 min Winter	0.186	0.186	0.6	33.3	Flood Risk
8640 min Winter	0.150	0.150	0.6	24.6	O K
10080 min Winter	0.122	0.122	0.6	17.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	33
60 min Winter	56.713	0.0	62
120 min Winter	34.190	0.0	122
180 min Winter	25.088	0.0	180
240 min Winter	20.020	0.0	240
360 min Winter	14.528	0.0	356
480 min Winter	11.570	0.0	472
600 min Winter	9.690	0.0	586
720 min Winter	8.380	0.0	700
960 min Winter	6.658	0.0	924
1440 min Winter	4.807	0.0	1326
2160 min Winter	3.465	0.0	1644
2880 min Winter	2.744	0.0	2104
4320 min Winter	1.973	0.0	2980
5760 min Winter	1.559	0.0	3752
7200 min Winter	1.298	0.0	4536
8640 min Winter	1.118	0.0	5192
10080 min Winter	0.985	0.0	5840

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.130

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.130

Model Details

Storage is Online Cover Level (m) 0.450

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	82.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	227.8	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Cap Volume Depth (m)	0.350

Summary of Results for 1 year Return Period

Half Drain Time : 324 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.044	0.044	0.3	3.2	O K
30 min Summer	0.076	0.076	0.6	9.7	O K
60 min Summer	0.100	0.100	0.8	16.5	O K
120 min Summer	0.119	0.119	0.9	23.3	Flood Risk
180 min Summer	0.127	0.127	1.0	26.8	Flood Risk
240 min Summer	0.132	0.132	1.0	28.9	Flood Risk
360 min Summer	0.137	0.137	1.1	30.9	Flood Risk
480 min Summer	0.139	0.139	1.1	32.2	Flood Risk
600 min Summer	0.141	0.141	1.1	33.0	Flood Risk
720 min Summer	0.142	0.142	1.1	33.6	Flood Risk
960 min Summer	0.143	0.143	1.1	34.0	Flood Risk
1440 min Summer	0.142	0.142	1.1	33.6	Flood Risk
2160 min Summer	0.138	0.138	1.1	31.5	Flood Risk
2880 min Summer	0.132	0.132	1.0	28.9	Flood Risk
4320 min Summer	0.120	0.120	1.0	23.9	Flood Risk
5760 min Summer	0.109	0.109	0.9	19.9	Flood Risk
7200 min Summer	0.101	0.101	0.8	16.8	Flood Risk
8640 min Summer	0.093	0.093	0.7	14.3	O K
10080 min Summer	0.086	0.086	0.7	12.4	O K
15 min Winter	0.060	0.060	0.5	5.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	31.093	0.0	19
30 min Summer	20.252	0.0	34
60 min Summer	12.800	0.0	64
120 min Summer	7.926	0.0	122
180 min Summer	5.960	0.0	182
240 min Summer	4.862	0.0	240
360 min Summer	3.628	0.0	308
480 min Summer	2.939	0.0	368
600 min Summer	2.495	0.0	432
720 min Summer	2.183	0.0	498
960 min Summer	1.768	0.0	636
1440 min Summer	1.314	0.0	910
2160 min Summer	0.977	0.0	1300
2880 min Summer	0.791	0.0	1700
4320 min Summer	0.588	0.0	2460
5760 min Summer	0.476	0.0	3176
7200 min Summer	0.405	0.0	3896
8640 min Summer	0.354	0.0	4664
10080 min Summer	0.317	0.0	5344
15 min Winter	31.093	0.0	19

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.089	0.089	0.7	13.2	O K
60 min Winter	0.113	0.113	0.9	21.0	Flood Risk
120 min Winter	0.132	0.132	1.0	28.7	Flood Risk
180 min Winter	0.141	0.141	1.1	32.8	Flood Risk
240 min Winter	0.146	0.146	1.2	35.3	Flood Risk
360 min Winter	0.151	0.151	1.2	37.6	Flood Risk
480 min Winter	0.153	0.153	1.2	38.5	Flood Risk
600 min Winter	0.154	0.154	1.2	39.2	Flood Risk
720 min Winter	0.154	0.154	1.2	39.5	Flood Risk
960 min Winter	0.154	0.154	1.2	39.3	Flood Risk
1440 min Winter	0.150	0.150	1.2	37.2	Flood Risk
2160 min Winter	0.141	0.141	1.1	33.1	Flood Risk
2880 min Winter	0.132	0.132	1.0	28.9	Flood Risk
4320 min Winter	0.115	0.115	0.9	21.9	Flood Risk
5760 min Winter	0.101	0.101	0.8	16.8	Flood Risk
7200 min Winter	0.089	0.089	0.7	13.0	O K
8640 min Winter	0.079	0.079	0.6	10.3	O K
10080 min Winter	0.071	0.071	0.6	8.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	20.252	0.0	33
60 min Winter	12.800	0.0	62
120 min Winter	7.926	0.0	120
180 min Winter	5.960	0.0	176
240 min Winter	4.862	0.0	232
360 min Winter	3.628	0.0	338
480 min Winter	2.939	0.0	382
600 min Winter	2.495	0.0	458
720 min Winter	2.183	0.0	534
960 min Winter	1.768	0.0	684
1440 min Winter	1.314	0.0	980
2160 min Winter	0.977	0.0	1388
2880 min Winter	0.791	0.0	1788
4320 min Winter	0.588	0.0	2552
5760 min Winter	0.476	0.0	3288
7200 min Winter	0.405	0.0	3968
8640 min Winter	0.354	0.0	4680
10080 min Winter	0.317	0.0	5440

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.395

Time From:	(mins) To:	Area (ha)
0	4	0.395

Model Details

Storage is Online Cover Level (m) 0.400

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	138.1
Membrane Percolation (mm/hr)	1000	Length (m)	28.4
Max Percolation (l/s)	1089.5	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Membrane Depth (m)	100

Summary of Results for 30 year Return Period

Half Drain Time : 546 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.148	0.148	1.2	36.1	Flood Risk
30 min Summer	0.177	0.177	1.4	52.2	Flood Risk
60 min Summer	0.203	0.203	1.6	68.1	Flood Risk
120 min Summer	0.224	0.224	1.8	82.9	Flood Risk
180 min Summer	0.233	0.233	1.8	90.0	Flood Risk
240 min Summer	0.238	0.238	1.9	93.9	Flood Risk
360 min Summer	0.242	0.242	1.9	97.2	Flood Risk
480 min Summer	0.243	0.243	1.9	98.3	Flood Risk
600 min Summer	0.244	0.244	1.9	98.8	Flood Risk
720 min Summer	0.244	0.244	1.9	99.0	Flood Risk
960 min Summer	0.244	0.244	1.9	98.6	Flood Risk
1440 min Summer	0.240	0.240	1.9	95.7	Flood Risk
2160 min Summer	0.232	0.232	1.8	89.3	Flood Risk
2880 min Summer	0.223	0.223	1.8	82.3	Flood Risk
4320 min Summer	0.205	0.205	1.6	69.6	Flood Risk
5760 min Summer	0.189	0.189	1.5	59.2	Flood Risk
7200 min Summer	0.175	0.175	1.4	50.8	Flood Risk
8640 min Summer	0.163	0.163	1.3	43.9	Flood Risk
10080 min Summer	0.152	0.152	1.2	38.3	Flood Risk
15 min Winter	0.161	0.161	1.3	42.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	19
30 min Summer	49.584	0.0	34
60 min Summer	30.811	0.0	64
120 min Summer	18.584	0.0	122
180 min Summer	13.680	0.0	182
240 min Summer	10.960	0.0	242
360 min Summer	8.001	0.0	360
480 min Summer	6.397	0.0	416
600 min Summer	5.375	0.0	476
720 min Summer	4.661	0.0	540
960 min Summer	3.719	0.0	672
1440 min Summer	2.704	0.0	940
2160 min Summer	1.963	0.0	1360
2880 min Summer	1.563	0.0	1756
4320 min Summer	1.133	0.0	2512
5760 min Summer	0.901	0.0	3288
7200 min Summer	0.754	0.0	4032
8640 min Summer	0.652	0.0	4752
10080 min Summer	0.576	0.0	5448
15 min Winter	76.290	0.0	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.192	0.192	1.5	60.9	Flood Risk
60 min Winter	0.218	0.218	1.7	78.8	Flood Risk
120 min Winter	0.240	0.240	1.9	95.6	Flood Risk
180 min Winter	0.250	0.250	2.0	103.8	Flood Risk
240 min Winter	0.256	0.256	2.0	108.5	Flood Risk
360 min Winter	0.261	0.261	2.1	112.9	Flood Risk
480 min Winter	0.262	0.262	2.1	114.1	Flood Risk
600 min Winter	0.262	0.262	2.1	113.8	Flood Risk
720 min Winter	0.262	0.262	2.1	113.7	Flood Risk
960 min Winter	0.260	0.260	2.1	112.3	Flood Risk
1440 min Winter	0.254	0.254	2.0	106.7	Flood Risk
2160 min Winter	0.241	0.241	1.9	96.1	Flood Risk
2880 min Winter	0.227	0.227	1.8	85.7	Flood Risk
4320 min Winter	0.202	0.202	1.6	67.7	Flood Risk
5760 min Winter	0.180	0.180	1.4	54.0	Flood Risk
7200 min Winter	0.162	0.162	1.3	43.5	Flood Risk
8640 min Winter	0.146	0.146	1.2	35.6	Flood Risk
10080 min Winter	0.133	0.133	1.1	29.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	33
60 min Winter	30.811	0.0	62
120 min Winter	18.584	0.0	120
180 min Winter	13.680	0.0	178
240 min Winter	10.960	0.0	236
360 min Winter	8.001	0.0	348
480 min Winter	6.397	0.0	454
600 min Winter	5.375	0.0	506
720 min Winter	4.661	0.0	566
960 min Winter	3.719	0.0	720
1440 min Winter	2.704	0.0	1024
2160 min Winter	1.963	0.0	1452
2880 min Winter	1.563	0.0	1872
4320 min Winter	1.133	0.0	2676
5760 min Winter	0.901	0.0	3408
7200 min Winter	0.754	0.0	4176
8640 min Winter	0.652	0.0	4920
10080 min Winter	0.576	0.0	5640

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.395

Time From:	(mins) To:	Area (ha)
0	4	0.395

Model Details

Storage is Online Cover Level (m) 0.400

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	138.1
Membrane Percolation (mm/hr)	1000	Length (m)	28.4
Max Percolation (l/s)	1089.5	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Membrane Depth (m)	100

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 805 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.222	0.222	1.8	81.9	Flood Risk
30 min Summer	0.261	0.261	2.1	112.5	Flood Risk
60 min Summer	0.294	0.294	2.3	143.1	Flood Risk
120 min Summer	0.323	0.323	2.6	171.6	Flood Risk
180 min Summer	0.337	0.337	2.7	185.7	Flood Risk
240 min Summer	0.345	0.345	2.7	193.5	Flood Risk
360 min Summer	0.352	0.352	2.8	201.2	Flood Risk
480 min Summer	0.355	0.355	2.8	203.7	Flood Risk
600 min Summer	0.355	0.355	2.8	203.8	Flood Risk
720 min Summer	0.355	0.355	2.8	203.6	Flood Risk
960 min Summer	0.353	0.353	2.8	202.3	Flood Risk
1440 min Summer	0.348	0.348	2.8	197.2	Flood Risk
2160 min Summer	0.337	0.337	2.7	186.4	Flood Risk
2880 min Summer	0.325	0.325	2.6	174.5	Flood Risk
4320 min Summer	0.303	0.303	2.4	152.0	Flood Risk
5760 min Summer	0.283	0.283	2.2	132.8	Flood Risk
7200 min Summer	0.266	0.266	2.1	116.9	Flood Risk
8640 min Summer	0.250	0.250	2.0	103.5	Flood Risk
10080 min Summer	0.236	0.236	1.9	92.3	Flood Risk
15 min Winter	0.238	0.238	1.9	94.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	19
30 min Summer	90.866	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	34.190	0.0	122
180 min Summer	25.088	0.0	182
240 min Summer	20.020	0.0	242
360 min Summer	14.528	0.0	360
480 min Summer	11.570	0.0	480
600 min Summer	9.690	0.0	546
720 min Summer	8.380	0.0	600
960 min Summer	6.658	0.0	722
1440 min Summer	4.807	0.0	982
2160 min Summer	3.465	0.0	1404
2880 min Summer	2.744	0.0	1816
4320 min Summer	1.973	0.0	2596
5760 min Summer	1.559	0.0	3400
7200 min Summer	1.298	0.0	4112
8640 min Summer	1.118	0.0	4848
10080 min Summer	0.985	0.0	5640
15 min Winter	138.634	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.278	0.278	2.2	128.5	Flood Risk
60 min Winter	0.314	0.314	2.5	163.0	Flood Risk
120 min Winter	0.346	0.346	2.7	195.2	Flood Risk
180 min Winter	0.363	0.363	2.8	211.4	Flood Risk
240 min Winter	0.372	0.372	2.8	220.7	Flood Risk
360 min Winter	0.383	0.383	2.8	230.9	Flood Risk
480 min Winter	0.389	0.389	2.8	235.5	Flood Risk
600 min Winter	0.390	0.390	2.8	236.7	Flood Risk
720 min Winter	0.389	0.389	2.8	235.9	Flood Risk
960 min Winter	0.385	0.385	2.8	232.1	Flood Risk
1440 min Winter	0.375	0.375	2.8	223.4	Flood Risk
2160 min Winter	0.357	0.357	2.8	205.8	Flood Risk
2880 min Winter	0.339	0.339	2.7	188.2	Flood Risk
4320 min Winter	0.307	0.307	2.4	156.5	Flood Risk
5760 min Winter	0.280	0.280	2.2	130.4	Flood Risk
7200 min Winter	0.257	0.257	2.0	109.5	Flood Risk
8640 min Winter	0.237	0.237	1.9	92.7	Flood Risk
10080 min Winter	0.218	0.218	1.7	79.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	33
60 min Winter	56.713	0.0	62
120 min Winter	34.190	0.0	120
180 min Winter	25.088	0.0	180
240 min Winter	20.020	0.0	238
360 min Winter	14.528	0.0	352
480 min Winter	11.570	0.0	464
600 min Winter	9.690	0.0	574
720 min Winter	8.380	0.0	678
960 min Winter	6.658	0.0	770
1440 min Winter	4.807	0.0	1068
2160 min Winter	3.465	0.0	1512
2880 min Winter	2.744	0.0	1956
4320 min Winter	1.973	0.0	2768
5760 min Winter	1.559	0.0	3576
7200 min Winter	1.298	0.0	4328
8640 min Winter	1.118	0.0	5096
10080 min Winter	0.985	0.0	5848

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.395

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.395

Model Details

Storage is Online Cover Level (m) 0.400

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	138.1
Membrane Percolation (mm/hr)	1000	Length (m)	28.4
Max Percolation (l/s)	1089.5	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Membrane Depth (m)	100

Summary of Results for 100 year Return Period

Half Drain Time : 649 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
15 min Summer	0.179	0.179	1.4	52.8	Flood Risk
30 min Summer	0.212	0.212	1.7	74.6	Flood Risk
60 min Summer	0.241	0.241	1.9	96.2	Flood Risk
120 min Summer	0.265	0.265	2.1	115.9	Flood Risk
180 min Summer	0.275	0.275	2.2	125.4	Flood Risk
240 min Summer	0.280	0.280	2.2	130.4	Flood Risk
360 min Summer	0.285	0.285	2.3	134.7	Flood Risk
480 min Summer	0.286	0.286	2.3	135.6	Flood Risk
600 min Summer	0.286	0.286	2.3	135.8	Flood Risk
720 min Summer	0.286	0.286	2.3	135.6	Flood Risk
960 min Summer	0.285	0.285	2.3	134.5	Flood Risk
1440 min Summer	0.280	0.280	2.2	130.1	Flood Risk
2160 min Summer	0.271	0.271	2.1	121.3	Flood Risk
2880 min Summer	0.260	0.260	2.1	112.1	Flood Risk
4320 min Summer	0.240	0.240	1.9	95.3	Flood Risk
5760 min Summer	0.222	0.222	1.8	81.4	Flood Risk
7200 min Summer	0.206	0.206	1.6	70.3	Flood Risk
8640 min Summer	0.192	0.192	1.5	61.1	Flood Risk
10080 min Summer	0.180	0.180	1.4	53.6	Flood Risk
15 min Winter	0.193	0.193	1.5	61.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Time-Peak (mins)
15 min Summer	99.025	0.0	19
30 min Summer	64.904	0.0	34
60 min Summer	40.510	0.0	64
120 min Summer	24.421	0.0	122
180 min Summer	17.920	0.0	182
240 min Summer	14.300	0.0	242
360 min Summer	10.377	0.0	360
480 min Summer	8.265	0.0	450
600 min Summer	6.922	0.0	502
720 min Summer	5.986	0.0	562
960 min Summer	4.756	0.0	690
1440 min Summer	3.434	0.0	964
2160 min Summer	2.475	0.0	1364
2880 min Summer	1.960	0.0	1784
4320 min Summer	1.409	0.0	2552
5760 min Summer	1.114	0.0	3336
7200 min Summer	0.927	0.0	4040
8640 min Summer	0.798	0.0	4760
10080 min Summer	0.703	0.0	5544
15 min Winter	99.025	0.0	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.228	0.228	1.8	86.0	Flood Risk
60 min Winter	0.258	0.258	2.0	110.3	Flood Risk
120 min Winter	0.283	0.283	2.2	132.7	Flood Risk
180 min Winter	0.294	0.294	2.3	143.6	Flood Risk
240 min Winter	0.300	0.300	2.4	149.5	Flood Risk
360 min Winter	0.306	0.306	2.4	155.2	Flood Risk
480 min Winter	0.308	0.308	2.4	157.0	Flood Risk
600 min Winter	0.307	0.307	2.4	156.6	Flood Risk
720 min Winter	0.306	0.306	2.4	155.4	Flood Risk
960 min Winter	0.304	0.304	2.4	153.3	Flood Risk
1440 min Winter	0.297	0.297	2.3	145.9	Flood Risk
2160 min Winter	0.282	0.282	2.2	132.2	Flood Risk
2880 min Winter	0.267	0.267	2.1	118.6	Flood Risk
4320 min Winter	0.239	0.239	1.9	95.0	Flood Risk
5760 min Winter	0.215	0.215	1.7	76.7	Flood Risk
7200 min Winter	0.194	0.194	1.5	62.6	Flood Risk
8640 min Winter	0.176	0.176	1.4	51.6	Flood Risk
10080 min Winter	0.161	0.161	1.3	43.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	64.904	0.0	33
60 min Winter	40.510	0.0	62
120 min Winter	24.421	0.0	120
180 min Winter	17.920	0.0	178
240 min Winter	14.300	0.0	236
360 min Winter	10.377	0.0	350
480 min Winter	8.265	0.0	458
600 min Winter	6.922	0.0	560
720 min Winter	5.986	0.0	586
960 min Winter	4.756	0.0	732
1440 min Winter	3.434	0.0	1038
2160 min Winter	2.475	0.0	1476
2880 min Winter	1.960	0.0	1904
4320 min Winter	1.409	0.0	2720
5760 min Winter	1.114	0.0	3464
7200 min Winter	0.927	0.0	4248
8640 min Winter	0.798	0.0	4936
10080 min Winter	0.703	0.0	5656

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.395

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.395

Model Details

Storage is Online Cover Level (m) 0.400

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	138.1
Membrane Percolation (mm/hr)	1000	Length (m)	28.4
Max Percolation (l/s)	1089.5	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Membrane Depth (m)	100

Summary of Results for 1 year Return Period

Half Drain Time : 264 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.064	0.064	0.1	1.7	O K
30 min Summer	0.081	0.081	0.2	2.8	O K
60 min Summer	0.095	0.095	0.2	3.9	O K
120 min Summer	0.107	0.107	0.2	4.9	O K
180 min Summer	0.112	0.112	0.2	5.3	O K
240 min Summer	0.115	0.115	0.2	5.6	O K
360 min Summer	0.118	0.118	0.2	5.9	O K
480 min Summer	0.119	0.119	0.2	6.1	O K
600 min Summer	0.120	0.120	0.2	6.1	O K
720 min Summer	0.120	0.120	0.2	6.2	O K
960 min Summer	0.120	0.120	0.2	6.1	O K
1440 min Summer	0.117	0.117	0.2	5.8	O K
2160 min Summer	0.111	0.111	0.2	5.2	O K
2880 min Summer	0.105	0.105	0.2	4.7	O K
4320 min Summer	0.093	0.093	0.2	3.7	O K
5760 min Summer	0.084	0.084	0.2	3.0	O K
7200 min Summer	0.077	0.077	0.2	2.5	O K
8640 min Summer	0.070	0.070	0.1	2.1	O K
10080 min Summer	0.065	0.065	0.1	1.8	O K
15 min Winter	0.071	0.071	0.1	2.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	31.093	0.0	19
30 min Summer	20.252	0.0	33
60 min Summer	12.800	0.0	62
120 min Summer	7.926	0.0	122
180 min Summer	5.960	0.0	180
240 min Summer	4.862	0.0	216
360 min Summer	3.628	0.0	276
480 min Summer	2.939	0.0	340
600 min Summer	2.495	0.0	410
720 min Summer	2.183	0.0	478
960 min Summer	1.768	0.0	616
1440 min Summer	1.314	0.0	882
2160 min Summer	0.977	0.0	1276
2880 min Summer	0.791	0.0	1648
4320 min Summer	0.588	0.0	2380
5760 min Summer	0.476	0.0	3112
7200 min Summer	0.405	0.0	3824
8640 min Summer	0.354	0.0	4576
10080 min Summer	0.317	0.0	5248
15 min Winter	31.093	0.0	18

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.089	0.089	0.2	3.4	O K
60 min Winter	0.104	0.104	0.2	4.6	O K
120 min Winter	0.116	0.116	0.2	5.7	O K
180 min Winter	0.122	0.122	0.2	6.3	O K
240 min Winter	0.124	0.124	0.3	6.6	O K
360 min Winter	0.127	0.127	0.3	6.8	O K
480 min Winter	0.128	0.128	0.3	7.0	O K
600 min Winter	0.128	0.128	0.3	7.0	O K
720 min Winter	0.127	0.127	0.3	6.9	O K
960 min Winter	0.125	0.125	0.3	6.7	O K
1440 min Winter	0.120	0.120	0.2	6.1	O K
2160 min Winter	0.110	0.110	0.2	5.2	O K
2880 min Winter	0.101	0.101	0.2	4.3	O K
4320 min Winter	0.085	0.085	0.2	3.1	O K
5760 min Winter	0.073	0.073	0.1	2.3	O K
7200 min Winter	0.064	0.064	0.1	1.8	O K
8640 min Winter	0.057	0.057	0.1	1.4	O K
10080 min Winter	0.052	0.052	0.1	1.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	20.252	0.0	33
60 min Winter	12.800	0.0	62
120 min Winter	7.926	0.0	118
180 min Winter	5.960	0.0	174
240 min Winter	4.862	0.0	228
360 min Winter	3.628	0.0	288
480 min Winter	2.939	0.0	364
600 min Winter	2.495	0.0	440
720 min Winter	2.183	0.0	516
960 min Winter	1.768	0.0	664
1440 min Winter	1.314	0.0	950
2160 min Winter	0.977	0.0	1344
2880 min Winter	0.791	0.0	1732
4320 min Winter	0.588	0.0	2464
5760 min Winter	0.476	0.0	3176
7200 min Winter	0.405	0.0	3896
8640 min Winter	0.354	0.0	4584
10080 min Winter	0.317	0.0	5240

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.065

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.065

Model Details

Storage is Online Cover Level (m) 0.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	28.4
Membrane Percolation (mm/hr)	1000	Length (m)	14.0
Max Percolation (l/s)	110.4	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Cap Volume Depth (m)	0.400

Summary of Results for 30 year Return Period

Half Drain Time : 592 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.130	0.130	0.3	7.1	O K
30 min Summer	0.152	0.152	0.3	9.8	O K
60 min Summer	0.174	0.174	0.3	12.4	O K
120 min Summer	0.194	0.194	0.3	14.8	O K
180 min Summer	0.204	0.204	0.3	16.0	Flood Risk
240 min Summer	0.209	0.209	0.3	16.6	Flood Risk
360 min Summer	0.214	0.214	0.3	17.2	Flood Risk
480 min Summer	0.215	0.215	0.3	17.3	Flood Risk
600 min Summer	0.215	0.215	0.3	17.3	Flood Risk
720 min Summer	0.215	0.215	0.3	17.2	Flood Risk
960 min Summer	0.212	0.212	0.3	17.0	Flood Risk
1440 min Summer	0.205	0.205	0.3	16.2	Flood Risk
2160 min Summer	0.193	0.193	0.3	14.6	O K
2880 min Summer	0.180	0.180	0.3	13.1	O K
4320 min Summer	0.157	0.157	0.3	10.3	O K
5760 min Summer	0.140	0.140	0.3	8.3	O K
7200 min Summer	0.128	0.128	0.3	7.0	O K
8640 min Summer	0.118	0.118	0.2	6.0	O K
10080 min Summer	0.110	0.110	0.2	5.2	O K
15 min Winter	0.139	0.139	0.3	8.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	19
30 min Summer	49.584	0.0	33
60 min Summer	30.811	0.0	64
120 min Summer	18.584	0.0	122
180 min Summer	13.680	0.0	182
240 min Summer	10.960	0.0	242
360 min Summer	8.001	0.0	360
480 min Summer	6.397	0.0	458
600 min Summer	5.375	0.0	510
720 min Summer	4.661	0.0	570
960 min Summer	3.719	0.0	694
1440 min Summer	2.704	0.0	966
2160 min Summer	1.963	0.0	1364
2880 min Summer	1.563	0.0	1760
4320 min Summer	1.133	0.0	2508
5760 min Summer	0.901	0.0	3224
7200 min Summer	0.754	0.0	3960
8640 min Summer	0.652	0.0	4672
10080 min Summer	0.576	0.0	5352
15 min Winter	76.290	0.0	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.164	0.164	0.3	11.2	O K
60 min Winter	0.189	0.189	0.3	14.1	O K
120 min Winter	0.212	0.212	0.3	16.9	Flood Risk
180 min Winter	0.223	0.223	0.3	18.3	Flood Risk
240 min Winter	0.230	0.230	0.3	19.1	Flood Risk
360 min Winter	0.237	0.237	0.3	19.9	Flood Risk
480 min Winter	0.239	0.239	0.3	20.2	Flood Risk
600 min Winter	0.239	0.239	0.3	20.2	Flood Risk
720 min Winter	0.237	0.237	0.3	19.9	Flood Risk
960 min Winter	0.233	0.233	0.3	19.5	Flood Risk
1440 min Winter	0.223	0.223	0.3	18.2	Flood Risk
2160 min Winter	0.203	0.203	0.3	15.9	Flood Risk
2880 min Winter	0.183	0.183	0.3	13.5	O K
4320 min Winter	0.150	0.150	0.3	9.5	O K
5760 min Winter	0.130	0.130	0.3	7.2	O K
7200 min Winter	0.115	0.115	0.2	5.7	O K
8640 min Winter	0.103	0.103	0.2	4.6	O K
10080 min Winter	0.093	0.093	0.2	3.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	33
60 min Winter	30.811	0.0	62
120 min Winter	18.584	0.0	120
180 min Winter	13.680	0.0	178
240 min Winter	10.960	0.0	236
360 min Winter	8.001	0.0	350
480 min Winter	6.397	0.0	462
600 min Winter	5.375	0.0	568
720 min Winter	4.661	0.0	664
960 min Winter	3.719	0.0	750
1440 min Winter	2.704	0.0	1054
2160 min Winter	1.963	0.0	1492
2880 min Winter	1.563	0.0	1900
4320 min Winter	1.133	0.0	2636
5760 min Winter	0.901	0.0	3344
7200 min Winter	0.754	0.0	4040
8640 min Winter	0.652	0.0	4760
10080 min Winter	0.576	0.0	5456

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.065

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.065

Model Details

Storage is Online Cover Level (m) 0.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	28.4
Membrane Percolation (mm/hr)	1000	Length (m)	14.0
Max Percolation (l/s)	110.4	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Cap Volume Depth (m)	0.400

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1262 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.193	0.193	0.3	14.7	O K
30 min Summer	0.236	0.236	0.3	19.8	Flood Risk
60 min Summer	0.279	0.279	0.3	24.9	Flood Risk
120 min Summer	0.320	0.320	0.3	29.8	Flood Risk
180 min Summer	0.341	0.341	0.3	32.3	Flood Risk
240 min Summer	0.354	0.354	0.3	33.9	Flood Risk
360 min Summer	0.369	0.369	0.3	35.7	Flood Risk
480 min Summer	0.377	0.377	0.3	36.7	Flood Risk
600 min Summer	0.381	0.381	0.3	37.1	Flood Risk
720 min Summer	0.382	0.382	0.3	37.3	Flood Risk
960 min Summer	0.379	0.379	0.3	36.9	Flood Risk
1440 min Summer	0.369	0.369	0.3	35.6	Flood Risk
2160 min Summer	0.351	0.351	0.3	33.5	Flood Risk
2880 min Summer	0.333	0.333	0.3	31.4	Flood Risk
4320 min Summer	0.298	0.298	0.3	27.2	Flood Risk
5760 min Summer	0.266	0.266	0.3	23.4	Flood Risk
7200 min Summer	0.238	0.238	0.3	20.0	Flood Risk
8640 min Summer	0.213	0.213	0.3	17.0	Flood Risk
10080 min Summer	0.191	0.191	0.3	14.4	O K
15 min Winter	0.210	0.210	0.3	16.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	19
30 min Summer	90.866	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	34.190	0.0	124
180 min Summer	25.088	0.0	182
240 min Summer	20.020	0.0	242
360 min Summer	14.528	0.0	362
480 min Summer	11.570	0.0	482
600 min Summer	9.690	0.0	602
720 min Summer	8.380	0.0	720
960 min Summer	6.658	0.0	936
1440 min Summer	4.807	0.0	1152
2160 min Summer	3.465	0.0	1532
2880 min Summer	2.744	0.0	1932
4320 min Summer	1.973	0.0	2728
5760 min Summer	1.559	0.0	3520
7200 min Summer	1.298	0.0	4320
8640 min Summer	1.118	0.0	5016
10080 min Summer	0.985	0.0	5744
15 min Winter	138.634	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.258	0.258	0.3	22.4	Flood Risk
60 min Winter	0.306	0.306	0.3	28.2	Flood Risk
120 min Winter	0.353	0.353	0.3	33.7	Flood Risk
180 min Winter	0.378	0.378	0.3	36.7	Flood Risk
240 min Winter	0.393	0.393	0.3	38.5	Flood Risk
360 min Winter	0.411	0.411	0.3	40.7	Flood Risk
480 min Winter	0.424	0.424	0.3	42.0	Flood Risk
600 min Winter	0.431	0.431	0.3	42.7	Flood Risk
720 min Winter	0.435	0.435	0.3	43.0	Flood Risk
960 min Winter	0.434	0.434	0.3	43.0	Flood Risk
1440 min Winter	0.419	0.419	0.3	41.5	Flood Risk
2160 min Winter	0.394	0.394	0.3	38.7	Flood Risk
2880 min Winter	0.369	0.369	0.3	35.7	Flood Risk
4320 min Winter	0.318	0.318	0.3	29.5	Flood Risk
5760 min Winter	0.270	0.270	0.3	23.8	Flood Risk
7200 min Winter	0.227	0.227	0.3	18.8	Flood Risk
8640 min Winter	0.191	0.191	0.3	14.5	O K
10080 min Winter	0.162	0.162	0.3	11.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	33
60 min Winter	56.713	0.0	64
120 min Winter	34.190	0.0	122
180 min Winter	25.088	0.0	180
240 min Winter	20.020	0.0	240
360 min Winter	14.528	0.0	356
480 min Winter	11.570	0.0	472
600 min Winter	9.690	0.0	588
720 min Winter	8.380	0.0	700
960 min Winter	6.658	0.0	924
1440 min Winter	4.807	0.0	1340
2160 min Winter	3.465	0.0	1648
2880 min Winter	2.744	0.0	2104
4320 min Winter	1.973	0.0	2984
5760 min Winter	1.559	0.0	3800
7200 min Winter	1.298	0.0	4544
8640 min Winter	1.118	0.0	5272
10080 min Winter	0.985	0.0	5856

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.065

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.065

Model Details

Storage is Online Cover Level (m) 0.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	28.4
Membrane Percolation (mm/hr)	1000	Length (m)	14.0
Max Percolation (l/s)	110.4	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Cap Volume Depth (m)	0.400

Summary of Results for 100 year Return Period

Half Drain Time : 837 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.153	0.153	0.3	9.9	O K
30 min Summer	0.183	0.183	0.3	13.5	O K
60 min Summer	0.213	0.213	0.3	17.0	Flood Risk
120 min Summer	0.241	0.241	0.3	20.4	Flood Risk
180 min Summer	0.255	0.255	0.3	22.0	Flood Risk
240 min Summer	0.262	0.262	0.3	22.9	Flood Risk
360 min Summer	0.270	0.270	0.3	23.9	Flood Risk
480 min Summer	0.273	0.273	0.3	24.2	Flood Risk
600 min Summer	0.273	0.273	0.3	24.2	Flood Risk
720 min Summer	0.272	0.272	0.3	24.0	Flood Risk
960 min Summer	0.268	0.268	0.3	23.6	Flood Risk
1440 min Summer	0.259	0.259	0.3	22.6	Flood Risk
2160 min Summer	0.243	0.243	0.3	20.7	Flood Risk
2880 min Summer	0.228	0.228	0.3	18.8	Flood Risk
4320 min Summer	0.198	0.198	0.3	15.3	O K
5760 min Summer	0.174	0.174	0.3	12.4	O K
7200 min Summer	0.154	0.154	0.3	10.0	O K
8640 min Summer	0.140	0.140	0.3	8.3	O K
10080 min Summer	0.130	0.130	0.3	7.2	O K
15 min Winter	0.165	0.165	0.3	11.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	19
30 min Summer	64.904	0.0	34
60 min Summer	40.510	0.0	64
120 min Summer	24.421	0.0	122
180 min Summer	17.920	0.0	182
240 min Summer	14.300	0.0	242
360 min Summer	10.377	0.0	362
480 min Summer	8.265	0.0	480
600 min Summer	6.922	0.0	600
720 min Summer	5.986	0.0	656
960 min Summer	4.756	0.0	762
1440 min Summer	3.434	0.0	1012
2160 min Summer	2.475	0.0	1424
2880 min Summer	1.960	0.0	1820
4320 min Summer	1.409	0.0	2596
5760 min Summer	1.114	0.0	3344
7200 min Summer	0.927	0.0	4040
8640 min Summer	0.798	0.0	4680
10080 min Summer	0.703	0.0	5440
15 min Winter	99.025	0.0	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.199	0.199	0.3	15.4	O K
60 min Winter	0.233	0.233	0.3	19.4	Flood Risk
120 min Winter	0.264	0.264	0.3	23.2	Flood Risk
180 min Winter	0.280	0.280	0.3	25.1	Flood Risk
240 min Winter	0.290	0.290	0.3	26.2	Flood Risk
360 min Winter	0.300	0.300	0.3	27.4	Flood Risk
480 min Winter	0.305	0.305	0.3	28.0	Flood Risk
600 min Winter	0.306	0.306	0.3	28.1	Flood Risk
720 min Winter	0.305	0.305	0.3	28.0	Flood Risk
960 min Winter	0.300	0.300	0.3	27.4	Flood Risk
1440 min Winter	0.287	0.287	0.3	25.9	Flood Risk
2160 min Winter	0.265	0.265	0.3	23.2	Flood Risk
2880 min Winter	0.241	0.241	0.3	20.4	Flood Risk
4320 min Winter	0.197	0.197	0.3	15.2	O K
5760 min Winter	0.162	0.162	0.3	11.0	O K
7200 min Winter	0.139	0.139	0.3	8.2	O K
8640 min Winter	0.125	0.125	0.3	6.6	O K
10080 min Winter	0.113	0.113	0.2	5.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	64.904	0.0	33
60 min Winter	40.510	0.0	62
120 min Winter	24.421	0.0	122
180 min Winter	17.920	0.0	180
240 min Winter	14.300	0.0	238
360 min Winter	10.377	0.0	354
480 min Winter	8.265	0.0	468
600 min Winter	6.922	0.0	580
720 min Winter	5.986	0.0	688
960 min Winter	4.756	0.0	892
1440 min Winter	3.434	0.0	1098
2160 min Winter	2.475	0.0	1556
2880 min Winter	1.960	0.0	1988
4320 min Winter	1.409	0.0	2768
5760 min Winter	1.114	0.0	3512
7200 min Winter	0.927	0.0	4112
8640 min Winter	0.798	0.0	4840
10080 min Winter	0.703	0.0	5544

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.065

Time (mins) From:	To:	Area (ha)
0	4	0.065

Model Details

Storage is Online Cover Level (m) 0.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	28.4
Membrane Percolation (mm/hr)	1000	Length (m)	14.0
Max Percolation (l/s)	110.4	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	0.000	Cap Volume Depth (m)	0.400

Summary of Results for 1 year Return Period

Half Drain Time : 1736 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.088	0.088	0.0	3.4	O K
30 min Summer	0.106	0.106	0.0	4.4	O K
60 min Summer	0.125	0.125	0.0	5.6	O K
120 min Summer	0.143	0.143	0.1	6.8	O K
180 min Summer	0.154	0.154	0.1	7.5	O K
240 min Summer	0.161	0.161	0.1	8.1	O K
360 min Summer	0.171	0.171	0.1	8.8	O K
480 min Summer	0.177	0.177	0.1	9.3	O K
600 min Summer	0.181	0.181	0.1	9.6	O K
720 min Summer	0.184	0.184	0.1	9.9	O K
960 min Summer	0.188	0.188	0.1	10.2	O K
1440 min Summer	0.191	0.191	0.1	10.4	O K
2160 min Summer	0.193	0.193	0.1	10.6	O K
2880 min Summer	0.193	0.193	0.1	10.6	O K
4320 min Summer	0.190	0.190	0.1	10.4	O K
5760 min Summer	0.186	0.186	0.1	10.0	O K
7200 min Summer	0.182	0.182	0.1	9.7	O K
8640 min Summer	0.177	0.177	0.1	9.3	O K
10080 min Summer	0.172	0.172	0.1	8.9	O K
15 min Winter	0.096	0.096	0.0	3.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	31.093	0.0	19
30 min Summer	20.252	0.0	34
60 min Summer	12.800	0.0	64
120 min Summer	7.926	0.0	124
180 min Summer	5.960	0.0	184
240 min Summer	4.862	0.0	242
360 min Summer	3.628	0.0	362
480 min Summer	2.939	0.0	482
600 min Summer	2.495	0.0	602
720 min Summer	2.183	0.0	722
960 min Summer	1.768	0.0	960
1440 min Summer	1.314	0.0	1254
2160 min Summer	0.977	0.0	1624
2880 min Summer	0.791	0.0	2020
4320 min Summer	0.588	0.0	2856
5760 min Summer	0.476	0.0	3688
7200 min Summer	0.405	0.0	4536
8640 min Summer	0.354	0.0	5280
10080 min Summer	0.317	0.0	6144
15 min Winter	31.093	0.0	19

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.115	0.115	0.0	5.0	O K
60 min Winter	0.135	0.135	0.0	6.2	O K
120 min Winter	0.155	0.155	0.1	7.6	O K
180 min Winter	0.166	0.166	0.1	8.5	O K
240 min Winter	0.175	0.175	0.1	9.1	O K
360 min Winter	0.185	0.185	0.1	9.9	O K
480 min Winter	0.192	0.192	0.1	10.5	O K
600 min Winter	0.197	0.197	0.1	10.9	O K
720 min Winter	0.200	0.200	0.1	11.2	Flood Risk
960 min Winter	0.205	0.205	0.1	11.6	Flood Risk
1440 min Winter	0.209	0.209	0.1	12.0	Flood Risk
2160 min Winter	0.210	0.210	0.1	12.0	Flood Risk
2880 min Winter	0.209	0.209	0.1	12.0	Flood Risk
4320 min Winter	0.205	0.205	0.1	11.6	Flood Risk
5760 min Winter	0.198	0.198	0.1	11.0	O K
7200 min Winter	0.191	0.191	0.1	10.4	O K
8640 min Winter	0.184	0.184	0.1	9.8	O K
10080 min Winter	0.177	0.177	0.1	9.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	20.252	0.0	34
60 min Winter	12.800	0.0	64
120 min Winter	7.926	0.0	122
180 min Winter	5.960	0.0	180
240 min Winter	4.862	0.0	240
360 min Winter	3.628	0.0	356
480 min Winter	2.939	0.0	474
600 min Winter	2.495	0.0	590
720 min Winter	2.183	0.0	702
960 min Winter	1.768	0.0	930
1440 min Winter	1.314	0.0	1358
2160 min Winter	0.977	0.0	1708
2880 min Winter	0.791	0.0	2164
4320 min Winter	0.588	0.0	3108
5760 min Winter	0.476	0.0	3984
7200 min Winter	0.405	0.0	4832
8640 min Winter	0.354	0.0	5704
10080 min Winter	0.317	0.0	6552

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.059

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.059

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 30 year Return Period

Half Drain Time : 2686 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.166	0.166	0.1	8.4	O K
30 min Summer	0.196	0.196	0.1	10.9	O K
60 min Summer	0.225	0.225	0.1	13.5	Flood Risk
120 min Summer	0.252	0.252	0.1	16.1	Flood Risk
180 min Summer	0.266	0.266	0.1	17.6	Flood Risk
240 min Summer	0.276	0.276	0.1	18.6	Flood Risk
360 min Summer	0.288	0.288	0.1	20.0	Flood Risk
480 min Summer	0.297	0.297	0.1	21.0	Flood Risk
600 min Summer	0.303	0.303	0.1	21.7	Flood Risk
720 min Summer	0.307	0.307	0.1	22.2	Flood Risk
960 min Summer	0.313	0.313	0.1	22.9	Flood Risk
1440 min Summer	0.317	0.317	0.1	23.5	Flood Risk
2160 min Summer	0.317	0.317	0.1	23.4	Flood Risk
2880 min Summer	0.316	0.316	0.1	23.2	Flood Risk
4320 min Summer	0.311	0.311	0.1	22.7	Flood Risk
5760 min Summer	0.305	0.305	0.1	21.9	Flood Risk
7200 min Summer	0.298	0.298	0.1	21.1	Flood Risk
8640 min Summer	0.291	0.291	0.1	20.3	Flood Risk
10080 min Summer	0.284	0.284	0.1	19.5	Flood Risk
15 min Winter	0.179	0.179	0.1	9.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	19
30 min Summer	49.584	0.0	34
60 min Summer	30.811	0.0	64
120 min Summer	18.584	0.0	124
180 min Summer	13.680	0.0	184
240 min Summer	10.960	0.0	244
360 min Summer	8.001	0.0	362
480 min Summer	6.397	0.0	482
600 min Summer	5.375	0.0	602
720 min Summer	4.661	0.0	722
960 min Summer	3.719	0.0	962
1440 min Summer	2.704	0.0	1440
2160 min Summer	1.963	0.0	1884
2880 min Summer	1.563	0.0	2276
4320 min Summer	1.133	0.0	3028
5760 min Summer	0.901	0.0	3864
7200 min Summer	0.754	0.0	4688
8640 min Summer	0.652	0.0	5528
10080 min Summer	0.576	0.0	6352
15 min Winter	76.290	0.0	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.211	0.211	0.1	12.2	Flood Risk
60 min Winter	0.242	0.242	0.1	15.1	Flood Risk
120 min Winter	0.270	0.270	0.1	18.0	Flood Risk
180 min Winter	0.286	0.286	0.1	19.8	Flood Risk
240 min Winter	0.296	0.296	0.1	20.9	Flood Risk
360 min Winter	0.310	0.310	0.1	22.5	Flood Risk
480 min Winter	0.319	0.319	0.1	23.7	Flood Risk
600 min Winter	0.326	0.326	0.1	24.5	Flood Risk
720 min Winter	0.331	0.331	0.1	25.1	Flood Risk
960 min Winter	0.337	0.337	0.1	25.9	Flood Risk
1440 min Winter	0.343	0.343	0.1	26.7	Flood Risk
2160 min Winter	0.344	0.344	0.1	26.9	Flood Risk
2880 min Winter	0.341	0.341	0.1	26.5	Flood Risk
4320 min Winter	0.335	0.335	0.1	25.7	Flood Risk
5760 min Winter	0.327	0.327	0.1	24.6	Flood Risk
7200 min Winter	0.317	0.317	0.1	23.5	Flood Risk
8640 min Winter	0.308	0.308	0.1	22.3	Flood Risk
10080 min Winter	0.298	0.298	0.1	21.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	34
60 min Winter	30.811	0.0	64
120 min Winter	18.584	0.0	122
180 min Winter	13.680	0.0	182
240 min Winter	10.960	0.0	240
360 min Winter	8.001	0.0	358
480 min Winter	6.397	0.0	476
600 min Winter	5.375	0.0	594
720 min Winter	4.661	0.0	708
960 min Winter	3.719	0.0	942
1440 min Winter	2.704	0.0	1396
2160 min Winter	1.963	0.0	2036
2880 min Winter	1.563	0.0	2368
4320 min Winter	1.133	0.0	3244
5760 min Winter	0.901	0.0	4160
7200 min Winter	0.754	0.0	5048
8640 min Winter	0.652	0.0	5968
10080 min Winter	0.576	0.0	6856

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.059

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.059

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 100 year Return Period

Half Drain Time : 3041 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.197	0.197	0.1	10.9	O K
30 min Summer	0.233	0.233	0.1	14.3	Flood Risk
60 min Summer	0.267	0.267	0.1	17.7	Flood Risk
120 min Summer	0.298	0.298	0.1	21.2	Flood Risk
180 min Summer	0.315	0.315	0.1	23.1	Flood Risk
240 min Summer	0.325	0.325	0.1	24.4	Flood Risk
360 min Summer	0.339	0.339	0.1	26.2	Flood Risk
480 min Summer	0.348	0.348	0.1	27.4	Flood Risk
600 min Summer	0.355	0.355	0.1	28.3	Flood Risk
720 min Summer	0.360	0.360	0.1	28.9	Flood Risk
960 min Summer	0.366	0.366	0.1	29.8	Flood Risk
1440 min Summer	0.371	0.371	0.1	30.5	Flood Risk
2160 min Summer	0.371	0.371	0.1	30.4	Flood Risk
2880 min Summer	0.368	0.368	0.1	30.1	Flood Risk
4320 min Summer	0.362	0.362	0.1	29.2	Flood Risk
5760 min Summer	0.355	0.355	0.1	28.2	Flood Risk
7200 min Summer	0.347	0.347	0.1	27.2	Flood Risk
8640 min Summer	0.339	0.339	0.1	26.1	Flood Risk
10080 min Summer	0.331	0.331	0.1	25.1	Flood Risk
15 min Winter	0.212	0.212	0.1	12.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	19
30 min Summer	64.904	0.0	34
60 min Summer	40.510	0.0	64
120 min Summer	24.421	0.0	124
180 min Summer	17.920	0.0	184
240 min Summer	14.300	0.0	244
360 min Summer	10.377	0.0	364
480 min Summer	8.265	0.0	482
600 min Summer	6.922	0.0	602
720 min Summer	5.986	0.0	722
960 min Summer	4.756	0.0	962
1440 min Summer	3.434	0.0	1440
2160 min Summer	2.475	0.0	2056
2880 min Summer	1.960	0.0	2368
4320 min Summer	1.409	0.0	3112
5760 min Summer	1.114	0.0	3928
7200 min Summer	0.927	0.0	4760
8640 min Summer	0.798	0.0	5616
10080 min Summer	0.703	0.0	6448
15 min Winter	99.025	0.0	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.251	0.251	0.1	16.0	Flood Risk
60 min Winter	0.287	0.287	0.1	19.9	Flood Risk
120 min Winter	0.320	0.320	0.1	23.8	Flood Risk
180 min Winter	0.337	0.337	0.1	26.0	Flood Risk
240 min Winter	0.349	0.349	0.1	27.4	Flood Risk
360 min Winter	0.364	0.364	0.1	29.4	Flood Risk
480 min Winter	0.374	0.374	0.1	30.8	Flood Risk
600 min Winter	0.381	0.381	0.1	31.8	Flood Risk
720 min Winter	0.386	0.386	0.1	32.6	Flood Risk
960 min Winter	0.394	0.394	0.1	33.7	Flood Risk
1440 min Winter	0.401	0.401	0.1	34.7	Flood Risk
2160 min Winter	0.402	0.402	0.1	34.9	Flood Risk
2880 min Winter	0.399	0.399	0.1	34.4	Flood Risk
4320 min Winter	0.391	0.391	0.1	33.2	Flood Risk
5760 min Winter	0.381	0.381	0.1	31.9	Flood Risk
7200 min Winter	0.371	0.371	0.1	30.4	Flood Risk
8640 min Winter	0.360	0.360	0.1	29.0	Flood Risk
10080 min Winter	0.349	0.349	0.1	27.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	64.904	0.0	34
60 min Winter	40.510	0.0	64
120 min Winter	24.421	0.0	122
180 min Winter	17.920	0.0	182
240 min Winter	14.300	0.0	240
360 min Winter	10.377	0.0	358
480 min Winter	8.265	0.0	476
600 min Winter	6.922	0.0	594
720 min Winter	5.986	0.0	710
960 min Winter	4.756	0.0	942
1440 min Winter	3.434	0.0	1400
2160 min Winter	2.475	0.0	2056
2880 min Winter	1.960	0.0	2676
4320 min Winter	1.409	0.0	3324
5760 min Winter	1.114	0.0	4256
7200 min Winter	0.927	0.0	5120
8640 min Winter	0.798	0.0	6048
10080 min Winter	0.703	0.0	6952

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.059

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.059

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 3698 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.244	0.244	0.1	15.3	Flood Risk
30 min Summer	0.288	0.288	0.1	20.0	Flood Risk
60 min Summer	0.329	0.329	0.1	24.9	Flood Risk
120 min Summer	0.366	0.366	0.1	29.8	Flood Risk
180 min Summer	0.386	0.386	0.1	32.5	Flood Risk
240 min Summer	0.399	0.399	0.1	34.4	Flood Risk
360 min Summer	0.416	0.416	0.1	37.0	Flood Risk
480 min Summer	0.427	0.427	0.1	38.8	Flood Risk
600 min Summer	0.436	0.436	0.1	40.1	Flood Risk
720 min Summer	0.442	0.442	0.1	41.1	Flood Risk
960 min Summer	0.451	0.451	0.1	42.5	Flood Risk
1440 min Summer	0.460	0.460	0.1	44.0	Flood Risk
2160 min Summer	0.463	0.463	0.1	44.4	Flood Risk
2880 min Summer	0.460	0.460	0.1	44.0	Flood Risk
4320 min Summer	0.454	0.454	0.1	43.1	Flood Risk
5760 min Summer	0.448	0.448	0.1	42.0	Flood Risk
7200 min Summer	0.440	0.440	0.1	40.8	Flood Risk
8640 min Summer	0.432	0.432	0.1	39.5	Flood Risk
10080 min Summer	0.424	0.424	0.1	38.3	Flood Risk
15 min Winter	0.262	0.262	0.1	17.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	19
30 min Summer	90.866	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	34.190	0.0	124
180 min Summer	25.088	0.0	184
240 min Summer	20.020	0.0	244
360 min Summer	14.528	0.0	364
480 min Summer	11.570	0.0	482
600 min Summer	9.690	0.0	602
720 min Summer	8.380	0.0	722
960 min Summer	6.658	0.0	962
1440 min Summer	4.807	0.0	1442
2160 min Summer	3.465	0.0	2160
2880 min Summer	2.744	0.0	2568
4320 min Summer	1.973	0.0	3288
5760 min Summer	1.559	0.0	4088
7200 min Summer	1.298	0.0	4896
8640 min Summer	1.118	0.0	5712
10080 min Summer	0.985	0.0	6552
15 min Winter	138.634	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.309	0.309	0.1	22.4	Flood Risk
60 min Winter	0.352	0.352	0.1	27.9	Flood Risk
120 min Winter	0.392	0.392	0.1	33.4	Flood Risk
180 min Winter	0.413	0.413	0.1	36.5	Flood Risk
240 min Winter	0.426	0.426	0.1	38.6	Flood Risk
360 min Winter	0.445	0.445	0.1	41.5	Flood Risk
480 min Winter	0.457	0.457	0.1	43.6	Flood Risk
600 min Winter	0.467	0.467	0.1	45.1	Flood Risk
720 min Winter	0.474	0.474	0.1	46.3	Flood Risk
960 min Winter	0.483	0.483	0.1	48.0	Flood Risk
1440 min Winter	0.494	0.494	0.1	49.8	Flood Risk
2160 min Winter	0.499	0.499	0.1	50.7	Flood Risk
2880 min Winter	0.498	0.498	0.1	50.5	Flood Risk
4320 min Winter	0.490	0.490	0.1	49.1	Flood Risk
5760 min Winter	0.481	0.481	0.1	47.6	Flood Risk
7200 min Winter	0.472	0.472	0.1	46.0	Flood Risk
8640 min Winter	0.461	0.461	0.1	44.2	Flood Risk
10080 min Winter	0.450	0.450	0.1	42.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	34
60 min Winter	56.713	0.0	64
120 min Winter	34.190	0.0	122
180 min Winter	25.088	0.0	182
240 min Winter	20.020	0.0	242
360 min Winter	14.528	0.0	360
480 min Winter	11.570	0.0	478
600 min Winter	9.690	0.0	596
720 min Winter	8.380	0.0	714
960 min Winter	6.658	0.0	944
1440 min Winter	4.807	0.0	1410
2160 min Winter	3.465	0.0	2076
2880 min Winter	2.744	0.0	2736
4320 min Winter	1.973	0.0	3456
5760 min Winter	1.559	0.0	4328
7200 min Winter	1.298	0.0	5264
8640 min Winter	1.118	0.0	6144
10080 min Winter	0.985	0.0	7064

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.059

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.059

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 1 year Return Period

Half Drain Time : 1685 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.084	0.084	0.0	2.0	O K
30 min Summer	0.102	0.102	0.0	2.6	O K
60 min Summer	0.120	0.120	0.0	3.3	O K
120 min Summer	0.138	0.138	0.0	4.0	O K
180 min Summer	0.148	0.148	0.0	4.5	O K
240 min Summer	0.155	0.155	0.0	4.8	O K
360 min Summer	0.164	0.164	0.0	5.2	O K
480 min Summer	0.170	0.170	0.0	5.5	O K
600 min Summer	0.174	0.174	0.0	5.7	O K
720 min Summer	0.177	0.177	0.0	5.8	O K
960 min Summer	0.180	0.180	0.0	6.0	O K
1440 min Summer	0.183	0.183	0.0	6.1	O K
2160 min Summer	0.185	0.185	0.0	6.2	O K
2880 min Summer	0.185	0.185	0.0	6.2	O K
4320 min Summer	0.182	0.182	0.0	6.1	O K
5760 min Summer	0.178	0.178	0.0	5.9	O K
7200 min Summer	0.173	0.173	0.0	5.6	O K
8640 min Summer	0.168	0.168	0.0	5.4	O K
10080 min Summer	0.163	0.163	0.0	5.2	O K
15 min Winter	0.092	0.092	0.0	2.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	31.093	0.0	19
30 min Summer	20.252	0.0	34
60 min Summer	12.800	0.0	64
120 min Summer	7.926	0.0	124
180 min Summer	5.960	0.0	184
240 min Summer	4.862	0.0	242
360 min Summer	3.628	0.0	362
480 min Summer	2.939	0.0	482
600 min Summer	2.495	0.0	602
720 min Summer	2.183	0.0	722
960 min Summer	1.768	0.0	960
1440 min Summer	1.314	0.0	1238
2160 min Summer	0.977	0.0	1620
2880 min Summer	0.791	0.0	2016
4320 min Summer	0.588	0.0	2852
5760 min Summer	0.476	0.0	3688
7200 min Summer	0.405	0.0	4472
8640 min Summer	0.354	0.0	5280
10080 min Summer	0.317	0.0	6056
15 min Winter	31.093	0.0	19

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.111	0.111	0.0	2.9	O K
60 min Winter	0.130	0.130	0.0	3.7	O K
120 min Winter	0.149	0.149	0.0	4.5	O K
180 min Winter	0.160	0.160	0.0	5.0	O K
240 min Winter	0.168	0.168	0.0	5.4	O K
360 min Winter	0.178	0.178	0.0	5.9	O K
480 min Winter	0.184	0.184	0.0	6.2	O K
600 min Winter	0.189	0.189	0.0	6.4	O K
720 min Winter	0.192	0.192	0.0	6.6	O K
960 min Winter	0.196	0.196	0.0	6.8	O K
1440 min Winter	0.200	0.200	0.0	7.0	O K
2160 min Winter	0.201	0.201	0.0	7.1	Flood Risk
2880 min Winter	0.200	0.200	0.0	7.0	Flood Risk
4320 min Winter	0.195	0.195	0.0	6.8	O K
5760 min Winter	0.188	0.188	0.0	6.4	O K
7200 min Winter	0.181	0.181	0.0	6.1	O K
8640 min Winter	0.174	0.174	0.0	5.7	O K
10080 min Winter	0.167	0.167	0.0	5.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	20.252	0.0	34
60 min Winter	12.800	0.0	64
120 min Winter	7.926	0.0	122
180 min Winter	5.960	0.0	180
240 min Winter	4.862	0.0	240
360 min Winter	3.628	0.0	356
480 min Winter	2.939	0.0	472
600 min Winter	2.495	0.0	588
720 min Winter	2.183	0.0	702
960 min Winter	1.768	0.0	926
1440 min Winter	1.314	0.0	1356
2160 min Winter	0.977	0.0	1692
2880 min Winter	0.791	0.0	2160
4320 min Winter	0.588	0.0	3072
5760 min Winter	0.476	0.0	3976
7200 min Winter	0.405	0.0	4832
8640 min Winter	0.354	0.0	5704
10080 min Winter	0.317	0.0	6552

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.035

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.035

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	32.0
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 30 year Return Period

Half Drain Time : 2571 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.159	0.159	0.0	5.0	O K
30 min Summer	0.189	0.189	0.0	6.5	O K
60 min Summer	0.217	0.217	0.0	8.0	Flood Risk
120 min Summer	0.243	0.243	0.0	9.5	Flood Risk
180 min Summer	0.257	0.257	0.0	10.4	Flood Risk
240 min Summer	0.266	0.266	0.1	11.0	Flood Risk
360 min Summer	0.278	0.278	0.1	11.9	Flood Risk
480 min Summer	0.286	0.286	0.1	12.4	Flood Risk
600 min Summer	0.292	0.292	0.1	12.8	Flood Risk
720 min Summer	0.296	0.296	0.1	13.1	Flood Risk
960 min Summer	0.301	0.301	0.1	13.5	Flood Risk
1440 min Summer	0.305	0.305	0.1	13.8	Flood Risk
2160 min Summer	0.305	0.305	0.1	13.8	Flood Risk
2880 min Summer	0.303	0.303	0.1	13.7	Flood Risk
4320 min Summer	0.298	0.298	0.1	13.3	Flood Risk
5760 min Summer	0.292	0.292	0.1	12.8	Flood Risk
7200 min Summer	0.285	0.285	0.1	12.3	Flood Risk
8640 min Summer	0.278	0.278	0.1	11.8	Flood Risk
10080 min Summer	0.271	0.271	0.1	11.4	Flood Risk
15 min Winter	0.172	0.172	0.0	5.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	19
30 min Summer	49.584	0.0	34
60 min Summer	30.811	0.0	64
120 min Summer	18.584	0.0	124
180 min Summer	13.680	0.0	184
240 min Summer	10.960	0.0	244
360 min Summer	8.001	0.0	362
480 min Summer	6.397	0.0	482
600 min Summer	5.375	0.0	602
720 min Summer	4.661	0.0	722
960 min Summer	3.719	0.0	962
1440 min Summer	2.704	0.0	1440
2160 min Summer	1.963	0.0	1860
2880 min Summer	1.563	0.0	2224
4320 min Summer	1.133	0.0	3024
5760 min Summer	0.901	0.0	3856
7200 min Summer	0.754	0.0	4680
8640 min Summer	0.652	0.0	5528
10080 min Summer	0.576	0.0	6344
15 min Winter	76.290	0.0	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.204	0.204	0.0	7.2	Flood Risk
60 min Winter	0.233	0.233	0.0	8.9	Flood Risk
120 min Winter	0.261	0.261	0.0	10.7	Flood Risk
180 min Winter	0.276	0.276	0.1	11.7	Flood Risk
240 min Winter	0.286	0.286	0.1	12.4	Flood Risk
360 min Winter	0.299	0.299	0.1	13.3	Flood Risk
480 min Winter	0.308	0.308	0.1	14.0	Flood Risk
600 min Winter	0.314	0.314	0.1	14.5	Flood Risk
720 min Winter	0.318	0.318	0.1	14.8	Flood Risk
960 min Winter	0.325	0.325	0.1	15.3	Flood Risk
1440 min Winter	0.330	0.330	0.1	15.8	Flood Risk
2160 min Winter	0.331	0.331	0.1	15.8	Flood Risk
2880 min Winter	0.328	0.328	0.1	15.6	Flood Risk
4320 min Winter	0.321	0.321	0.1	15.1	Flood Risk
5760 min Winter	0.313	0.313	0.1	14.4	Flood Risk
7200 min Winter	0.303	0.303	0.1	13.7	Flood Risk
8640 min Winter	0.293	0.293	0.1	13.0	Flood Risk
10080 min Winter	0.284	0.284	0.1	12.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	34
60 min Winter	30.811	0.0	64
120 min Winter	18.584	0.0	122
180 min Winter	13.680	0.0	182
240 min Winter	10.960	0.0	240
360 min Winter	8.001	0.0	358
480 min Winter	6.397	0.0	476
600 min Winter	5.375	0.0	592
720 min Winter	4.661	0.0	708
960 min Winter	3.719	0.0	942
1440 min Winter	2.704	0.0	1388
2160 min Winter	1.963	0.0	2032
2880 min Winter	1.563	0.0	2336
4320 min Winter	1.133	0.0	3240
5760 min Winter	0.901	0.0	4152
7200 min Winter	0.754	0.0	5048
8640 min Winter	0.652	0.0	5960
10080 min Winter	0.576	0.0	6760

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.035

Time From:	(mins) To:	Area (ha)
0	4	0.035

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	32.0
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 3547 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.235	0.235	0.0	9.1	Flood Risk
30 min Summer	0.278	0.278	0.1	11.9	Flood Risk
60 min Summer	0.317	0.317	0.1	14.7	Flood Risk
120 min Summer	0.353	0.353	0.1	17.6	Flood Risk
180 min Summer	0.373	0.373	0.1	19.3	Flood Risk
240 min Summer	0.385	0.385	0.1	20.4	Flood Risk
360 min Summer	0.401	0.401	0.1	21.9	Flood Risk
480 min Summer	0.413	0.413	0.1	23.0	Flood Risk
600 min Summer	0.421	0.421	0.1	23.7	Flood Risk
720 min Summer	0.427	0.427	0.1	24.3	Flood Risk
960 min Summer	0.435	0.435	0.1	25.1	Flood Risk
1440 min Summer	0.443	0.443	0.1	26.0	Flood Risk
2160 min Summer	0.445	0.445	0.1	26.2	Flood Risk
2880 min Summer	0.443	0.443	0.1	25.9	Flood Risk
4320 min Summer	0.437	0.437	0.1	25.3	Flood Risk
5760 min Summer	0.430	0.430	0.1	24.6	Flood Risk
7200 min Summer	0.422	0.422	0.1	23.9	Flood Risk
8640 min Summer	0.414	0.414	0.1	23.1	Flood Risk
10080 min Summer	0.406	0.406	0.1	22.3	Flood Risk
15 min Winter	0.252	0.252	0.0	10.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	19
30 min Summer	90.866	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	34.190	0.0	124
180 min Summer	25.088	0.0	184
240 min Summer	20.020	0.0	244
360 min Summer	14.528	0.0	364
480 min Summer	11.570	0.0	482
600 min Summer	9.690	0.0	602
720 min Summer	8.380	0.0	722
960 min Summer	6.658	0.0	962
1440 min Summer	4.807	0.0	1442
2160 min Summer	3.465	0.0	2160
2880 min Summer	2.744	0.0	2508
4320 min Summer	1.973	0.0	3244
5760 min Summer	1.559	0.0	4040
7200 min Summer	1.298	0.0	4896
8640 min Summer	1.118	0.0	5704
10080 min Summer	0.985	0.0	6464
15 min Winter	138.634	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.298	0.298	0.1	13.3	Flood Risk
60 min Winter	0.340	0.340	0.1	16.5	Flood Risk
120 min Winter	0.378	0.378	0.1	19.8	Flood Risk
180 min Winter	0.399	0.399	0.1	21.6	Flood Risk
240 min Winter	0.412	0.412	0.1	22.9	Flood Risk
360 min Winter	0.430	0.430	0.1	24.6	Flood Risk
480 min Winter	0.442	0.442	0.1	25.8	Flood Risk
600 min Winter	0.451	0.451	0.1	26.7	Flood Risk
720 min Winter	0.457	0.457	0.1	27.4	Flood Risk
960 min Winter	0.467	0.467	0.1	28.4	Flood Risk
1440 min Winter	0.477	0.477	0.1	29.4	Flood Risk
2160 min Winter	0.481	0.481	0.1	29.9	Flood Risk
2880 min Winter	0.479	0.479	0.1	29.7	Flood Risk
4320 min Winter	0.471	0.471	0.1	28.8	Flood Risk
5760 min Winter	0.462	0.462	0.1	27.9	Flood Risk
7200 min Winter	0.452	0.452	0.1	26.9	Flood Risk
8640 min Winter	0.442	0.442	0.1	25.8	Flood Risk
10080 min Winter	0.431	0.431	0.1	24.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	34
60 min Winter	56.713	0.0	64
120 min Winter	34.190	0.0	122
180 min Winter	25.088	0.0	182
240 min Winter	20.020	0.0	240
360 min Winter	14.528	0.0	360
480 min Winter	11.570	0.0	478
600 min Winter	9.690	0.0	596
720 min Winter	8.380	0.0	712
960 min Winter	6.658	0.0	944
1440 min Winter	4.807	0.0	1402
2160 min Winter	3.465	0.0	2076
2880 min Winter	2.744	0.0	2712
4320 min Winter	1.973	0.0	3412
5760 min Winter	1.559	0.0	4328
7200 min Winter	1.298	0.0	5256
8640 min Winter	1.118	0.0	6144
10080 min Winter	0.985	0.0	7056

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time From:	(mins) To:	Area (ha)
0	4	0.035

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	32.0
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 100 year Return Period

Half Drain Time : 2949 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.189	0.189	0.0	6.5	O K
30 min Summer	0.225	0.225	0.0	8.5	Flood Risk
60 min Summer	0.258	0.258	0.0	10.5	Flood Risk
120 min Summer	0.288	0.288	0.1	12.6	Flood Risk
180 min Summer	0.304	0.304	0.1	13.7	Flood Risk
240 min Summer	0.314	0.314	0.1	14.5	Flood Risk
360 min Summer	0.327	0.327	0.1	15.5	Flood Risk
480 min Summer	0.336	0.336	0.1	16.2	Flood Risk
600 min Summer	0.342	0.342	0.1	16.7	Flood Risk
720 min Summer	0.347	0.347	0.1	17.1	Flood Risk
960 min Summer	0.353	0.353	0.1	17.6	Flood Risk
1440 min Summer	0.358	0.358	0.1	18.0	Flood Risk
2160 min Summer	0.357	0.357	0.1	17.9	Flood Risk
2880 min Summer	0.354	0.354	0.1	17.7	Flood Risk
4320 min Summer	0.348	0.348	0.1	17.2	Flood Risk
5760 min Summer	0.340	0.340	0.1	16.6	Flood Risk
7200 min Summer	0.332	0.332	0.1	15.9	Flood Risk
8640 min Summer	0.324	0.324	0.1	15.3	Flood Risk
10080 min Summer	0.316	0.316	0.1	14.7	Flood Risk
15 min Winter	0.204	0.204	0.0	7.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	19
30 min Summer	64.904	0.0	34
60 min Summer	40.510	0.0	64
120 min Summer	24.421	0.0	124
180 min Summer	17.920	0.0	184
240 min Summer	14.300	0.0	244
360 min Summer	10.377	0.0	364
480 min Summer	8.265	0.0	482
600 min Summer	6.922	0.0	602
720 min Summer	5.986	0.0	722
960 min Summer	4.756	0.0	962
1440 min Summer	3.434	0.0	1440
2160 min Summer	2.475	0.0	2012
2880 min Summer	1.960	0.0	2336
4320 min Summer	1.409	0.0	3108
5760 min Summer	1.114	0.0	3920
7200 min Summer	0.927	0.0	4752
8640 min Summer	0.798	0.0	5536
10080 min Summer	0.703	0.0	6360
15 min Winter	99.025	0.0	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.242	0.242	0.0	9.5	Flood Risk
60 min Winter	0.277	0.277	0.1	11.8	Flood Risk
120 min Winter	0.309	0.309	0.1	14.1	Flood Risk
180 min Winter	0.326	0.326	0.1	15.4	Flood Risk
240 min Winter	0.337	0.337	0.1	16.3	Flood Risk
360 min Winter	0.351	0.351	0.1	17.4	Flood Risk
480 min Winter	0.361	0.361	0.1	18.3	Flood Risk
600 min Winter	0.367	0.367	0.1	18.8	Flood Risk
720 min Winter	0.373	0.373	0.1	19.3	Flood Risk
960 min Winter	0.379	0.379	0.1	19.9	Flood Risk
1440 min Winter	0.386	0.386	0.1	20.5	Flood Risk
2160 min Winter	0.387	0.387	0.1	20.5	Flood Risk
2880 min Winter	0.383	0.383	0.1	20.2	Flood Risk
4320 min Winter	0.375	0.375	0.1	19.5	Flood Risk
5760 min Winter	0.365	0.365	0.1	18.7	Flood Risk
7200 min Winter	0.355	0.355	0.1	17.8	Flood Risk
8640 min Winter	0.344	0.344	0.1	16.9	Flood Risk
10080 min Winter	0.333	0.333	0.1	16.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	64.904	0.0	34
60 min Winter	40.510	0.0	64
120 min Winter	24.421	0.0	122
180 min Winter	17.920	0.0	182
240 min Winter	14.300	0.0	240
360 min Winter	10.377	0.0	358
480 min Winter	8.265	0.0	476
600 min Winter	6.922	0.0	594
720 min Winter	5.986	0.0	710
960 min Winter	4.756	0.0	942
1440 min Winter	3.434	0.0	1398
2160 min Winter	2.475	0.0	2056
2880 min Winter	1.960	0.0	2652
4320 min Winter	1.409	0.0	3288
5760 min Winter	1.114	0.0	4208
7200 min Winter	0.927	0.0	5120
8640 min Winter	0.798	0.0	6048
10080 min Winter	0.703	0.0	6864

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.035

Time (mins) From:	To:	Area (ha)
0	4	0.035

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	32.0
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 1 year Return Period

Half Drain Time : 992 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.045	0.045	0.0	0.6	O K
30 min Summer	0.056	0.056	0.0	0.7	O K
60 min Summer	0.067	0.067	0.0	0.9	O K
120 min Summer	0.077	0.077	0.0	1.1	O K
180 min Summer	0.083	0.083	0.0	1.2	O K
240 min Summer	0.087	0.087	0.0	1.3	O K
360 min Summer	0.092	0.092	0.0	1.4	O K
480 min Summer	0.094	0.094	0.0	1.5	O K
600 min Summer	0.096	0.096	0.0	1.5	O K
720 min Summer	0.097	0.097	0.0	1.5	O K
960 min Summer	0.098	0.098	0.0	1.6	O K
1440 min Summer	0.099	0.099	0.0	1.6	O K
2160 min Summer	0.099	0.099	0.0	1.6	O K
2880 min Summer	0.097	0.097	0.0	1.5	O K
4320 min Summer	0.093	0.093	0.0	1.4	O K
5760 min Summer	0.088	0.088	0.0	1.3	O K
7200 min Summer	0.083	0.083	0.0	1.3	O K
8640 min Summer	0.079	0.079	0.0	1.2	O K
10080 min Summer	0.075	0.075	0.0	1.1	O K
15 min Winter	0.050	0.050	0.0	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	31.093	0.0	19
30 min Summer	20.252	0.0	34
60 min Summer	12.800	0.0	64
120 min Summer	7.926	0.0	122
180 min Summer	5.960	0.0	182
240 min Summer	4.862	0.0	242
360 min Summer	3.628	0.0	362
480 min Summer	2.939	0.0	480
600 min Summer	2.495	0.0	600
720 min Summer	2.183	0.0	672
960 min Summer	1.768	0.0	788
1440 min Summer	1.314	0.0	1040
2160 min Summer	0.977	0.0	1452
2880 min Summer	0.791	0.0	1872
4320 min Summer	0.588	0.0	2680
5760 min Summer	0.476	0.0	3464
7200 min Summer	0.405	0.0	4256
8640 min Summer	0.354	0.0	5016
10080 min Summer	0.317	0.0	5752
15 min Winter	31.093	0.0	19

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.061	0.061	0.0	0.8	O K
60 min Winter	0.073	0.073	0.0	1.0	O K
120 min Winter	0.084	0.084	0.0	1.3	O K
180 min Winter	0.091	0.091	0.0	1.4	O K
240 min Winter	0.095	0.095	0.0	1.5	O K
360 min Winter	0.101	0.101	0.0	1.6	O K
480 min Winter	0.104	0.104	0.0	1.7	O K
600 min Winter	0.105	0.105	0.0	1.7	O K
720 min Winter	0.107	0.107	0.0	1.7	O K
960 min Winter	0.108	0.108	0.0	1.8	O K
1440 min Winter	0.108	0.108	0.0	1.8	O K
2160 min Winter	0.107	0.107	0.0	1.8	O K
2880 min Winter	0.104	0.104	0.0	1.7	O K
4320 min Winter	0.097	0.097	0.0	1.5	O K
5760 min Winter	0.090	0.090	0.0	1.4	O K
7200 min Winter	0.083	0.083	0.0	1.2	O K
8640 min Winter	0.076	0.076	0.0	1.1	O K
10080 min Winter	0.070	0.070	0.0	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	20.252	0.0	33
60 min Winter	12.800	0.0	62
120 min Winter	7.926	0.0	122
180 min Winter	5.960	0.0	180
240 min Winter	4.862	0.0	238
360 min Winter	3.628	0.0	354
480 min Winter	2.939	0.0	468
600 min Winter	2.495	0.0	578
720 min Winter	2.183	0.0	688
960 min Winter	1.768	0.0	892
1440 min Winter	1.314	0.0	1110
2160 min Winter	0.977	0.0	1576
2880 min Winter	0.791	0.0	2020
4320 min Winter	0.588	0.0	2896
5760 min Winter	0.476	0.0	3744
7200 min Winter	0.405	0.0	4536
8640 min Winter	0.354	0.0	5280
10080 min Winter	0.317	0.0	6048

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.010

Time From:	(mins) To:	Area (ha)
0	4	0.010

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 30 year Return Period

Half Drain Time : 1612 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.092	0.092	0.0	1.4	O K
30 min Summer	0.111	0.111	0.0	1.8	O K
60 min Summer	0.128	0.128	0.0	2.3	O K
120 min Summer	0.144	0.144	0.0	2.7	O K
180 min Summer	0.153	0.153	0.0	2.9	O K
240 min Summer	0.158	0.158	0.0	3.1	O K
360 min Summer	0.165	0.165	0.0	3.3	O K
480 min Summer	0.169	0.169	0.0	3.4	O K
600 min Summer	0.172	0.172	0.0	3.5	O K
720 min Summer	0.174	0.174	0.0	3.5	O K
960 min Summer	0.175	0.175	0.0	3.6	O K
1440 min Summer	0.175	0.175	0.0	3.6	O K
2160 min Summer	0.173	0.173	0.0	3.5	O K
2880 min Summer	0.170	0.170	0.0	3.4	O K
4320 min Summer	0.164	0.164	0.0	3.3	O K
5760 min Summer	0.157	0.157	0.0	3.1	O K
7200 min Summer	0.150	0.150	0.0	2.9	O K
8640 min Summer	0.144	0.144	0.0	2.7	O K
10080 min Summer	0.138	0.138	0.0	2.5	O K
15 min Winter	0.100	0.100	0.0	1.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	19
30 min Summer	49.584	0.0	34
60 min Summer	30.811	0.0	64
120 min Summer	18.584	0.0	124
180 min Summer	13.680	0.0	184
240 min Summer	10.960	0.0	242
360 min Summer	8.001	0.0	362
480 min Summer	6.397	0.0	482
600 min Summer	5.375	0.0	602
720 min Summer	4.661	0.0	722
960 min Summer	3.719	0.0	960
1440 min Summer	2.704	0.0	1212
2160 min Summer	1.963	0.0	1580
2880 min Summer	1.563	0.0	1988
4320 min Summer	1.133	0.0	2812
5760 min Summer	0.901	0.0	3632
7200 min Summer	0.754	0.0	4464
8640 min Summer	0.652	0.0	5272
10080 min Summer	0.576	0.0	6048
15 min Winter	76.290	0.0	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.120	0.120	0.0	2.1	O K
60 min Winter	0.139	0.139	0.0	2.5	O K
120 min Winter	0.156	0.156	0.0	3.0	O K
180 min Winter	0.165	0.165	0.0	3.3	O K
240 min Winter	0.171	0.171	0.0	3.5	O K
360 min Winter	0.179	0.179	0.0	3.7	O K
480 min Winter	0.184	0.184	0.0	3.9	O K
600 min Winter	0.187	0.187	0.0	4.0	O K
720 min Winter	0.189	0.189	0.0	4.0	O K
960 min Winter	0.191	0.191	0.0	4.1	O K
1440 min Winter	0.191	0.191	0.0	4.1	O K
2160 min Winter	0.188	0.188	0.0	4.0	O K
2880 min Winter	0.185	0.185	0.0	3.9	O K
4320 min Winter	0.176	0.176	0.0	3.6	O K
5760 min Winter	0.166	0.166	0.0	3.3	O K
7200 min Winter	0.156	0.156	0.0	3.0	O K
8640 min Winter	0.147	0.147	0.0	2.8	O K
10080 min Winter	0.139	0.139	0.0	2.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	34
60 min Winter	30.811	0.0	64
120 min Winter	18.584	0.0	122
180 min Winter	13.680	0.0	180
240 min Winter	10.960	0.0	240
360 min Winter	8.001	0.0	356
480 min Winter	6.397	0.0	472
600 min Winter	5.375	0.0	588
720 min Winter	4.661	0.0	702
960 min Winter	3.719	0.0	924
1440 min Winter	2.704	0.0	1352
2160 min Winter	1.963	0.0	1684
2880 min Winter	1.563	0.0	2136
4320 min Winter	1.133	0.0	3028
5760 min Winter	0.901	0.0	3920
7200 min Winter	0.754	0.0	4760
8640 min Winter	0.652	0.0	5616
10080 min Winter	0.576	0.0	6448

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.010

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.010

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 100 year Return Period

Half Drain Time : 1862 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.111	0.111	0.0	1.8	O K
30 min Summer	0.134	0.134	0.0	2.4	O K
60 min Summer	0.155	0.155	0.0	3.0	O K
120 min Summer	0.174	0.174	0.0	3.6	O K
180 min Summer	0.184	0.184	0.0	3.9	O K
240 min Summer	0.190	0.190	0.0	4.1	O K
360 min Summer	0.198	0.198	0.0	4.3	O K
480 min Summer	0.202	0.202	0.0	4.5	Flood Risk
600 min Summer	0.205	0.205	0.0	4.6	Flood Risk
720 min Summer	0.207	0.207	0.0	4.6	Flood Risk
960 min Summer	0.209	0.209	0.0	4.7	Flood Risk
1440 min Summer	0.208	0.208	0.0	4.7	Flood Risk
2160 min Summer	0.206	0.206	0.0	4.6	Flood Risk
2880 min Summer	0.203	0.203	0.0	4.5	Flood Risk
4320 min Summer	0.195	0.195	0.0	4.2	O K
5760 min Summer	0.187	0.187	0.0	4.0	O K
7200 min Summer	0.180	0.180	0.0	3.7	O K
8640 min Summer	0.172	0.172	0.0	3.5	O K
10080 min Summer	0.165	0.165	0.0	3.3	O K
15 min Winter	0.120	0.120	0.0	2.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	19
30 min Summer	64.904	0.0	34
60 min Summer	40.510	0.0	64
120 min Summer	24.421	0.0	124
180 min Summer	17.920	0.0	184
240 min Summer	14.300	0.0	242
360 min Summer	10.377	0.0	362
480 min Summer	8.265	0.0	482
600 min Summer	6.922	0.0	602
720 min Summer	5.986	0.0	722
960 min Summer	4.756	0.0	960
1440 min Summer	3.434	0.0	1310
2160 min Summer	2.475	0.0	1664
2880 min Summer	1.960	0.0	2044
4320 min Summer	1.409	0.0	2856
5760 min Summer	1.114	0.0	3688
7200 min Summer	0.927	0.0	4536
8640 min Summer	0.798	0.0	5280
10080 min Summer	0.703	0.0	6056
15 min Winter	99.025	0.0	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.145	0.145	0.0	2.7	O K
60 min Winter	0.167	0.167	0.0	3.3	O K
120 min Winter	0.188	0.188	0.0	4.0	O K
180 min Winter	0.198	0.198	0.0	4.3	O K
240 min Winter	0.205	0.205	0.0	4.6	Flood Risk
360 min Winter	0.213	0.213	0.0	4.9	Flood Risk
480 min Winter	0.219	0.219	0.0	5.1	Flood Risk
600 min Winter	0.222	0.222	0.0	5.2	Flood Risk
720 min Winter	0.224	0.224	0.0	5.3	Flood Risk
960 min Winter	0.227	0.227	0.0	5.4	Flood Risk
1440 min Winter	0.227	0.227	0.0	5.4	Flood Risk
2160 min Winter	0.223	0.223	0.0	5.2	Flood Risk
2880 min Winter	0.220	0.220	0.0	5.1	Flood Risk
4320 min Winter	0.210	0.210	0.0	4.7	Flood Risk
5760 min Winter	0.199	0.199	0.0	4.4	O K
7200 min Winter	0.189	0.189	0.0	4.0	O K
8640 min Winter	0.179	0.179	0.0	3.7	O K
10080 min Winter	0.169	0.169	0.0	3.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	64.904	0.0	34
60 min Winter	40.510	0.0	64
120 min Winter	24.421	0.0	122
180 min Winter	17.920	0.0	180
240 min Winter	14.300	0.0	240
360 min Winter	10.377	0.0	358
480 min Winter	8.265	0.0	474
600 min Winter	6.922	0.0	590
720 min Winter	5.986	0.0	706
960 min Winter	4.756	0.0	932
1440 min Winter	3.434	0.0	1370
2160 min Winter	2.475	0.0	1728
2880 min Winter	1.960	0.0	2188
4320 min Winter	1.409	0.0	3108
5760 min Winter	1.114	0.0	3984
7200 min Winter	0.927	0.0	4832
8640 min Winter	0.798	0.0	5704
10080 min Winter	0.703	0.0	6552

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.010

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.010

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 2258 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.140	0.140	0.0	2.6	O K
30 min Summer	0.168	0.168	0.0	3.4	O K
60 min Summer	0.194	0.194	0.0	4.2	O K
120 min Summer	0.217	0.217	0.0	5.0	Flood Risk
180 min Summer	0.229	0.229	0.0	5.4	Flood Risk
240 min Summer	0.237	0.237	0.0	5.7	Flood Risk
360 min Summer	0.247	0.247	0.0	6.1	Flood Risk
480 min Summer	0.253	0.253	0.0	6.4	Flood Risk
600 min Summer	0.257	0.257	0.0	6.5	Flood Risk
720 min Summer	0.260	0.260	0.0	6.7	Flood Risk
960 min Summer	0.263	0.263	0.0	6.8	Flood Risk
1440 min Summer	0.265	0.265	0.0	6.8	Flood Risk
2160 min Summer	0.262	0.262	0.0	6.7	Flood Risk
2880 min Summer	0.259	0.259	0.0	6.6	Flood Risk
4320 min Summer	0.252	0.252	0.0	6.3	Flood Risk
5760 min Summer	0.244	0.244	0.0	6.0	Flood Risk
7200 min Summer	0.236	0.236	0.0	5.7	Flood Risk
8640 min Summer	0.229	0.229	0.0	5.4	Flood Risk
10080 min Summer	0.221	0.221	0.0	5.1	Flood Risk
15 min Winter	0.152	0.152	0.0	2.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	19
30 min Summer	90.866	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	34.190	0.0	124
180 min Summer	25.088	0.0	184
240 min Summer	20.020	0.0	244
360 min Summer	14.528	0.0	362
480 min Summer	11.570	0.0	482
600 min Summer	9.690	0.0	602
720 min Summer	8.380	0.0	722
960 min Summer	6.658	0.0	962
1440 min Summer	4.807	0.0	1440
2160 min Summer	3.465	0.0	1772
2880 min Summer	2.744	0.0	2136
4320 min Summer	1.973	0.0	2940
5760 min Summer	1.559	0.0	3752
7200 min Summer	1.298	0.0	4608
8640 min Summer	1.118	0.0	5440
10080 min Summer	0.985	0.0	6248
15 min Winter	138.634	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.181	0.181	0.0	3.8	O K
60 min Winter	0.209	0.209	0.0	4.7	Flood Risk
120 min Winter	0.234	0.234	0.0	5.6	Flood Risk
180 min Winter	0.247	0.247	0.0	6.1	Flood Risk
240 min Winter	0.255	0.255	0.0	6.4	Flood Risk
360 min Winter	0.266	0.266	0.0	6.9	Flood Risk
480 min Winter	0.272	0.272	0.0	7.2	Flood Risk
600 min Winter	0.277	0.277	0.0	7.4	Flood Risk
720 min Winter	0.281	0.281	0.0	7.5	Flood Risk
960 min Winter	0.285	0.285	0.0	7.7	Flood Risk
1440 min Winter	0.287	0.287	0.0	7.8	Flood Risk
2160 min Winter	0.285	0.285	0.0	7.7	Flood Risk
2880 min Winter	0.281	0.281	0.0	7.5	Flood Risk
4320 min Winter	0.272	0.272	0.0	7.1	Flood Risk
5760 min Winter	0.261	0.261	0.0	6.7	Flood Risk
7200 min Winter	0.251	0.251	0.0	6.3	Flood Risk
8640 min Winter	0.240	0.240	0.0	5.9	Flood Risk
10080 min Winter	0.230	0.230	0.0	5.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	34
60 min Winter	56.713	0.0	64
120 min Winter	34.190	0.0	122
180 min Winter	25.088	0.0	182
240 min Winter	20.020	0.0	240
360 min Winter	14.528	0.0	358
480 min Winter	11.570	0.0	476
600 min Winter	9.690	0.0	592
720 min Winter	8.380	0.0	708
960 min Winter	6.658	0.0	936
1440 min Winter	4.807	0.0	1384
2160 min Winter	3.465	0.0	2008
2880 min Winter	2.744	0.0	2252
4320 min Winter	1.973	0.0	3160
5760 min Winter	1.559	0.0	4088
7200 min Winter	1.298	0.0	4968
8640 min Winter	1.118	0.0	5800
10080 min Winter	0.985	0.0	6656

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.010

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.010

Model Details

Storage is Online Cover Level (m) 0.500

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Appendix E

Surface Water Drainage Pro-Forma

Surface Water Drainage Pro-forma for new developments

This pro-forma accompanies our "Surface Water Drainage; Local Guidance for Planning Applications" note. It is expected that applicants/developers should complete and submit the pro-forma to present a summary of the surface water drainage strategy for the site and demonstrate compliance with the National Planning Policy Guidance and Non-Statutory Technical Standards. The pro-forma will then be used to support the LPA in making a decision on the suitability of the proposal and, if the LPA is minded to find the completed pro-forma acceptable, then it may be used as an evidence base for a relevant surface water condition to be appended to the decision notice, stating that the developments drainage proposal will be constructed in accordance with the details set out in the relevant pro-forma.

It must however be noted that this pro-forma submitted alone, will not be considered a suitable surface water drainage strategy. It should be clearly referenced within the pro-forma where in the other submission documents the details provided are taken from.

The pro-forma is supported by the Defra/EA guidance on Rainfall Runoff Management. and uses the storage calculator on www.UKsuds.com. The pro-forma should be considered alongside other supporting SuDS Guidance, but focuses on ensuring flood risk is not made worse elsewhere. This proforma is based upon current industry standard practice.

1. Site Details

Site	Bicester Heritage Hotel
Address & post code or LPA reference	A4421, Bicester OX26 5HA
Grid reference	SP 59258 24680
Is the existing site developed or Greenfield?	Greenfield
Total Site Area	3.34 Hectares
Total Site Area served by drainage system (excluding open space) (Ha)*	1.80 Hectares
Pre-application sought? (Ref)	

***** The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers
Impermeable area (ha)	0 Hectares	1.80 Hectares	1.80 Hectares	If proposed > existing, then runoff rates and volumes will be increasing. Section 6 must be filled in. If proposed ≤ existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)	Infiltration	Infiltration	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

3. Proposing to Discharge Surface Water via

	Yes	No	Justification and Evidence that this is possible	Notes for developers
Infiltration	X		Soakage tests have been carried out within Bicester Heritage. Infiltration rate 1.43×10^{-6} m/s	Soakage tests will need to be provided and results included in drainage strategy. Section 7 (infiltration) must be filled in if infiltration is proposed.
To watercourse	X			If infiltration is not possible - is there a watercourse nearby? Have the EA or IDB provided input where necessary?
To surface water sewer	X		.	This should be a last resort. If required, has sewer provider confirmed that sufficient capacity exists for this connection? Has an appropriate connection detail been agreed?
Combination of above	X			e.g. part infiltration, part discharge to sewer or watercourse. Provide evidence as above.

4. Peak Discharge Rates – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	Notes for developers
Greenfield QBAR	0.7 l/s	N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 7 (QBAR) is proposed.
1 in 1	0.6 l/s	0 l/s	-0.6 l/s	Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. E.g. discharging all flow from site at the existing 1 in 100 event increases flood risk during smaller events.
1 in 30	1.6 l/s	0 l/s	-1.6 l/s	
1in 100	2.3 l/s	0 l/s	-2.3 l/s	
1 in 100 plus climate change	N/A	0 l/s	-2.3 l/s	To mitigate for climate change the proposed 1 in 100 +CC must be no greater than the existing 1 in 100 runoff rate. If not, flood risk increases under climate change. - Where lifetime of development is 100 years (residential) 30% should be added to the peak rainfall intensity. - Where lifetime of development is 60 years (residential) 20% should be added to the peak rainfall intensity.

5. Calculate additional volumes for storage –The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of storm water that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers
1 in 1	16.946 m^3	0 m^3	-16.946 m^3	Proposed discharge volumes (without mitigation) should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	54.053 m^3	0 m^3	-54.053 m^3	
1in 100	92.734 m^3	0 m^3	-92.734 m^3	
1 in 100 plus climate change	N/A	0 m^3	-92.734 m^3	To mitigate for climate change the volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk will increase under climate change.

6. Calculate attenuation storage – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		Notes for developers
What Storage Attenuation volume (Flow rate control) is required to retain rates as existing (m^3) **Where is the storage to be accommodated on site?**	New cellular soakaway will be installed under parking area to attenuate and infiltrate runoff volume from roof area and adjacent hard paving. In addition, permeable paving for all car parks will drain and infiltrate runoff water from this area. New access road will drain into 3 No. swales and infiltrate into the ground	Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers
Infiltration	**State the Site's Geology and known Source Protection Zones (SPZ)**	Outside SPZ	- Infiltration rates are highly variable, soakage tests should be comprehensive. - Avoid infiltrating in made ground. - Refer to Environment Agency website to identify and source protection zones (SPZ)
	Infiltration Rate (m/s)?	1.43×10^{-6} m/s	Infiltration rates should be no lower than 1×10^{-6} m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level	No recorded	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.

	Were infiltration rates obtained by desk study or infiltration test?	Infiltration test.	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided.
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	No.	Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	**Yes/No? If the answer is No, please identify how the storm water will be stored prior to release**	Yes.	If infiltration is not feasible how will the additional volume be stored? The applicant should consider the following options in the next section.

Storage requirements

The developer must confirm one of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at **QBAR** (Mean annual flow rate). This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers
Please confirm what option has been chosen and how much storage is required on site.	New cellular soakaway with a capacity of 729.6 m^3 will be installed under soft landscape area to attenuate and infiltrate runoff volume from roof and adjacent. In addition, permeable sub-base in car parks will drain and infiltrate runoff water from this area.	The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

	The new access road will drain into 3No. swales located to both sides of the road.	

8. Please confirm

		Notes for developers
1. Which Drainage Systems measures have been used? Provide an overview of the SuDS design scheme used? - Is the runoff managed at, or close to, the surface wherever possible. - Where the system serves more than one property, is public space used and integrated with the drainage system in an appropriate and beneficial way?	- Permeable paving - Cellular tank - Swales	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697.
2. Functionality Are the design features sufficiently durable to ensure structural integrity over the system design life (residential 100 years and commercial 60 years), with reasonable maintenance requirements?	Yes	
Are all parts of the SuDS system outside any areas of flood risk?	Yes	If not, provide justification and evidence that performance will not be adversely affected.
Has runoff and flooding from all sources (both on and off site) been considered and taken into account in the design?	Yes	
Has residual risk been addressed?	Yes refer Drainage strategy	• Does the drainage system contain the 1 in 30 storm event without any flooding (include description of how any exceedance of surface water systems will be routed exceptional rain fall away from property)? • Are 1 in 100 year flows contained or stored on-site within safe exceedance storage areas and flow paths? • Is any flooding between 1 in 30 and 100 +CC storm events safely contained on site, without causing property flooding or a hazard to site users? • Has it been ensured that there is no flooding from the system to downstream property or access routes for the 100 year + climate change event?
How are rates being restricted (hydro brakes etc.)?	No rates to be restricted	- Hydrobrakes to be used where rates are between 2l/s to 5l/s. - Orifices not to be used below 5l/s as the pipes may

		block. - Pipes with flows < 2l/s are prone to blockage.
3. Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	Bicester Heritage Hotel	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.
How is the entire drainage system to be maintained? An acceptable maintenance plan, clearly defining the operating and maintenance requirements of the drainage system will need to be submitted and approved.	The drainage drawings and schedules will form part of the O&M manual along with a post completion CCTV survey to ensure the system if fully operational at handover.	If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than those above, please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all element of the proposed drainage system must be provided. Poorly maintained drainage can lead to increased flooding problems in the future.

9. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your pro-forma, in particular exceedance routes, ownership and location of SuDS (maintenance access strips etc.)

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2	Drainage Strategy	1, Appendix A &C
Section 3	Drainage Strategy	Appendix C
Section 4	Drainage Strategy	Appendix B &D
Section 5	Drainage Strategy	Appendix B&D
Section 6	Drainage Strategy	Appendix C
Section 7	Drainage Strategy	Appendix A & C

The above form is completed using factual information and evidence from the Surface Water Drainage Strategy, Flood Risk Assessment and site plans and can be used as a summary of the surface water drainage strategy on this site, clearly showing that the proposed surface water rate and volume will not be increasing as a result of the development. Where an increase in rate or volume is shown the appropriate sections of the pro-forma have been completed setting out how the additional rate/volume is being dealt with, to ensure no increased flood risk on or off site.

Where the pro-forma is found to be acceptable to the Local Planning Authority then the surface water drainage system design must be built in accordance with the details provided here.

Form completed by: Graham Taylor

Qualification of person responsible for signing of this pro-forma: IEng MICE

Company: AKS Ward

On behalf of (Client's details): Bicester Heritage

Date 11.07.18

Appendix F

SuDS Maintenance Schedule

Cellular Tanks Operation & Maintenance Requirements

Regular inspection and maintenance is required to ensure the effective long-term operation of below ground modular storage systems.

Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Modular systems – operation and maintenance requirements

Maintenance schedule	Required action	Recommended Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlet , overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

Maintenance activities should be detailed in the health and safety plan and a risk assessment should be undertaken.

Permeable Paving Operation & Maintenance Requirements

Regular inspection and maintenance is important for the effective operation of pervious pavements. The facility should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. Manufacturers' recommendations should always be followed.

A brush cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:

1. End of winter (April) – to collect winter debris.
2. Mid-summer (July/August) – to collect dust, flower and grass-type deposits.
3. After autumn leaf fall (November).

Care should be taken in using vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced.

If reconstruction is necessary, the following procedure should be followed:

1. Lift surface layer and laying course.
2. Remove any geo-textile filter layer.
3. Inspect sub-base and remove, and replace if required.
4. Renew any geo-textile layers.
5. Renew laying course, jointing material and concrete block paving.

The reconstruction of failed areas of concrete block pavement should be less costly and disruptive than the rehabilitation of continuous concrete or asphalt porous surfaces due to the reduced area that is likely to be affected. Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Pervious pavement operation and maintenance requirements

Maintenance schedule	**Required action**	**Frequency**
Regular maintenance	Brushing	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilize and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements

Maintenance schedule	Required action	Frequency
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting, and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every ten to fifteen years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Maintenance activities should be detailed in the Health and Safety Plan and a risk assessment should be undertaken.

Swales Operation & Maintenance Requirements

Regular inspection and maintenance is important for the effective operation of swales as designed.

Adequate access must be provided to all swale areas for inspection and maintenance, including for appropriate equipment and vehicles. Operation and maintenance requirements for swales are described below.

Swales operation and maintenance requirements

Maintenance schedule	**Required action**	**Frequency**
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets, and overflows for blockages and clear of required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48hrs	Monthly, or when required
	Inspect vegetation coverage	Monthly for six months, quarterly for two years, then bi-annually
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Re-level uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits, and prevent compaction of the soil surface	As required
	Remove buildup of sediment on upstream gravel trench, flow spreader of the soil surface	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly

Maintenance schedule	Required action	Frequency
	Inspect infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for >48 hours	Monthly, or when required
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Half yearly

Sediments excavated from swales that receive runoff from residential or standard road and roof areas are generally not toxic or hazardous material and can be safely disposed of by either land application or land filling. However, consultation should take place with the environmental regulator to confirm appropriate protocols. Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods. For industrial site runoff, sediment testing will be essential. In the majority of cases, it will be acceptable to distribute the sediment on site if there is an appropriate safe and acceptable location to do so.

Many of the specific maintenance activities for swales can be undertaken as part of a general landscaping contract and so if landscape management is already required at site, should have marginal cost implications.

Maintenance activities should be detailed in the health and safety plan and a risk assessment should be undertaken.

APPENDIX C

Geotechnical Report
(Infiltration test results)

ID	Type	X (Easting)	Y (Northing)	Proposed Depth (m)	Installation	Soakaway
	TP	459157.08	224654.95	4	N	Y
TP101	TP	459173.48	224647.69	4	N	N
TP102	TP	459215.18	224631.99	4	N	n
TP103	TP	459224.55	224809.33	4	N	Y
TP104	TP	459282.65	224726.4	4	n	Y
TP105	TP	459237.67	224673.92	4	n	n
TP106	TP	459304.67	224648.16	4	N	N
TP107	TP	459228.77	224762.01	4	N	N
TP108	TP	459276.09	224621.92	4	N	N
TP109	TP	459197.22	224708.28	4	N	N
RO1	RO	459253.75	224710.47	3	Y	N
RO2	RO	459240.01	224616.45	3	Y	N
RO3	RO	459211.27	224655.18	3	Y	n

KEY PLAN

Site Boundary

Proposed Locations

- Trial Pit
- Rotary Open
- Soakaway
- Installation

NOTES

1. Contains OS data © Crown copyright and database right (2021)

REVISIONS

REV.	DRAWN BY INITIALS	CHECKED BY INITIALS	DATE	REVISION NOTES/COMMENTS
P01	MT	AB	09/02/22	First issue

Hydrock

TITLE	PROPOSED GROUND INVESTIGATION PLAN
HYDROCK PROJECT NO.	22457
SCALE @ A3	1:2,000
CLIENT	Bicester Motion
PURPOSE OF ISSUE	SUITABLE FOR INFORMATION
STATUS	S2
PROJECT	Bicester Heritage Hotel
DRAWING NO.	22457-HYD-XX-XX-DR-GE-1001
REVISION	P01

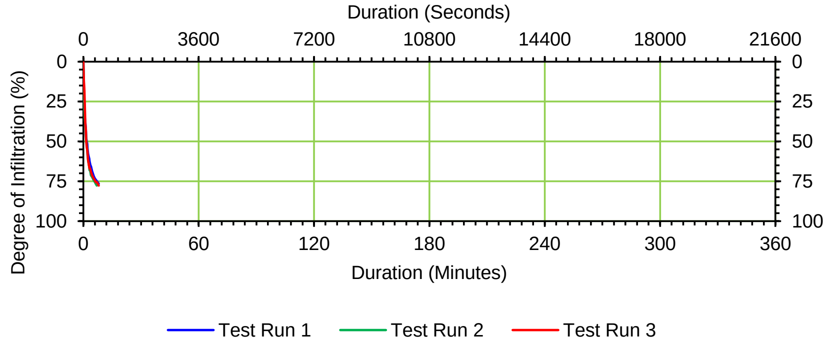
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Bicester Heritage

Client: IKS Consulting on behalf of Bicester Motion

Test Location TP103 **Date of start** 17/02/2022 **Date at end** 17/02/2022

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				Pit Dimensions (m)				Pit Dimensions (m)			
Trial Pit Length (L)			2.300m	Trial Pit Length (L)			2.300m	Trial Pit Length (L)			2.300m
Trial Pit Breadth / Width (B)			0.800m	Trial Pit Breadth / Width (B)			0.800m	Trial Pit Breadth / Width (B)			0.800m
Effective Depth (D)			1.800m	Effective Depth (D)			1.800m	Effective Depth (D)			1.800m
Time at Start of Filling			13.24	Time at Start of Filling			14.03	Time at Start of Filling			15.02
Time at End of Filling			13.35	Time at End of Filling			14.13	Time at End of Filling			15.12
Depth from Surface to Water (D_{TW})			1.160m	Depth below Surface to Water (D_{TW})			0.860m	Depth below Surface to Water (D_{TW})			0.860m
Water Depth (W_D)			0.640m	Water Depth (W_D)			0.940m	Water Depth (W_D)			0.940m
Maximum Fill Volume (V_W)			1.178m^3	Maximum Fill Volume (V_W)			1.730m^3	Maximum Fill Volume (V_W)			1.730m^3
Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes
Porosity of Gravel Backfill (P_t)			0.300	Porosity of Gravel Backfill (P_t)			0.300	Porosity of Gravel Backfill (P_t)			0.300
Corrected Water Volume (V_{WC})			0.353m^3	Corrected Water Volume (V_{WC})			0.519m^3	Corrected Water Volume (V_{WC})			0.519m^3
Time to soakaway				Time to soakaway				Time to soakaway			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	13.350	1.160	0	1	14.130	0.860	0	1	15.115	0.860	0
1	13.353	1.270	15	1	14.133	1.000	15	1	15.118	0.970	15
1	13.355	1.320	30	1	14.135	1.150	30	1	15.120	1.030	30
1	13.358	1.380	45	1	14.138	1.190	45	1	15.125	1.220	60
1	13.360	1.400	60	1	14.140	1.230	60	1	15.128	1.260	75
1	13.363	1.430	75	1	14.142	1.270	74	1	15.130	1.320	90
1	13.365	1.460	90	1	14.145	1.310	90	1	15.133	1.360	105
1	13.368	1.480	105	1	14.148	1.350	105	1	15.135	1.380	120
1	13.370	1.490	120	1	14.150	1.380	120	1	15.138	1.400	135
1	13.373	1.510	135	1	14.153	1.410	135	1	15.140	1.440	150
1	13.375	1.530	150	1	14.155	1.440	150	1	15.143	1.460	165
1	13.378	1.540	165	1	14.158	1.460	165	1	15.145	1.480	180
1	13.380	1.550	180	1	14.160	1.480	180	1	15.148	1.490	195
1	13.383	1.560	195	1	14.163	1.500	195	1	15.150	1.490	210
1	13.385	1.570	210	1	14.165	1.500	210	1	15.155	1.510	240
1	13.388	1.580	225	1	14.168	1.520	225	1	15.160	1.530	270
1	13.390	1.580	240	1	14.170	1.530	240	1	15.165	1.540	300
1	13.395	1.600	270	1	14.175	1.540	270	1	15.170	1.550	330
1	13.400	1.610	300	1	14.180	1.550	300	1	15.175	1.560	360
1	13.405	1.620	330	1	14.185	1.560	330	1	15.180	1.570	390
1	13.410	1.630	360	1	14.190	1.570	360	1	15.185	1.570	420
1	13.420	1.640	420	1	14.195	1.580	390	1	15.190	1.580	450
1	13.430	1.650	480	1	14.200	1.590	420	1	15.195	1.590	480
25% water loss (75% full)			1.320m	**25% water loss (75% full)**			1.095m	**25% water loss (75% full)**			1.095m
50% water loss (50% full)			1.480m	**50% water loss (50% full)**			1.330m	**50% water loss (50% full)**			1.330m
75% water loss (25% full)			1.640m	**75% water loss (25% full)**			1.565m	**75% water loss (25% full)**			1.565m
25% time (seconds)			29 sec	**25% time (seconds)**			24 sec	**25% time (seconds)**			40 sec
75% time (seconds)			420 sec	**75% time (seconds)**			345 sec	**75% time (seconds)**			375 sec
Vp 75-25			0.177m^3	**Vp 75-25**			0.259m^3	**Vp 75-25**			0.259m^3
ap 50 (Actual area from test)			3.824m^3	**ap 50 (Actual area from test)**			4.754m^3	**ap 50 (Actual area from test)**			4.754m^3
tp 75 - 25			391 sec	**tp 75 - 25**			321 sec	**tp 75 - 25**			335 sec
Soil Infiltration Rate	**1.18E-04m/s**			**Soil Infiltration Rate**	**1.70E-04m/s**			**Soil Infiltration Rate**	**1.63E-04m/s**		



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	DATE	01/03/2022
Checked by	PRINT	CA
	SIGN	CA
	DATE	02/03/2022

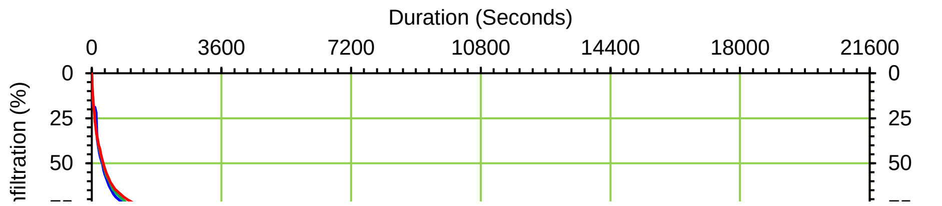
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Bicester Heritage

Client: IKS Consulting on behalf of Bicester Motion

Test Location TP106 **Date of start** 18/02/2022 **Date at end** 18/02/2022

Test Run 1				**Test Run 2**				**Test Run 3**			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			1.800m	Trial Pit Length (L)			1.800m	Trial Pit Length (L)			1.800m
Trial Pit Breadth / Width (B)			0.600m	Trial Pit Breadth / Width (B)			0.600m	Trial Pit Breadth / Width (B)			0.600m
Effective Depth (D)			1.800m	Effective Depth (D)			1.800m	Effective Depth (D)			1.800m
Time at Start of Filling			9.18	Time at Start of Filling			9.58	Time at Start of Filling			10.30
Time at End of Filling			9.28	Time at End of Filling			10.04	Time at End of Filling			10.36
Depth from Surface to Water (D_{TW})			0.520m	Depth below Surface to Water (D_{TW})			0.450m	Depth below Surface to Water (D_{TW})			0.450m
Water Depth (W_D)			1.280m	Water Depth (W_D)			1.350m	Water Depth (W_D)			1.350m
Maximum Fill Volume (V_W)			1.382m³	Maximum Fill Volume (V_W)			1.458m³	Maximum Fill Volume (V_W)			1.458m³
Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes
Porosity of Gravel Backfill (P_t)			0.300	Porosity of Gravel Backfill (P_t)			0.300	Porosity of Gravel Backfill (P_t)			0.300
Corrected Water Volume (V_{WC})			0.415m³	Corrected Water Volume (V_{WC})			0.437m³	Corrected Water Volume (V_{WC})			0.437m³
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	9.280	0.520	0	1	10.043	0.450	0	1	10.363	0.450	0
1	9.283	0.680	15	1	10.045	0.560	15	1	10.365	0.560	15
1	9.285	0.750	30	1	10.048	0.650	30	1	10.368	0.630	30
1	9.288	0.760	45	1	10.050	0.680	45	1	10.370	0.670	45
1	9.294	0.760	85	1	10.053	0.720	60	1	10.373	0.720	60
1	9.300	0.800	120	1	10.055	0.750	75	1	10.375	0.750	75
1	9.305	0.990	150	1	10.058	0.810	90	1	10.378	0.800	90
1	9.308	1.020	165	1	10.060	0.840	105	1	10.385	0.900	135
1	9.310	1.050	180	1	10.065	0.910	135	1	10.390	0.950	165
1	9.315	1.090	210	1	10.070	0.960	165	1	10.395	0.990	195
1	9.320	1.120	240	1	10.075	1.000	195	1	10.400	1.020	225
1	9.325	1.150	270	1	10.080	1.040	225	1	10.405	1.060	255
1	9.330	1.170	300	1	10.085	1.070	255	1	10.410	1.090	285
1	9.335	1.210	330	1	10.090	1.100	285	1	10.420	1.150	345
1	9.340	1.240	360	1	10.100	1.160	345	1	10.430	1.200	405
1	9.360	1.320	480	1	10.110	1.220	405	1	10.450	1.270	525
1	9.380	1.380	600	1	10.120	1.250	465	1	10.470	1.320	645
1	9.390	1.400	660	1	10.140	1.320	585	1	10.510	1.380	885
1	9.420	1.440	840	1	10.160	1.360	705	1	10.530	1.400	1005
1	9.440	1.460	960	1	10.200	1.420	945	1	10.560	1.430	1185
1	9.460	1.470	1080	1	10.240	1.450	1185	1	11.010	1.450	1485
1	9.480	1.490	1200	1	10.280	1.470	1425	1	11.060	1.470	1785
1	9.500	1.500	1320	1	10.300	1.480	1545	1	11.110	1.490	2085
25% water loss (75% full)			0.840m	**25% water loss (75% full)**			0.788m	**25% water loss (75% full)**			0.788m
50% water loss (50% full)			1.160m	**50% water loss (50% full)**			1.125m	**50% water loss (50% full)**			1.125m
75% water loss (25% full)			1.480m	**75% water loss (25% full)**			1.463m	**75% water loss (25% full)**			1.463m
25% time (seconds)			126 sec	**25% time (seconds)**			84 sec	**25% time (seconds)**			86 sec
75% time (seconds)			1140 sec	**75% time (seconds)**			1335 sec	**75% time (seconds)**			1673 sec
Vp 75-25			0.207m³	**Vp 75-25**			0.219m³	**Vp 75-25**			0.219m³
ap 50 (Actual area from test)			4.152m³	**ap 50 (Actual area from test)**			4.320m³	**ap 50 (Actual area from test)**			4.320m³
tp 75 - 25			1014 sec	**tp 75 - 25**			1251 sec	**tp 75 - 25**			1586 sec
Soil Infiltration Rate		**4.93E-05m/s**		**Soil Infiltration Rate**		**4.05E-05m/s**		**Soil Infiltration Rate**		**3.19E-05m/s**	



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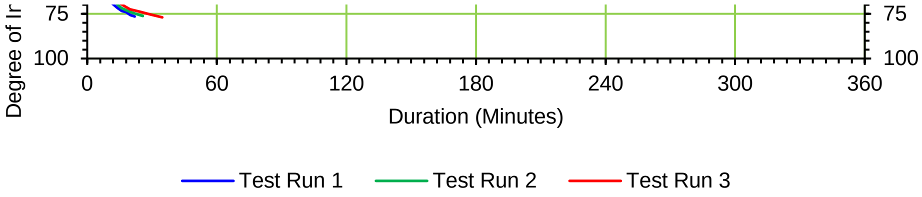

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	SIGN	CA
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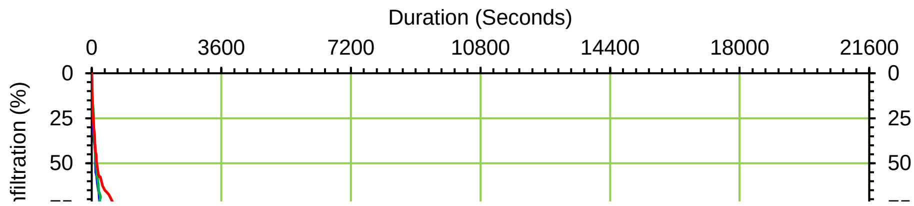
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Bicester Heritage

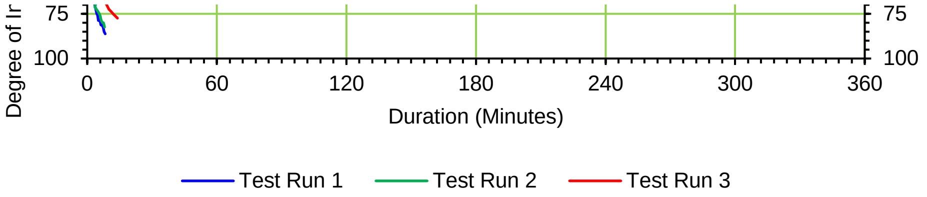
Client: IKS Consulting on behalf of Bicester Motion

Test Location TP110 **Date of start** 17/02/2022 **Date at end** 17/02/2022

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			1.800m	Trial Pit Length (L)			1.800m	Trial Pit Length (L)			1.800m
Trial Pit Breadth / Width (B)			0.740m	Trial Pit Breadth / Width (B)			0.740m	Trial Pit Breadth / Width (B)			0.740m
Effective Depth (D)			1.300m	Effective Depth (D)			1.300m	Effective Depth (D)			1.300m
Time at Start of Filling			11.05	Time at Start of Filling			12.12	Time at Start of Filling			12.32
Time at End of Filling			11.10	Time at End of Filling			12.17	Time at End of Filling			12.49
Depth from Surface to Water (D_{TW})			0.500m	Depth below Surface to Water (D_{TW})			0.500m	Depth below Surface to Water (D_{TW})			0.500m
Water Depth (W_D)			0.800m	Water Depth (W_D)			0.800m	Water Depth (W_D)			0.800m
Maximum Fill Volume (V_W)			1.066m³	Maximum Fill Volume (V_W)			1.066m³	Maximum Fill Volume (V_W)			1.066m³
Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes
Porosity of Gravel Backfill (P_t)			0.300	Porosity of Gravel Backfill (P_t)			0.300	Porosity of Gravel Backfill (P_t)			0.300
Corrected Water Volume (V_{WC})			0.320m³	Corrected Water Volume (V_{WC})			0.320m³	Corrected Water Volume (V_{WC})			0.320m³
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	11.097	0.500	0	1	12.170	0.500	0	1	12.490	0.500	0
1	11.102	0.700	30	1	12.173	0.610	17	1	12.493	0.640	15
1	11.107	0.800	60	1	12.178	0.680	47	1	12.498	0.710	45
1	11.109	0.810	75	1	12.180	0.760	62	1	12.500	0.750	60
1	11.113	0.840	95	1	12.183	0.810	77	1	12.503	0.770	75
1	11.115	0.940	110	1	12.185	0.830	92	1	12.505	0.810	90
1	11.120	0.960	140	1	12.188	0.880	107	1	12.508	0.850	105
1	11.123	0.990	155	1	12.190	0.900	122	1	12.510	0.860	120
1	11.125	1.000	170	1	12.193	0.930	137	1	12.513	0.890	135
1	11.128	1.020	185	1	12.195	0.960	152	1	12.515	0.910	150
1	11.130	1.030	200	1	12.198	0.970	167	1	12.518	0.930	165
1	11.133	1.060	215	1	12.200	1.000	182	1	12.520	0.950	180
1	11.140	1.100	260	1	12.203	1.030	197	1	12.525	0.960	210
1	11.143	1.100	275	1	12.205	1.030	212	1	12.530	0.960	240
1	11.145	1.110	290	1	12.210	1.050	242	1	12.540	1.000	300
1	11.148	1.130	305	1	12.205	1.070	212	1	12.550	1.020	360
1	11.150	1.130	320	1	12.220	1.090	302	1	12.560	1.030	420
1	11.155	1.130	350	1	12.225	1.100	332	1	12.570	1.040	480
1	11.160	1.150	380	1	12.230	1.110	362	1	12.580	1.060	540
1	11.165	1.150	410	1	12.235	1.130	392	1	12.590	1.080	600
1	11.170	1.160	440	1	12.240	1.140	422	1	13.000	1.090	660
1	11.175	1.180	470	1	12.245	1.140	452	1	13.010	1.100	720
1	11.180	1.190	500	1	12.250	1.160	482	1	13.030	1.120	840
25% water loss (75% full)			0.700m	**25% water loss (75% full)**			0.700m	**25% water loss (75% full)**			0.700m
50% water loss (50% full)			0.900m	**50% water loss (50% full)**			0.900m	**50% water loss (50% full)**			0.900m
75% water loss (25% full)			1.100m	**75% water loss (25% full)**			1.100m	**75% water loss (25% full)**			1.100m
25% time (seconds)			40 sec	**25% time (seconds)**			51 sec	**25% time (seconds)**			41 sec
75% time (seconds)			275 sec	**75% time (seconds)**			332 sec	**75% time (seconds)**			720 sec
Vp 75-25			0.160m³	**Vp 75-25**			0.160m³	**Vp 75-25**			0.160m³
ap 50 (Actual area from test)			3.364m³	**ap 50 (Actual area from test)**			3.364m³	**ap 50 (Actual area from test)**			3.364m³
tp 75 - 25			235 sec	**tp 75 - 25**			281 sec	**tp 75 - 25**			679 sec
Soil Infiltration Rate		**2.02E-04m/s**		**Soil Infiltration Rate**		**1.69E-04m/s**		**Soil Infiltration Rate**		**6.99E-05m/s**	



Form completed by		
Tested By	PRINT	HT
	SIGN	HT
	DATE	17/02/2022
	PRINT	HT



Calculated By	SIGN	HT
	DATE	28/02/2022
Checked by	PRINT	CA
	SIGN	CA
	DATE	02/03/2022

APPENDIX D

Surface Water Drainage Calculations

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Car Park Permeable Paving Type : Porous Paving

Dimensions

Exceedence Level (m)	82.859
Depth (m)	0.300
Base Level (m)	82.559
Paving Layer Depth (mm)	100
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	56.869
Long. Slope (1:x)	300.00
Width (m)	133.499
Total Volume (m³)	455.515

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	car park
Bypass Destination	(None)
Capacity Type	No Restriction

Advanced

Base Infiltration Rate (m/hr)	0.4248
Safety Factor	2.0
Conductivity (m/hr)	500.0

Building Permeable paving Type : Porous Paving

Dimensions

Exceedence Level (m)	82.603
Depth (m)	0.300
Base Level (m)	82.303
Paving Layer Depth (mm)	60
Membrane Percolation (m/hr)	324.0
Porosity (%)	30
Length (m)	43.932
Long. Slope (1:x)	318.00
Width (m)	5.039
Total Volume (m³)	15.940

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (1)
Bypass Destination	(None)
Capacity Type	No Restriction

Advanced

Base Infiltration Rate (m/hr)	0.11484
Safety Factor	2.0
Conductivity (m/hr)	500.0

Porous Paving

Type : Porous Paving

Dimensions

Exceedence Level (m)	82.703
Depth (m)	0.300
Base Level (m)	82.403
Paving Layer Depth (mm)	60
Membrane Percolation (m/hr)	346.0
Porosity (%)	30
Length (m)	68.386
Long. Slope (1:x)	500.00
Width (m)	10.289
Total Volume (m³)	50.663

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (7)
Bypass Destination	(None)
Capacity Type	No Restriction

Advanced

Base Infiltration Rate (m/hr)	0.11484
Safety Factor	2.0
Conductivity (m/hr)	500.0

Porous Paving (1) Type : Porous Paving

Dimensions

Exceedence Level (m)	81.948
Depth (m)	0.300
Base Level (m)	81.648
Paving Layer Depth (mm)	100
Membrane Percolation (m/hr)	346.0
Porosity (%)	30
Length (m)	13.076
Long. Slope (1:x)	30.00
Width (m)	26.257
Total Volume (m³)	20.600

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (8)
Bypass Destination	(None)
Capacity Type	No Restriction

Advanced

Base Infiltration Rate (m/hr)	0.11484
Safety Factor	2.0
Conductivity (m/hr)	500.0

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

RS1 Type : Swale

Swale

Exceedence Level (m)	82.813
Depth (m)	0.300
Base Level (m)	82.513
Top Width (m)	2.584
Side Slope (1:x)	3.00
Base Width (m)	0.784
Freeboard (mm)	10
Length (m)	20.673
Long. Slope (1:x)	60.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.033
Total Volume (m³)	9.916

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (2)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Advanced

Safety Factor	2.0

Swale

Base Infiltration Rate (m/hr)	0.11484
Side Infiltration Rate (m/hr)	0.11484
Porosity (%)	100

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

RS2 Type : Swale

Swale

Exceedence Level (m)	82.933
Depth (m)	0.300
Base Level (m)	82.633
Top Width (m)	3.333
Side Slope (1:x)	3.00
Base Width (m)	1.533
Freeboard (mm)	100
Length (m)	18.705
Long. Slope (1:x)	60.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.033
Total Volume (m³)	7.981

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (3)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Advanced

Safety Factor	2.0

Swale

Base Infiltration Rate (m/hr)	0.11484
Side Infiltration Rate (m/hr)	0.11484
Porosity (%)	100

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

RS3

Type : Swale

Swale

Exceedence Level (m)	82.242
Depth (m)	0.300
Base Level (m)	81.942
Top Width (m)	6.000
Side Slope (1:x)	3.00
Base Width (m)	4.200
Freeboard (mm)	0
Length (m)	33.287
Long. Slope (1:x)	150.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.033
Total Volume (m³)	50.929

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (6)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (4)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Advanced

Safety Factor	2.0

Swale

Base Infiltration Rate (m/hr)	0.11484
Porosity (%)	100

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

RS4 Type : Swale

Swale

Exceedence Level (m)	82.474
Depth (m)	0.300
Base Level (m)	82.174
Top Width (m)	5.874
Side Slope (1:x)	3.00
Base Width (m)	4.074
Freeboard (mm)	10
Length (m)	33.108
Long. Slope (1:x)	450.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.033
Total Volume (m³)	47.469

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (5)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Advanced

Safety Factor	2.0

Swale

Base Infiltration Rate (m/hr)	0.11484
Porosity (%)	100

Main Building Soakaway

Type : Cellular Storage

Dimensions

Exceedence Level (m)	83.000
Depth (m)	0.800
Base Level (m)	82.000
Number of Crates Long	42
Number of Crates Wide	18
Number of Crates High	2
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	287.480

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Advanced

Base Infiltration Rate (m/hr)	0.11484
Side Infiltration Rate (m/hr)	0.11484
Safety Factor	2.0

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
car park	Car Park Permeable Paving		Time of Concentration	0.792	100	0	100	0.792
Catchment Area	Main Building Soakaway		Time of Concentration	0.541	100	0	100	0.541
Catchment Area (1)	Building Permeable paving		Time of Concentration	0.022	100	0	100	0.022
Catchment Area (2)	RS1		Time of Concentration	0.007	100	0	100	0.007
Catchment Area (3)	RS2		Time of Concentration	0.006	100	0	100	0.006
Catchment Area (4)	RS3		Time of Concentration	0.069	100	0	100	0.069
Catchment Area (5)	RS4		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (6)	RS3		Time of Concentration	0.011	100	0	100	0.011
Catchment Area (7)	Porous Paving		Time of Concentration	0.090	100	0	100	0.090
Catchment Area (8)	Porous Paving (1)		Time of Concentration	0.039	100	0	100	0.039
TOTAL		**0.0**		**1.586**				**1.586**

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address:		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Level	Level Inverts
Min. Cover Depth (m)	1.200
Min. Slope (1:x)	500.00
Max. Slope (1:x)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75

Diameter (mm)	Min. Slope (1:x)	Max. Slope (1:x)
100	0.00	0.00
150	0.00	0.00

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address:		

Manhole Options

Apply Offset	☐
Synchronise Manhole Invert Levels	☑

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	1
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FSR

Type: FSR

Region	England and Wales
M5-60 (mm)	20.0
Ratio R	0.411
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	0
30.0	0
100.0	0
100.0	40

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)	Status
Car Park Permeable Paving	FSR: 1 years: +0 %: 15 mins: Winter	82.756	82.559	0.007	0.000	111.4	3.196	0.000	52.049	0.0	0.000	0	99	OK
Main Building Soakaway	FSR: 1 years: +0 %: 60 mins: Winter	82.103	82.103	0.103	0.103	39.7	37.106	0.000	42.697	0.0	0.000	53	87	OK
Building Permeable paving	FSR: 1 years: +0 %: 30 mins: Winter	82.503	82.303	0.063	0.000	2.4	0.831	0.000	1.903	0.0	0.000	10	95	OK
RS1	FSR: 1 years: +0 %: 15 mins: Winter	82.865	82.558	0.008	0.045	1.0	0.247	0.000	0.301	0.0	0.000	9	98	OK
RS2	FSR: 1 years: +0 %: 15 mins: Winter	82.951	82.640	0.006	0.007	0.8	0.115	0.000	0.364	0.0	0.000	2	99	OK
RS3	FSR: 1 years: +0 %: 30 mins: Winter	82.178	82.028	0.014	0.085	8.7	3.790	0.000	4.926	0.0	0.000	14	93	OK
RS4	FSR: 1 years: +0 %: 15 mins: Winter	82.255	82.174	0.007	0.000	1.4	0.192	0.000	0.651	0.0	0.000	2	100	OK
Porous Paving	FSR: 1 years: +0 %: 30 mins: Winter	82.634	82.403	0.095	0.000	9.9	3.996	0.000	7.696	0.0	0.000	16	92	OK
Porous Paving (1)	FSR: 1 years: +0 %: 15 mins: Winter	82.112	81.648	0.028	0.000	5.5	0.969	0.000	2.554	0.0	0.000	5	95	OK

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)	Status
Car Park Permeable Paving	FSR: 30 years: +0 %: 15 mins: Winter	82.870	82.559	0.121	0.000	274.3	55.379	0.000	126.946	0.0	0.000	5	88	OK
Main Building Soakaway	FSR: 30 years: +0 %: 120 mins: Winter	82.346	82.346	0.346	0.346	58.6	124.119	0.000	90.524	0.0	0.000	164	57	OK
Building Permeable paving	FSR: 30 years: +0 %: 30 mins: Winter	82.667	82.303	0.226	0.000	6.0	2.999	0.000	3.369	0.0	0.000	24	81	OK
RS1	FSR: 30 years: +0 %: 30 mins: Winter	82.869	82.646	0.011	0.133	1.8	0.918	0.000	0.818	0.0	0.000	24	91	OK
RS2	FSR: 30 years: +0 %: 30 mins: Winter	82.952	82.679	0.007	0.046	1.5	0.531	0.000	1.005	0.0	0.000	9	93	OK
RS3	FSR: 30 years: +0 %: 60 mins: Winter	82.183	82.133	0.019	0.191	14.0	13.367	0.000	12.713	0.0	0.000	51	74	OK
RS4	FSR: 30 years: +0 %: 15 mins: Winter	82.261	82.175	0.013	0.000	3.4	0.751	0.000	1.590	0.0	0.000	4	98	OK
Porous Paving	FSR: 30 years: +0 %: 60 mins: Winter	82.860	82.403	0.320	0.000	15.9	13.359	2.863	21.226	0.0	0.000	33	74	Flood
Porous Paving (1)	FSR: 30 years: +0 %: 30 mins: Winter	82.187	81.648	0.103	0.000	10.4	3.749	0.000	8.099	0.0	0.000	11	82	OK

FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)	Status
Car Park Permeable Paving	FSR: 100 years: +0 %: 15 mins: Winter	82.939	82.559	0.190	0.000	356.3	86.466	0.000	150.911	0.0	0.000	7	81	OK
Main Building Soakaway	FSR: 100 years: +0 %: 120 mins: Winter	82.489	82.489	0.489	0.489	77.1	175.711	0.000	93.215	0.0	0.000	225	39	OK
Building Permeable paving	FSR: 100 years: +0 %: 30 mins: Winter	82.757	82.303	0.316	0.000	7.8	4.190	0.725	4.308	0.0	0.000	29	74	Flood
RS1	FSR: 100 years: +0 %: 60 mins: Winter	82.868	82.675	0.010	0.161	1.6	1.312	0.000	1.752	0.0	0.000	34	87	OK
RS2	FSR: 100 years: +0 %: 30 mins: Winter	82.953	82.703	0.008	0.070	1.9	0.811	0.000	1.094	0.0	0.000	14	90	OK
RS3	FSR: 100 years: +0 %: 60 mins: Winter	82.186	82.178	0.022	0.236	18.4	19.582	0.000	14.037	0.0	0.000	76	62	OK
RS4	FSR: 100 years: +0 %: 15 mins: Winter	82.263	82.187	0.015	0.012	4.5	1.072	0.000	1.967	0.0	0.000	6	98	OK
Porous Paving	FSR: 100 years: +0 %: 30 mins: Winter	82.879	82.403	0.339	0.000	31.6	18.373	5.540	13.917	0.0	0.000	41	64	Flood
Porous Paving (1)	FSR: 100 years: +0 %: 30 mins: Winter	82.226	81.648	0.143	0.000	13.6	5.650	0.000	10.598	0.0	0.000	14	73	OK

FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Project:	Date: 27/04/2022		
	Designed by: tomclark	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)	Status
Car Park Permeable Paving	FSR: 100 years: +40 %: 30 mins: Winter	83.077	82.559	0.328	0.000	387.5	133.755	42.625	302.158	0.0	0.000	10	71	Flood
Main Building Soakaway	FSR: 100 years: +40 %: 240 mins: Winter	82.750	82.750	0.750	0.750	63.5	269.290	0.000	194.399	0.0	0.000	329	6	OK
Building Permeable paving	FSR: 100 years: +40 %: 30 mins: Winter	82.777	82.303	0.336	0.000	10.9	6.356	1.591	4.974	0.0	0.000	35	60	Flood
RS1	FSR: 100 years: +40 %: 60 mins: Winter	82.871	82.722	0.013	0.209	2.2	2.077	0.000	2.113	0.0	0.000	48	79	OK
RS2	FSR: 100 years: +40 %: 30 mins: Winter	82.955	82.742	0.010	0.109	2.7	1.321	0.000	1.209	0.0	0.000	22	83	OK
RS3	FSR: 100 years: +40 %: 120 mins: Winter	82.242	82.242	0.078	0.300	15.8	30.584	0.001	30.326	0.0	0.000	116	40	OK
RS4	FSR: 100 years: +40 %: 15 mins: Winter	82.264	82.203	0.016	0.029	6.3	1.677	0.000	2.334	0.0	0.000	9	96	OK
Porous Paving	FSR: 100 years: +40 %: 30 mins: Winter	82.902	82.403	0.363	0.000	44.2	27.319	8.859	17.626	0.0	0.000	41	46	Flood
Porous Paving (1)	FSR: 100 years: +40 %: 30 mins: Winter	82.385	81.665	0.301	0.017	19.1	8.954	0.168	14.637	0.0	0.000	19	57	Flood

APPENDIX E

Proposed Levels Drawing

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CLIENT:
BICESTER MOTION LTD

IN ASSOCIATION WITH:

PROJECT:
HOTEL
PRE-COMMENCEMENT CONDITIONS

TITLE:
PROPOSED LEVELS STRATEGY

TECH:	CSE:	ICSE:	SCALE: 1:500 @ A1
JM			INITIAL ISSUE: 28/04/2022

STATUS:
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PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
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APPENDIX F

PROPOSED Overland Flow Drawing

DRAWING NOTES:

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LEGEND

↘ EXCEEDENCE FLOW ROUTE ARROW

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BICESTER MOTION LTD

IN ASSOCIATION WITH:

PROJECT:

HOTEL
PRE-COMMENCEMENT CONDITIONS

TITLE:

PROPOSED EXCEEDENCE FLOW LAYOUT

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JM			INITIAL ISSUE: 28/04/2022

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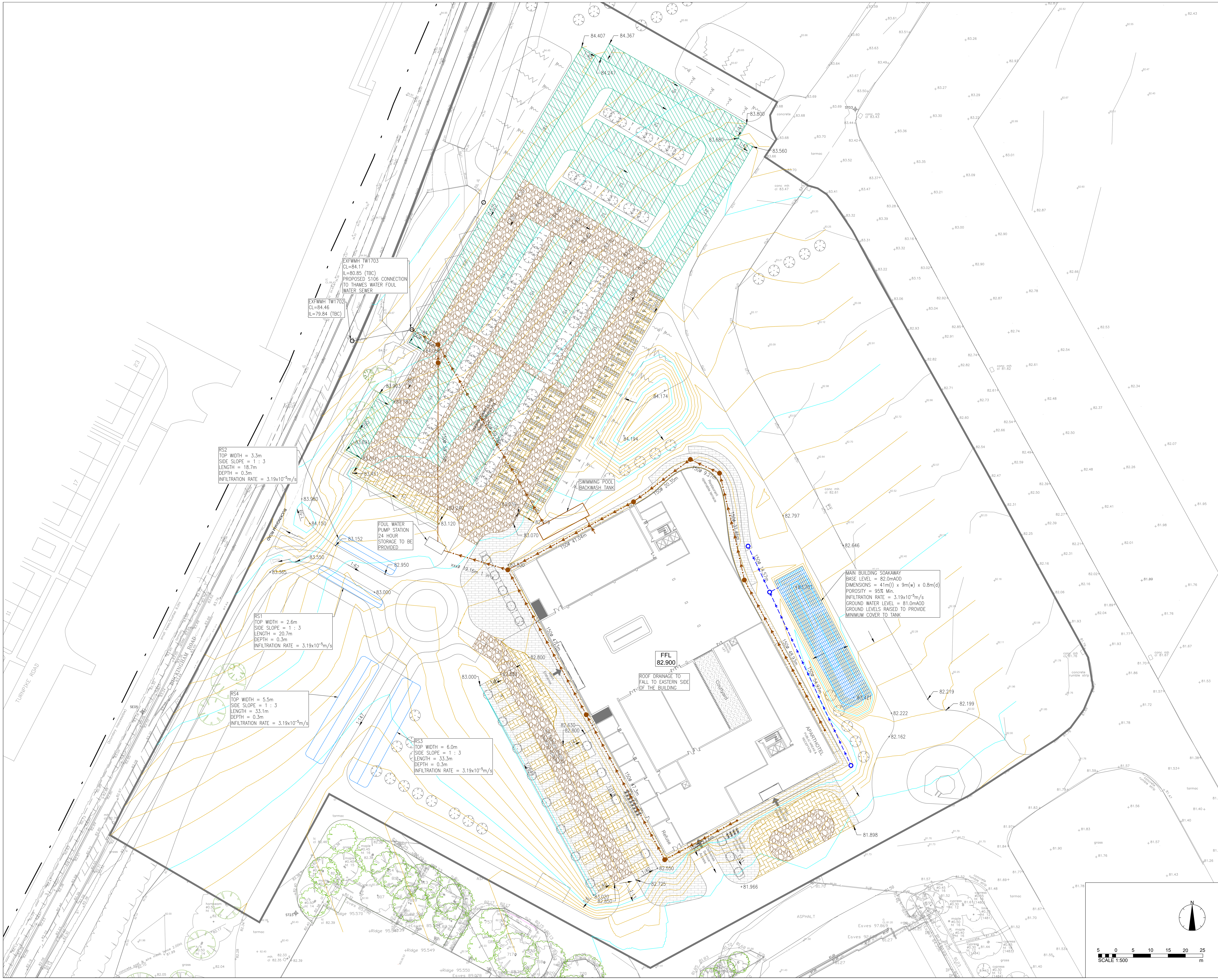
5017396	RDG	XX	ST	DR	C	0501	-

APPENDIX G

PROPOSED Drainage Layout



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LEGEND

- PROPOSED PRIVATE FOUL DRAIN
- PROPOSED FOUL PUMPING MAIN
- PROPOSED PRIVATE S.W. DRAIN
- EXISTING SEWER
- PROPOSED 1200mmø MANHOLE
- MH/IC — PROPOSED PRIVATE MANHOLE/INSPECTION CHAMBER depth > 600mm – 450mmø (SEE PLAN FOR TYPE)
- PROPOSED GEOCELLULAR SOAKAWAY
- PROPOSED SWALE
- PROPOSED PERMEABLE PAVED FOOTPATH – BASE 300mm BELOW PROPOSED GROUND LEVEL WITH 30% Min. NO FINES AGGREGATE
- PROPOSED PERMEABLE PAVING – BASE 300mm BELOW PROPOSED GROUND LEVEL WITH 30% Min. NO FINES AGGREGATE
- PROPOSED GRASSCRETE PAVING – BASE 300mm BELOW PROPOSED GROUND LEVEL WITH 30% Min. NO FINES AGGREGATE
- PROPOSED PERMEABLE SUB–BASE – BASE 300mm BELOW PROPOSED GROUND LEVEL WITH 30% Min. NO FINES AGGREGATE

REV	DESCRIPTION	DATE	DRAWN
-	PRELIMINARY ISSUE	28/04/2022	JM

ORIGINATOR:

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TITLE:

PROPOSED DRAINAGE STRATEGY

TECH:	CSE:	ICSE:	SCALE: 1:500 @ A1
JM	Tom Clark I have reviewed this document 2022.04.28 22:58:28 +01'00'		INITIAL ISSUE: 28/04/2022

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