

Flood Risk Assessment & Drainage Strategy

**Ratby Sports Club,
Desford Lane,
Ratby**

Document Reference: 25-22211 0-040P1

Flood Risk Assessment

Project: **Ratby Sports Club, Desford Lane, Ratby**

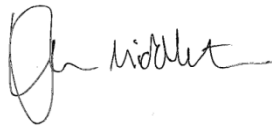
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DRAWINGS	9431_02_01B	
	25-22211 0-010P1	
	25-22211 0-500P1	
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1. INTRODUCTION

1.1 Project Scope

- 1.1.1 Diamond Wood & Shaw Ltd has been commissioned by Wolfdale Leisure Ltd to carry out a flood risk assessment for proposals at the Ratby Sports Club, Desford Lane, Ratby, Leicestershire.
- 1.1.2 It is understood that this Flood Risk Assessment will be submitted to the Planning Authority as part of a planning application. Specifically, this assessment intends to:
- a) Review any literature and guidance specific to this area such as the SFRA;
 - b) Assess the risks to people and property and propose mitigation measures accordingly;
 - c) Review existing evacuation and warning procedures for the area;
 - d) Carry out an appraisal of flood risk from all sources as required by NPPF;
 - e) Report findings and recommendations.
- 1.1.3 This assessment is carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) dated 2025. Other documents which have been consulted include:
- DEFRA/EA document entitled *Framework and guidance for assessing and managing flood risk for new development Phase 2 (FD2320/TR2)*, 2005;
 - Communities and Local Government 2007. *Improving the Flood Performance of New Buildings*. HMSO.
 - DEFRA/EA document entitled *The flood risks to people methodology (FD2321/TR1)*, 2006;
 - EA *Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose*, 2008;
 - National Planning Practice Guidance – Flood Risk and Coastal Change.
 - UK Government’s climate change allowances guidance.
 - Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment (2017 SFRA) dated 2017.
 - Hinkley and Bosworth Borough Council Strategic Flood Risk Assessment (2019 SFRA) dated 2019.

2. DATA COLLECTION

2.1 To assist with this report, the data collected included:

- Ordnance Survey 1:10,000 street view map obtained via Promap (Evans Rivers and Coastal Ltd OS licence number 100049458).
- British Geological Survey, *Online Geology of Britain Viewer*.
- British Geological Survey, *Groundwater flooding susceptibility map*.
- 1:625,000 *Hydrogeological Map of England and Wales*, published in 1977 by the Institute of Geological Sciences (now the British Geological Survey).
- LIDAR data at 1m resolution.
- Product 4 flood data provided by the Environment Agency as part of their response received 20th January 2026 (Appendix A).
- Topographical survey data as shown on Drawing Number 9431_02_01B.

3. SITE CHARACTERISTICS

3.1 Existing Site Characteristics and Location

- 3.1.1 The site is located at the Ratby Sports Club, Desford Lane, Ratby, Leicestershire. The approximate Ordnance Survey (OS) grid reference for the site is 450992, 305512 and the location of the site is shown on Figure 1.

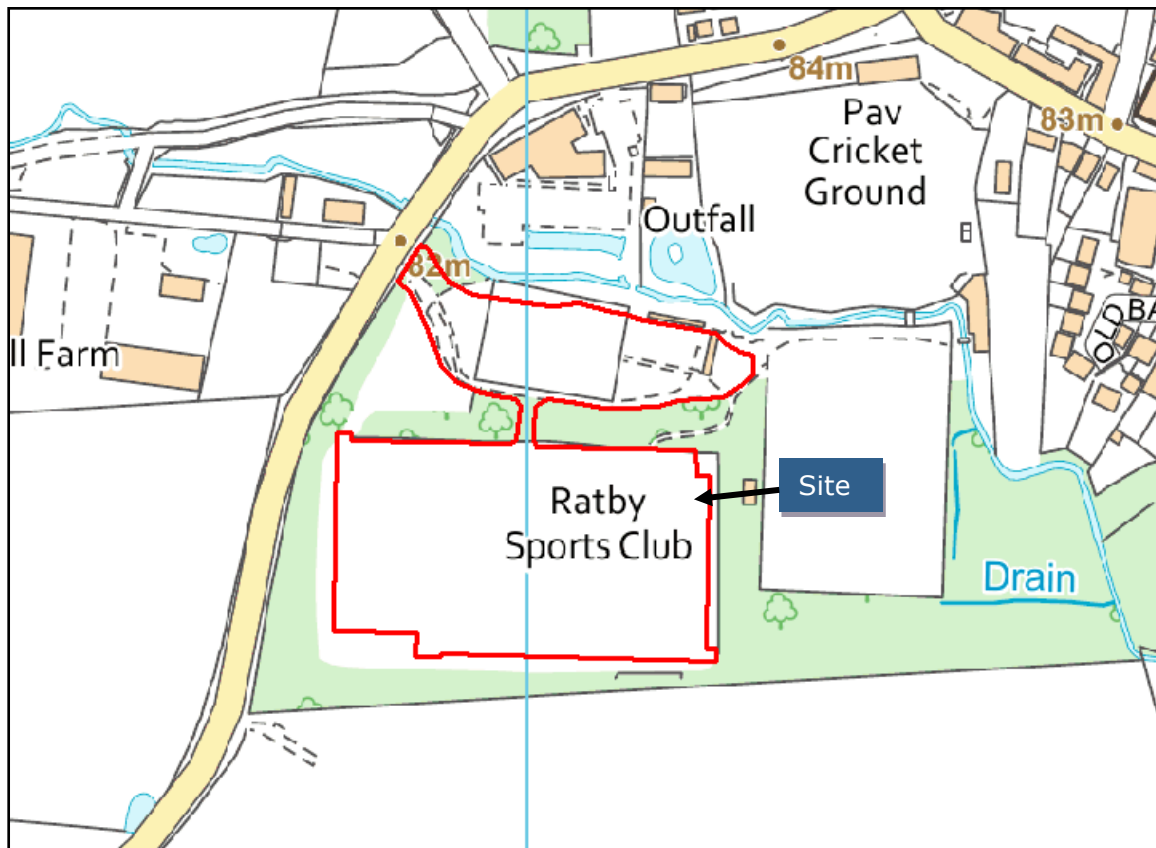


Figure 1: Site location plan (Source: Ordnance Survey)

- 3.1.2 The site comprises the Ratby Sports Club which includes sports pitches, car park and open space. The site is accessed from Desford Lane to the north west of the site.
- 3.1.3 Topographical survey data is shown on Drawing Number 9431_02_01B. Filtered LIDAR data at 1m resolution has also been obtained in order to determine and illustrate the topography across the site and surrounding area (Figure 2).
- 3.1.4 The survey data indicates that ground levels fall in a northerly direction towards a tributary of the Rothley Brook.

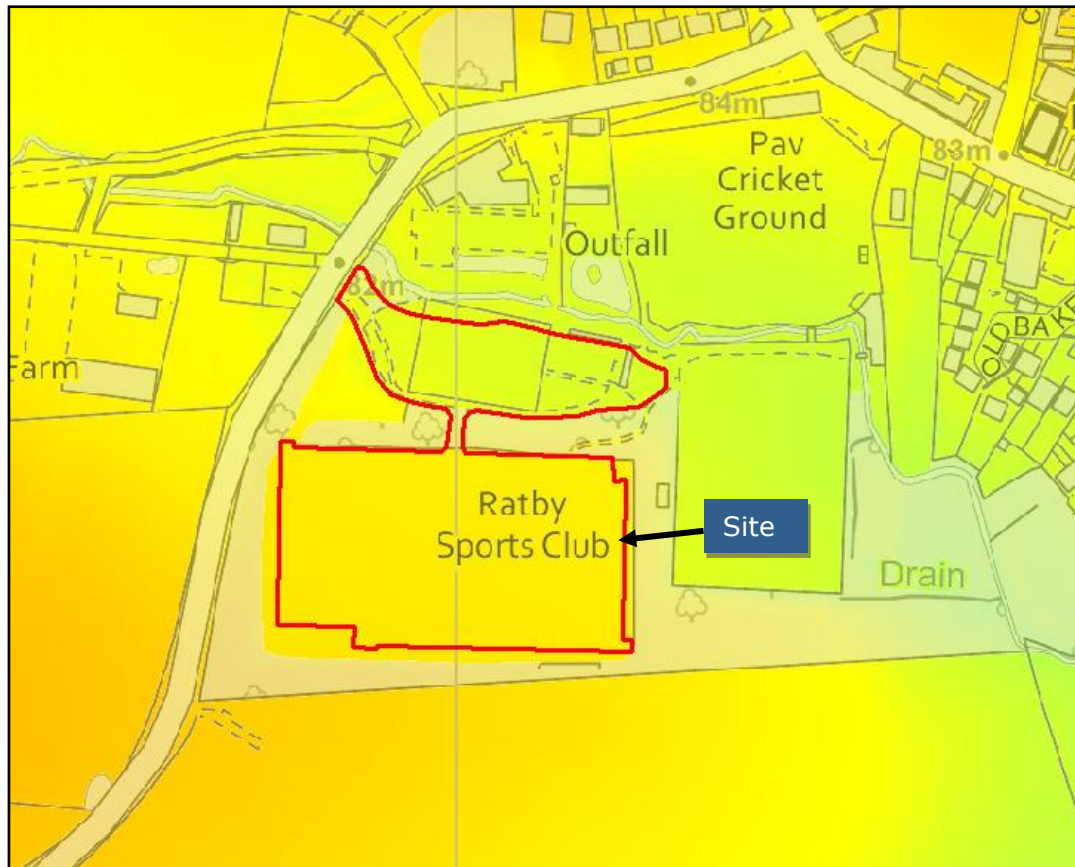


Figure 2: LIDAR survey data where higher ground is denoted as orange and yellow colours and lower areas denoted by blue and green colours

3.2 Site Proposals

- 3.2.1 It is the Client's intention to formally create grassed sports pitches, padel courts, clubroom and changing block, spectator stands, machinery store and parking areas.
- 3.2.2 The proposed site layout is shown on shown on Drawing Number 9431_02_01B.
- 3.2.3 Annex 3 of the NPPF confirms that this type of development is classified as a 'less-vulnerable' use and 'water-compatible' use.

4. SOURCES OF FLOODING

4.1 Fluvial

Flood Map for Planning

- 4.1.1 The DEFRA Flood Map for Planning and associated data was updated on 25th March 2025 (Figure 3 and 4) with pdf guidance entitled *Flood Zones Product Description*.
- 4.1.2 This map together with the 2017 SFRA Appendix A map 76 shows that the site is located within the NPPF Flood Zone 3, 2 and 1 associated with a tributary of the Rothley Brook located north of the site.
- 4.1.3 The 2017 SFRA Appendix A map 76 shows that this watercourse is not designated Main River and is an Ordinary Watercourse.
- 4.1.4 Figure 5 shows that the proposed car parking area and access would be located within Flood Zone 3 and 2.
- 4.1.5 The Environment Agency flood defence information via <https://environment.data.gov.uk/asset-management/index.html> shows that there are no formal raised flood defences along the watercourse at this location.

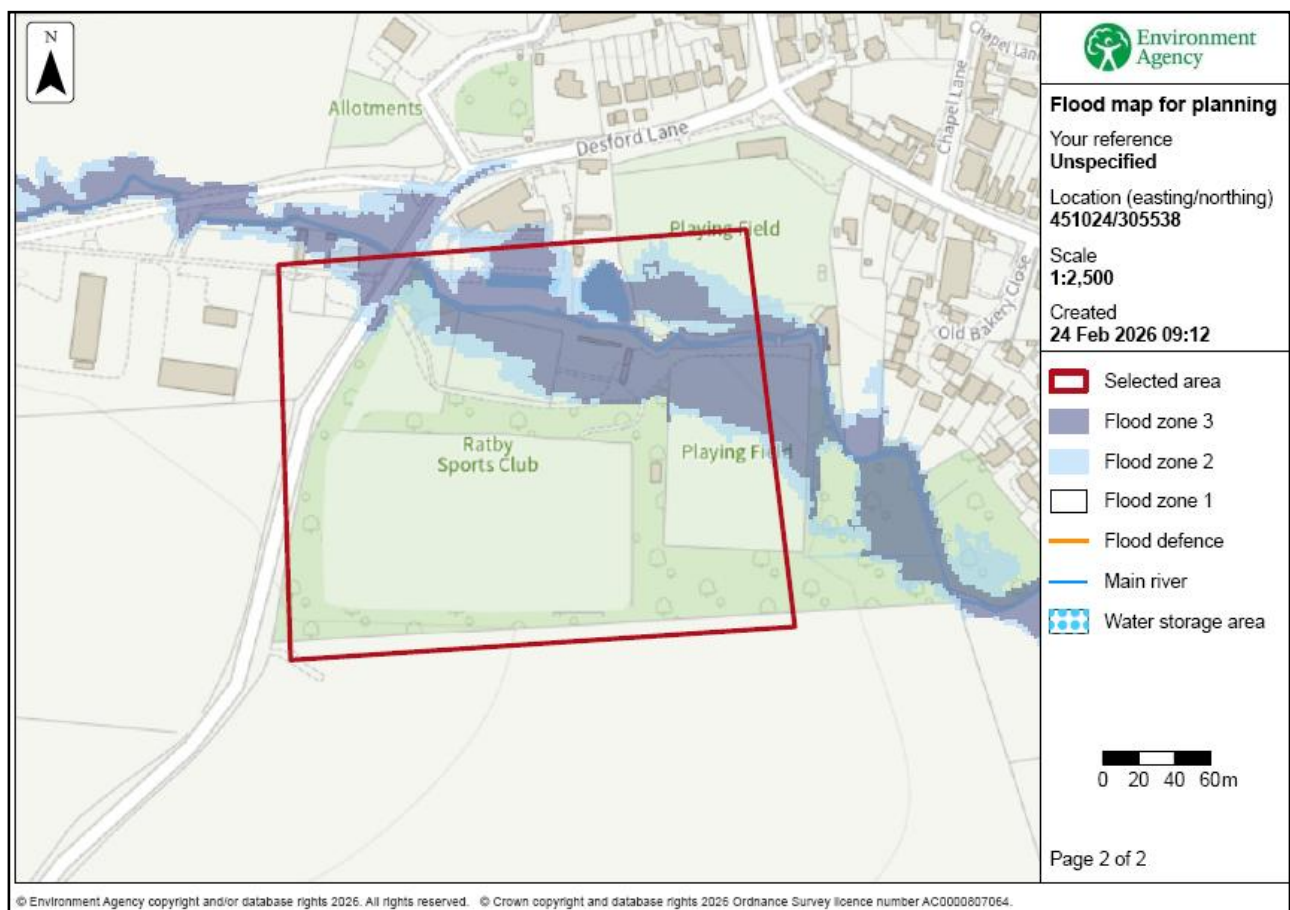


Figure 3: Flood Map for Planning

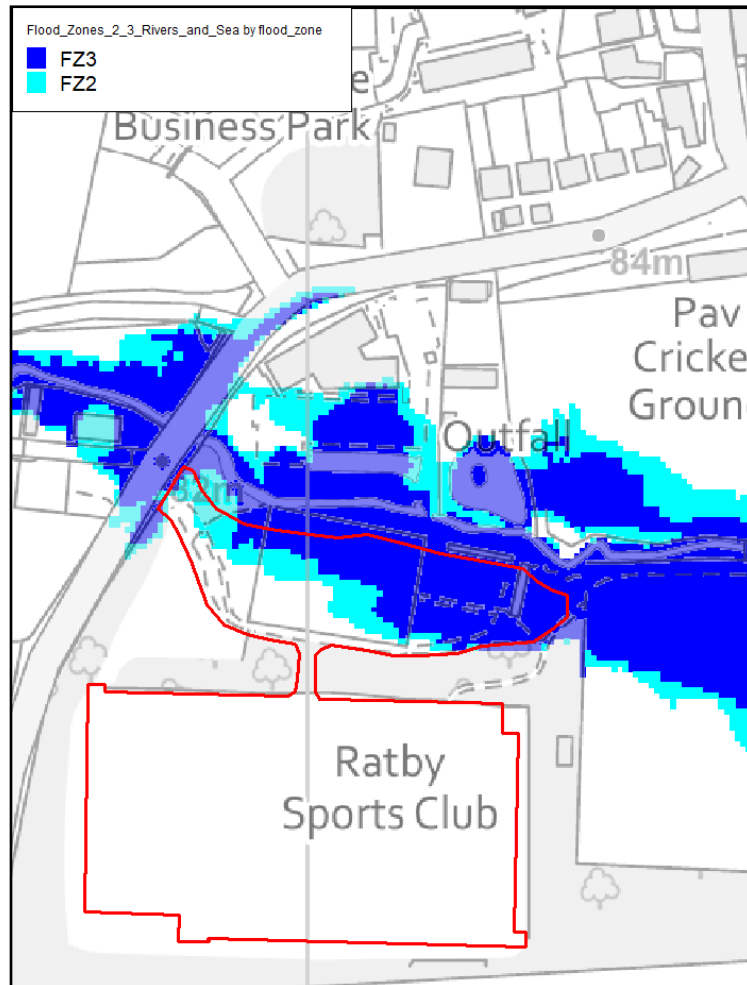


Figure 4: Flood Map for Planning together with site boundary

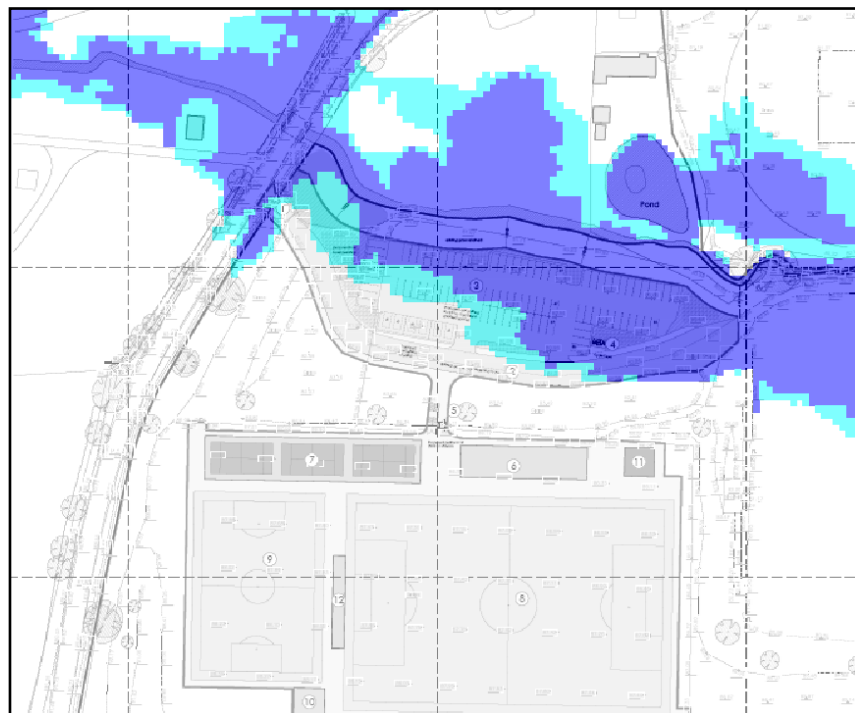


Figure 5: Flood Map for Planning together with proposed layout
Rothley Brook

- 4.1.6 Product 4 flood data for the Rothley Brook has been provided by the Environment Agency as part of their response received 20th January 2026 (Appendix A). The mapping confirms that floodwater from the Rothley Brook does not reach the site during all modelled events.

DEFRA Risk of flooding from Rivers and Sea (RoFRS)

- 4.1.7 In the absence of flood modelling for the Ordinary Watercourse to the north of the site, in order to determine the fluvial risk, the following DEFRA risk of flooding from rivers and sea can be used.
- 4.1.8 The DEFRA Risk of flooding from rivers and sea (*RoFRS*) map and associated data was updated on 28th January 2025 with pdf guidance entitled *RoFRS Product Description*. It now supersedes previous datasets and can be viewed at <https://www.gov.uk/check-long-term-flood-risk> and <https://environment.data.gov.uk/explore/96ab4342-82c1-4095-87f1-0082e8d84ef1> with the raw GIS data being available at <https://environment.data.gov.uk/explore/96ab4342-82c1-4095-87f1-0082e8d84ef1?download=true>.
- 4.1.9 The DEFRA Data Services Platform states that the Risk of Flooding from rivers and sea (*RoFRS*) map shows the chance of flooding from rivers and the sea taking into account the presence and condition of flood defences
- 4.1.10 The DEFRA Data Services Platform also states that *RoFRS* is a probabilistic product, meaning that it shows the overall risk, rather than the risk associated with a specific event or scenario. In externally published versions of this dataset, risk is displayed as one of four likelihood bandings:
- High - greater than or equal to 1 in 30 (3.3%) chance of flooding in any given year;
 - Medium - less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance of flooding in any given year;
 - Low - less than 1 in 100 (1%) but greater than or equal to 1 in 1000 year (0.1%) chance of flooding in any given year.
 - Very Low – less than 1 in 1000 year (0.1%) chance of flooding in any given year (also denoted by the mapping as 'Unavailable').
- 4.1.11 The DEFRA Data Services Platform 'Announcements' section states that while the previous *RoFRS* Depth datasets showed the maximum depth of flooding that could result from a flood with a 0.1%, 1% and 3.3% chance of happening in any given year, the new *RoFRS* Depth datasets show the annual chance of flooding beyond a specific depth, for depths at intervals from 20cm to 120cm.
- 4.1.12 For example, the 20cm dataset shows a map of likelihood of flooding beyond 20cm depth within the 4 likelihood bands. The depths are as follows:
- 0.2m
 - 0.3m
 - 0.6m
 - 0.9m
 - 1.2m
- 4.1.13 Where the mapping shows an area with no depth results, despite it being located within a risk banding, DEFRA have confirmed that this denotes a Very Low probability for that particular depth to occur.
- 4.1.14 Information has also been created which indicates the possible impacts of climate change on future risk in line with the guidance at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#when-to-use-climate-change-allowance>.
- 4.1.15 For rivers and sea flood risk the mapping considers the fluvial 'Central' allowance for the 2050s epoch (2040-2069), and the coastal 'Higher Central' allowance for 2036-2065 and can be viewed at <https://www.gov.uk/check-long-term-flood-risk> and

<https://environment.data.gov.uk/explore/de4079f2-3569-45b2-8009-a00bccc520a1>, with the raw GIS data being available at <https://environment.data.gov.uk/explore/de4079f2-3569-45b2-8009-a00bccc520a1?download=true>.

- 4.1.16 The associated climate change depths within the 4 likelihood bands are the same as the non-climate change depths set out above.
- 4.1.17 The DEFRA Risk of flooding from rivers and sea (*RoFRS*) map and associated data (Figures 6, 7, 8 and 9) shows that there is a Very Low to High flood risk across the site and when accounting for future climate change.
- 4.1.18 Figure 10 shows that the proposed car park and access would be located within Low to High risk areas and all proposed building and other structures would be located within Very Low climate change risk areas thus preventing internal flooding.

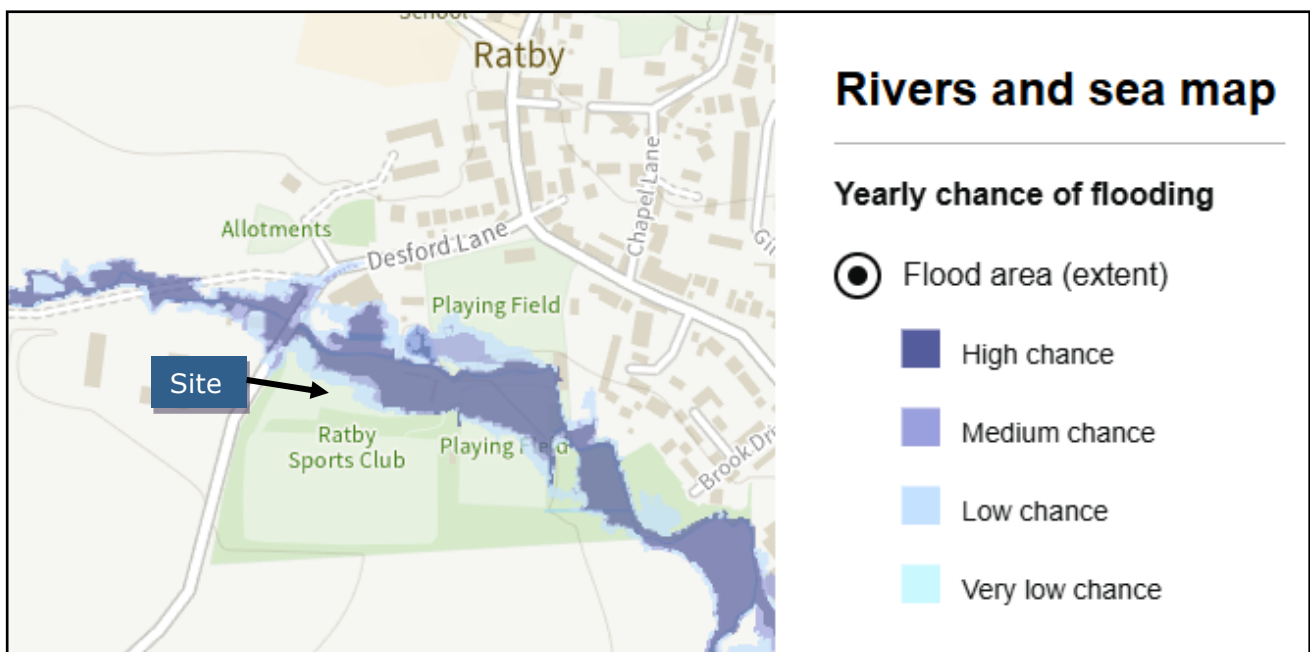


Figure 6: DEFRA Risk of flooding from rivers and sea (*RoFRS*) map from <https://www.gov.uk/check-long-term-flood-risk>

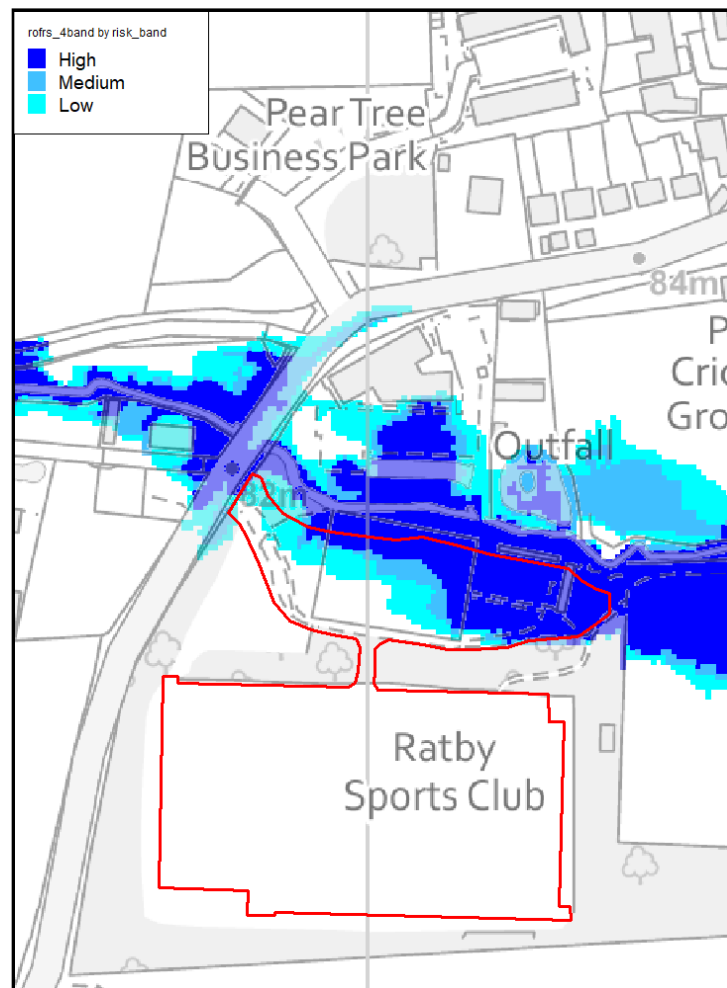


Figure 7: DEFRA Risk of flooding from rivers and sea (*RoFRS*) map data
<https://environment.data.gov.uk/explore/96ab4342-82c1-4095-87f1-0082e8d84ef1?download=true>

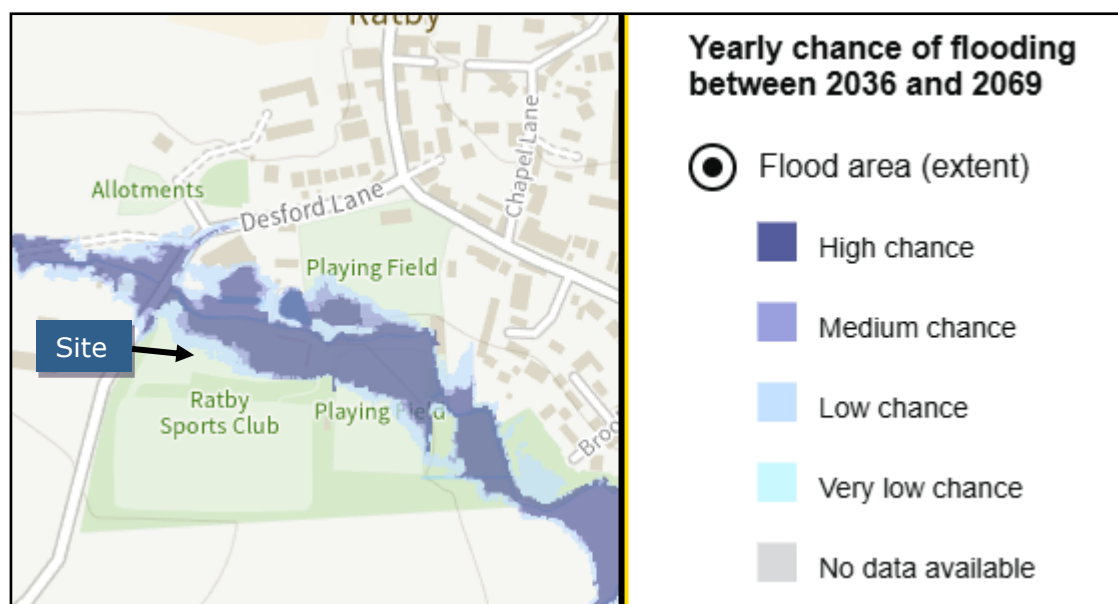


Figure 8: DEFRA Risk of flooding from rivers and sea (*RoFRS*) map data with climate change
 from <https://www.gov.uk/check-long-term-flood-risk>

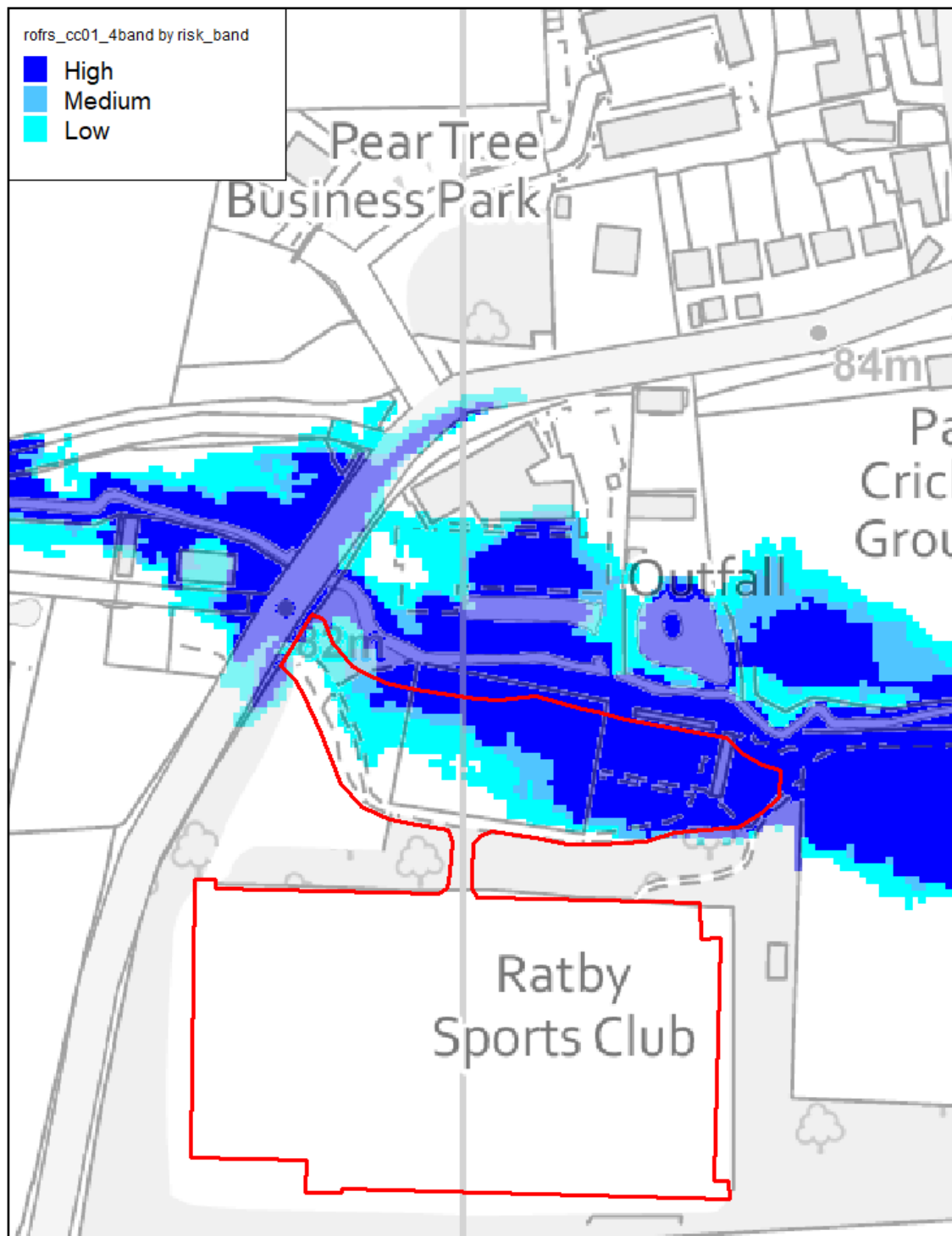


Figure 9: DEFRA Risk of flooding from rivers and sea (*RoFRS*) map data with climate change from <https://environment.data.gov.uk/explore/de4079f2-3569-45b2-8009-a00bccc520a1?download=true>

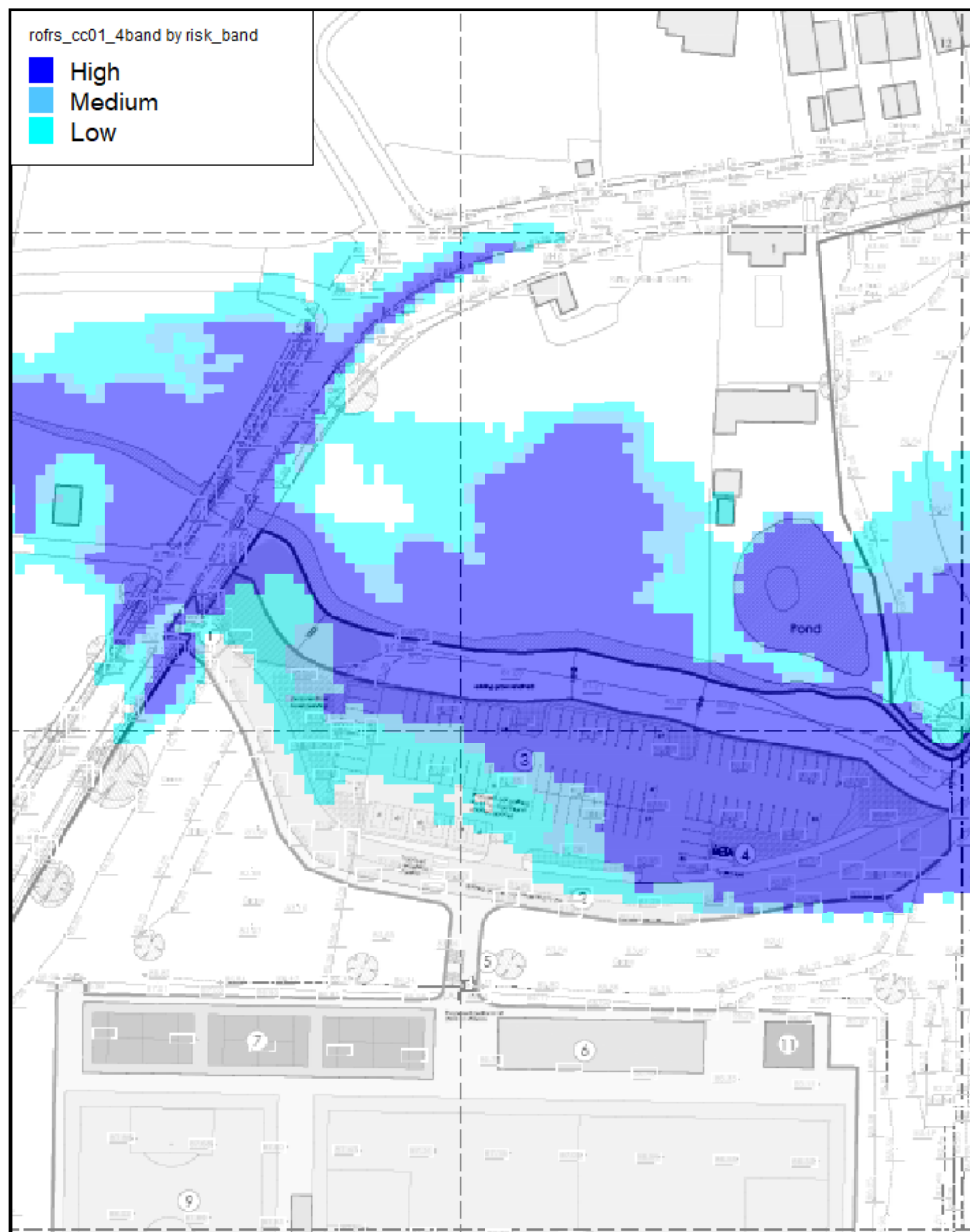


Figure 10: DEFRA Risk of flooding from rivers and sea (RoFRS) map data with climate change and site layout

4.2 Groundwater Flooding

Soil and Geology at the Site

- 4.2.1 The British Geological Survey's *Online Geology of Britain Viewer*, indicates that the soils beneath the site comprise clay, silt, sand and gravel.

Groundwater Flooding Potential at the Site

- 4.2.2 The BGS Groundwater Flooding Susceptibility Map and 2017 SFRA Appendix A map 76 indicate that there is a 50% to 75% susceptibility to groundwater flooding.
- 4.2.3 The 'Check the long term flood risk for an area in England' at <https://www.gov.uk/check-long-term-flood-risk> states that flooding from groundwater is unlikely in this area.

- 4.2.4 It is considered that the groundwater flood risk at the site will be low as the hardstanding areas and building footprint will confine the water table reducing its potential to rise. Other areas of the site comprise open space across which groundwater emergence is not significantly detrimental.

4.3 Surface Water Flooding and Sewer Flooding

DEFRA Risk of flooding from surface water (RoFSW)

- 4.3.1 The DEFRA Risk of flooding from surface water (RoFSW) map and associated data was also updated on 28th January 2025 with pdf guidance entitled *RoFSW Product Description*. It now supersedes previous datasets and can be viewed at <https://www.gov.uk/check-long-term-flood-risk> and <https://environment.data.gov.uk/explore/b5aaa28d-6eb9-460e-8d6f-43caa71fbe0e> with the raw GIS data being available at <https://environment.data.gov.uk/explore/b5aaa28d-6eb9-460e-8d6f-43caa71fbe0e?download=true>.
- 4.3.2 The DEFRA Data Services Platform states that the Risk of Flooding from Surface Water (RoFSW) map is an assessment of where surface water flooding may occur when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.
- 4.3.3 The DEFRA Data Services Platform also states that RoFSW is a probabilistic product, meaning that it shows the overall risk, rather than the risk associated with a specific event or scenario. In externally published versions of this dataset, risk is displayed as one of four likelihood bandings:
- High - greater than or equal to 1 in 30 (3.3%) chance of flooding in any given year;
 - Medium - less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance of flooding in any given year;
 - Low - less than 1 in 100 (1%) but greater than or equal to 1 in 1000 year (0.1%) chance of flooding in any given year.
 - Very Low – less than 1 in 1000 year (0.1%) chance of flooding in any given year (also denoted by the mapping as 'Unavailable').
- 4.3.4 The DEFRA Data Services Platform 'Announcements' section states that while the previous RoFSW Depth datasets showed the maximum depth of flooding from surface water that could result from a flood with a 0.1%, 1% and 3.3% chance of happening in any given year, the new RoFSW Depth datasets show the annual chance of flooding beyond a specific depth, for depths at intervals from 20cm to 120cm.
- 4.3.5 For example, the 20cm dataset shows a map of likelihood of flooding beyond 20cm depth within the 4 likelihood bands. The depths are as follows:
- 0.2m
 - 0.3m
 - 0.6m
 - 0.9m
 - 1.2m
- 4.3.6 Where the mapping shows an area with no depth results, despite it being located within a risk banding, DEFRA have confirmed that this denotes a Very Low probability for that particular depth to occur.
- 4.3.7 Information has also been created which indicates the possible impacts of climate change on future risk in line with the guidance at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#when-to-use-climate-change-allowance>.
- 4.3.8 For surface water flood risk the mapping considers the 'Central' allowance for the 2050s epoch (2040-2060) and can be viewed at <https://www.gov.uk/check-long-term-flood-risk> and <https://environment.data.gov.uk/explore/e5b38de2-99b3-44ee-b10c-b244926878ef>, with the raw GIS

data being available at <https://environment.data.gov.uk/explore/e5b38de2-99b3-44ee-b10c-b244926878ef?download=true>.

- 4.3.9 The associated climate change depths within the 4 likelihood bands are the same as the non-climate change depths set out above.
- 4.3.10 The DEFRA Risk of flooding from surface water (RoFSW) map and associated data (Figures 11, 12, 13 and 14) shows that there is a Very Low to Low surface water flood risk at the site and when accounting for future climate change.
- 4.3.11 Figure 15 shows that part of the proposed car park would be located within Low risk areas and all proposed building and other structures would be located within Very Low climate change risk areas thus preventing internal flooding.

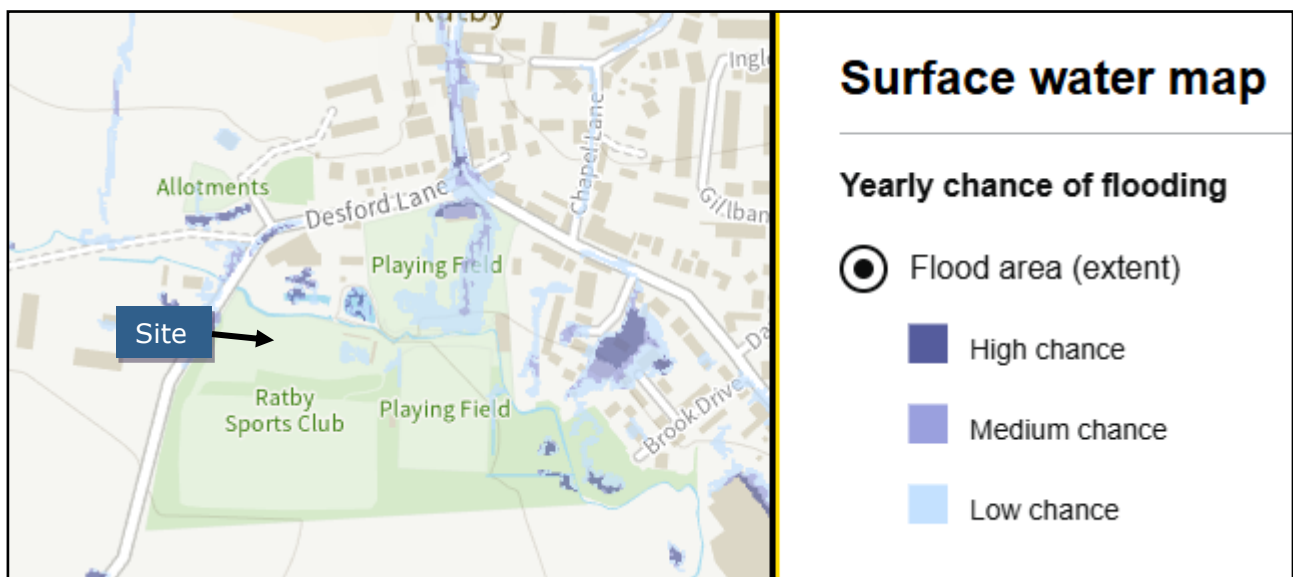


Figure 11: DEFRA Risk of flooding from surface water (RoFSW) map from
<https://www.gov.uk/check-long-term-flood-risk>

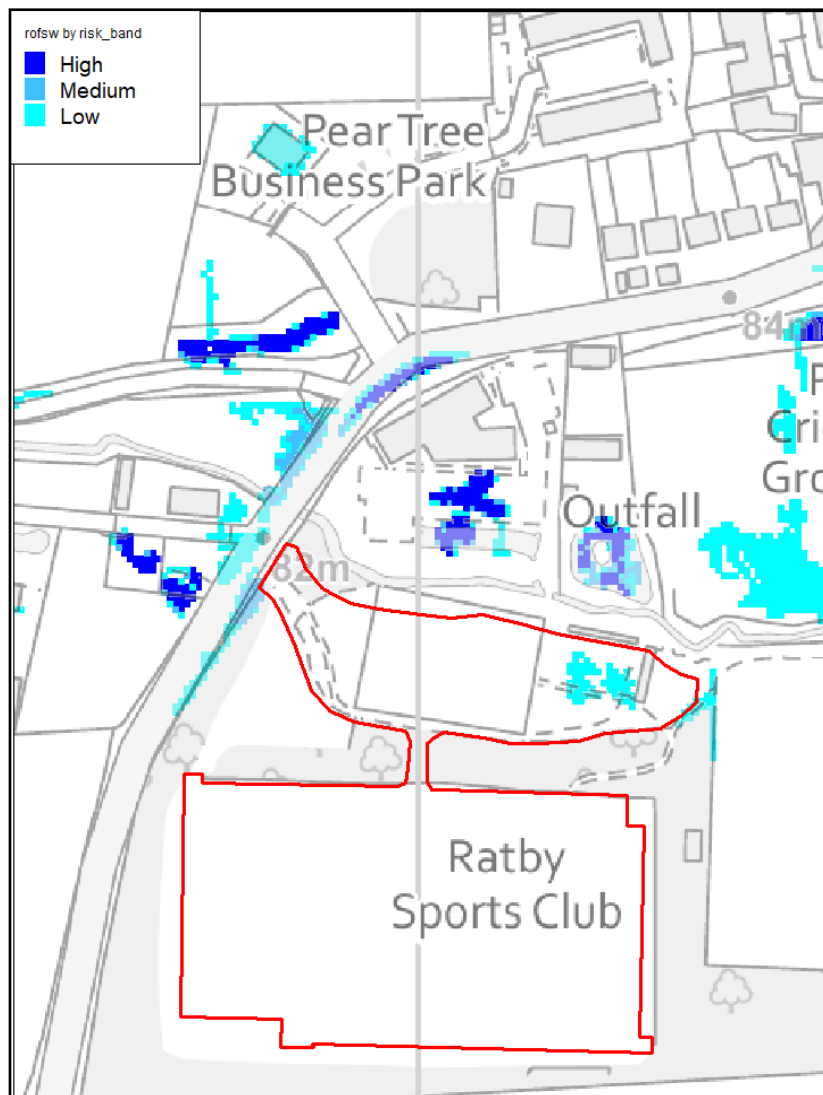


Figure 12: DEFRA Risk of flooding from surface water (RoFSW) map data
<https://environment.data.gov.uk/explore/e5b38de2-99b3-44ee-b10c-b244926878ef?download=true>

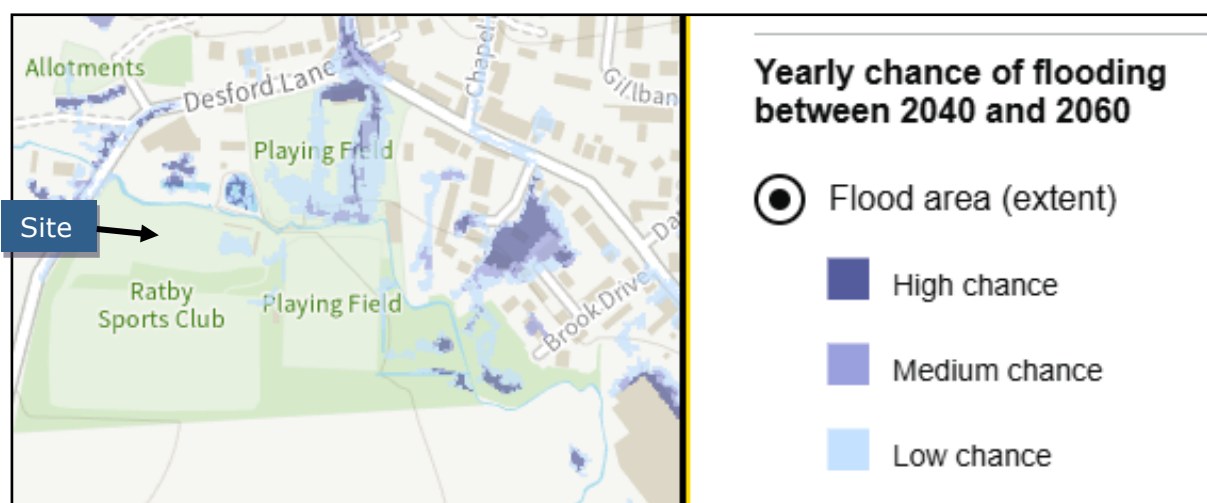


Figure 13: DEFRA Risk of flooding from surface water (RoFSW) map data with climate change
 from <https://www.gov.uk/check-long-term-flood-risk>

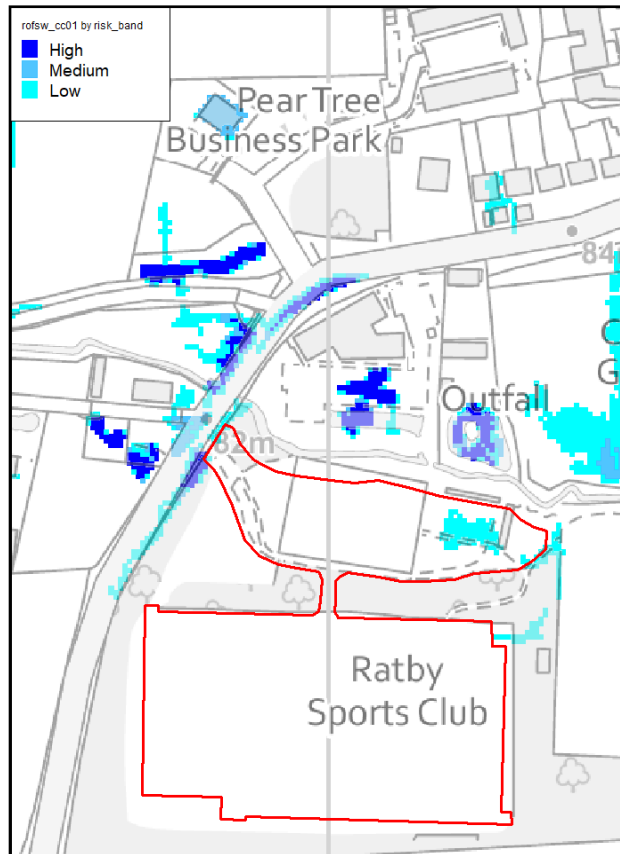


Figure 14: DEFRA Risk of flooding from surface water (RoFSW) map data with climate change
 from <https://environment.data.gov.uk/explore/e5b38de2-99b3-44ee-b10c-b244926878ef?download=true>

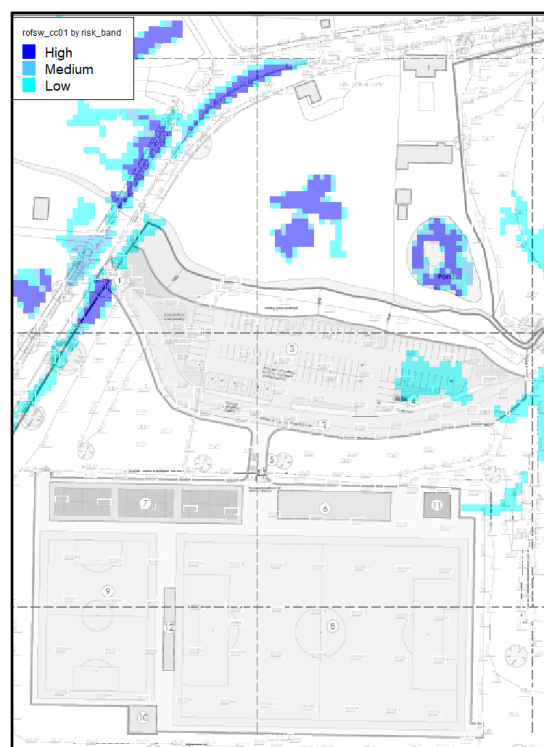


Figure 15: DEFRA Risk of flooding from surface water (RoFSW) map data with climate change and site layout

4.4 Reducing Vulnerability to the Hazard

- 4.4.1 Flood Warnings for surface water flooding do not currently exist, however, the occupants should sign up to the Met Office weather warning system <https://www.metoffice.gov.uk/public/weather/warnings>.
- 4.4.2 The site is located within Environment Agency Flood Alert area 034WAF403 – Rothley Brook, Quorn Brook and Sileby Brook in Leicestershire.
- 4.4.3 Sites at risk of fluvial flooding could have a minimum of 2 hours warning before any of the levels of flood warning is issued.
- 4.4.4 It is recommended that the site management liaise with the Agency in order to register with the Agency's Flood Warnings Direct service and ensure that they are aware of the flood risk so that they have the option to escape/evacuate upon receipt of a *Flood Alert* or upon the instruction of the emergency services.
- 4.4.5 The site management should develop a *Business Flood Plan*.

4.5 Safe Access/Egress

Fluvial

- 4.5.1 Figure 9 and 10 above shows that during climate change events the access and Desford Lane adjacent to the site entrance would be affected during Low to High risk events.
- 4.5.2 It is understood from the DEFRA Data Services Platform 'Announcements' section that the previous 'hazard' dataset for *Rivers and Sea* will be replaced in the future.
- 4.5.3 Therefore, in the interim, in order to determine the flood hazard, the hazard categories outlined in Table 13.1 of *FD2320/TR2* (Figure 16), which is defined by the depth and velocity of the floodwater and the ability of people to evacuate once flooding occurs, has been used (assuming <0.5 m/s velocity). It should be noted that the white cells shown on Figure 16 denote a *Very low* hazard.

Velocity (m/s)	Depth of flooding (m)											
	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.00												
0.10												
0.25												
0.50												
1.00												
1.50												
2.00												
2.50												
3.00												
3.50												
4.00												
4.50												
5.00												

(Source Table 13.1 of FD2320/TR2)

Key:
Danger for some
Danger for most
Danger for all

Figure 16: Hazard Classification

- 4.5.4 The depth data indicates that during fluvial climate change events, the depth would be $\leq 0.2\text{m}$ (Figure 17). Therefore, when considering fluvial events there would be a *Very Low* risk.

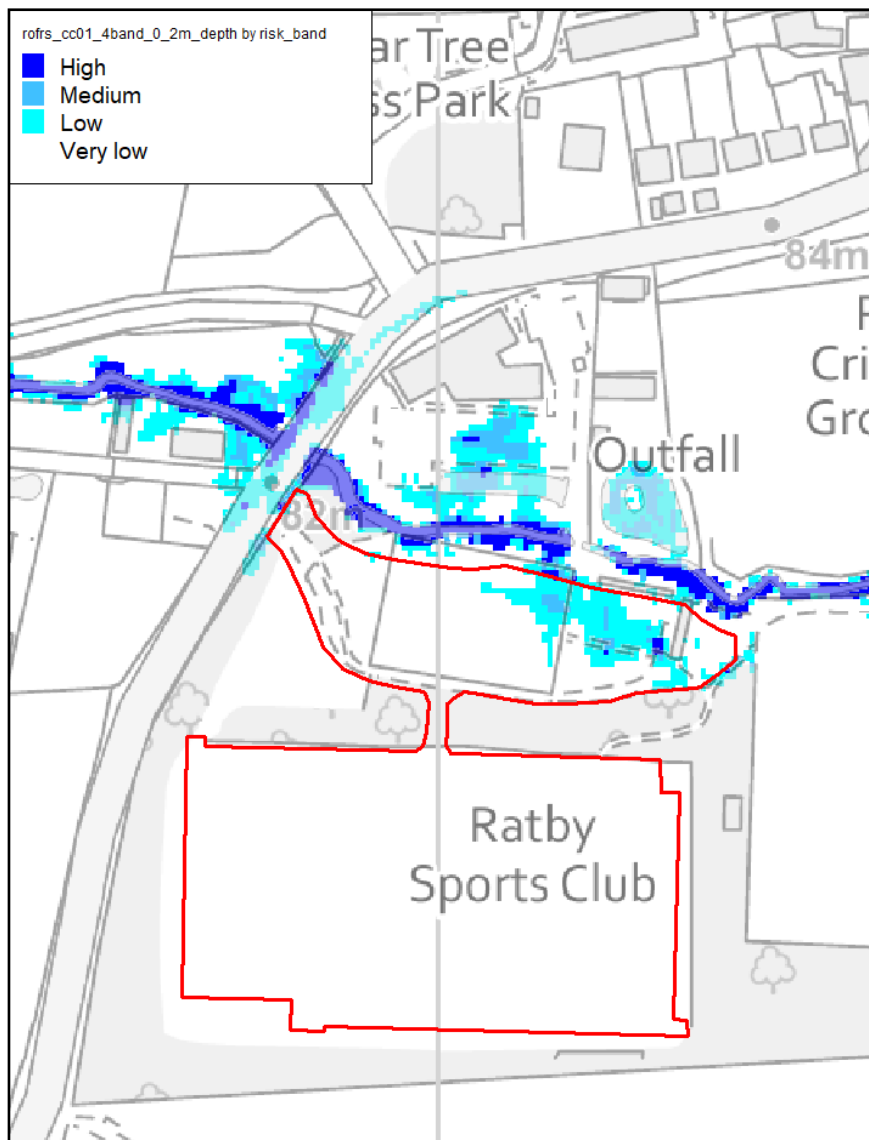


Figure 17: DEFRA Risk of flooding from rivers and sea (RoFRS) 0.2m depth map data with climate change from <https://environment.data.gov.uk/explore/de4079f2-3569-45b2-8009-a00bccc520a1?download=true>

Surface Water

- 4.5.5 Figure 14 and 15 above shows that during climate change events the access would not be affected but Desford Lane adjacent to the site entrance would be affected during Low to Medium risk events.
- 4.5.6 The DEFRA Data Services Platform now provides the 'hazard' dataset for surface water flooding, and the raw GIS data is available at <https://environment.data.gov.uk/explore/765c25d4-86cb-4674-8cfe-fc91e844e6ac?download=true>.
- 4.5.7 The flood hazard is calculated based on different combinations of floodwater depth and velocity, and subsequently by using the hazard equation as cited in the DEFRA/EA R&D Document *Framework and guidance for assessing and managing flood risk for new development Phase 2 (FD2320/TR2)*. The numerical hazard rating extracted from the model is then categorised into four degrees of flood hazard (Table 1).

Table 1: DEFRA's FD2320/TR2 "Flood Risks to People" classifications

Hazard Rating	Degree of Flood Hazard	Description
< 0.75	Very low hazard	Caution "Flood zone with shallow flowing water or deep standing water"
0.75 – 1.25	Danger for Some	Dangerous for some (i.e. children) "Danger: Flood zone with deep or fast flowing water"
1.25 – 2.0	Danger for Most	Dangerous for most people (i.e. general public) "Danger: Flood zone with deep fast flowing water"
> 2.0	Danger for All	Dangerous for all "Extreme danger: flood zone with deep fast flowing water"

- 4.5.8 The mapping shows a hazard to people leaving the site would be lower than the *Dangerous for Some* threshold of 0.75 (Figure 18) and therefore *Very Low*.

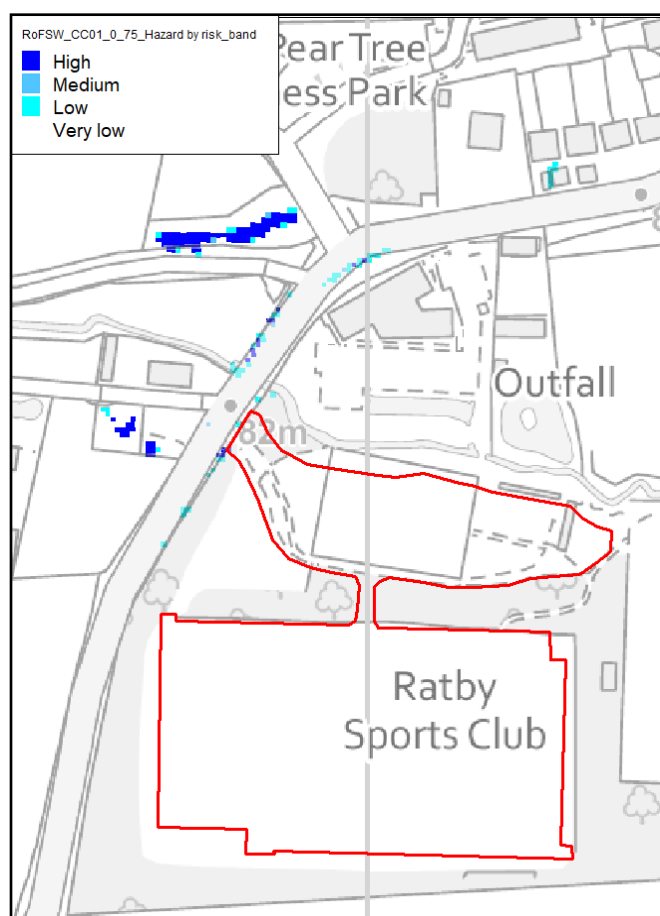


Figure 18: Evacuation route together with DEFRA Risk of flooding from surface water (RoFSW) 0.75 Dangerous for Some hazard map data with climate change from

<https://environment.data.gov.uk/explore/765c25d4-86cb-4674-8cfe-fc91e844e6ac?download=true>

4.6 Reservoirs, Canals And Other Artificial Sources

- 4.6.1 The failure of man-made infrastructure such as flood defences and other structures can result in unexpected flooding. Flooding from artificial sources such as reservoirs, canals and lakes can also occur suddenly and without warning, leading to high depths and velocities of flood water which pose a safety risk to people and property.
- 4.6.2 The 'Check the long term flood risk for an area in England' at <https://www.gov.uk/check-long-term-flood-risk> states that flooding from reservoirs is unlikely in this area.

5. DRAINAGE STRATEGY

- 5.1 The development is for construction of artificial sports pitches, club house and a car park with associated works.

For the surface water drainage, there are two main elements that need to be considered, this is the surface water from the roof areas of the club house and the large external areas.

5.2 Hierarchy

- 5.2.1 When designing a surface water drainage system for any site there is a hierarchy of discharge methods that must be assessed to find the best possible option for the site. The hierarchy is as follows:

1. Re-use of water on site.
2. Discharge to the ground using SuDS/infiltration features.
3. Discharge to a watercourse.
4. Discharge to a sewer, this level can be further split down to discharge to a surface water sewer and discharge to a combined/foul water sewer, the former being on top.

When designing a drainage system all the parts of the hierarchy must be assessed in order, discounting options that are not viable for the site until the best possible option is selected for the development scheme.

- 5.2.2 Applying the hierarchy to this site:

1. The re-use of water within the development is possible but cannot be relied upon as the primary discharge method as we cannot guarantee that the water will be consistently used. For this reason, this option has been discounted. This does mean that re-use of water cannot be implemented, it is just means they cannot be the primary method of surface water disposal.
2. A formal ground investigation for the site has not been completed; this will need to be complete to confirm the use of infiltration techniques. Without this information we cannot progress a design using infiltration therefore, we have discounted it. We must ensure there is a viable discharge method.
3. There is a watercourse at the rear of the site, we have taken a scheme forward that discharges to this watercourse.

5.3 Proposed Discharge Rate

- 5.3.1 This site is considered a greenfield development. The highest option on the hierarchy is to use the watercourse. Greenfield discharge rates should be used design purposes.

As a summary of part of greenfield discharge rate calculations.

Using the HR Wallingford Greenfield Runoff Rate Estimation Tool, IH124 and a site area of 1.98ha:

Event	Rate
1 in 1 year	7.3 l/s
1 in 2 year	7.9 l/s
Qbar	8.8 l/s
1 in 10 years	13.2 l/s
1 in 30 year	17.7 l/s
1 in 100 year	22.7 l/s
1 in 200 year	26.9 l/s

We propose that the development should be attenuated to 8.8 l/s at all events up to the 1 in 100 year event + 40% climate change to ensure that all event discharge below their required target.

5.4 **Foul Water Strategy**

- 5.4.1 There is a main foul sewer in junction of Desford Lane and Main Street. We cannot connect to this system as it is the other side of a watercourse, cricket ground and club house for the cricket ground.
- 5.4.2 We propose the site uses a treatment plant and then connect to the watercourse. Detailed design will be required to determine the final treatment plant required to serve the development.

5.5 **Surface Water Strategy**

- 5.5.1 There are two main areas that need to be accounted for in the surface water design in the strategy. They are the sports pitches/club house and the car parking areas. As explained earlier in this section, the discharge point selected to move forward is the discharge to the watercourse.
- 5.5.2 There is limited space on site, and we must include SuDS features on site. With the limited space, open features such as ponds and reed beds are not possible as the functions of the development require large open spaces. We must use features that can be integrated into the scheme that has other benefits. We propose that permeable paving is used extensively.
- 5.5.3 The two areas are easy to split, the sports pitches/club house is at a higher level compared to the access road and the car parking. We have considered them like separate areas that act in tandem.
- 5.5.4 The sports pitch/club area has a large area of permeability due to the sports pitches, like other pitches of the same type have a permeable surface and sub-base that allows the storing of water. This water is then limited and allow to flow down the hill.
- 5.5.5 Like the sports pitches, the car park will have a permeable surface and allow the water to be stored in the sub-base. As the whole car park is proposed to be permeable, water has to be controlled as it flows through the system, as the sub-base will be constructed as one unit, check dams/baffles have to be added to the sub-base to ensure that water is store in the required areas.
- 5.5.6 This is limited to ensure the final rate to the watercourse is below 8.8 l/s via a headwall.
- 5.5.7 The permeable paving used, is a multifunctional feature. It delays and reduces the peak flow from the system. The permeable paving also provides water quality benefits, by trapping carbon and other volatiles in the stone sub-base structure stopping it from being discharged into the wider system.
- 5.5.8 For the basic system, we proposed a traditional piped system with a control. We recommend that a vortex flow control device is used as it maximises the use of storage in a range of events. We have proposed the use of the sub-base for attenuation, this will be multifunctional, as they allow items to be installed above them. The discharge is to the watercourse in the northeast corner of the site.
- 5.5.9 The system needs to be limited to 8.8 l/s and storage up to the 1 in 100 year event (1% AEP) with 40% climate change applied.
- 5.5.10 The headwall will require Land Drainage Consent.

6. CONCLUSIONS

- It is the Client's intention to formally create grassed sports pitches, padel courts, clubroom and changing block, spectator stands, machinery store and parking areas.
- Annex 3 of the NPPF confirms that this type of development is classified as a 'less-vulnerable' use and 'water-compatible' use.
- The site is located outside of fluvial flood extents from the Rothley Brook to the south.
- The site is located within the NPPF Flood Zone 3, 2 and 1 associated with a tributary of the Rothley Brook located north of the site, which is designated an Ordinary Watercourse. The proposed car parking area and access would be located within Flood Zone 3 and 2, with other proposed areas, buildings and structures located within Flood Zone 1.
- Analysis of the updated DEFRA Risk of flooding from rivers and sea (*RoFRS*) map indicates that there is a Very Low to High fluvial flood risk at the site and when accounting for future climate change. Part of the proposed car park and access would be located within Low to High risk areas and all proposed building and other structures would be located within Very Low climate change risk areas thus preventing internal flooding.
- The DEFRA Risk of flooding from surface water (*RoFSW*) map and associated data shows that there is a Very Low to Low surface water flood risk at the site and when accounting for future climate change. Part of the proposed car park would be located within Low risk areas and all proposed building and other structures would be located within Very Low climate change risk areas thus preventing internal flooding.
- Safe access/egress is available during fluvial and surface water flood events.
- It is considered that there is a low risk of groundwater flooding at the site from underlying deposits.
- A warning and evacuation strategy has been developed within this assessment. It is proposed that the site operators register with the Agency's *Flood Warnings Direct* and prepare a *Business Flood Plan*.
- A system implements multifunctional SuDS features that limits the flow from site to 8.8 l/s up to the 1 in 100 year event (1% AEP) with 40% climate change applied.

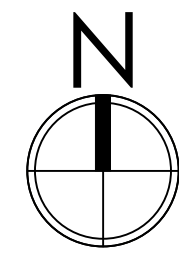
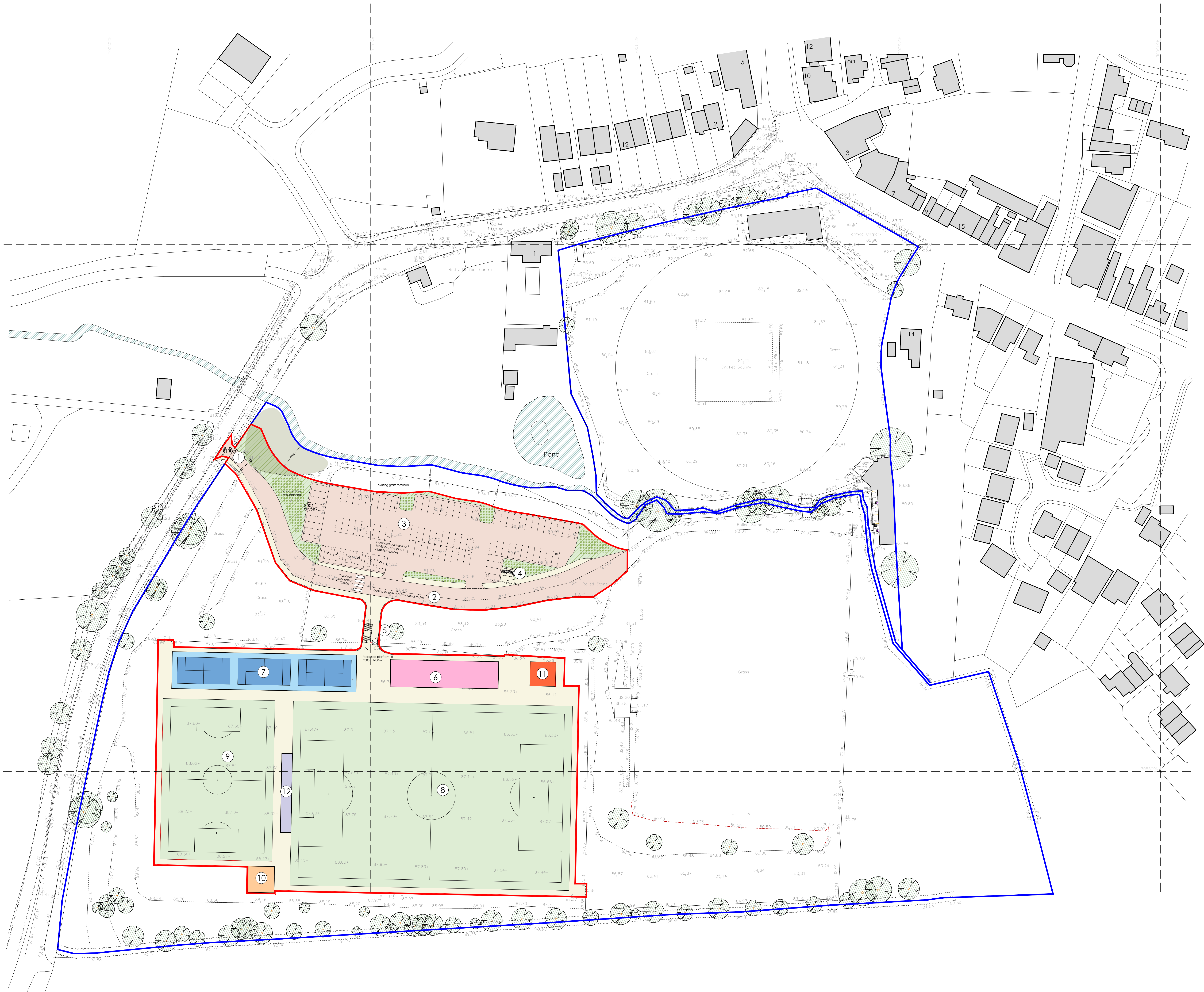
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- ix. Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment (2017 SFRA) dated 2017.
- x. Soil Survey of England and Wales 1983. *Soil Map of East England (Sheet 4)*, 1:250,000. Cranfield University.

APPENDIX A – ENVIRONMENT AGENCY FLOOD DATA

DRAWINGS

- Key:**
1. Existing access: improvements TBC subject to highways report
 2. Existing access road widened to 7m
 3. Existing gravel parking upgraded to accommodate 85 car parking spaces + 4 disabled parking spaces
 4. Sheffield style cycle parking
 5. Stairs and platform lift: 2000mm x 1400mm integrated stands
 6. New clubroom and changing block with integrated stands
 7. Padel court building - to specialist design
 8. 11-a-side grass pitch
 9. 7-a-side grass pitch
 10. Proposed tractor/machinery store
 11. Proposed modular Director's facilities
 12. Proposed stands to accommodate 500 spectators



Diamond Wood & Shaw Limited

The Old School · Blaby Road · Enderby · Leicester · LE19 4AR
Tel: 0116 284 8989 · Email: mail@dwsd.co.uk

Drainage Calculations

Client: Wolfdale Leisure Ltd

Architect: HSSP Architects

Project: Ratby Sports Club

Project No: 25-22211

Document No: 0-010

Issue: Rev P1: March 2026

Status: Preliminary

Date: 11th March 2026

Engineer: LM

Issue Status:
A=Approval
B=Building Regulations
C=Construction
D=Draft
P=Preliminary
R=Review
T=Tender
Z=Final Construction

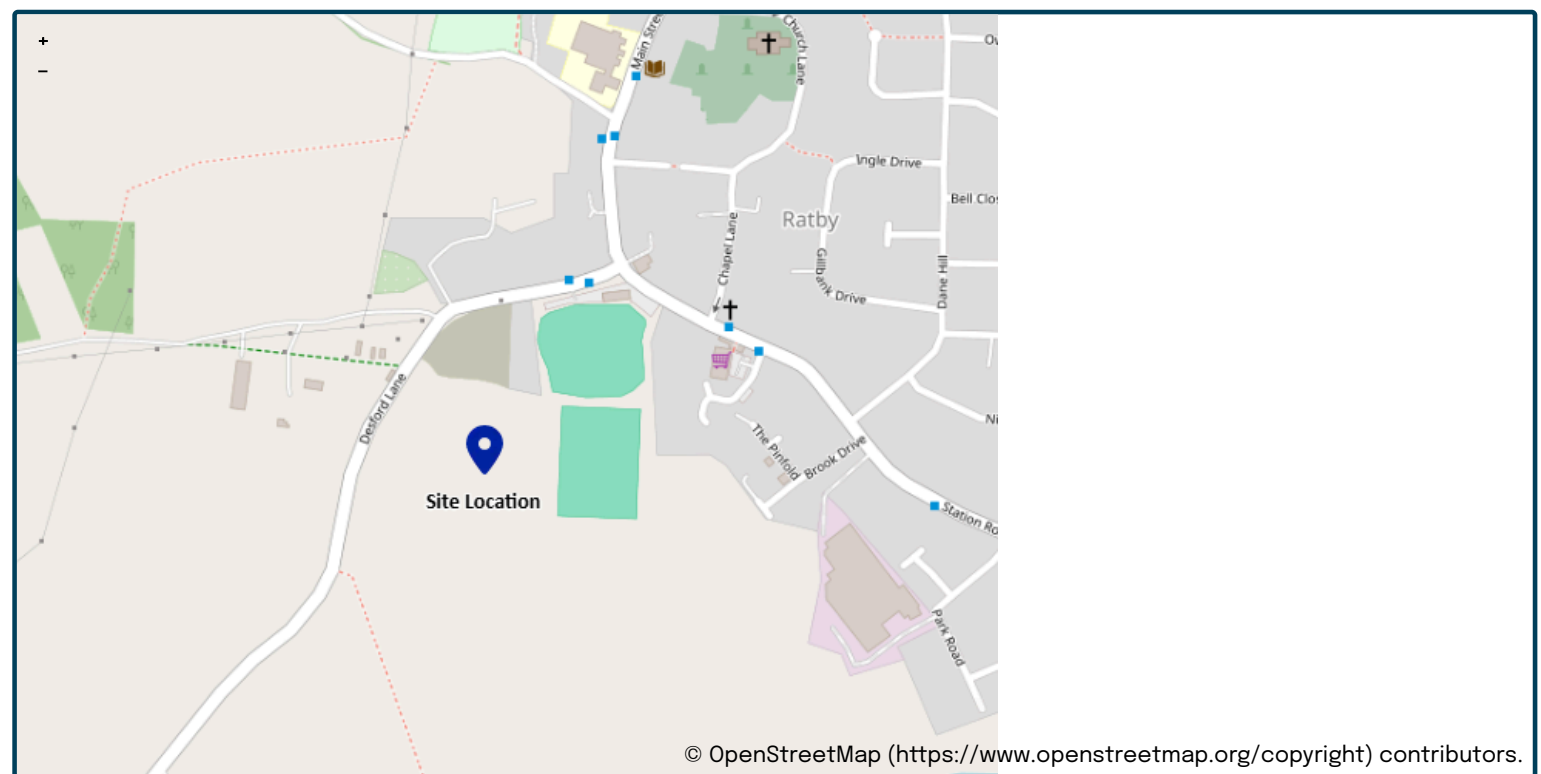
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	09/03/2026
Calculated by	LM
Reference	25-22211
Model version	2.2.3

Location

Site name	Ratby Sports Club
Site location	Desford Lane, Ratby



Site easting (British National Grid)	451027
Site northing (British National Grid)	305505

Site details

Total site area (ha)	1.98	ha
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Greenfield runoff

Method

Method	IH124		
IH124			
	<u>My value</u>	☐	<u>Map value</u>
SAAR (mm)	655mm		655
How should SPR be derived?	WRAP soil type		
WRAP soil type	4	☐	4
SPR	0.47		
QBar (IH124) (l/s)	8.8l/s		

Growth curve factors

	<u>My value</u>	☐	<u>Map value</u>
Hydrological region	4		4
1 year growth factor	0.83		
2 year growth factor	0.89		
10 year growth factor	1.49		
30 year growth factor	2		
100 year growth factor	2.57		
200 year growth factor	3.04		

Results

Method	IH124
Flow rate 1 year (l/s)	7.3l/s
Flow rate 2 year (l/s)	7.9l/s
Flow rate 10 years (l/s)	13.2l/s
Flow rate 30 years (l/s)	17.7l/s
Flow rate 100 years (l/s)	22.7l/s
Flow rate 200 years (l/s)	26.9l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com) (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

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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)	100	PIMP (%)	100
M5-60 (mm)	21.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	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

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	35.800	0.240	149.2	0.157	4.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	37.000	0.250	148.0	0.192	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	43.300	0.340	127.4	0.080	4.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	45.000	0.375	120.0	0.367	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.003	45.000	0.300	150.0	0.400	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	19.800	0.140	141.4	0.187	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	35.800	0.750	47.7	0.016	4.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	36.900	0.255	144.7	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	10.900	0.080	136.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.46	86.750	0.157	0.0	0.0	0.0	1.29	90.8	21.3
1.001	50.00	4.94	86.510	0.349	0.0	0.0	0.0	1.29	91.2	47.3
2.000	50.00	4.52	86.600	0.080	0.0	0.0	0.0	1.39	98.4	10.8
1.002	50.00	5.40	86.185	0.796	0.0	0.0	0.0	1.65	182.6	107.8
1.003	50.00	5.90	85.810	1.196	0.0	0.0	0.0	1.48	163.1	162.0
1.004	50.00	6.10	85.435	1.383	0.0	0.0	0.0	1.71	271.6	187.3
3.000	50.00	4.41	86.600	0.016	0.0	0.0	0.0	1.46	25.8	2.2
3.001	50.00	5.15	85.850	0.032	0.0	0.0	0.0	0.83	14.7	4.3
1.005	50.00	6.20	85.295	1.415	0.0	0.0	0.0	1.74	276.7	191.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.006	14.600	4.115	3.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.007	37.600	1.640	22.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
4.000	39.400	0.270	145.9	0.006	4.00	0.0	0.600	o	225	Pipe/Conduit	
5.000	11.900	0.080	148.8	0.039	4.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	11.800	0.080	147.5	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	27.600	0.255	108.2	0.051	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.000	13.400	0.090	148.9	0.057	4.00	0.0	0.600	o	225	Pipe/Conduit	
6.001	12.400	0.090	137.8	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.002	30.900	0.200	154.5	0.065	0.00	0.0	0.600	o	225	Pipe/Conduit	
7.000	10.000	0.070	142.9	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	
7.001	14.600	0.100	146.0	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.003	32.400	0.220	147.3	0.133	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.004	17.800	0.245	72.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	11.700	0.085	137.6	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	50.00	6.22	85.215	1.415	0.0	0.0	0.0	10.85	1725.6	191.6
1.007	50.00	6.37	81.100	1.415	0.0	0.0	0.0	4.26	677.6	191.6
4.000	50.00	4.61	80.875	0.006	0.0	0.0	0.0	1.08	42.9	0.8
5.000	50.00	4.19	80.765	0.039	0.0	0.0	0.0	1.07	42.5	5.3
5.001	50.00	4.37	80.685	0.050	0.0	0.0	0.0	1.07	42.7	6.8
4.001	50.00	4.97	80.605	0.107	0.0	0.0	0.0	1.26	49.9	14.5
6.000	50.00	4.21	80.530	0.057	0.0	0.0	0.0	1.07	42.5	7.7
6.001	50.00	4.39	80.440	0.091	0.0	0.0	0.0	1.11	44.2	12.3
4.002	50.00	5.46	80.350	0.263	0.0	0.0	0.0	1.05	41.7	35.6
7.000	50.00	4.15	80.320	0.031	0.0	0.0	0.0	1.09	43.4	4.2
7.001	50.00	4.38	80.250	0.054	0.0	0.0	0.0	1.08	42.9	7.3
4.003	50.00	5.88	80.075	0.450	0.0	0.0	0.0	1.29	91.4	60.9
4.004	50.00	6.04	79.855	0.450	0.0	0.0	0.0	1.85	130.5	60.9
1.008	50.00	6.48	79.460	1.865	0.0	0.0	0.0	1.73	275.3	252.5

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	87.300	0.550	Junction		1.000	86.750	300				
S2	87.300	0.790	Open Manhole	1500	1.001	86.510	300	1.000	86.510	300	
S3	87.300	0.700	Junction		2.000	86.600	300				
S4	87.300	1.115	Open Manhole	1500	1.002	86.185	375	1.001	86.260	300	
								2.000	86.260	300	
S5	87.300	1.490	Open Manhole	1500	1.003	85.810	375	1.002	85.810	375	
S6	87.300	1.865	Open Manhole	1500	1.004	85.435	450	1.003	85.510	375	
S7	87.300	0.700	Junction		3.000	86.600	150				
S8	87.300	1.450	Open Manhole	1200	3.001	85.850	150	3.000	85.850	150	
S9	87.300	2.005	Open Manhole	1500	1.005	85.295	450	1.004	85.295	450	
								3.001	85.595	150	
S10	87.300	2.085	Open Manhole	1500	1.006	85.215	450	1.005	85.215	450	
S11	82.300	1.200	Open Manhole	1500	1.007	81.100	450	1.006	81.100	450	
S12	81.850	0.975	Open Manhole	1200	4.000	80.875	225				
S13	81.900	1.135	Open Manhole	1200	5.000	80.765	225				
S14	81.550	0.865	Open Manhole	1200	5.001	80.685	225	5.000	80.685	225	
S15	81.400	0.795	Open Manhole	1200	4.001	80.605	225	4.000	80.605	225	
								5.001	80.605	225	
S16	81.600	1.070	Open Manhole	1200	6.000	80.530	225				
S17	81.250	0.810	Open Manhole	1200	6.001	80.440	225	6.000	80.440	225	
S18	81.150	0.800	Open Manhole	1200	4.002	80.350	225	4.001	80.350	225	
								6.001	80.350	225	
S19	81.200	0.880	Open Manhole	1200	7.000	80.320	225				
S20	81.000	0.750	Open Manhole	1200	7.001	80.250	225	7.000	80.250	225	
S21	80.800	0.725	Open Manhole	1200	4.003	80.075	300	4.002	80.150	225	
								7.001	80.150	225	
S22	80.650	0.795	Open Manhole	1200	4.004	79.855	300	4.003	79.855	300	
S23	80.500	1.040	Open Manhole	1500	1.008	79.460	450	1.007	79.460	450	
								4.004	79.610	300	
Headwall	80.400	1.025	Open Manhole	0		OUTFALL		1.008	79.375	450	

No coordinates have been specified, layout information cannot be produced.

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	S1	87.300	86.750	0.250	Junction	
1.001	o	300	S2	87.300	86.510	0.490	Open Manhole	1500
2.000	o	300	S3	87.300	86.600	0.400	Junction	
1.002	o	375	S4	87.300	86.185	0.740	Open Manhole	1500
1.003	o	375	S5	87.300	85.810	1.115	Open Manhole	1500
1.004	o	450	S6	87.300	85.435	1.415	Open Manhole	1500
3.000	o	150	S7	87.300	86.600	0.550	Junction	
3.001	o	150	S8	87.300	85.850	1.300	Open Manhole	1200
1.005	o	450	S9	87.300	85.295	1.555	Open Manhole	1500
1.006	o	450	S10	87.300	85.215	1.635	Open Manhole	1500
1.007	o	450	S11	82.300	81.100	0.750	Open Manhole	1500
4.000	o	225	S12	81.850	80.875	0.750	Open Manhole	1200
5.000	o	225	S13	81.900	80.765	0.910	Open Manhole	1200
5.001	o	225	S14	81.550	80.685	0.640	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	35.800	149.2	S2	87.300	86.510	0.490	Open Manhole	1500
1.001	37.000	148.0	S4	87.300	86.260	0.740	Open Manhole	1500
2.000	43.300	127.4	S4	87.300	86.260	0.740	Open Manhole	1500
1.002	45.000	120.0	S5	87.300	85.810	1.115	Open Manhole	1500
1.003	45.000	150.0	S6	87.300	85.510	1.415	Open Manhole	1500
1.004	19.800	141.4	S9	87.300	85.295	1.555	Open Manhole	1500
3.000	35.800	47.7	S8	87.300	85.850	1.300	Open Manhole	1200
3.001	36.900	144.7	S9	87.300	85.595	1.555	Open Manhole	1500
1.005	10.900	136.3	S10	87.300	85.215	1.635	Open Manhole	1500
1.006	14.600	3.5	S11	82.300	81.100	0.750	Open Manhole	1500
1.007	37.600	22.9	S23	80.500	79.460	0.590	Open Manhole	1500
4.000	39.400	145.9	S15	81.400	80.605	0.570	Open Manhole	1200
5.000	11.900	148.8	S14	81.550	80.685	0.640	Open Manhole	1200
5.001	11.800	147.5	S15	81.400	80.605	0.570	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.001	o	225	S15	81.400	80.605	0.570	Open Manhole	1200
6.000	o	225	S16	81.600	80.530	0.845	Open Manhole	1200
6.001	o	225	S17	81.250	80.440	0.585	Open Manhole	1200
4.002	o	225	S18	81.150	80.350	0.575	Open Manhole	1200
7.000	o	225	S19	81.200	80.320	0.655	Open Manhole	1200
7.001	o	225	S20	81.000	80.250	0.525	Open Manhole	1200
4.003	o	300	S21	80.800	80.075	0.425	Open Manhole	1200
4.004	o	300	S22	80.650	79.855	0.495	Open Manhole	1200
1.008	o	450	S23	80.500	79.460	0.590	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.001	27.600	108.2	S18	81.150	80.350	0.575	Open Manhole	1200
6.000	13.400	148.9	S17	81.250	80.440	0.585	Open Manhole	1200
6.001	12.400	137.8	S18	81.150	80.350	0.575	Open Manhole	1200
4.002	30.900	154.5	S21	80.800	80.150	0.425	Open Manhole	1200
7.000	10.000	142.9	S20	81.000	80.250	0.525	Open Manhole	1200
7.001	14.600	146.0	S21	80.800	80.150	0.425	Open Manhole	1200
4.003	32.400	147.3	S22	80.650	79.855	0.495	Open Manhole	1200
4.004	17.800	72.7	S23	80.500	79.610	0.590	Open Manhole	1500
1.008	11.700	137.6	Headwall	80.400	79.375	0.575	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008	Headwall	80.400	79.375	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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	13
Number of Online Controls	5	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)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S10, DS/PN: 1.006, Volume (m³): 5.2

Unit Reference	MD-SHE-0056-2000-2085-2000
Design Head (m)	2.085
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	56
Invert Level (m)	85.215
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.085	2.0
Flush-Flo™	0.249	1.3
Kick-Flo®	0.504	1.1
Mean Flow over Head Range	-	1.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.1	1.200	1.6	3.000	2.4	7.000	3.5
0.200	1.3	1.400	1.7	3.500	2.5	7.500	3.6
0.300	1.3	1.600	1.8	4.000	2.7	8.000	3.7
0.400	1.2	1.800	1.9	4.500	2.9	8.500	3.8
0.500	1.1	2.000	2.0	5.000	3.0	9.000	3.9
0.600	1.1	2.200	2.0	5.500	3.1	9.500	4.0
0.800	1.3	2.400	2.1	6.000	3.3		
1.000	1.4	2.600	2.2	6.500	3.4		

Hydro-Brake® Optimum Manhole: S15, DS/PN: 4.001, Volume (m³): 2.8

Unit Reference	MD-SHE-0109-5000-0795-5000
Design Head (m)	0.795
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	109
Invert Level (m)	80.605
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

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Hydro-Brake® Optimum Manhole: S15, DS/PN: 4.001, Volume (m³): 2.8

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.795	5.0
Flush-Flo™	0.239	5.0
Kick-Flo®	0.534	4.2
Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	6.1	3.000	9.3	7.000	13.9
0.200	5.0	1.400	6.5	3.500	10.0	7.500	14.4
0.300	5.0	1.600	6.9	4.000	10.7	8.000	14.8
0.400	4.8	1.800	7.3	4.500	11.3	8.500	15.3
0.500	4.4	2.000	7.7	5.000	11.9	9.000	15.7
0.600	4.4	2.200	8.0	5.500	12.4	9.500	16.2
0.800	5.0	2.400	8.4	6.000	12.9		
1.000	5.6	2.600	8.7	6.500	13.5		

Hydro-Brake® Optimum Manhole: S18, DS/PN: 4.002, Volume (m³): 2.4

Unit Reference	MD-SHE-0109-5000-0800-5000
Design Head (m)	0.800
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	109
Invert Level (m)	80.350
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	5.0
Flush-Flo™	0.241	5.0
Kick-Flo®	0.537	4.2
Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	0.300	5.0	0.500	4.5	0.800	5.0
0.200	5.0	0.400	4.8	0.600	4.4	1.000	5.5

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Hydro-Brake® Optimum Manhole: S18, DS/PN: 4.002, Volume (m³): 2.4

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.200	6.0	2.400	8.4	5.000	11.8	8.000	14.8
1.400	6.5	2.600	8.7	5.500	12.4	8.500	15.2
1.600	6.9	3.000	9.3	6.000	12.9	9.000	15.7
1.800	7.3	3.500	10.0	6.500	13.4	9.500	16.1
2.000	7.7	4.000	10.6	7.000	13.9		
2.200	8.0	4.500	11.3	7.500	14.4		

Hydro-Brake® Optimum Manhole: S21, DS/PN: 4.003, Volume (m³): 2.5

Unit Reference	MD-SHE-0110-5000-0725-5000
Design Head (m)	0.725
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	110
Invert Level (m)	80.075
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.725	5.0
Flush-Flo™	0.219	5.0
Kick-Flo®	0.495	4.2
Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.8	1.200	6.3	3.000	9.7	7.000	14.6
0.200	5.0	1.400	6.8	3.500	10.5	7.500	15.0
0.300	4.9	1.600	7.2	4.000	11.1	8.000	15.5
0.400	4.7	1.800	7.6	4.500	11.8	8.500	16.0
0.500	4.2	2.000	8.0	5.000	12.4	9.000	16.4
0.600	4.6	2.200	8.4	5.500	13.0	9.500	16.9
0.800	5.2	2.400	8.7	6.000	13.5		
1.000	5.8	2.600	9.1	6.500	14.1		

Hydro-Brake® Optimum Manhole: S22, DS/PN: 4.004, Volume (m³): 3.1

Unit Reference	MD-SHE-0109-5000-0795-5000
Design Head (m)	0.795
Design Flow (l/s)	5.0
Flush-Flo™	Calculated

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Storage Structures for Storm

Porous Car Park Manhole: S1, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	26.0
Membrane Percolation (mm/hr)	1000	Length (m)	42.5
Max Percolation (l/s)	306.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.740	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S2, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	35.0
Membrane Percolation (mm/hr)	1000	Length (m)	42.5
Max Percolation (l/s)	413.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.740	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S4, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	39.3
Membrane Percolation (mm/hr)	1000	Length (m)	70.0
Max Percolation (l/s)	764.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.740	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S5, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	45.0
Membrane Percolation (mm/hr)	1000	Length (m)	70.0
Max Percolation (l/s)	875.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.740	Cap Volume Depth (m)	0.500

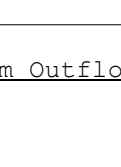
Complex Manhole: S6, DS/PN: 1.004

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	22.0
Membrane Percolation (mm/hr)	1000	Length (m)	70.0
Max Percolation (l/s)	427.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.740	Cap Volume Depth (m)	0.500

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<u>Porous Car Park Manhole: S14, DS/PN: 5.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>6.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>16.6</td></tr><tr><td>Max Percolation (l/s)</td><td>31.4</td><td>Slope (1:X)</td><td>79.8</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>80.820</td><td>Cap Volume Depth (m)</td><td>0.450</td></tr></table> <u>Porous Car Park Manhole: S15, DS/PN: 4.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>14.2</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>35.9</td></tr><tr><td>Max Percolation (l/s)</td><td>141.6</td><td>Slope (1:X)</td><td>110.1</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>80.570</td><td>Cap Volume Depth (m)</td><td>0.450</td></tr></table> <u>Porous Car Park Manhole: S16, DS/PN: 6.000</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>4.3</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>18.3</td></tr><tr><td>Max Percolation (l/s)</td><td>21.9</td><td>Slope (1:X)</td><td>43.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>80.670</td><td>Cap Volume Depth (m)</td><td>0.450</td></tr></table> <u>Porous Car Park Manhole: S17, DS/PN: 6.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>9.5</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>36.0</td></tr><tr><td>Max Percolation (l/s)</td><td>95.0</td><td>Slope (1:X)</td><td>74.9</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>80.570</td><td>Cap Volume Depth (m)</td><td>0.450</td></tr></table> <u>Porous Car Park Manhole: S18, DS/PN: 4.002</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>19.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>34.0</td></tr><tr><td>Max Percolation (l/s)</td><td>179.4</td><td>Slope (1:X)</td><td>75.5</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>80.220</td><td>Cap Volume Depth (m)</td><td>0.450</td></tr></table> <u>Porous Car Park Manhole: S19, DS/PN: 7.000</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Invert Level (m)</td><td>80.420</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Width (m)</td><td>2.5</td></tr><tr><td>Max Percolation (l/s)</td><td>5.3</td><td>Length (m)</td><td>7.6</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Slope (1:X)</td><td>51.7</td></tr><tr><td>Porosity</td><td>0.30</td><td>Depression Storage (mm)</td><td>5</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.8	Membrane Percolation (mm/hr)	1000	Length (m)	16.6	Max Percolation (l/s)	31.4	Slope (1:X)	79.8	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	80.820	Cap Volume Depth (m)	0.450	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.2	Membrane Percolation (mm/hr)	1000	Length (m)	35.9	Max Percolation (l/s)	141.6	Slope (1:X)	110.1	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	80.570	Cap Volume Depth (m)	0.450	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.3	Membrane Percolation (mm/hr)	1000	Length (m)	18.3	Max Percolation (l/s)	21.9	Slope (1:X)	43.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	80.670	Cap Volume Depth (m)	0.450	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.5	Membrane Percolation (mm/hr)	1000	Length (m)	36.0	Max Percolation (l/s)	95.0	Slope (1:X)	74.9	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	80.570	Cap Volume Depth (m)	0.450	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	19.0	Membrane Percolation (mm/hr)	1000	Length (m)	34.0	Max Percolation (l/s)	179.4	Slope (1:X)	75.5	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	80.220	Cap Volume Depth (m)	0.450	Infiltration 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Innovyze Network 2020.1.3																																																		
<u>Porous Car Park Manhole: S19, DS/PN: 7.000</u> Evaporation (mm/day) 3 Cap Volume Depth (m) 0.450 <u>Porous Car Park Manhole: S20, DS/PN: 7.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>9.9</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>23.2</td></tr><tr><td>Max Percolation (l/s)</td><td>63.8</td><td>Slope (1:X)</td><td>74.9</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>80.220</td><td>Cap Volume Depth (m)</td><td>0.450</td></tr></table> <u>Porous Car Park Manhole: S21, DS/PN: 4.003</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>18.7</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>38.0</td></tr><tr><td>Max Percolation (l/s)</td><td>197.4</td><td>Slope (1:X)</td><td>102.9</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>80.070</td><td>Cap Volume Depth (m)</td><td>0.450</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.9	Membrane Percolation (mm/hr)	1000	Length (m)	23.2	Max Percolation (l/s)	63.8	Slope (1:X)	74.9	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	80.220	Cap Volume Depth (m)	0.450	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.7	Membrane Percolation (mm/hr)	1000	Length (m)	38.0	Max Percolation (l/s)	197.4	Slope (1:X)	102.9	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	80.070	Cap Volume Depth (m)	0.450
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1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /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	13
Number of Online Controls	5	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	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.700	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) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	240 Winter	1	+0%	100/480 Winter				86.784
1.001	S2	30 Winter	1	+0%	30/60 Summer				86.746
2.000	S3	15 Winter	1	+0%					86.670
1.002	S4	30 Winter	1	+0%	1/15 Winter				86.746
1.003	S5	30 Winter	1	+0%	1/15 Summer				86.746
1.004	S6	30 Winter	1	+0%	1/15 Summer				86.745
3.000	S7	15 Winter	1	+0%					86.631
3.001	S8	15 Winter	1	+0%	1/15 Summer				86.561
1.005	S9	60 Summer	1	+0%	1/15 Summer				86.793
1.006	S10	2160 Winter	1	+0%	1/15 Summer				86.860
1.007	S11	2160 Winter	1	+0%					81.106
4.000	S12	15 Summer	1	+0%					80.898
5.000	S13	15 Summer	1	+0%					80.826
5.001	S14	15 Summer	1	+0%	100/30 Winter				80.746
4.001	S15	60 Winter	1	+0%	100/15 Summer				80.699
6.000	S16	15 Summer	1	+0%	100/15 Summer				80.604
6.001	S17	15 Summer	1	+0%	100/15 Summer				80.514

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

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow (l/s)		
1.000	S1	-0.266	0.000	0.01		619	1.1		OK*	
1.001	S2	-0.064	0.000	0.22		135	18.5		OK	
2.000	S3	-0.230	0.000	0.13			12.4		OK*	
1.002	S4	0.186	0.000	0.36		213	60.4		SURCHARGED	
1.003	S5	0.561	0.000	0.58		331	86.3		SURCHARGED	
1.004	S6	0.860	0.000	0.25		555	52.5		SURCHARGED	
3.000	S7	-0.119	0.000	0.10			2.5		OK*	
3.001	S8	0.561	0.000	0.31			4.4		SURCHARGED	
1.005	S9	1.048	0.000	0.11			19.2		SURCHARGED	
1.006	S10	1.195	0.000	0.00			1.8		SURCHARGED	
1.007	S11	-0.444	0.000	0.00			1.8		OK	
4.000	S12	-0.202	0.000	0.02			0.9		OK	
5.000	S13	-0.164	0.000	0.17			6.0		OK	
5.001	S14	-0.164	0.000	0.17		6	6.0		OK	
4.001	S15	-0.131	0.000	0.08		27	3.5		OK	
6.000	S16	-0.151	0.000	0.24		5	8.8		OK	
6.001	S17	-0.151	0.000	0.23		8	8.8		OK	

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

US/MH		Return Climate		First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act. Level (m)
4.002	S18	180	Winter	1	+0%	30/60	Summer	80.474
7.000	S19	15	Summer	1	+0%	100/60	Winter	80.374
7.001	S20	30	Winter	1	+0%	30/240	Winter	80.301
4.003	S21	120	Winter	1	+0%	30/30	Winter	80.278
4.004	S22	720	Summer	1	+0%	30/480	Winter	80.034
1.008	S23	600	Winter	1	+0%			79.517

US/MH		Surcharged Flooded		Half Drain		Pipe	Level	
PN	Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status Exceeded
4.002	S18	-0.101	0.000	0.12		83	4.6	OK
7.000	S19	-0.171	0.000	0.13		5	4.8	OK
7.001	S20	-0.174	0.000	0.11		12	4.3	OK
4.003	S21	-0.097	0.000	0.06		53	5.0	OK
4.004	S22	-0.121	0.000	0.04			4.9	OK
1.008	S23	-0.393	0.000	0.04			6.7	OK

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The Old School Blaby Road

Enderby

Leicester, LE19 4AR

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

Simulation Criteria

Areal Reduction Factor 1.000

Hot Start (mins) 0

Hot Start Level (mm) 0

Manhole Headloss Coeff (Global) 0.500

Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000

MADD Factor * 10m³/ha Storage 2.000

Inlet Coefficient 0.800

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Online Controls 5

Number of Offline Controls 0

Number of Storage Structures 13

Number of Time/Area Diagrams 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model

Region England and Wales

M5-60 (mm)

FSR

Cv (Summer)

20.700 Cv (Winter)

Ratio R 0.400

0.750

0.840

Margin for Flood Risk Warning (mm)

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status

DVD Status

Inertia Status

300.0

OFF

ON

ON

Profile(s)

Duration(s) (mins)

Return Period(s) (years)

Climate Change (%)

Summer and Winter

15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

1, 30, 100

0, 0, 40

US/MH

PN

Name

Storm

Return Period

Climate Change

First (X) Surcharge

First (Y) Flood

First (Z) Overflow

Overflow Act.

Water Level (m)

1.000

S1

60 Winter

30

+0%

100/480 Winter

86.832

1.001

S2

15 Winter

30

+0%

30/60 Summer

86.784

2.000

S3

15 Winter

30

+0%

86.798

1.002

S4

15 Winter

30

+0%

1/15 Winter

86.783

1.003

S5

15 Winter

30

+0%

1/15 Summer

86.782

1.004

S6

15 Summer

30

+0%

1/15 Summer

86.775

3.000

S7

15 Summer

30

+0%

86.750

3.001

S8

15 Summer

30

+0%

1/15 Summer

86.861

1.005

S9

15 Summer

30

+0%

1/15 Summer

86.950

1.006

S10

2160 Winter

30

+0%

1/15 Summer

86.989

1.007

S11

2160 Winter

30

+0%

81.107

4.000

S12

15 Winter

30

+0%

80.909

5.000

S13

15 Winter

30

+0%

80.865

5.001

S14

15 Summer

30

+0%

100/30 Winter

80.802

4.001

S15

30 Winter

30

+0%

100/15 Summer

80.806

6.000

S16

15 Winter

30

+0%

100/15 Summer

80.654

6.001

S17

15 Winter

30

+0%

100/15 Summer

80.607

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The Old School Blaby Road Enderby Leicester, LE19 4AR	25-22211 Ratby Sports Club Surface Water Calculations	
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Innovyze	Network 2020.1.3	

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

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level
		Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)		Exceeded
1.000	S1	-0.218	0.000	0.05		1270	4.6	OK*	
1.001	S2	-0.026	0.000	0.60		653	50.9	OK	
2.000	S3	-0.102	0.000	0.28			27.3	OK*	
1.002	S4	0.223	0.000	0.72		743	120.7	SURCHARGED	
1.003	S5	0.597	0.000	0.93		755	139.7	SURCHARGED	
1.004	S6	0.890	0.000	0.45		716	93.9	SURCHARGED	
3.000	S7	0.000	0.000	0.23			6.0	SURCHARGED*	
3.001	S8	0.861	0.000	0.65			9.3	SURCHARGED	
1.005	S9	1.205	0.000	0.22			37.5	SURCHARGED	
1.006	S10	1.324	0.000	0.00			1.8	SURCHARGED	
1.007	S11	-0.443	0.000	0.00			1.8	OK	
4.000	S12	-0.191	0.000	0.05			2.2	OK	
5.000	S13	-0.125	0.000	0.41			14.8	OK	
5.001	S14	-0.108	0.000	0.52		15	19.1	OK	
4.001	S15	-0.024	0.000	0.11		29	5.0	OK	
6.000	S16	-0.101	0.000	0.59		6	21.6	OK	
6.001	S17	-0.058	0.000	0.89		3	33.6	OK	

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Innovyze	Network 2020.1.3	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
4.002	S18	60 Winter	30	+0%	30/60 Summer				80.618
7.000	S19	15 Winter	30	+0%	100/60 Winter				80.408
7.001	S20	15 Winter	30	+0%	30/240 Winter				80.355
4.003	S21	15 Summer	30	+0%	30/30 Winter				80.322
4.004	S22	30 Winter	30	+0%	30/480 Winter				80.131
1.008	S23	1440 Winter	30	+0%					79.517

		Surcharged Flooded			Half Drain		Pipe		
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded
4.002	S18	0.043	0.000	0.13		123	5.0	SURCHARGED	
7.000	S19	-0.137	0.000	0.33		7	11.8	OK	
7.001	S20	-0.120	0.000	0.44		103	16.4	OK	
4.003	S21	-0.053	0.000	0.06		112	5.0	OK	
4.004	S22	-0.024	0.000	0.04			4.9	OK	
1.008	S23	-0.393	0.000	0.04			6.7	OK	

Diamond Wood & Shaw Limited

The Old School Blaby Road

Enderby

Leicester, LE19 4AR

25-22211

Ratby Sports Club

Surface Water Calculations

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100 year Return Period Summary of Critical Results by Maximum Outflow (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 Coefficient 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 13

Number of Online Controls 5

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 0.400

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 20.700 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) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	30 Winter	100	+40%	100/480 Winter				86.890
1.001	S2	15 Summer	100	+40%	30/60 Summer				86.833
2.000	S3	15 Summer	100	+40%					86.900
1.002	S4	15 Summer	100	+40%	1/15 Winter				86.833
1.003	S5	15 Summer	100	+40%	1/15 Summer				86.830
1.004	S6	15 Winter	100	+40%	1/15 Summer				86.844
3.000	S7	15 Winter	100	+40%					86.750
3.001	S8	15 Winter	100	+40%	1/15 Summer				87.226
1.005	S9	15 Winter	100	+40%	1/15 Summer				87.017
1.006	S10	2880 Winter	100	+40%	1/15 Summer				87.201
1.007	S11	2880 Winter	100	+40%					81.107
4.000	S12	15 Winter	100	+40%					80.923
5.000	S13	15 Winter	100	+40%					80.910
5.001	S14	15 Summer	100	+40%	100/30 Winter				80.865
4.001	S15	15 Summer	100	+40%	100/15 Summer				80.860
6.000	S16	15 Winter	100	+40%	100/15 Summer				80.803
6.001	S17	15 Winter	100	+40%	100/15 Summer				80.722

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

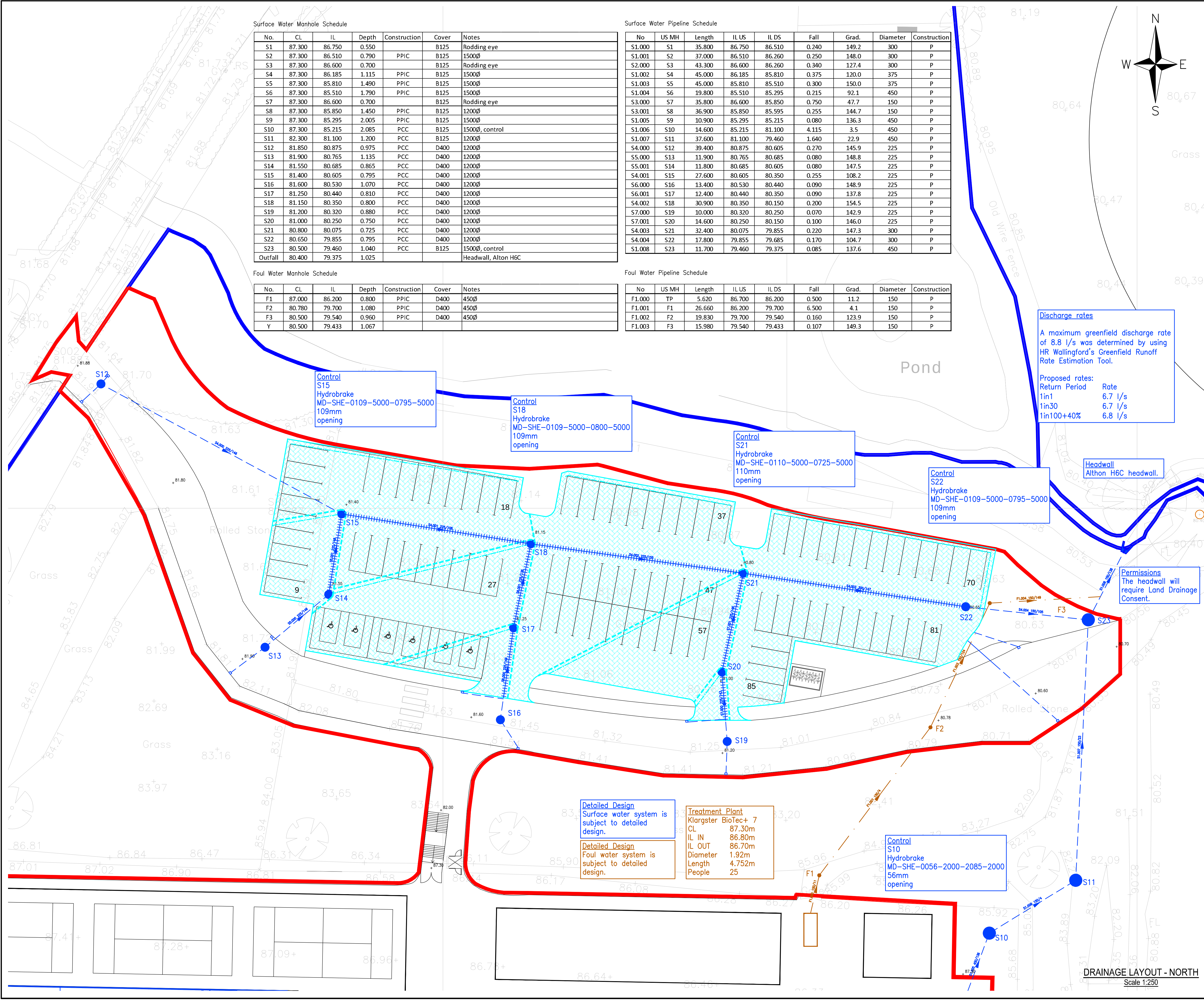
PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)						
1.000	S1	-0.160	0.000	0.13			11.5	OK*	
1.001	S2	0.023	0.000	0.55		1333	46.4	SURCHARGED	
2.000	S3	0.000	0.000	0.53			52.1	SURCHARGED*	
1.002	S4	0.273	0.000	0.67		1401	112.2	SURCHARGED	
1.003	S5	0.645	0.000	0.96			143.6	SURCHARGED	
1.004	S6	0.959	0.000	0.50			104.9	SURCHARGED	
3.000	S7	0.000	0.000	0.35			9.1	SURCHARGED*	
3.001	S8	1.226	0.000	1.15			16.4	FLOOD RISK	
1.005	S9	1.272	0.000	0.23			39.1	FLOOD RISK	
1.006	S10	1.536	0.000	0.00			1.9	FLOOD RISK	
1.007	S11	-0.443	0.000	0.00			1.9	OK	
4.000	S12	-0.177	0.000	0.10			4.1	OK	
5.000	S13	-0.080	0.000	0.74			26.9	OK	
5.001	S14	-0.045	0.000	0.93		23	33.8	OK	
4.001	S15	0.030	0.000	0.11		42	5.0	SURCHARGED	
6.000	S16	0.048	0.000	0.95		4	35.1	SURCHARGED	
6.001	S17	0.057	0.000	1.30		6	49.3	SURCHARGED	

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

US/MH		Return Climate		First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act. Level (m)
4.002	S18	480 Summer	100	+40%	30/60 Summer			80.802
7.000	S19	15 Summer	100	+40%	100/60 Winter			80.445
7.001	S20	15 Summer	100	+40%	30/240 Winter			80.424
4.003	S21	720 Winter	100	+40%	30/30 Winter			80.739
4.004	S22	4320 Winter	100	+40%	30/480 Winter			80.119
1.008	S23	2160 Winter	100	+40%				79.518

US/MH		Surcharged Flooded		Half Drain		Pipe	Level	
PN	Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status Exceeded
4.002	S18	0.227	0.000	0.13		466	5.0	SURCHARGED
7.000	S19	-0.100	0.000	0.59		202	21.4	OK
7.001	S20	-0.051	0.000	0.72		168	27.1	OK
4.003	S21	0.364	0.000	0.06		662	5.0	FLOOD RISK
4.004	S22	-0.036	0.000	0.04			4.9	OK
1.008	S23	-0.392	0.000	0.04			6.8	OK



Surface Water Manhole Schedule

No.	CL	IL	Depth	Construction	Cover	Notes
S1	87.300	86.750	0.550		B125	Rodding eye
S2	87.300	86.510	0.790	PPIC	B125	1500Ø
S3	87.300	86.600	0.700		B125	Rodding eye
S4	87.300	86.185	1.115	PPIC	B125	1500Ø
S5	87.300	85.810	1.490	PPIC	B125	1500Ø
S6	87.300	85.510	1.790	PPIC	B125	1500Ø
S7	87.300	86.600	0.700		B125	Rodding eye
S8	87.300	85.850	1.450	PPIC	B125	1200Ø
S9	87.300	85.295	2.005	PPIC	B125	1500Ø
S10	87.300	85.215	2.085	PCC	B125	1500Ø, control
S11	82.300	81.100	1.200	PCC	B125	1200Ø
S12	81.850	80.875	0.975	PCC	D400	1200Ø
S13	81.900	80.765	1.135	PCC	D400	1200Ø
S14	81.550	80.685	0.865	PCC	D400	1200Ø
S15	81.400	80.605	0.795	PCC	D400	1200Ø
S16	81.600	80.530	1.070	PCC	D400	1200Ø
S17	81.250	80.440	0.810	PCC	D400	1200Ø
S18	81.150	80.350	0.800	PCC	D400	1200Ø
S19	81.200	80.320	0.880	PCC	D400	1200Ø
S20	81.000	80.250	0.750	PCC	D400	1200Ø
S21	80.800	80.075	0.725	PCC	D400	1200Ø
S22	80.650	79.855	0.795	PCC	D400	1200Ø
S23	80.500	79.460	1.040	PCC	B125	1500Ø, control
Outfall	80.400	79.375	1.025			Headwall, Alton H6C

Foul Water Manhole Schedule

No.	CL	IL	Depth	Construction	Cover	Notes
F1	87.000	86.200	0.800	PPIC	D400	450Ø
F2	80.780	79.700	1.080	PPIC	D400	450Ø
F3	80.500	79.540	0.960	PPIC	D400	450Ø
Y	80.500	79.433	1.067			

Surface Water Pipeline Schedule

No	US MH	Length	IL US	IL DS	Fall	Grad.	Diameter	Construction
S1.000	S1	35.800	86.750	86.510	0.240	149.2	300	P
S1.001	S2	37.000	86.510	86.260	0.250	148.0	300	P
S2.000	S3	43.300	86.600	86.260	0.340	127.4	300	P
S1.002	S4	45.000	86.185	85.810	0.375	120.0	375	P
S1.003	S5	45.000	85.810	85.510	0.300	150.0	375	P
S1.004	S6	19.800	85.510	85.295	0.215	92.1	450	P
S3.000	S7	35.800	86.600	85.850	0.750	47.7	150	P
S3.001	S8	36.900	85.850	85.595	0.255	144.7	150	P
S1.005	S9	10.900	85.295	85.215	0.080	136.3	450	P
S1.006	S10	14.600	85.215	81.100	4.115	3.5	450	P
S1.007	S11	37.600	81.100	79.460	1.640	22.9	450	P
S4.000	S12	39.400	80.875	80.605	0.270	145.9	225	P
S5.000	S13	11.900	80.765	80.685	0.080	148.8	225	P
S5.001	S14	11.800	80.685	80.605	0.080	147.5	225	P
S4.001	S15	27.600	80.605	80.350	0.255	108.2	225	P
S6.000	S16	13.400	80.530	80.440	0.090	148.9	225	P
S6.001	S17	12.400	80.440	80.350	0.090	137.8	225	P
S4.002	S18	30.900	80.350	80.150	0.200	154.5	225	P
S7.000	S19	10.000	80.320	80.250	0.070	142.9	225	P
S7.001	S20	14.600	80.250	80.150	0.100	146.0	225	P
S4.003	S21	32.400	80.075	79.855	0.220	147.3	300	P
S4.004	S22	17.800	79.855	79.685	0.170	104.7	300	P
S1.008	S23	11.700	79.460	79.375	0.085	137.6	450	P

Foul Water Pipeline Schedule

No	US MH	Length	IL US	IL DS	Fall	Grad.	Diameter	Construction
F1.000	TP	5.620	86.700	86.200	0.500	11.2	150	P
F1.001	F1	26.660	86.200	79.700	6.500	4.1	150	P
F1.002	F2	19.830	79.700	79.540	0.160	123.9	150	P
F1.003	F3	15.980	79.540	79.433	0.107	149.3	150	P



Discharge rates

A maximum greenfield discharge rate of 8.8 l/s was determined by using HR Wallingford's Greenfield Runoff Rate Estimation Tool.

Proposed rates:

Return Period	Rate
1in1	6.7 l/s
1in30	6.7 l/s
1in100+40%	6.8 l/s

Headwall
Althon H6C headwall.

Permissions
The headwall will require Land Drainage Consent.

Detailed Design
Surface water system is subject to detailed design.

Detailed Design
Foul water system is subject to detailed design.

Treatment Plant
Klargster BioTec+ 7
CL 87.30m
IL IN 86.80m
IL OUT 86.70m
Diameter 1.92m
Length 4.752m
People 25

Control
S10
Hydrobrake
MD-SHE-0056-2000-2085-2000
56mm opening

DRAINAGE LAYOUT - NORTH
Scale 1:250

DO NOT SCALE

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NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DWS DRAWINGS, CALCULATIONS, REPORTS AND SPECIFICATIONS (WHERE APPLICABLE) AND, ALL OTHER RELEVANT ENGINEERS, ARCHITECTS & SPECIALIST DESIGN DETAILS.
- STANDARD NOTES & DETAILS:**
Refer to drawing number 0-170 onwards for standard notes - CIVIL
Refer to drawing number 0-180 onwards for standard details - CIVIL



- KEY**
- Surface Water Pipe (Private)
 - Surface Water Pipe (Perforated)
 - Surface Water Chamber (Private)
 - Rodding Eye
 - Linear Drain
 - Permeable Paving - Playing Pitch
 - Permeable Paving - Parking Bays
 - Fin Drain
 - Check Dam
 - Foul Water Pipe (Private)
 - Foul Water Chamber (Private)
 - Site Boundary

P1	First issue	26.03.26	LM
Ref	Revision	Date	By

PRELIMINARY

DWS
Consulting Engineers

Diamond Wood & Shaw Limited
The Old School • Babay Road • Enderby • Leicester • LE19 4AR
Tel: 0115 284 8888 • Email: mail@dws.co.uk

Project Title
RATBY SPORTS CLUB,
DESFORD LANE,
RATBY

Drawn LM	Engineer LM	Checked BP
Scale at 1:250 @ A1		Date MAR 2026

Drawing Title
DRAINAGE LAYOUT - NORTH

Project No. 25-22211	Drawing No. 0-500	Revision P1
BIM Code		

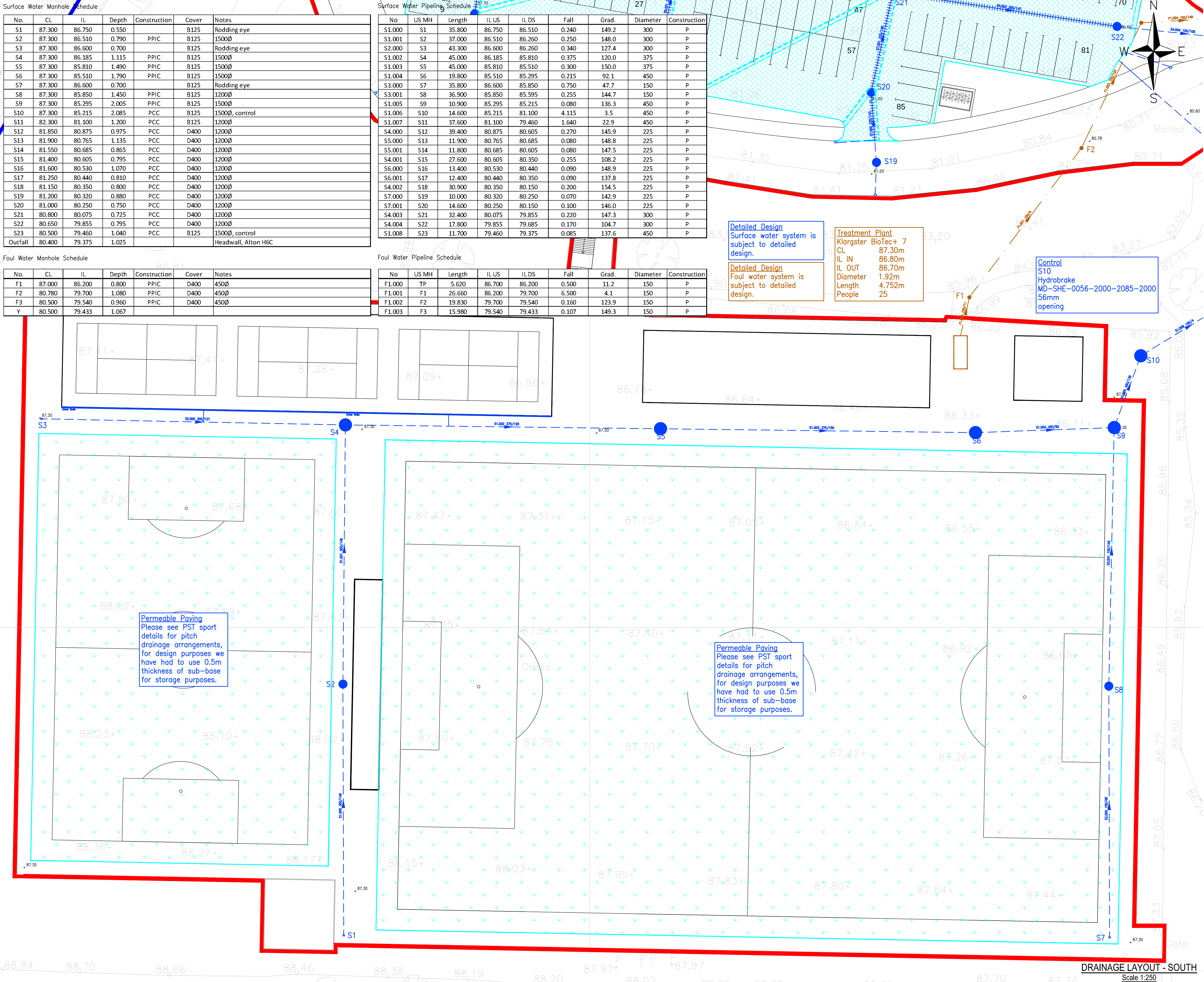
NOT FOR CONSTRUCTION

Surface Water Manhole Schedule						
No.	CL	IL	Depth	Construction	Cover	Notes
S1	87.300	86.750	0.550		B125	Rodding eye
S2	87.300	86.510	0.790	PPIC	B125	1500Ø
S3	87.300	86.600	0.700		B125	Rodding eye
S4	87.300	86.185	1.115	PPIC	B125	1500Ø
S5	87.300	85.810	1.490	PPIC	B125	1500Ø
S6	87.300	85.510	1.790	PPIC	B125	1500Ø
S7	87.300	86.600	0.700		B125	Rodding eye
S8	87.300	85.850	1.450	PPIC	B125	1200Ø
S9	87.300	85.295	2.005	PPIC	B125	1500Ø
S10	87.300	85.215	2.085	PCC	B125	1500Ø, control
S11	82.300	81.100	1.200	PCC	B125	1200Ø
S12	81.850	80.875	0.975	PCC	D400	1200Ø
S13	81.900	80.765	1.135	PCC	D400	1200Ø
S14	81.550	80.685	0.865	PCC	D400	1200Ø
S15	81.400	80.605	0.795	PCC	D400	1200Ø
S16	81.600	80.530	1.070	PCC	D400	1200Ø
S17	81.250	80.440	0.810	PCC	D400	1200Ø
S18	81.150	80.350	0.800	PCC	D400	1200Ø
S19	81.200	80.320	0.880	PCC	D400	1200Ø
S20	81.000	80.250	0.750	PCC	D400	1200Ø
S21	80.800	80.075	0.725	PCC	D400	1200Ø
S22	80.650	79.855	0.795	PCC	D400	1200Ø
S23	80.500	79.460	1.040	PCC	B125	1500Ø, control
Outfall	80.400	79.375	1.025			Headwall, Alton H6C

Foul Water Manhole Schedule						
No.	CL	IL	Depth	Construction	Cover	Notes
F1	87.000	86.200	0.800	PPIC	D400	450Ø
F2	80.780	79.700	1.080	PPIC	D400	450Ø
F3	80.500	79.540	0.960	PPIC	D400	450Ø
Y	80.500	79.433	1.067			

Surface Water Pipelining Schedule									
No	US MH	Length	IL US	IL DS	Fall	Grad.	Diameter	Construction	
S1.000	S1	35.800	86.750	86.510	0.240	149.2	300	P	
S1.001	S2	37.000	86.510	86.260	0.250	148.0	300	P	
S2.000	S3	43.300	86.600	86.260	0.340	127.4	300	P	
S1.002	S4	45.000	86.185	85.810	0.375	120.0	375	P	
S1.003	S5	45.000	85.810	85.510	0.300	150.0	375	P	
S1.004	S6	19.800	85.510	85.295	0.215	92.1	450	P	
S3.000	S7	35.800	86.600	85.850	0.750	47.7	150	P	
S3.001	S8	36.900	85.850	85.595	0.255	144.7	150	P	
S1.005	S9	10.900	85.295	85.215	0.080	136.3	450	P	
S1.006	S10	14.600	85.215	81.100	4.115	3.5	450	P	
S1.007	S11	37.600	81.100	79.460	1.640	22.9	450	P	
S4.000	S12	39.400	80.875	80.605	0.270	145.9	225	P	
S5.000	S13	11.900	80.765	80.685	0.080	148.8	225	P	
S5.001	S14	11.800	80.685	80.605	0.080	147.5	225	P	
S4.001	S15	27.600	80.605	80.350	0.255	108.2	225	P	
S6.000	S16	13.400	80.530	80.440	0.090	148.9	225	P	
S6.001	S17	12.400	80.440	80.350	0.090	137.8	225	P	
S4.002	S18	30.900	80.350	80.150	0.200	154.5	225	P	
S7.000	S19	10.000	80.320	80.250	0.070	142.9	225	P	
S7.001	S20	14.600	80.250	80.150	0.100	146.0	225	P	
S4.003	S21	32.400	80.075	79.855	0.220	147.3	300	P	
S4.004	S22	17.800	79.855	79.685	0.170	104.7	300	P	
S1.008	S23	11.700	79.460	79.375	0.085	137.6	450	P	

Foul Water Pipeline Schedule									
No	US MH	Length	IL US	IL DS	Fall	Grad.	Diameter	Construction	
F1.000	TP	5.620	86.700	86.200	0.500	11.2	150	P	
F1.001	F1	26.660	86.200	79.700	6.500	4.1	150	P	
F1.002	F2	19.830	79.700	79.540	0.160	123.9	150	P	
F1.003	F3	15.980	79.540	79.433	0.107	149.3	150	P	



DO NOT SCALE

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NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DWS DRAWINGS, CALCULATIONS, REPORTS AND SPECIFICATIONS (WHERE APPLICABLE) AND, ALL OTHER RELEVANT ENGINEERS, ARCHITECTS & SPECIALIST DESIGN DETAILS.

2. STANDARD NOTES & DETAILS: Refer to drawing number 0-170 onwards for standard notes - CIVIL

Refer to drawing number 0-180 onwards for standard details - CIVIL



- KEY
- Surface Water Pipe (Private)
 - Surface Water Pipe (Perforated)
 - Surface Water Chamber (Private)
 - Rodding Eye
 - Linear Drain
 - Permeable Paving - Playing Pitch
 - Permeable Paving - Parking Bays
 - Fin Drain
 - Check Dam
 - Foul Water Pipe (Private)
 - Foul Water Chamber (Private)
 - Site Boundary

P1	First issue	26.03.26	LM
Ref	Revision	Date	By

Issue

PRELIMINARY

DWS Consulting Engineers

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Project Title

RATBY SPORTS CLUB, DESFORD LANE, RATBY

Drawn LM	Engineer LM	Checked BP
Scale at 1:250 @ A1	Date MAR 2026	

Drawing Title

DRAINAGE LAYOUT - SOUTH

Project No. 25-22211	Drawing No. 0-501	Revision P1
BIM Code		

NOT FOR CONSTRUCTION