CTSDESIGN
CONSULTING ENGINEERS

Proposed Development at Bushloe House, Station Road, Wigston

Flood Risk Assessment & Sustainable Drainage Strategy

November 2023

MACC Group Limited

PROJECT REF: CS230701-RP01

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Issue and revision record:

Revision	Date	Prepared	Checked	Approved	Notes
0	21-11-2023	AE	DM	DM	FIRST ISSUE

1. Introduction

1.1 This Flood Risk Assessment (FRA) and Sustainable Drainage Strategy has been prepared on behalf of MACC Group Limited. This report relates to the proposed development of an 80-bed care home involving the partial demolition and extension to Bushloe House, Station Road, Wigston (OS Grid Reference: - SP600987) – see Figure 1-1.

1.2 The 1.06ha site falls within the administrative area of Oadby and Wigston Borough Council and Leicestershire County Council is the Lead Local Flood Authority (LLFA).

1.3 This report assesses the existing flood risk and drainage characteristics of the site and immediate surrounding location and determines the recommended mitigation measures to be employed as part of the development of the site to ensure that the proposed development is safe from flooding and will not increase flood risk off-site.

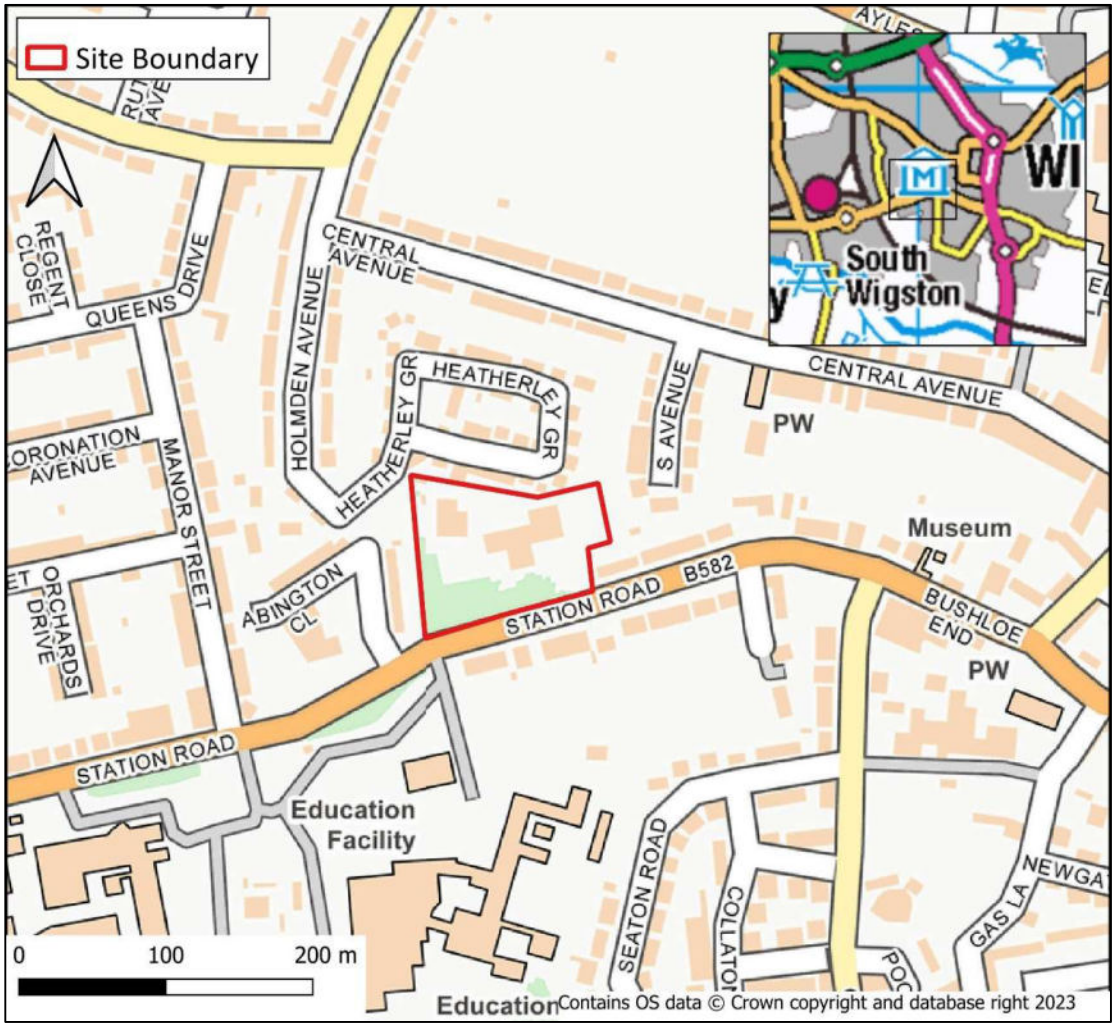

Figure 1-1: Site Location Plan

Existing Site

1.4 The existing site is occupied by Bushloe House, a Grade II listed property built in 1850 and most recently used as the headquarters of Oadby and Wigston Borough Council. Additional land within the site boundary is predominantly used for vehicle parking and outbuildings. The site is bounded by Station Road to the south, and existing residential development to the west, north and east.

1.5 The site is accessed from Station Road to the south.

1.6 A topographical survey of the site is included as Appendix A and shows the site to have a very slight fall from east to west with levels ranging slightly from c.92.5m AOD within the eastern site to c.91.4m AOD along the western site boundary. A representation of the elevation data shown in the LiDAR is included within Figure 1-2.

1.7 The British Geological Society (BGS) Geology Viewer[1] shows the site is underlain by a mudstone bedrock from the Blue Lias Formation.

1.8 Sedimentary superficial deposits of clay from the Glen Parva Member are evidenced across most of the site with the far eastern extent of the site identified as having sand and gravel sedimentary superficial deposits from the Wigston Member.

1.9 The Cranfield Soil and Agrifood Institute Soilscapes Viewer[2] describes the soils at the site as *slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.*

1.10 The geology and soils data suggests that a surface water management strategy led by infiltration is likely to be unviable. However, infiltration testing in line with the BRE Digest 365 methodology will be completed as part of the Ground Investigation works at detailed design stage.

[1] BGS Geology of Britain Viewer. https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/
[2] Cranfield Soil and Agrifood Institute Soilscapes Viewer. https://www.landis.org.uk/soilscapes/

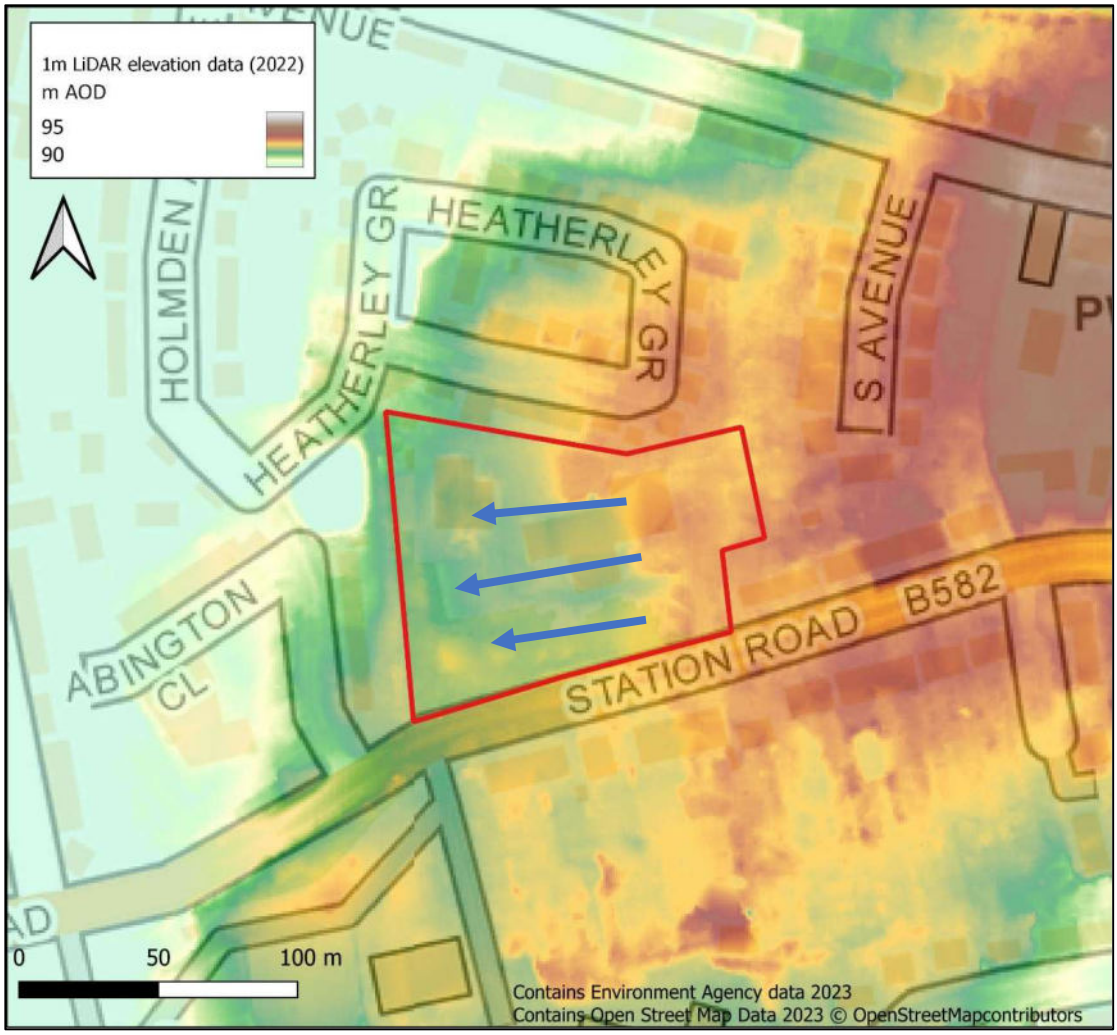

Figure 1-2 Elevation of site and surrounding area

1.11 The nearest Severn Trent Water public sewers are show in Figure 1-3. An existing 300mm combined sewer flows east to west along Station Road to the south of the site. Section 104 sewers serve the recent development to the west and north of the site.

1.12 There are existing manholes and a drainage regime onsite which discharges both surface water and foul water flows at an unrestricted rate to the public combined sewer along Station Road to the south.

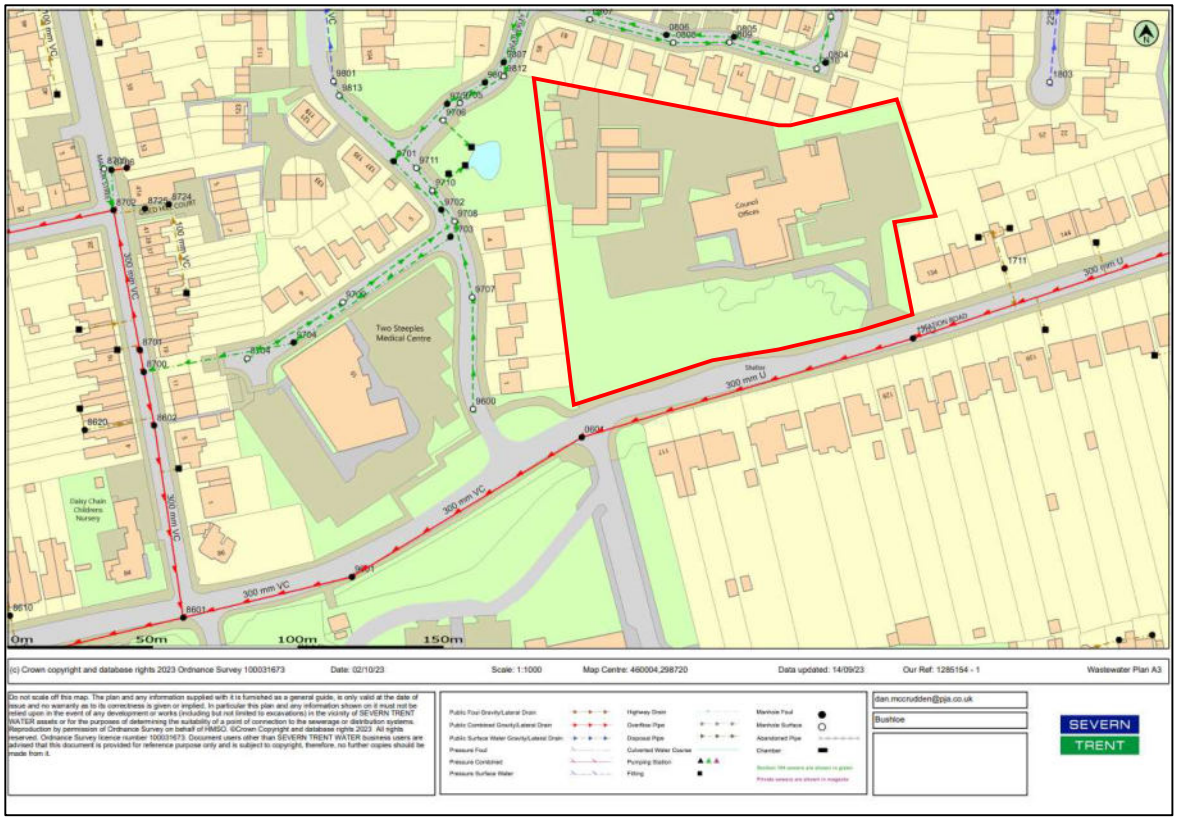

Figure 1-3: Severn Trent Water asset mapping

Proposed Development

1.13 The proposal is for the development of an 80-bed residential care home, and associated parking and amenity space. This will involve the part-demolition and extension to Bushloe House.

1.14 The proposed development is shown in Figure 1-4, Figure 1-5 and in Appendix B.

Figure 1-4: Proposed Site Clearance and Demolition Plan

Figure 1-5: Proposed Site Layout

2 Flood Risk Assessment*Policy Context*

2.1 Paragraph 167 of the National Planning Policy Framework (NPPF) advises that when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere and that where appropriate, applications should be supported by a site-specific FRA. The NPPF also states that developments should incorporate Sustainable Drainage Systems (SuDS) unless there is clear evidence that this would be inappropriate.

2.2 This FRA has been prepared in line with the guidelines of the NPPF, accompanying Planning Policy Guidance for Flood Risk & Coastal Change (PPG-FRCC) and local standards to provide sufficient evidence to inform the design and decision-making process for the proposed development.

2.3 The principle aims of this FRA are:

- To assess potential sources of flooding at the site and consider whether there is an associated flood risk present both to and arising from redevelopment of the site;
- To take the impacts of climate change into account and ensure that the development remains safe from flood risk during its lifetime as reasonably practicable as possible;
- To consider the vulnerability and safety of occupants relative to flood risk;
- To identify any opportunity for flood risk reduction and subsequently identify whether residual risk management should be considered;
- To consider existing and proposed methods of surface water runoff management and in turn establish a sustainable strategy for drainage of the development.

National Planning Policy Framework (NPPF)

2.4 Paragraphs 159 and 162 of the NPPF sets out the principle aim to avoid inappropriate development in areas at risk of flooding, to steer new development to areas with the lowest risk of flooding from any source and that development should be made safe for its lifetime without increasing flood risk elsewhere.

2.5 According to Annex 3 of the NPPF, the primary proposed land use (residential care home) falls within the category of 'More Vulnerable'. The site is located within Flood Zone 1 of the Flood Map for Planning.

2.6 Table 2 of the Planning Practice Guidance - Flood Risk & Climate Change (PPG-FRCC) indicates that development with this vulnerability of use within Flood Zone 1 is appropriate.

2.7 Paragraph 23 of the PPG-FRCC advises that 'other forms of flooding need to be treated consistently with river and tidal flooding in mapping probability and assessing vulnerability, so that the sequential approach can be applied across all areas of flood risk.'

2.8 Paragraph 37 of the PPG-FRCC directs developers to 'identify opportunities to reduce the flood risk overall and to demonstrate that the measures go beyond just managing the flood risk resulting from the development'. It advises that 'reductions could be

achieved, for example, through the incorporation of green infrastructure; providing Sustainable Drainage Systems that manage flood risk beyond the site and above the usual standard; and, providing or making contributions to flood risk management infrastructure that will provide a benefit to existing communities.'

2.9 A proposed surface water drainage strategy in accordance with best practice drainage design to suit the constraints of the site (i.e. topography, ground conditions and location) and proposed layout is described later in this report.

Relevant Local Flood Risk & Drainage Policy & Guidance

2.10 Oadby and Wigston Borough Council is the local planning authority for the site. The Council adopted the current Local Plan (2011-2031) in April 2019. This Local Plan sets out the Vision, Spatial Objectives, Spatial Strategy and Planning Policies for development for the entire Borough area, for the period up to 2031. The site is not allocated with the current adopted Local Plan.

2.11 Policy 38 within the Local Plan refers to Climate Change, Flood Risk and Renewable Low Carbon Energy. This policy states that:

New development proposals in the Borough must take into account the potential impact of climate change on water resources, water quality and on the level of flood risk posed, as detailed in the Council's latest Strategic Flood Risk Assessment (SFRA) and by the Environment Agency.

Development must proactively manage surface water run-off through the promotion of sustainable drainage techniques and positive land management, including the use of permeable surfacing.

2.12 A Joint Strategic Flood Risk Assessment (SFRA) for Hinckley & Bosworth Borough Council, Blaby District Council and Oadby & Wigston Borough Council was prepared in 2014 to inform emerging Local Plans. The site is not identified as an area of flood risk within the SFRA.

Leicestershire County Council SuDS Guidance

2.13 Leicestershire County Council, as the Lead Local Flood Authority (LLFA), has produced an *Interim LLFA Guidance Note: Planning and Development in Leicestershire* as well as a checklist. The requirements for surface water management are in line with the current planning legislation including the NPPF and non-statutory technical standards.

Review of Existing Flood Risk

Fluvial and tidal Flood Risk

2.14 A review of the Flood Map for Planning (Figure 2-1) shows the site to lie within Flood Zone 1 - land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

2.15 Therefore, the risk of flooding from fluvial or tidal sources is considered to be very low.

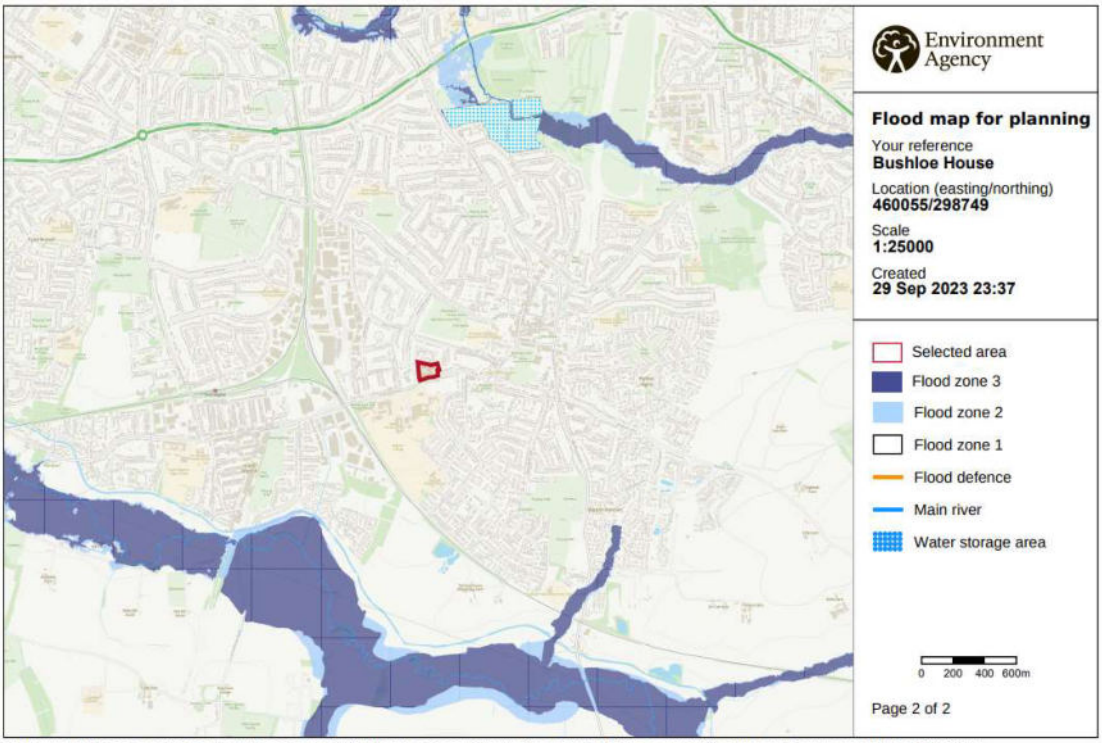

Figure 2-1: Flood Map for Planning

Surface water Flood Risk

2.16 The Environment Agency's Risk of Flooding from Survey Water (RoFSW) mapping shows the majority of the site to be at a very low risk from surface water flooding as shown in Figure 2-2.

2.17 There is an isolated area of 275m^2 at medium or low risk of surface water flooding within the western site. This is associated with a slight depression in the topography. This small, localised surface water flood risk will be mitigated through the proposed sustainable surface water drainage strategy and exceedance flow routing.

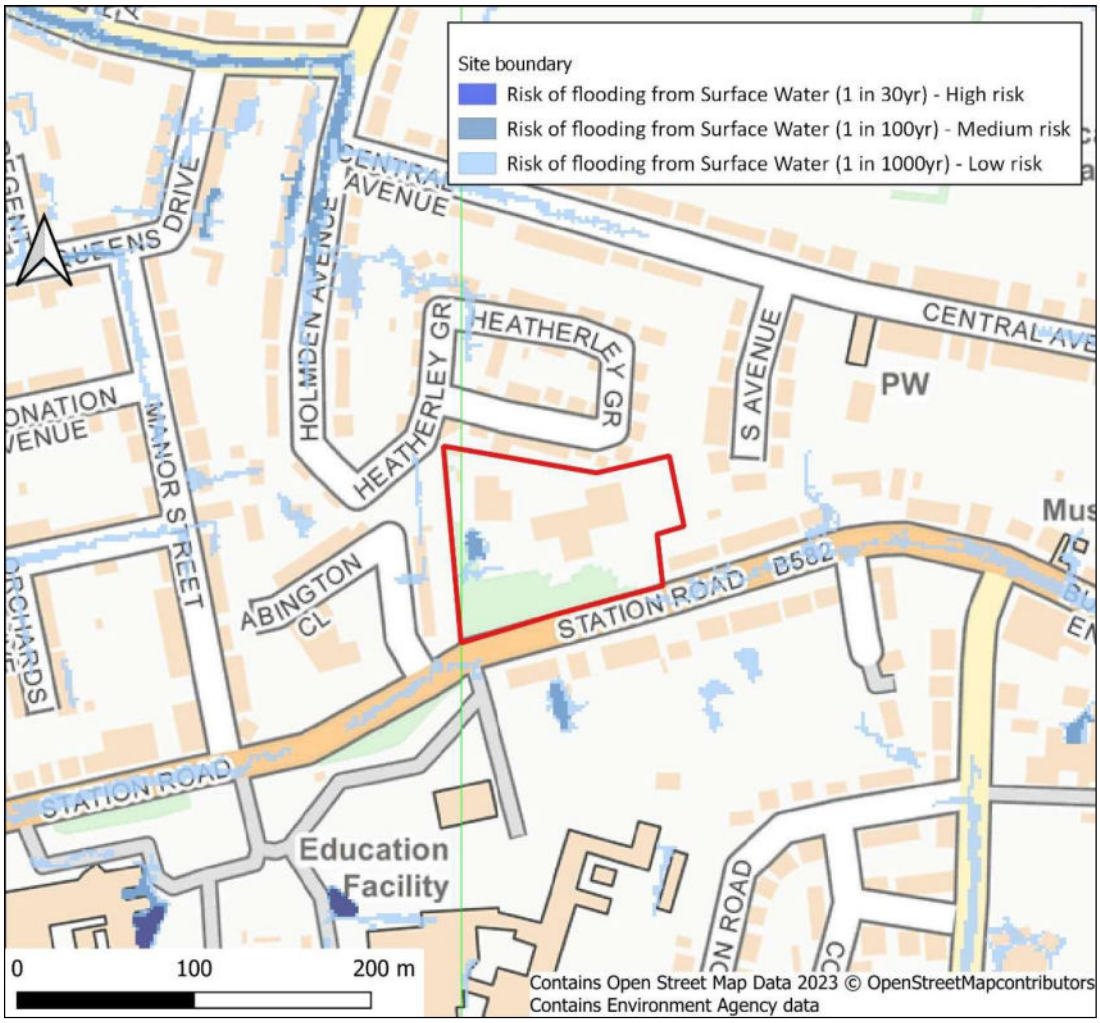

Figure 2-2: Environment Agency's Risk of Flooding From Surface Water (RoFSW) mapping

Climate change impacts on fluvial and surface water flood risk

2.1 The site is not expected to be at any significant additional risk associated with climate change. The site is removed from any fluvial system and the potential increase in rainfall intensity as a result of climate change is allowed for in general mitigation measures and surface water drainage strategy.

Groundwater flood risk

2.18 Flood risk mapping within the Level 1 SFRA's Appendix A: GeoPDFs indicate the site to lie within an area of 'medium potential susceptibility of groundwater flooding' (≥ 50% <75%).

2.19 However, the SFRA does not identify any reports of groundwater flooding or issues locally to the site.

2.20 As such groundwater is not considered likely to be a significant source of flood risk to the development.

Risk of flooding from Canals and Reservoir

2.21 There are no canals in the vicinity of the site and a review of the Environment Agency's mapping on reservoir flood risk has indicated that the site is not in a location that is at flood risk from this source.

Sewer flood risk

2.22 The SFRA and an internet search does not suggest there have been any incidents of sewer flooding within the vicinity of the site. Given this, the risk of flooding from this source is considered to be low.

3. Flood Risk Mitigation Recommendations

3.1 This FRA has identified that the site is not at significant risk from flooding from any sources assessed.

3.2 The proposed sustainable drainage strategy will manage surface water flows from the site and will provide exceedance routing. The localised depression shown within the surface water flood risk mapping will be removed through the strategy.

3.3 Finished Floor Levels (FFL) for the buildings should be proposed at a minimum of 92.03m AOD. These levels are set a minimum 150mm above immediate surrounding ground levels. The proposed 150mm is a standard minimum raised threshold and is considered given the low flood risk at the site.

3.4 The proposed raised FFL will also mitigate for any low residual risk from groundwater flooding and sewer flooding.

3.5 Given the low flood risk to the site safe access and egress remains operational during all events to the east along Station Road and a flood risk emergency evacuation plan is not required.

4. Surface & Foul Water Management

Surface water drainage strategy

4.1 A Sustainable Surface Water Drainage Strategy describing the means of surface water management and disposal from the proposed development Site has been produced in line with the latest guidance specifically:

- CIRIA C753 "The SuDS Manual", November 2015;
- CIRIA document C522 Sustainable Drainage Systems – design manual for England and Wales;
- CIRIA document C635 Designing for exceedance in urban drainage;
- Rainfall Runoff Management for Developments – SC030219 (Environment Agency, 2013);
- Severn Trent Water guidance notes relating to disposals of surface water;
- Environment Agency's pollution prevention guidelines (PPGs);
- Sewerage Sector Guidance – Design & Construction Guidance v2 (Water UK, March 2020); and
- Leicestershire County Council's Statutory Consultation Checklist and Interim LLFA Guidance Note: Planning and Development in Leicestershire (2018).

4.2 In accordance with the NPPF and supporting Planning Practice Guidance, the drainage strategy demonstrates how flood risk will be managed now and over the development's lifetime, taking climate change into account.

Discharge Hierarchy

4.3 In accordance with SuDS guidance, surface water should be sustainably managed and designed in accordance with the discharge hierarchy as shown below in Figure 4-1.

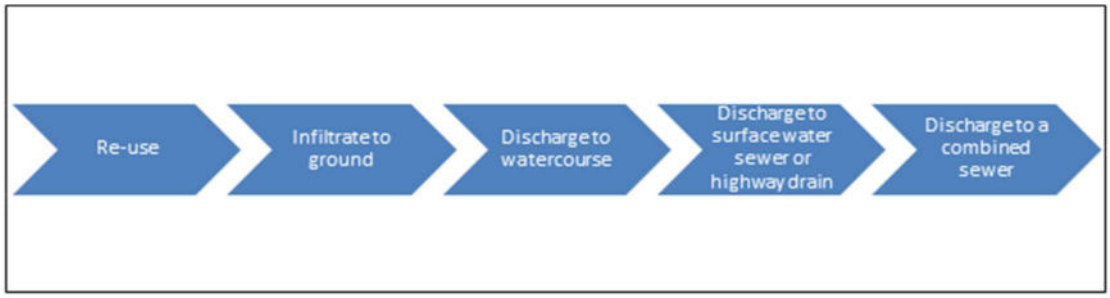

Figure 4-1: Hierarchy for the discharge of surface water flows

4.4 Due to the demand for water being insufficient, opportunities to incorporate rainwater are such that harvesting cannot be used solely to manage surface water runoff on the Site.

4.5 Given the underlying soils and geology, infiltration may not be a viable means of surface water disposal. However, this may be confirmed through infiltration testing in

accordance with BRE Digest 365 infiltration testing, which may be undertaken at the next stage of design.

4.6 There are no watercourses or ditch courses located within or in close proximity to the Site boundary and therefore discharge of surface water flows to a watercourse has not been proposed.

4.7 As stated in Section 1, there is an existing 300mm Severn Trent Water combined sewer flowing east to west along Station Road to the south of the site. The existing site is assumed to drain into this asset at an unattenuated rate. There are no Severn Trent Water surface water sewers in the vicinity of the site. However, should the Section 104 sewers to the west or north of the site become a possibility for surface water sewer discharge this may later be considered, but would be subject to a sewer requisition by Severn Trent Water Ltd to overcome third party land issues..

4.8 In line with the drainage hierarchy, surface water flows from the Site will be attenuated and discharged into the existing Severn Trent Water combined water sewers along Station Road replicating the current surface water arrangement, but with the discharge significantly reduced. This forms the principle of the proposed surface water drainage strategy at the Site and is further described below.

Flow control

4.9 Following best practise and national and local guidance, there are three design storm events which should be considered when designing the SuDS and managing surface water flows and volumes:

- 1 in 1 year storm event, where surcharging above soffits of any surface water drainage pipework is not permitted.
- 1 in 30 year storm event, where surface water flooding of the site is not permitted.
- 1 in 100 year storm event with allowances for future climate change, where runoff from the site should be controlled to the greenfield rate using SuDS attenuation features to manage flows and volumes within the extents of the development Site.

4.10 In addition to the above design events, the SuDS strategy will identify a dedicated overland flow route to convey any exceedance flows in events greater than the 1 in 100-year plus climate change event or in the event of system failure.

4.11 Greenfield run-off rates for the site have been calculated based on the development Site area (1.06ha) using the HR Wallingford IoH124 Greenfield Runoff Tool. the results are contained in Appendix C and are summarised in Table 4-1.

Table 4-1: Greenfield Runoff Rates

Design rainfall event	Peak flow (l/s)
1 in 1 year	3.69
QBAR	4.44
1 in 30 year	8.88
1 in 100 year	11.41

4.12 The calculations from HR Wallingford tool show the QBar greenfield runoff rate to be 4.4l/s for the Site.

4.13 The existing site (impermeable area of 5050m^2) brownfield unattenuated rate has been calculated using the rational method to be 19.7 l/s ($Q=2.78x50xA_{imp}$). Part of the existing site will continue to drain unaltered, where redevelopment is not proposed.

4.14 Because the proposed site will drain to the existing combined sewer, the proposed surface water drainage strategy will significantly reduce flows to a maximum rate of 2.0 l/s (50% greenfield QBar) for all events up to and including the 1 in 100 year event plus climate change event.

4.15 This will provide a 90% reduction in the peak flow compared to the current brownfield surface water drainage regime.

Climate Change Allowances

4.16 Climate change will affect peak river flows and rainfall intensities, consequently, the extent of flooding is likely to increase in the future. The Environment Agency published their Climate Change Guidance and recommended allowances applied to peak rainfall intensity in 2016 and this was updated based on specific management catchments in 2022.

4.17 Peak rainfall intensities in surface water drainage design should be assessed by increasing in accordance with the Environment Agency guidance for commercial/industrial development (2070s epoch from 2061 to 2125) to account for climate change. The Site is located within the Soar Management Catchment and therefore requires a 40% climate change allowance to be used to design the surface water drainage strategy.

4.18 The proposed development and associated surface water drainage scheme has been designed to sustainably manage the run-off from the critical 1 in 100 year storm event with a 40% allowance for climate change.

Development Creep

4.19 Over the lifetime of a development, it may be possible that the proportion of impermeable area within the Site could increase by as much as 10% through the owners undertaking activities such as property extensions and introducing paved gardens.

4.20 However, given the proposed development at the Site will feature a single care home, the likelihood of development creep is low and therefore an allowance for development creep have not been applied within the drainage strategy calculations.

Sustainable Surface Water Drainage Proposed on this Development

4.21 The proposed Surface Water Drainage Strategy aims to sustainably manage surface water runoff from the new development on the site without increasing flood risk on- or off-Site, nor adversely impacting on water quality through the use of SuDS in line with the requirements of Leicestershire County Council as the Lead Local Flood Authority.

4.22 It should be noted that the existing building, access and parking to be retained will continue to adopt the existing drainage regime.

4.23 The Surface Water Drainage Strategy drawing within Appendix D demonstrates the proposed Surface Water Drainage Strategy based on the latest masterplan.

4.24 It is proposed that the runoff from the impermeable surfaces on Site (1.06ha) will be treated within lined permeable paving proposed within the vehicle parking areas.

4.25 The runoff will then be attenuated within a cellular attenuation tank before being discharged into the existing connection on Station Road.

4.26 Flows will be restricted to a 50% Qbar discharge rate of 2l/s with a cellular attenuation tank with a volume of approximately 244m^3.

4.27 Surface water discharge rates to the receiving Severn Trent Water combined water sewer will be restricted through the use of a vortex flow control structure such as a Hydrobrake.

4.28 The proposed SuDS features have been sized in MicroDrainage to ensure that the proposed system is capable of conveying run-off from the design storm event without causing flooding. The MicroDrainage model outputs are included in Appendix E.

4.29 The calculations confirm that the proposed surface water drainage system is capable of attenuating, and discharging in a controlled manner, the run-off from the design 1 in 100 year storm with a 40% allowance for climate change without flooding of the development.

4.30 The drainage strategy is based upon the site masterplan at the time of production. Changes to the site development profile, proportion of impermeable surfaces or other such aspects of the scheme will result in the need to revise the drainage calculations.

Designing for Exceedance

4.31 During a rainfall event with a return period well in excess of that for which the surface water drainage system was designed (in this case a 1 in 100 year plus 40% climate change allowance), or in the event of a blockage or surface water ingress from a neighbouring site, the capacity of the surface water drainage system may be exceeded. This residual risk could result in localised flooding in the areas affected.

4.32 The layout and landscaping of the proposed development should be designed to ensure that exceedance flood flow paths are routed away from vulnerable development and toward landscaped areas, areas of open attenuation or green infrastructure as shown in the Exceedance Plan within Appendix F.

4.33 In line with Building Regulations and the recommendations with regards to surface water described in Section 3, the finished floor levels of the proposed units will be set at least 150mm above the surrounding ground levels to prevent surface water ingress through doorways.

4.34 Minor modifications to topography, the profile of the access road, footpath or kerb and strategically placed built and green infrastructure will be developed to ensure that exceedance flood flows are managed and there is little or no risk of property flooding or unacceptable ponding within existing or new highways.

Water Quality Treatment Train

4.35 The principles to mitigate against adverse impacts on water quality in the receiving water environment is described in the CIRIA C753 “The SuDS Manual” (2015).

4.36 Integrated SuDs features throughout a development can manage rainfall at the sources by providing an interception function. The proposed permeable paving will provide an interception function within the proposed development, ensuring that no runoff leaves the Site during a 5mm rainfall across the entire Site.

4.37 The proposed uses at the site will comprise residential roofs and residential parking. The roofs are classified as a 'very low' pollution hazard risk level and the residential car parking is classified as a 'low' pollution hazard risk level in Table 26.2 of CIRIA C753 The SuDS Manual.

4.38 These hazard pollution levels require application of a simple index approach for water quality risk assessment for discharge to surface and groundwaters. The pollution hazard indices for very low and low pollution hazard Site are given in Table 4-2 below.

Table 4-2: Pollution Hazard Indices for a very low and Low Pollution Hazard Site

Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Very Low	0.2	0.2	0.05
Low	0.5	0.4	0.4

4.39 Table 4-3 provides the indicative SuDS mitigation indices for the proposed SuDS features for the Site. It demonstrates that the mitigation index for the proposed permeable paving is greater than the pollution hazard index for each pollutant type. Therefore, the strategy is deemed to comply with the water quality requirements of the SuDS standards.

Table 4-3: Proposed SuDS mitigation indices

SuDS proposed	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7

4.40 The proposed surface water drainage strategy should provide a sufficient level of water quality treatment to prevent pollution receiving waterbodies downstream.

Adoption and Maintenance of SuDS

Adoption

4.41 Responsibility for the maintenance of the main surface water drainage networks and SuDS features may be offered to Severn Trent Water for adoption under S104 of the Water Industry Act 1991. To meet the requirements for adoption, the proposed infrastructure must be designed and constructed according to Sewerage Sector Guidance – Design & Construction Guidance v2 (Water UK, March 2020).

4.42 Alternatively, and most likely, the SuDS features may be operated and maintained by a third-party private maintenance company. This management company would maintain the features in perpetuity based upon the CIRIA ICoP MA2 SuDS Maintenance Framework Agreement.

4.43 The details of the party responsible for maintenance of the surface water management features will be confirmed prior to occupation of the proposed development.

Maintenance

4.44 Maintenance of the system is vital to the continued performance of the system. It is important that the original design intent is achieved throughout the lifespan of the development otherwise the likelihood of flooding increases as the performance of the system decreases.

4.45 All maintenance will need to take the protection of habitats and associated ecology into account. Maintenance regimes should be regularly assessed (i.e. once per year) to make sure that the approach is still achieving objectives in terms of drainage, landscaping, amenity and biodiversity.

4.46 The proposed maintenance regimes for the SuDS should be largely in accordance with The SuDS Manual (CIRIA C753) and other best practice guidelines and in accordance with manufacturer's recommendations. This will ensure the design performance, structural integrity and where applicable- appearance of each feature is maintained throughout its lifetime.

4.47 However, a typical maintenance schedule of the permeable paving, attenuation tank and flow control devices proposed on Site are shown in Table 4-4 to Table 4-7.

Table 4-4: Typical Permeable Paving Maintenance Regime

First 3 months	Soon after site works have completed, a large amount of build-up is normally expected within the drainage system. Therefore, inspections of outfalls should be undertaken. Refer to manufacturers specifications.
Annually	Brushing and vacuuming of the permeable paving to manufacturers requirements and re-gritting where necessary. For sealed systems, inspections of outfalls should be undertaken. Refer to manufacturers specifications.
Following severe storms	Inspect all inlets, outlets, inspection chambers, surface and overflows (where required) to ensure that they are in good condition, free from blockages and working to full operational order. Take action where required. Refer to manufacturers' specifications**.**

Table 4-5: Typical Attenuation Tank Maintenance Regime

First 3 months	Inspect the performance of the system and advise a drainage engineer of any problems with water levels. The system should only reach full capacity during a very severe storm. Water levels should reduce consistently to nil shortly following a storm.
Annually	Ensure all road gullies and silt traps are clear from blockage and silt build up and clear as required. Excessive build up could enter the tank and reduce the efficiency of the system. A maintenance company can be called out to pressure jet the system and clear out any issues.
Following severe storms	Inspect the drainage network and ensure the system is operating as designed. In the majority of cases no overland flooding should occur. Any flooding will be an indication of blockage reducing the performance.

Table 4-6: Typical Flow Control Chamber Maintenance Regime

First 3 months	Inspect the performance of the system and advise a drainage engineer of any problems with water levels. The system should only reach full capacity during a severe storm.
Annually	Inspect the chamber and ensure no debris is present, which may cause blockages. Remove as necessary.
Following severe storms	Inspect the drainage network and ensure the system is operating as designed. In the majority of cases no overland flooding should occur. Any flooding will be an indication of blockage reducing the performance. Inspect the chambers either side of the tank for silt / blockage and remove as necessary.

Table 4-7: Typical Vortex Separator Maintenance Regime

Note	The Vortex Separator has no moving parts and operates under gravity flow. The inspection chamber provides direct access from the surface to the sediment and oils accumulated in the reservoir tank.
First 3 months	Soon after site works have completed, a large amount of build up is normally expected within the drainage system. Lift the cover to the chamber and assess any silt build up. Any build up should be removed and disposed of.
Annually	This chamber should be emptied yearly to prevent build-up of silt from entering the tank and reducing its performance efficiency.
Following severe storms	Inspect the chambers for silt / blockage and remove as necessary.

Foul drainage Strategy

4.48 Foul drainage for the development is proposed to be discharged into the existing 300mm diameter combined sewer within Station Road to the south of the site in line with the existing foul drainage regime.

5. Summary & Conclusions

5.1 This Flood Risk Assessment and Sustainable Drainage Strategy report has been prepared on behalf of MACC Group Limited. This report relates to the proposed development of an 80-bed care home involving the partial demolition and extension to Bushloe House, Station Road, Wigston.

5.2 The 1.06ha site has a very slight fall from east to west with levels ranging slightly from c.92.5m AOD within the eastern site to c.91.4m AOD along the western site boundary.

5.3 The Site is within Flood Zone 1 of the Flood Map for Planning and is therefore not at significant risk of flooding from fluvial sources. Flood risk from surface water, sewers, groundwater or as a result of a canal or reservoir failure is also considered to be low.

5.4 Finished Floor Levels (FFL) for the buildings should be proposed at a minimum of 92.03m AOD. These levels are set a minimum 150mm above immediate surrounding ground levels.

5.5 A Surface Water Drainage Strategy has been prepared to demonstrate that a sustainable drainage solution can be provided for the proposed development largely in accordance with current best practice and meeting the requirements of Leicestershire County Council as the LLFA.

5.6 The geology and soils data suggests that a surface water management strategy led by infiltration is likely to be unviable. However, infiltration testing in line with the BRE Digest 365 methodology should be completed as part of the Ground Investigation works at detailed design stage.

5.7 Surface water discharged from the proposed development is to be restricted to 2l/s for all events up to and including the 1 in 100 year plus climate change (40%) event. Site runoff with be attenuated through an attenuation tank before being discharged into the existing combined sewer to the south of the site, in line with the current surface water drainage regime but at a significantly reduced rate (circa 90% reduction).

5.8 It is proposed that the necessary surface water treatment will be delivered through permeable paving.

5.9 A Foul Water Drainage Strategy has been prepared to demonstrate that a drainage solution can be provided for the proposed development.

5.10 Given the low flood risk to the site safe access and egress remains operational during all events to the east along Station Road and a flood risk emergency evacuation plan is not required.

5.11 This FRA and Sustainable Drainage Strategy report demonstrates that the proposed development may be designed in a sustainable and safe manner without adversely impacting the flood risk either at the site or to any third-party land in line with NPPF requirements.

Appendix A – Topographical Survey

CS1	460029.614	298782.543	91.821
CS2	460097.755	298788.236	92.301
CS3	460101.373	298728.535	92.386

0 2 4 6 8 10 12 14 16 18 20

Scale Bar m

Floor Plan Legend:

- SH 1.00m / HH 2.00m — Window Cill & Head Height (SH: Sill Height From FFL, HH: Head Height From FFL)
- Ht 2.00 — Door Height From FFL
- Overhead Detail
- Stairs/Step
- RAD — Radiator
- Ventilation / Overhead
- Hatch — Access Hatch
- TV Point
- Phone Point
- 13A Power Socket
- Fused Socket
- Shaver Socket
- Extractor Fan
- Lantern Light
- Down Light
- Light Dimmer Switch
- Light Switch
- Fixed Lighting
- FA — Fire Alarm Button
- FX — Fire Extinguisher
- Reception — Room Name
- Carpet — Floor Covering
- 2.49 — Ceiling Height
- IFL 145.80 — Internal Floor Level

Topographic Legend:

- Buildings / Walls
- Building Canopy / Overhang
- Concrete edge
- Kerb line
- Centre Line
- Barrier
- Hedge
- Security Fence
- Panel Fence
- Gate
- Overhead Line
- SAP — Tree / Sapling
- Tree Canopy Line
- Chambers
- CS1 — Survey Station & Name
- BM 100.00 — Bench Mark
- TBM 100.00 — Temporary Bench Mark
- CL — Cover level
- IL — Invert level
- Inv Ø 0.25 — Pipe invert (diameter)
- GU — Gully
- MH — Manhole
- IC — Inspection chamber

Trig	Trig Pillar	FS	Flag Staff
Rdg	Ridge Level	Mrk	Gas Marker
Eave	Eave Level	EP	Electric Post
DPC	Dpc Level	TP	Telegraph Post
FL	Floor Level	Invt	Pipe Invert
Soff	Soffit Level	GU	Gully
TBo	Control Box	RP	Rodding Point
LP	Lamp Post	BT	Bt Cover
SP Post	Sign Post	CO	Cover Unknown
	Post	EC	Electricity Cover
WM	Water Meter	TL	Traffic Light
BB	Bellisha Beacon	FH	Fire Hydrant
BOL	Bollard	GAS	Gas Cover
BS	Bus Stop	SV	Stop Valve
ER	Earthing Rod	TV	Tv Cover
Box	Post Box	GV	Gas Valve
MS	Mile Stone	Peg	Peg

THE SURVEY ASSOCIATION

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LAND · BUILDING · 3D LASER SCANNING · BIM · SITE ENGINEERING & SETTING OUT · UTILITY · DRAINAGE CCTV SURVEYS & REPORTS · QUALITY ASSURANCE SURVEYS & REPORTS

CLIENT: MACC Group

SITE DETAILS: Bushloe House, Station Road
Wigston, LE12 2DR

TITLE: Topographical

DRAWING NO.: 22310-22-01

REV:

SCALE: 1: 200

DATE: 19/05/2022

DRAWN: TL

CHECKED: PJ

LEVEL DATUM: OSGB36(15)

Paper Size - A0

Comments:

This plan should only be used for its original purpose. Castle Surveys Ltd dos not accept any responsibility for this plan if supplied to any other party, other than the original client.

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

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only. Some services may have been omitted due to parked vehicles or due to the site being overgrown with vegetation.

Tree information (where applicable) has been surveyed from ground level and therefore should be treated as approximate only. Advise that a tree survey should be carried out.

Roof linework (where applicable) is indicative only.

DO NOT SCALE

Appendix B – Proposed Site Plan

Drawn Scale

0 5 10 20m

NORTH

CARE HOME CAR PARK (30No.)

APARTMENTS CAR PAR (23No.)

Ambulance / Deliveries

Bin Store

Bicycle Park (7No.)

Station Rd

Station Rd

Rev K: 22.11.23: Care home plan updated.

Rev J: 07.11.23: Care home relocated to correspond with updated tree locations.

Rev H: 06.10.23: Tarmac area reduced to trees G2.

Rev G: 05.10.23: Floor plans updated.

Rev F: 06.08.23: Floor plans updated.

Rev E: 18.07.23: Refuse store & parking updated.

Rev D: 14.07.23: Care home layout updated.

Rev C: 07.07.23: Care home layout updated.

Rev B: 28.04.23: Glazed link omitted.

Rev A: 24.03.23: Updated following comments.

Revision

Client

MACC Group

Project Name

Station Road

Wigston, Leicestershire

PLANNING

Proposed Site Plan

PCPT Architects Limited
86 Spencer Street
Jewellery Quarter
Birmingham
B18 6DS

T: 0121 523 9335

design@pcptarchitects.co.uk

Scale	Date
1:200 @ A1	May 2022
Drawn by	Checked by
RGR	DRM
Plot Date	
-	

Drawing No. 3918 AD(0) 10

Revision K

AutoCAD reference:
H:\Drawings\3918 Wigston\3918 AD(0)

Appendix C – Greenfield Runoff Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Daniel McCrudden
Site name:	Bushloe
Site location:	Leicester

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

Site Details

Latitude:	52.58321° N
Longitude:	1.11529° W
Reference:	1399028668
Date:	Oct 02 2023 09:47

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.06

Methodology

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

Soil characteristics

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

Hydrological characteristics

	Default	Edited
SAAR (mm):	620	620
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 30 years:	2	2
Growth curve factor 100 years:	2.57	2.57
Growth curve factor 200 years:	3.04	3.04

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	4.44	4.44
1 in 1 year (l/s):	3.69	3.69
1 in 30 years (l/s):	8.88	8.88
1 in 100 year (l/s):	11.41	11.41
1 in 200 years (l/s):	13.5	13.5

Appendix D – Sustainable Drainage Strategy Drawing

1:250
0 4 6 8 10 12 14 16 18
Scale Bar:

N

Bin Store

Attenuation Tank
37m x 10m x 0.66m dp
Min GL 91.80
Soffit 91.11
Il 90.45

S1 CL 91.88 IL 91.38
S2 CL 91.88 IL 91.12
S3 CL 91.88 IL 91.00
S4 CL 91.75 IL 90.90
S5 Silt Trap CL 91.85 IL 90.50
S6 CL 91.88 IL 91.38
S7 CL 91.90 91.00
S8 CL 91.88 IL 90.70
S9 CL 91.85 IL 90.60
S10 RE CL 91.88 IL 91.45
S11 CL 91.88 IL 91.10
S12 CL 91.85 IL 91.50
S13 CL 91.85 IL 90.85
S14 CL 91.85 IL 90.70
S15 CL 91.85 IL 90.55
S16 RE CL 92.50 IL 91.75
S17 CL 92.38 IL 91.50
S18 CL 92.35 IL 91.00
S19 Silt Trap CL 91.85 IL 90.50
S20 Flow Control Chamber Discharge Rate 2.0 l/s CL 91.85 Il 90.45
S21 CL 92.56 IL 89.76
S21 CL 92.56 IL 90.09
S22 CL 92.32 CL 92.60

FFL 92.030
FFL 92.600

1500 Filter Drain
Permeable Paving
Flow Control Chamber
Bicycle Park (100)
Existing 300D Combined Public Sewer
Existing MH CL 92.30 IL 89.55 tbc
Existing Public MH 1702 CL 92.26 IL 89.31
1500 1:20

KEY

- Planning Application Boundary
- Existing Foul / Combined Drainage
- Existing Storm Drainage
- Existing potion of the site unchanged, and to continue to drain as existing.
- Foul Drainage
- Storm Drainage
- Lined Permeable Paving
- Perforated Filter Pipe
- Attenuation Tank
- Existing Tree Root Protection Area

Drainage Contribution Areas

Upstream Manhole	Impermeable Area
S1	420
S2	190
S3	-
S4	60
S5	150
S6	250
S7	170
S8	600
S9	-
S10	80
S11	-
S12	50
S13	-
S14	200
S15	-
S16	120
S17	220
S18	-
S19	-
S20	990

REV	DESCRIPTION	BY	DATE
A	Updated site plan	DMcC	29.11.23

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CLIENT
MACC Group

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Wigston, LE18 2DR

PHASE
PLANNING

DRAWN BY	DATE
DMcC	17.11.2023
CHECKED BY	DATE

SCALE
1:250 @ A1

DRAWING
Drainage Layout

PWG No CS230701
REV A

Appendix E – MicroDrainage Outputs

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.246	0.246	2.0	91.1	O K
30 min Summer	100.321	0.321	2.0	118.8	O K
60 min Summer	100.396	0.396	2.0	146.7	O K
120 min Summer	100.469	0.469	2.0	173.4	O K
180 min Summer	100.505	0.505	2.0	187.0	O K
240 min Summer	100.527	0.527	2.0	194.9	O K
360 min Summer	100.550	0.550	2.0	203.6	O K
480 min Summer	100.561	0.561	2.0	207.7	O K
600 min Summer	100.565	0.565	2.0	208.9	O K
720 min Summer	100.563	0.563	2.0	208.4	O K
960 min Summer	100.553	0.553	2.0	204.5	O K
1440 min Summer	100.529	0.529	2.0	195.7	O K
2160 min Summer	100.492	0.492	2.0	181.9	O K
2880 min Summer	100.452	0.452	2.0	167.4	O K
4320 min Summer	100.372	0.372	2.0	137.6	O K
5760 min Summer	100.305	0.305	2.0	113.0	O K
7200 min Summer	100.250	0.250	2.0	92.4	O K
8640 min Summer	100.205	0.205	2.0	75.8	O K
10080 min Summer	100.170	0.170	2.0	62.8	O K
15 min Winter	100.276	0.276	2.0	102.1	O K
30 min Winter	100.360	0.360	2.0	133.3	O K
60 min Winter	100.446	0.446	2.0	164.9	O K
120 min Winter	100.528	0.528	2.0	195.2	O K
180 min Winter	100.570	0.570	2.0	210.8	O K
240 min Winter	100.594	0.594	2.0	219.9	O K
360 min Winter	100.623	0.623	2.0	230.6	O K
480 min Winter	100.638	0.638	2.0	236.1	O K
600 min Winter	100.644	0.644	2.0	238.4	O K
720 min Winter	100.645	0.645	2.0	238.8	O K
960 min Winter	100.638	0.638	2.0	236.0	O K
1440 min Winter	100.606	0.606	2.0	224.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	87.3	19
30 min Summer	90.705	0.0	114.5	34
60 min Summer	56.713	0.0	149.2	64
120 min Summer	34.246	0.0	180.2	124
180 min Summer	25.149	0.0	198.4	182
240 min Summer	20.078	0.0	211.0	242
360 min Summer	14.585	0.0	229.5	362
480 min Summer	11.622	0.0	243.3	482
600 min Summer	9.738	0.0	254.1	600
720 min Summer	8.424	0.0	262.8	720
960 min Summer	6.697	0.0	275.7	878
1440 min Summer	4.839	0.0	283.0	1122
2160 min Summer	3.490	0.0	334.5	1516
2880 min Summer	2.766	0.0	353.2	1932
4320 min Summer	1.989	0.0	380.3	2684
5760 min Summer	1.573	0.0	403.6	3456
7200 min Summer	1.311	0.0	420.1	4176
8640 min Summer	1.129	0.0	433.7	4840
10080 min Summer	0.994	0.0	444.8	5544
15 min Winter	138.153	0.0	97.9	19
30 min Winter	90.705	0.0	127.7	33
60 min Winter	56.713	0.0	167.2	62
120 min Winter	34.246	0.0	201.7	122
180 min Winter	25.149	0.0	221.9	180
240 min Winter	20.078	0.0	235.9	238
360 min Winter	14.585	0.0	256.2	356
480 min Winter	11.622	0.0	271.0	470
600 min Winter	9.738	0.0	282.1	584
720 min Winter	8.424	0.0	290.4	696
960 min Winter	6.697	0.0	299.0	914
1440 min Winter	4.839	0.0	290.2	1168

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
2160 min Winter	100.559	0.559	2.0	206.8	O K
2880 min Winter	100.506	0.506	2.0	187.4	O K
4320 min Winter	100.386	0.386	2.0	142.7	O K
5760 min Winter	100.284	0.284	2.0	105.2	O K
7200 min Winter	100.206	0.206	2.0	76.4	O K
8640 min Winter	100.151	0.151	2.0	56.0	O K
10080 min Winter	100.115	0.115	1.9	42.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2160 min Winter	3.490	0.0	374.7	1624
2880 min Winter	2.766	0.0	395.5	2100
4320 min Winter	1.989	0.0	425.8	2900
5760 min Winter	1.573	0.0	452.1	3640
7200 min Winter	1.311	0.0	470.6	4320
8640 min Winter	1.129	0.0	485.9	4936
10080 min Winter	0.994	0.0	498.6	5552

Rainfall Details

Rainfall Model	FSR	Ratio R	0.400	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Cv (Summer)	0.750	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.357

Time (mins) From:	To:	Area (ha)
0	4	0.357

Model Details

Storage is Online Cover Level (m) 105.000

Tank or Pond Structure

Invert Level (m) 100.000

Depth (m)	Area (m²)
0.000	370.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2000-0700-2000	Sump Available	Yes
Design Head (m)	0.700	Diameter (mm)	71
Design Flow (l/s)	2.0	Invert Level (m)	100.000
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	2.0	Kick-Flo®	0.450	1.6
Flush-Flo™	0.207	2.0	Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	0.800	2.1	2.000	3.2	4.000	4.5	7.000	5.8
0.200	2.0	1.000	2.4	2.200	3.4	4.500	4.7	7.500	6.0
0.300	2.0	1.200	2.6	2.400	3.5	5.000	5.0	8.000	6.2
0.400	1.8	1.400	2.7	2.600	3.7	5.500	5.2	8.500	6.4
0.500	1.7	1.600	2.9	3.000	3.9	6.000	5.4	9.000	6.6
0.600	1.9	1.800	3.1	3.500	4.2	6.500	5.6	9.500	6.8

Appendix F – Exceedance Routing Plan

1:250

Scale Bar: 0 2 4 6 8 10 12 14 16 18

N

Overland Exceedance Flood Routing

Building levels are designed to be 150mm above external ground levels, except where level thresholds are required for accessibility, in these cases the ground is sloped away from the entrance to ensure no flooding enters the building.

Flood routing arrows are indicated to show where overland flooding will be directed. The drainage system is designed to accommodate all rainfall up to and including a 100 year return period with an additional 40% allowance for climate change. Flooding will only occur if a rainfall event above these parameters, or critical failure of the network should occur

REV	DESCRIPTION	BY	DATE
A	Updated site plan	DMcC	29.11.23

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Station Road
Wigston, LE18 2DR

PHASE
PLANNING

DRAWN BY	DATE
DMcC	17.11.2023
CHECKED BY	DATE

SCALE
1:250 @ A1

DRAWING
Overland Exceedance Flood Routing

DWG No	REV
CS230701-104	A