BOWBRIDGE HOMES LTD

PROPOSED RESIDENTIAL DEVELOPMENT
LECONFIELD ROAD, NANPANTAN

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY REPORT

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Project Number: ADC1905			report reference: ADC1905-RP-B	
Version	Date	Author	Authorised	Comments
1		Matthew Genn		internal draft
2	06/11/2020	Matthew Genn	Richard Winn	first issue
3	11/11/2020	Matthew Genn	Richard Winn	amended based on client feedback
4	18/11/2020	Matthew Genn	Richard Winn	amended based on updated Masterplan

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APPENDICES

1.0 INTRODUCTION

1.1 ADC Infrastructure have been commissioned by Bowbridge Homes Limited to produce a joint Flood Risk Assessment and Drainage Strategy report in support of an outline planning application for a proposed residential development off Leconfield Road in Nanpantan, Leicestershire.

1.2 This Flood Risk Assessment has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG). It investigates the flood risk posed to the site from fluvial, pluvial, sewer and groundwater-based sources. A section in this report provides recommendations for mitigation and an analysis of any likely residual risks.

1.3 An initial drainage strategy for both foul and surface water seeks to identify the potential constraints that need to be considered as the development proposals progress. Leicestershire County Council as the Lead Local Flood Authority (LLFA), the Environment Agency and Severn Trent Water Limited have all been consulted as the relevant statutory authorities to inform the drainage strategy for the site.

2.0 SOURCES OF INFORMATION

2.1 This report has been based upon a variety of information sources as listed below:

- Charnwood Borough Council – Level 1 SFRA
- Charnwood Borough Council – Local Plan
- CIRIA (2015) – C753 The SuDs Manual
- Environment Agency online flood mapping
- Lead Local Flood Authority Consultation response
- Severn Trent Developer Enquiry response
- Severn Trent sewer asset records

3.0 SITE DESCRIPTION

3.1 The development site is located to the north of Nanpantan, approximately 3.5km from the centre of Loughborough. It covers an area of approximately 1.69ha and is currently undeveloped, greenfield land. The site is bound by existing residential development to the north, east and south, and Burleigh Wood, an area of ancient woodland to the west. The location of the site is included in Figure 1 below and is centred on grid reference 450949, 317552.

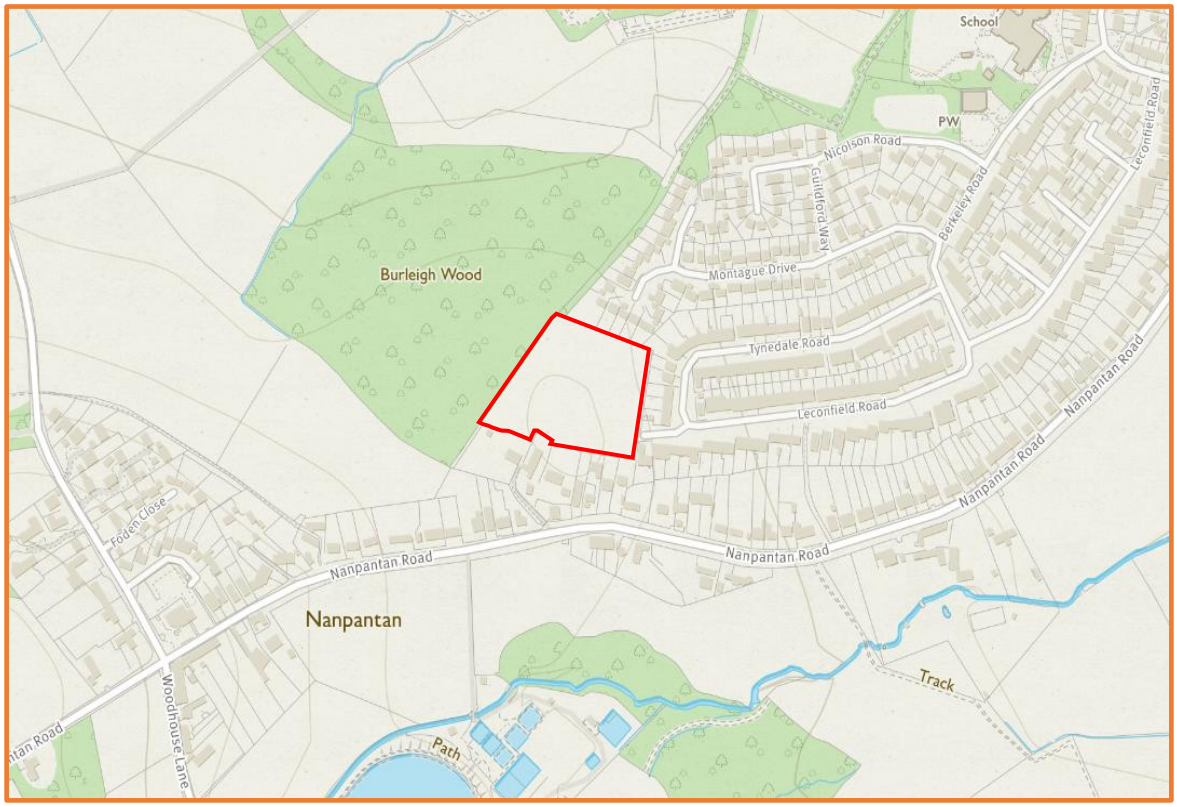


Figure 1 – The site location, with the red line boundary shown.

3.2 A walkover of the site, and the surrounding area was undertaken by ADC Infrastructure in January 2020. Photographs were taken across the site and focused on the existing drainage features and onsite levels; copies of the photos taken during the site walkover can be found in **Appendix A**.

Topography

3.3 A topographical survey of the site was undertaken by Survey Hub Ltd in September 2018, a copy of which is provided in **Appendix B**. The survey shows that the centre of the site is on a crest of a hill that forms the topographic high point, with onsite levels shown to fall towards the north-east and south-west corners.

3.4 There is a total elevation range of 9.5m across the site. The highest site levels are located towards the southern site boundary at 87.65m AOD, whilst the lowest levels are in the north-east corner at 78m AOD.

3.5 The publicly available LiDAR datasets for the surrounding area were obtained and reviewed to gain a better appreciation of the general topography of the area. Contour lines were than extracted from the LiDAR data.

3.6 An extracted digital elevation model from the LiDAR data can be found in Figure 2 below, the contour lines with the elevation in mAOD have also been shown. The contour lines extracted

confirm the findings of the topographic survey and show that levels fall away from the centre of the site towards the north-east and south-west site corners.

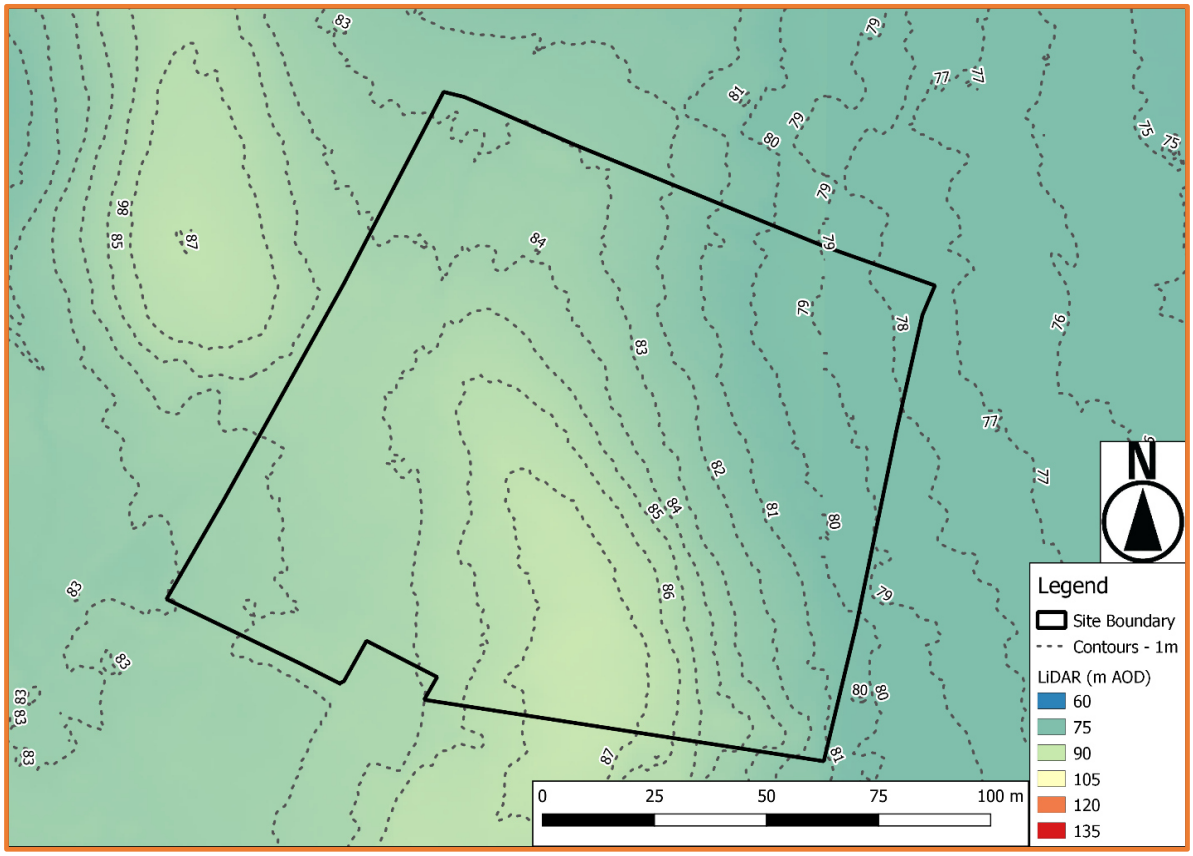


Figure 2 – The digital elevation model extract for the site taken from the EA datasets.

3.7 Due to the noticeable variation in the existing onsite levels, it is proposed that there is significant reprofiling of the site to even out these variations. ADC Infrastructure undertook an outline earthworks assessment to gain a better understanding of the volume of cut and fill required, and the volume of build-up needed for the proposed internal access road.

Existing site drainage

3.8 The site is greenfield and is not currently served by a formal drainage network for surface water runoff. It is believed that runoff generated onsite drains via a combination of slow infiltration into the underlying soils and runoff to the south-west and north-east corners.

3.9 The adopted sewer network for Nanpantan and the surrounding area is maintained by Severn Trent Water. The sewer asset record plans have been obtained for the site and the surrounding area, a copy of the plans can be found in **Appendix C**.

3.10 The plans show that there is a segregated gravity conveyed drainage network within Leconfield Road immediately to the east of the proposed site entrance.

Geology

3.11 The British Geological Survey (BGS) online mapping was reviewed to give an indication of the underlying ground conditions on site. The online mapping showed that the bedrock geology and superficial deposits are as follows:

- ***Bedrock Geology:*** *Swithland Formation – Mudstone. Sedimentary Bedrock formed approximately 508 to 526 million years ago in the Cambrian Period. Local environment previously dominated by open seas with pelagite deposits.*
- ***Superficial Deposits:*** *None recorded.*

Soils

3.12 The Cranfield Soil and Agrifood Institute Soilscapes mapping for the site was also reviewed. The mapping defined the underlying soil classification as:

- ***Soilscape 8:*** *Slightly acid loamy and clayey soils with slightly impeded drainage.*

These soils are described as having a loamy and clayey texture and have slightly impeded drainage

Onsite drainage implications

3.13 Based on the desktop data, the underlying ground conditions appear to be impermeable in nature, and not conducive for infiltration drainage techniques. However, in order to determine whether the use of infiltration offers any potential for the discharge of runoff, it is recommended that infiltration testing (conducted in accordance with BRE365 guidance) is to be undertaken. This would act to confirm ground conditions and provide an infiltration rate for the underlying soil strata and make an informed decision on the use of infiltration drainage onsite.

Flood Warnings/Flood Alert

3.14 The site does not fall within a Flood Warning Area, and so does not receive the Flood Warning Service from the Environment Agency.

4.0 PROPOSED DEVELOPMENT

4.1 The development proposals are for a residential development comprised of up to 30 dwellings. The main vehicular and pedestrian access will be off Leconfield Road directly, with provision for accompanying car parking facilities that will serve each dwelling.

4.2 There are also areas of soft landscaping, with an area near the eastern boundary of the site that has been set aside for the provision of a surface water detention basin. Furthermore, due to the requirement to reprofile the site to create a level development platform, and ecological constraints, the western portion of the site has set aside as open, green space.

4.3 An illustrative masterplan for the site prepared by Nineteen 47 is included within Figure 3 below.

Figure 3 – Proposed site masterplan.

5.0 PLANNING CONTEXT

Flood and Water Management Act

5.1 In combination with the Flood Risk Regulations 2009 (which enact the EU Floods Directive in England and Wales), the Flood and Water Management Act places significantly greater responsibility on Local Authorities to manage and lead on local flooding issues. The Act and Regulations together raise the requirements and targets that Local Authorities need to meet; this includes:

- To play an active role in leading flood risk management in an area;
- The development of a Local Flood Risk Management Strategy;
- To prepare preliminary flood risk assessments (PFRAs), flood hazard and risk maps, and flood risk management plans (FRMPs);
- To develop and implement drainage and flood risk management strategies;
- To be responsible for the approval, adoption, and subsequent maintenance of Sustainable Urban Drainage Systems (SuDS).

5.2 The Local Lead Flood Authority (LLFA) for Coalville area is Leicestershire County Council (LCC), who have the responsibility for the management of flood risk for the local area. LCC have been consulted during the preparation of this flood risk assessment, and a copy of their response can be found in **Appendix D.**

The National Planning Policy Framework (NPPF)

5.3 The NPPF sets out the government's planning policies for England and the expectations of how these policies should be applied. It acts as guidance for local planning authorities and decision-makers, both in drawing up plans and making decisions about individual planning applications.

5.4 Section 14 of the NPPF sets out how the government intends decision-making authorities to meet the challenge of climate change plus flooding and coastal change. Paragraph 155 sets out how inappropriate development in areas at risk of flooding should be avoided by directing development away from these areas, but where development is necessary, making it safe for its lifetime without increasing the flood risk elsewhere.

5.5 Paragraph 159 advises:

> *"If it is not possible for development to be in zones with a lower risk of flooding, the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance."*

5.6 Paragraph 160 advises that:

> *"The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. For the exception test to be passed it should be demonstrated that:*
>
> *a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and*
>
> *b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall."*

5.7 Paragraph 163 continues to advise that:

"When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-

specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan."

Planning Practice Guidance (PPG)

5.8 The PPG associated with the NPPF provides more detailed guidance on how the requirements of the NPPF can be met in practice. It includes recommendations on the allowances for climate change and for the application the sequential and exception tests. Three critically important tables are included within the PPG that set the framework for discussion and analysis of site-specific flood risk.

5.9 Table 1 of the Planning Practice Guidance defines flood zones based upon event return probability and is used to steer development and classify land for development. The table is reproduced below.

Table 1 – Flood Zone Classification

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (not separately distinguished from Zone 3a on the Flood Map)

5.10 Table 2 of the Planning Practice Guidance defines development type by associated vulnerability to flooding. The table is reproduced overleaf.

Table 2 – Development Vulnerability Classification

Vulnerability Classification	Definition
Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which must be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable	• Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes, and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable	• Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons, and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs, and hotels. • Non–residential uses for health services, nurseries, and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	• Police, ambulance, and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional, and other services; restaurants, cafes, and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water Compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas, and wharves. • Navigation facilities. • Ministry of Defence installations. • Ship building, repairing, and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

5.11 Table 3 of the Planning Practice Guidance (Flood Risk Vulnerability and flood zone 'compatibility') outlines the circumstances in which development may or may not be appropriate and when an Exception Test will be required. The table is reproduced below.

Table 3 – Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required.	✓	✓	✓
Zone 3a	Exception Test Required †	×	Exception Test Required	✓	✓
Zone 3b	Exception Test Required*	×	×	×	✓*

† *In Flood Zone 3a – essential infrastructure should be designed and constructed to remain operational and safe in times of flood.*

* *In Flood Zone 3b (functional flood plain) essential infrastructure that must be there and has passed the Exception Test, and water- compatible uses, should be designed to:*

- *remain operational and safe for users in times of flood*
- *result in no net loss of flood plain storage*
- *not impede water flows and not increase flood risk elsewhere.*

Charnwood Borough Council Local Plan

5.12 The site falls under the jurisdiction of Charnwood Borough Council, and its local planning policies and guidelines. The current Core Strategy of the Local Plan was adopted in November 2015 and covers the period up to 2028. The current Local Plan is due to be superseded by an updated plan that is due to be adopted in 2021.

5.13 The current policies for flood risk and drainage that are relevant to the proposed development are as follows:

Policy CS16 'Sustainable Construction and Energy' which states that:

"We will adapt to and mitigate against the effects of climate change by encouraging sustainable design and construction. We will do this by:

- *directing development to locations within the Borough at the lowest risk of flooding, applying the Sequential Test, and if necessary, applying the Exception Test. Where development is proposed in flood risk areas, mitigation methods must be in place to reduce the effects of flood water;*
- *supporting developments which take opportunities to reduce flood risk elsewhere;*
- *requiring developments to manage surface water runoff with no net increase in the rate of surface water runoff for Greenfield sites"*

Local SFRA

5.14 The updated Charnwood Level 1 SFRA dated December 2018 provides a summary of the current flood risk information for the whole of Charnwood including Nanpantan. It provides details of any development constraints in respect of flood risk and drainage.

5.15 The SFRA report also provides details of historic flooding incidents, and recommendations of mitigation measures to minimise the residual flood risk to a proposed development. There were no available historic records of flooding within the immediate vicinity of the site.

Flood Risk Status

5.16 The Environment Agency online flood mapping shows that the site lies within Flood Zone 1 (see Figure 4 below). A direct request was also made to the EA, to confirm the flood risk status of the site, as well as providing general guidance to inform the flood risk assessment but they have yet to provide a formal response. However, the site is clearly located in Flood Zone 1.

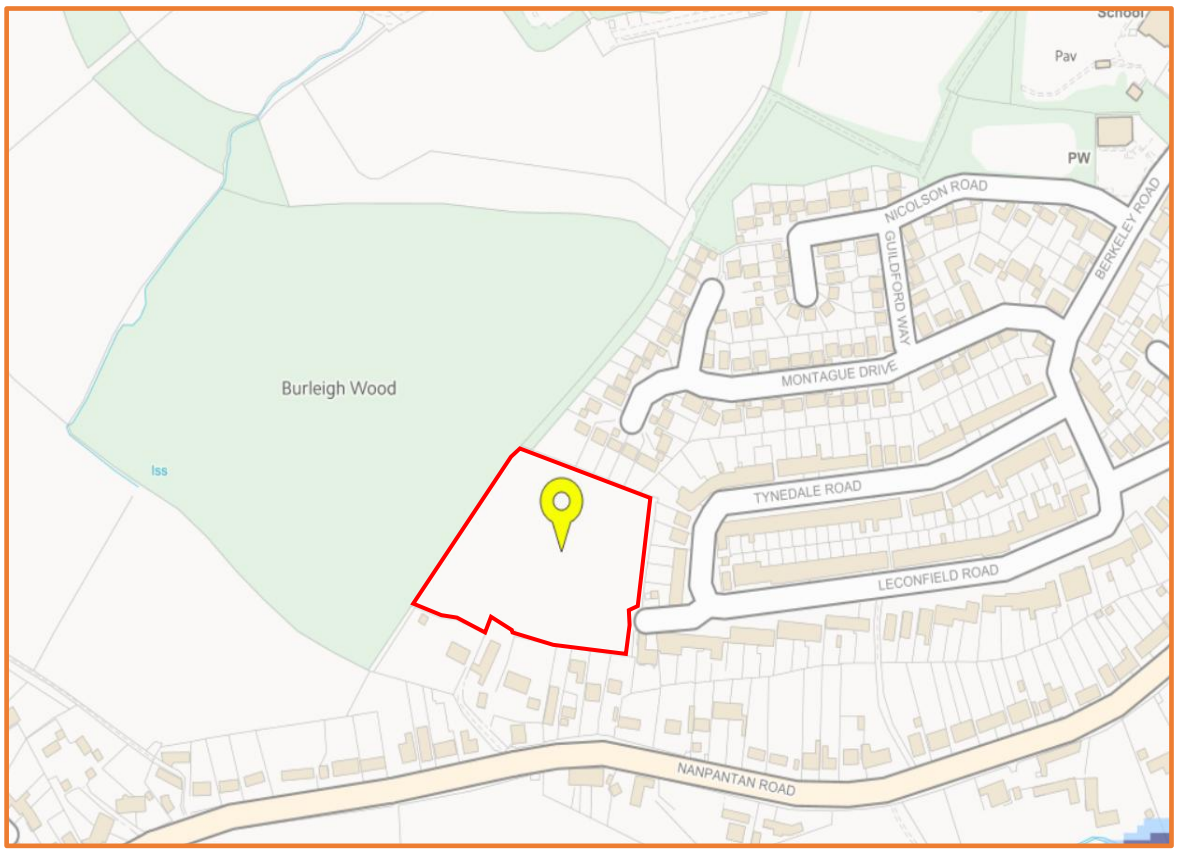


Figure 4 - EA Flood Map for Planning extract, showing the fluvial flood risk to the site.

5.17 In Table 2 of the PPG guidance, residential dwellings are categorised as a 'more vulnerable' development type. In accordance with Table 3 of the PPG, the development is deemed appropriate. As such, there is no requirement for the Sequential and Exception Tests to be carried out. A summary of the flood risk status of the development proposals is provided in the table below.

Table 4 – Development Flood Risk Classification

Flood Zone	Flood Zone 1
Development Vulnerability Classification	More Vulnerable
Flood Zone Compatibility	Sequential and Exception Tests are not required.

Flood history and consultation

5.18 As the site is located within Flood Zone 1, and there are no known watercourses within the immediate vicinity, there are limited records of historical flooding incidents. A similar search of the Chronology of British Hydrological Events database also confirmed that there are no historic flood events in the vicinity of Nanpantan.

6.0 FLOOD RISK ASSESSMENT

Existing risks

6.1 In accordance with the NPPF and local planning guidance, this Flood Risk Assessment considers the risk posed to the development from a range of flooding sources. This section of the report details the investigation of flood risk from all pertinent sources; a subsequent section provides recommended mitigation where the risk is deemed significant.

6.2 The flood risks that may be posed to any site are summarised in the table below. The degree of risk to the site is indicated in the table below and site-specific factors site are outlined and described in greater detail within the forthcoming sections.

Table 5 – Development Flood Risk Summary

Flooding Source	Degree of Risk	Source of Risk
Fluvial	Low	The site lies within Flood Zone 1 and is at a low risk of flooding from fluvial sources.
Tidal	None	Site is not in a tidally influenced area.
Canals	None	There are no canals within the immediate vicinity of the site.
Groundwater	Low	Mapping accompanying the Charnwood SFRA showed that the site falls within an area deemed to have a low risk of groundwater flooding. Underlying geology and soils found to be relatively impermeable which prevents groundwater rising to the surface. Residual risk is deemed to be low.
Sewers	Low	Site is currently greenfield and is not served by an existing drainage network.
Pluvial (Surface Water) runoff	Low	The EA flooding mapping shows that the majority of the site is not at risk of surface water flooding. The exception being a small area in the south-west site corner, which sits in a topographic low spot.
Reservoirs and Waterbodies	None	The EA mapping shows that the site does not fall within an area deemed to be at risk of reservoir flooding.

Fluvial risk

6.3 The online Environment Agency mapping was reviewed and shows the site to be within Flood Zone 1. There are no main rivers within the vicinity of the site that could potentially pose a direct risk to the proposed development. Therefore, the fluvial flood risk to the site can be considered to be low.

Tidal flooding

6.4 The site is located within an area that is not tidally influenced, and as such there is no current risk of flooding from tidal sources.

Canal flooding

6.5 There are no canals within the immediate vicinity of the site, and therefore there is no risk posed to the site.

Groundwater flooding

6.6 Groundwater flooding occurs when the water table rises following a period of prolonged rainfall and emerges on the ground surface. It is most likely to occur in low-lying area that are underlain by permeable bedrock and superficial deposits.

6.7 The updated SFRA for Charnwood Borough Council includes mapping which shows the areas across the Borough that are susceptible to groundwater flooding. This is derived from the proportion of a 1km square within the map area that is believed to susceptible to groundwater flooding. The mapping shows that the site falls within an area that is deemed to have a low susceptibility (<25%) to groundwater flooding. A copy of the Areas Susceptible to Groundwater Flooding map can be found in **Appendix E**.

6.8 The SFRA notes that the geology of the Borough, including the site, is largely of a low permeability which acts to limit the risk posed by groundwater flooding, with a natural increase in surface water runoff rates. As such the overall risk to the site is deemed to be minimal and is unlikely to pose a direct risk to the proposed development.

Pluvial risk

6.9 The EA publish pluvial (surface water) flood maps which show the route of surface water runoff across the ground. Typically, these flood maps identify overland drainage paths that are often part of a historic natural land drainage system.

6.10 In the mapping, the site is shown to have a low risk of surface water flooding. There is a minor area of high risk, which has a chance of flooding greater than 1 in 30-year storm event (3.3% AEP), in the south-west site corner. An extract of the mapping can be found below in Figure 5.

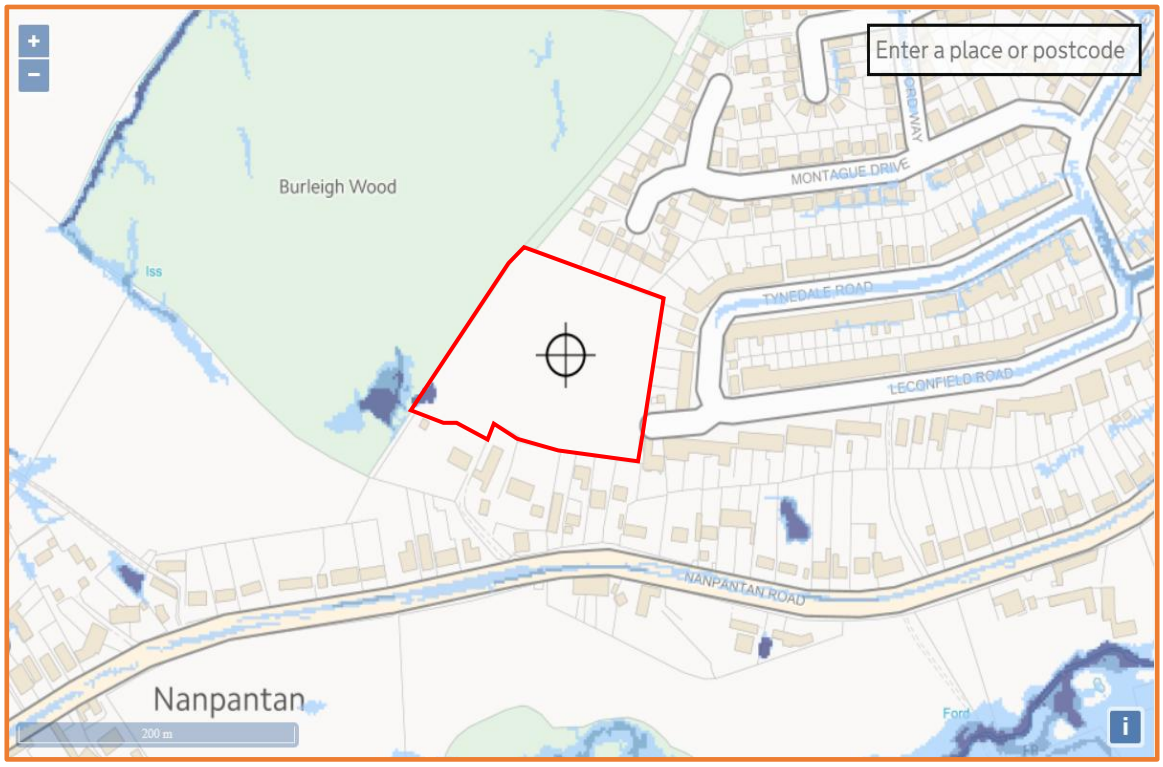


Figure 5 - The pluvial flood risk to the site.

6.11 The minor area of flooding corresponds with the onsite topography, with the areas at greatest risk in the south-west corner of the site are where levels are lower than the surrounding land, as shown by the topographic survey and available LiDAR data (see Figure 2). This causes overland flow to preferentially drain to this area, along the natural gradient of the site where it naturally ponds.

6.12 This will be mitigated by the reprofiling of this area of the site to provide a level development platform, as well as the proposed surface water strategy and general design considerations such

as the raising of finished floor levels and arrangement of external levels to preferentially divert any exceedance flows away from building thresholds.

6.13 The centre of the site is at a topographical high point with onsite levels falling away to the north-east and south-west, therefore the flood risk from overland flow from offsite areas is considered low.

6.14 The development proposals will see an increase in the impermeable area onsite. However, provided that careful mitigation is included within the development design, it is anticipated that the risk of surface water flooding can be adequately managed onsite.

Sewer flooding

6.15 The adopted sewer assets for the Nanpantan area are currently managed by Severn Trent Water. As mentioned previously, there is no evidence of a formal drainage network within the site at present, with the closest adopted assets being within Leconfield Road to the east. Furthermore, the existing levels for the site and the surrounding area fall away from the site, any foul water flows from the existing drainage network would preferentially be directed away from the development.

6.16 The Asset Protection team from Severn Trent Water were contacted directly to see if they held any record of sewer flooding to have affected the site and its immediate vicinity, and there are no historic records of sewer flooding affecting the site.

Reservoirs and waterbodies

6.17 The EA has prepared reservoir flood risk mapping to show the largest area that might be flooded if a reservoir were to fail. The mapping displays a worse - case scenario and is only intended to act as a guide.

6.18 The mapping indicates that the site does not fall within an area that would be flooded in the event of the failure of a reservoir retention structure, see Figure 6 below for an extract of the EA mapping. As such there is deemed to be no residual risk to the site.

Figure 6 - The flood risk from reservoirs to the site.

Proposed Mitigation

6.19 The risk of flooding to the site from a variety of sources has been investigated, and there is a low overall risk of flooding from both fluvial and pluvial (surface water) flooding. The development site is located within Flood Zone 1 and is not at significant flood risk.

6.20 There is some minor surface water flood risk shown for the site at the topographical low points, however the provision of a formal drainage system will significantly reduce the risk of surface water flooding.

6.21 A detailed surface water drainage strategy for the site is discussed in further detail in Section 7 and presents a management strategy that will seek to reduce the surface water flood risk to the development and the surrounding area. Although there are additional design features that can be incorporated within the development design to further reduce this risk.

Drainage System Design

6.22 The Non-statutory Technical Standard for SuDS has a series of recommendations in relation to the design of the prospective drainage system that will serve the development. These are to ensure that the drainage system on site is designed to a standard to negate the additional flood risk that may arise from the development. The recommendations are as follows:

- *"The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30-year (3.3% AEP) event."*
- *"The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year (1% AEP) rainfall event in any part of: a building (including basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development."*

Finished Floor Levels

6.23 To manage the potential risk from pluvial flooding, the finished floor levels should be nominally lifted above external ground levels where possible. The NPPF guidance specifies that ground floor levels should be a minimum of whichever is higher:

- 300mm above the general ground level of the site;
- 600mm above the estimated river or sea flood level.

6.24 As the site is located within Flood Zone 1, and is at minimal risk from flooding, it is recommended that finished floor levels for all buildings on site are set to 300mm above the local ground level.

External Site Levels

6.25 External levels should be shaped to direct any exceedance flow from the drainage system or external surfaces away from building entrances. The local SFRA also highlights that any raising of levels onsite should be tested to ensure that there is no increase in surface water runoff onto neighbouring third party land.

6.26 Likewise, similar design considerations to minimise the risk from sewer flooding from the onsite drainage system should also be considered, to prevent foul effluent from entering residential properties.

7.0 SURFACE WATER DRAINAGE STATEMENT

Existing Discharge Rate

7.1 The existing site is greenfield and is generally permeable in nature, and for the purposes of this assessment it has been assumed that the site drains via a combination of slow infiltration and overland flow.

7.2 The rate of greenfield runoff for the developable area of the site was estimated using the IH124 method on the online UK SuDs tool for various storm event return periods. A full print out of the results is included within **Appendix F**, and the results have been summarised in the table below. The figures give a realistic estimate of the likely discharge associated with the development.

Table 6 – Existing Site Discharge Rates

Return Period	Site Area (ha)	Runoff Rate (l/s)
QBar	1.20	5.6
1 in 1 Year	1.20	4.6
1 in 30 Year	1.20	11.2
1 in 100 Year	1.20	14.4
1 in 200 Year	1.20	17.0

Discharge Options

7.3 In accordance with the Building Regulations Part H, the newly published Non-Statutory Technical Standards for SuDS and prevailing best practice, surface water should look to be discharged according to the following preferential hierarchy:

- Infiltration drainage techniques, such as swales and soakaways;
- An open watercourse, river or ditch;
- A surface water sewer.
- A combined sewer.

7.4 Based on the initial desktop review of the available ground conditions information, it appears that infiltration potential is limited for surface water disposal. As such it is advised that a ground investigation that includes infiltration testing is undertaken to determine whether there is any soakage potential across the site.

7.5 The use of infiltration drainage techniques does not appear feasible, and there is a lack of a suitable watercourse or land drainage network immediate adjacent to the site into which an offsite connection could be made. As such preference should be given to the disposal of surface water runoff into the nearest surface water sewer.

7.6 The sewer asset plans show that the surrounding area is served by a segregated drainage network, with the nearest surface water sewer being located to south-east of the site in Leconfield Road, which is shown to be a gravity conveyed network that continues to flow east.

7.7 Leicestershire County Council as the LLFA require that the surface water discharge rate for greenfield sites should not exceed the pre-development greenfield (QBar) runoff rate. So that the site behaves like the existing site across a range of storm events.

7.8 A Developer Enquiry was submitted to Severn Trent to provide an initial consultation response on the proposed surface water strategy for the site, and whether connection to the local sewer network would be permitted.

7.9 In their formal response (see **Appendix G**), it was stated that subject to evidence that onsite infiltration is not considered to be a feasible option, a connection into the adopted surface water sewer would be able to accept greenfield runoff at the rate of 5l/s/ha. This could either be at manhole MH0508 or at a new manhole connection point. Given that the contributing area is estimated to be approximately 0.85ha, for the purposes of the outline drainage calculations a restricted discharge rate of 4.2l/s has been used. The drainage design parameters will be subject to finalisation at detailed design stage.

Onsite Surface Water Strategy

7.10 The strategy for the development will involve the use of a below-ground, gravity conveyed surface water drainage network that will collect runoff from impermeable surfaces (roofs and highways) and drain down towards a detention basin located towards the eastern boundary to suit the onsite topography and development layout. A restricted discharge will look to be made into the Severn Trent surface water sewer in Leconfield Road, at a restricted rate, subject to a formal agreement by Severn Trent via a Section 106 agreement.

7.11 An indicative detention basin has been sized using the Micro Drainage Source Control module to a design standard of a 1 in 100 year plus 40% climate change storm event. An additional 10% to account for urban creep, as specified in the LLFA guidance, was also included within the total impermeable surface area.

7.12 To provide the required onsite attenuation for the site, that includes the provision of 300mm of additional freeboard, a basin with a depth of 1m, and approximate surface area of 690m^2 is required, the details of which can be found within **Appendix H**.

7.13 The public surface water drainage network within the development shall be put forward for adoption under a Section 104 agreement with Severn Trent, to maintain on an ongoing basis. Whilst the private homeowners as part of the long-term maintenance of their individual properties.

Proposed Drainage Layout

7.14 An outline drainage layout plan, drawing ADC1905-DR-050, has been prepared by ADC Infrastructure, a copy of which can be found within **Appendix I**. The plan shows a surface water drainage network for the site, details of the onsite detention basin, and the proposed discharge location into the surface water sewer in Leconfield Road.

8.0 FOUL WATER DRAINAGE STATEMENT

Proposed discharge rate

8.1 Based on the current illustrative masterplan, there will be up to 30 residential dwellings to be built as part of the development proposals, see Figure 3.

8.2 In line with the guidance within Section B5.1 of the Sewers for Adoption (SFA) 8th Edition, an average daily discharge rate of 4000l/s per residential dwelling has been used to calculate the anticipated peak foul water flow.

8.3 The peak flow for the development has been calculated as follows:

30 x 4000 = 120,000l/day
120,000/ (24 x 60 x 60) = **1.39l/s**

Proposed discharge strategy

8.4 In accordance with the guidance specified within the Building Regulations Part H, foul water effluent should look to be discharged according to the following preferential hierarchy:

- A foul water sewer;
- A combined sewer;
- A septic tank;
- A cesspool.

8.5 The site is greenfield by nature and has no foul discharge at present. Sewer asset record plans provided by Severn Trent confirm that there are no adopted sewers within the site boundary, with the sewer assets being the foul sewer within Leconfield Road to the south-east. A copy of the sewer asset record plans can be found within **Appendix C**.

8.6 A Developer Enquiry was submitted to Severn Trent for comment on the development proposals. In their response, it was confirmed that a gravity connection into the adopted foul sewer in Leconfield Road could be made, and that there is sufficient capacity within the network to accommodate foul flows generated by the development. A connection could either be made into manhole 0507 or a new manhole, subject to a Section 106 approval. A copy of the Developer Enquiry response provided by Severn Trent can be found in **Appendix G**.

8.7 Foul water effluent shall look to drain via a new gravity conveyed drainage network that will discharge into the foul sewer in Leconfield Road, via a new connection that will be made into manhole 0507 at an unrestricted rate.

8.8 The proposed foul network and connection to the foul sewer shall be put forward for adoption under a Section 104 agreement with Severn Trent to maintain on an ongoing basis.

8.9 The private lateral connections that will serve the residential dwellings shall be maintained by the individual property owners, as part of the long-term maintenance of their individual dwellings.

Drainage Layout

8.10 A proposed drainage layout plan, drawing ADC1905/DR/050 has been prepared by ADC Infrastructure. This includes the indicative layout of the onsite drainage network, and the proposed connection into the adopted foul network. A copy of the proposed drainage layout plan can be found in **Appendix I**.

9.0 SUSTAINABLE DRAINAGE ASSESSMENT

9.1 The proposed development will require attenuation to balance flows from the site and ensure that there is no increase in flood risk elsewhere due to the development.

9.2 The anticipated ground conditions onsite comprising soils with low permeability are likely to mean that SuDS features utilising infiltration will not be viable, however appropriate ground investigation and infiltration is recommended to confirm this.

9.3 Any such development can give rise to pollution during both the construction and occupation phases in relation to hydrocarbons, suspended solids, and general waste. Careful consideration of the treatment of surface water runoff should provide confidence that the proposed development will not result in any detriment to the receiving waters.

9.4 The proposed impermeable areas on the site are currently divided into private driveways, roads, service yards, car parking and buildings. In accordance with the 'CIRIA SuDS Manual C753 (2015), the attributed pollution 'hazard' levels associated with these classifications of hardstanding are typically 'low'. Roofed areas, car parking and access roads are all classified as 'low' risk.

9.5 The final SUDs combination will be determined at the detailed design stage but potentially would incorporate the following components:

- Detention basin,
- Permeable paving with a voided sub-base will be considered for the car parking areas.

Table 7 – Land Use Pollution Risk Classification (CIRIA SuDS Manual Table 26.2 extract)

Land Use	Pollution Hazard Level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Private driveways	Low	0.5	0.4	0.4
Low traffic road	Low	0.5	0.4	0.4
Car park low usage	Low	0.5	0.4	0.4

9.6 The selected SUDs components and the associated total pollution mitigation indexes are outlined in Table 8 below. The proposed SUDs treatment train is designed to exceed the pollution values/risk occurring from proposed land uses highlighted in Table 7.

Table 8 – Indicative SuDS mitigation indices for discharges to surface waters.
(CIRIA SuDS Manual Table 26.3 extract)

Type of SuDS component	TSS	Metals	Hydrocarbons
Detention basin	0.5	0.5	0.6
Permeable paving surfaces	0.7	0.6	0.7
Conventional gully and pipe drainage	1.0	1.0	1.0

9.7 In this instance it is anticipated that the bulk of the storage volume will be provided by a detention basin that will be sized appropriately. Furthermore, to provide an additional surface water treatment train, the basin feature could be designed to include a forebay, and a small permanent pool near the outlet.

10.0 MAINTENANCE AND ADOPTION

10.1 The proposed infiltration and attenuation systems are entirely contained within the site and maintenance of the drainage system will be the responsibility of the landowners to maintain on an ongoing basis

10.2 The maintenance of the recommended features is expected to be dictated by the general maintenance associated with the externals and drainage of the proposed development.

10.3 The tables below have been prepared from the recommendations contained in the CIRIA SuDS Manual and should be set the minimum standards for inspection and maintenance of the detention basin, and other proposed drainage features, as per the tables below.

Table 9a – Proposed maintenance schedule for onsite detention basin.

Drainage Component	Maintenance Task	Frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required.
	Cut grass – meadow grass in and around basin	Half yearly (spring-before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets, and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in CIRIA SuDs guidance)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of riprap	As required
	Repair/rehabilitation of inlets, outlets, and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Table 9b – Proposed maintenance schedule for other drainage features.

Drainage Component	Maintenance Task	Frequency
Drainage Network	Inspect for blockages to ensure network is free running	Every 3 months and after any significant storm event
Surface water gullies/ Linear drainage features	Inspect for blockages and ensure that the drainage feature is free running Jet or vacuum as appropriate	Every 3 months and after any significant storm event
Discharge Control	Inspect for blockage and correct operation	Every 3 months and after any significant storm event

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 This Flood Risk Assessment and Discharge Strategy report has been carried out on behalf of Bowbridge Homes in support of an outline planning application for a residential development on land off Leconfield Road, Nanpantan in Leicestershire. It has been conducted in accordance with the requirements of the NPPF and associated Planning Practice Guidance.

11.2 The site has not been found to be at any direct risk from flooding associated with fluvial, reservoir, sewer, or groundwater sources. The development site is entirely within Flood Zone 1 and there are no established sources of flood risk.

11.3 The EA mapping highlights that there are areas of minor surface water flood risk in the south-west site corner. This will be mitigated by the reprofiling of this area of the site to provide a level development platform, as well as the proposed surface water strategy and general design considerations such as the raising of finished floor levels and arrangement of external levels to preferentially divert any exceedance flows away from building thresholds.

11.4 The surface water drainage strategy has been considered and a calculation of the anticipated discharge rates and attenuation volumes has been carried out. The proposed development shall look to discharge surface water runoff into the adopted surface water sewer in Leconfield Road to the south-east at a restricted discharge rate. This is subject to further consultation with Severn Trent following the submission of a Section 106 application once planning consent has been granted.

11.5 Attenuation is proposed via the use of a detention basin feature that will be located in the east of the site to suit the development proposals. The basin feature has been designed to attenuate surface water runoff for all storm events up to and including the 1 in 100 year plus 40% climate change event, in line with the LLFA consultation response.

11.6 The detention basin will serve as the primary SuDs feature to serve the development and will be designed to incorporate the required treatment trains to ensure there is no detriment in water quality for the offsite flows into the surface water sewer.

11.7 Foul effluent shall look to be conveyed via a gravity foul sewer network that will discharge via a new connection into the adopted foul water sewer in Leconfield Road to the south east, adjacent to the proposed site entrance. The connection point to the network in Leconfield Road is subject to approval from Severn Trent via a Section 106 application.

11.8 The proposed onsite foul and surface water drainage networks shall be put forward for adoption by Severn Trent under a Section 104 agreement to maintain on an ongoing basis. The private drainage network and lateral connections shall be the responsibility of the private homeowners to maintain as part of the overall maintenance of each individual dwelling.

11.9 Provided that the recommendations of this report are followed, then the development can proceed without being at any significant flood risk and without increasing flood risk elsewhere. The development proposals are considered sustainable from a flood risk perspective.

APPENDIX A
SITE WALKOVER PHOTOS

View looking east across the site towards Leconfield Road.

View looking south- west across the site, showing how the site gradient slopes to the sw corner.

View looking towards the northern site boundary.

View looking west across the site. Note how the site gradient slopes away to the north and south respectively.

Photo of adopted drainage network in Leconfield Road adjacent to site entrance.

Photo of adopted drainage network in Leconfield Road.

APPENDIX B
SITE TOPOGRAPHICAL SURVEY

Station	Easting (m)	Northing (m)	Level (m)
SH01	451068.846	317506.804	76.891
SH02	451109.959	317523.710	75.062
SH03	451062.412	317569.529	75.873
SH04	451019.945	317501.526	79.386
SH05	450976.591	317500.045	83.969
SH06	450947.285	317529.374	87.332

Survey Coordinates and Grid

Please note that the grid shown on this drawing is as follows;

- ☐ *Arbitrary*
- ☐ *Arbitrary but approx. related to North*
- ☐ *Best fit to an Ordnance Survey Digital Sheet*
- ■ *Related to the Ordnance Survey National GPS Network*

Levels

Please note that the levels shown on this drawing are as follows;

- ☐ *Arbitrary*
- ☐ *Related to an Ordnance Survey Bench Mark*
- ■ *Related to the Ordnance Survey National GPS Network*

Survey Hub

Survey Hub Ltd
34 Regent Street
Nottingham
NG1 5BT

Tel: 0115 714 1123
Email: mail@surveyhub.co.uk
Website: www.surveyhub.co.uk

Client: Golby and Luck

Project: Leconfield Road, Loughborough

Title: Topographical Survey

Surveyed: AP
Sheet No: 1 of 1
Date: 12/09/2018
Scale: 1:250@A0

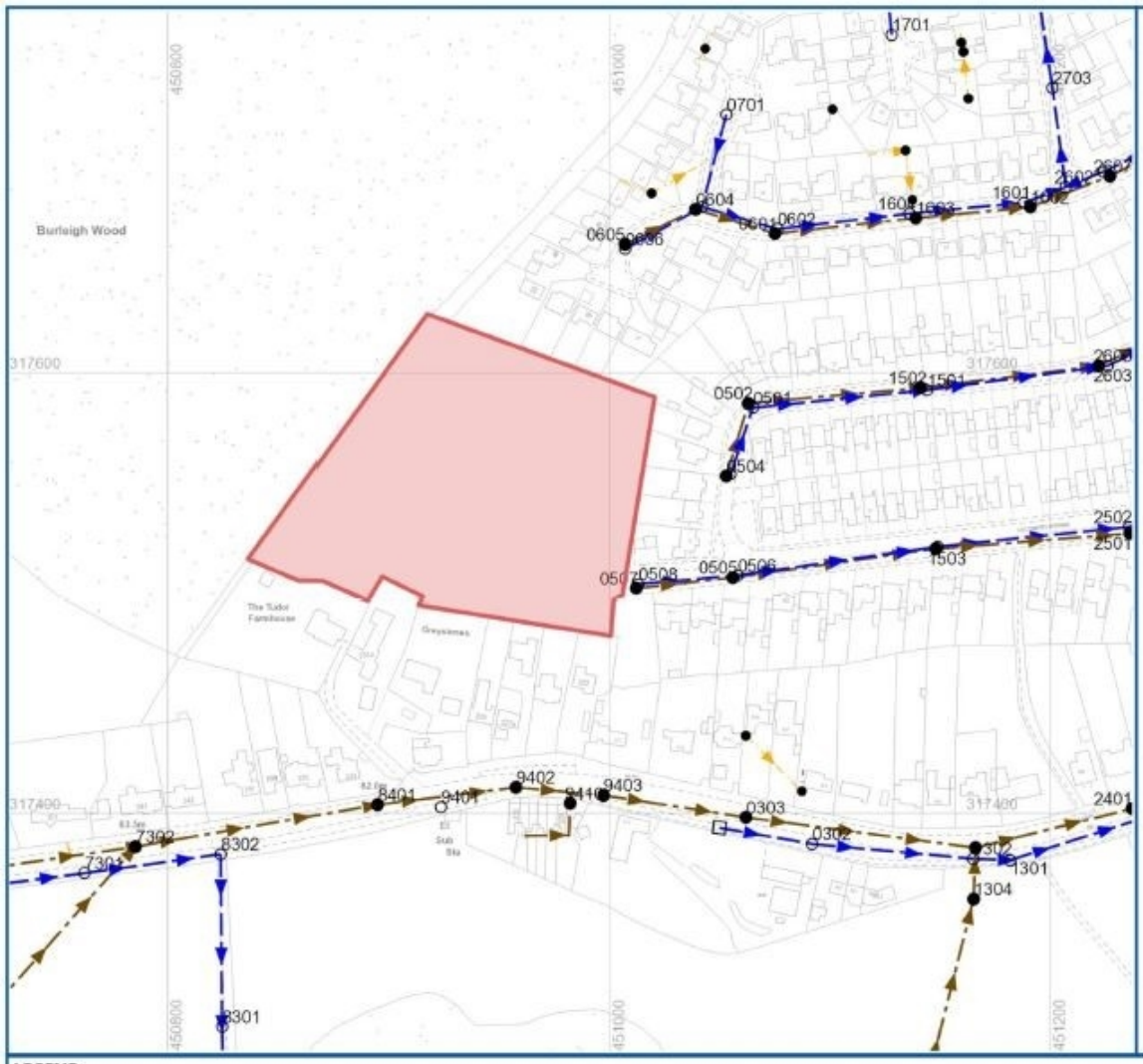
Job No. 3538
Rev. A

NOTES:

All critical measurements should be checked on site prior to design.
No liability will be taken for this plan if passed on to 3rd parties.
Some services/data may be omitted in areas of parked vehicles and vegetation.

THIS SURVEY HAS BEEN ORIENTATED TO THE ORDNANCE SURVEY (O.S) NATIONAL GRID (OSGB36) VIA A GLOBAL POSITION SYSTEM (GPS) AND THE O.S. ACTIVE NETWORK (OS NET). A TRUE OSGB36 COORDINATE HAS BEEN ESTABLISHED NEAR TO THE SITE CENTRE VIA A TRANSFORMATION USING THE OSTN02 & OSGM02 TRANSFORMATION MODELS. THE SURVEY HAS BEEN CORRELATED TO THIS POINT AND A FURTHER ONE OR MORE OSGB36 POINTS ESTABLISHED TO CREATE A TRUE O.S. BEARING FOR ANGLE ORIENTATION. NO SCALE FACTOR HAS BEEN APPLIED TO THE SURVEY THEREFORE THE COORDINATES SHOWN ARE ARBITRARY & NOT TRUE O.S. COORDINATES WHICH HAVE A SCALE FACTOR APPLIED.
PLEASE REFER TO SURVEY STATION TABLE TO ENABLE ESTABLISHMENT OF THE ON-SITE GRID.

APPENDIX C
SEWER ASSET RECORD PLANS



Reference	Cover Level	Invert Level Upstream	Invert Level Downstream	Purpose	Material	Pipe Shape	Max Size	Min Size	Gradient	Year Laid
SK50179410	<UNK>	<UNK>	<UNK>	F	VC	C	150	<UNK>	0	31/12/1899 00:00:00
SK50178302	82.664	<UNK>	80.172	S	<UNK>	<UNK>	<UNK>	<UNK>	0	31/12/1899 00:00:00
SK51172401	73.2839	71.644	69.209	F	VC	C	150	<UNK>	41.74	31/12/1899 00:00:00
SK51170502	75.424	73.314	71.337	F	VC	C	225	<UNK>	39.55	31/12/1899 00:00:00
SK51170601	74.735	72.865	70.019	F	VC	C	150	<UNK>	22.59	31/12/1899 00:00:00
SK51171502	72.847	71.307	69.109	F	VC	C	225	<UNK>	37.1	31/12/1899 00:00:00
SK51171504	73.874	71.934	69.533	S	VC	C	225	<UNK>	36.44	31/12/1899 00:00:00
SK51171601	71.257	69.337	68.782	S	VC	C	300	<UNK>	36.16	31/12/1899 00:00:00
SK51171602	71.1809	68.881	68.147	F	VC	C	225	<UNK>	52.92	31/12/1899 00:00:00
SK51171701	72.0609	70.541	70.479	S	VC	C	225	<UNK>	318.33	31/12/1899 00:00:00
SK51172501	71.148	68.878	66.488	F	VC	C	225	<UNK>	38.16	31/12/1899 00:00:00
SK50178301	81.8519	80.162	79.556	S	VC	C	300	<UNK>	131.16	31/12/1899 00:00:00
SK51170303	78.313	76.703	73.436	F	VC	C	150	<UNK>	32.18	31/12/1899 00:00:00
SK51170505	77.136	74.676	72.017	F	VC	C	225	<UNK>	34.93	31/12/1899 00:00:00
SK51170507	79.7409	77.761	74.686	F	VC	C	225	<UNK>	14.38	31/12/1899 00:00:00
SK51171604	72.291	70.531	69.347	S	VC	C	300	<UNK>	44.27	31/12/1899 00:00:00
SK51172502	71.1029	69.533	66.962	S	VC	C	225	<UNK>	34.54	31/12/1899 00:00:00
SK51172602	70.8119	66.612	66.257	S	CO	C	375	<UNK>	126.11	31/12/1899 00:00:00
SK51172603	70.5	68.08	67.145	S	VC	C	300	<UNK>	56.63	31/12/1899 00:00:00
SK50177301	84.6969	82.727	<UNK>	S	VC	C	300	<UNK>	0	31/12/1899 00:00:00
SK50177302	83.622	81.812	80.336	F	VC	C	150	<UNK>	74.76	31/12/1899 00:00:00
SK51170302	77.4929	75.633	73.461	S	VC	C	225	<UNK>	33.89	31/12/1899 00:00:00
SK50179402	81.458	79.83	78.909	F	VC	C	150	<UNK>	43.6	31/12/1899 00:00:00
SK51170501	75.2699	72.82	70.37	S	VC	C	225	<UNK>	32.41	31/12/1899 00:00:00
SK51170503	76.2289	74.379	72.64	S	VC	C	225	<UNK>	20.53	31/12/1899 00:00:00
SK51171503	73.857	71.467	68.888	F	VC	C	225	<UNK>	34.22	31/12/1899 00:00:00
SK51171603	72.2389	69.909	68.681	F	VC	C	225	<UNK>	50.72	31/12/1899 00:00:00
SK51170603	76.607	74.827	73.173	S	VC	C	225	<UNK>	21.48	31/12/1899 00:00:00
SK51171501	72.79	70.31	68.17	S	VC	C	300	<UNK>	38.66	31/12/1899 00:00:00

LEGEND

MATERIALS

-	NONE
AC	ASBESTOS CEME
BR	BRICK
CC	CONCRETE BOX CULVERT
CI	CAST IRON
CO	CONCRETE
CSB	CONCRETE SEGMENTS (BOLTED)
CSU	CONCRETE SEGMENTS (UNBOLTED)
DI	DUCTILE IRON
GRP	GLASS REINFORCED PLASTIC
MAC	MASONRY IN REGULAR COURSES
MAR	MASONRY RANDOMLY COURSED
PE	POLYETHLENE
PF	PITCH
PP	POLYPROPYLENE
PSC	PLASTIC STEEL COMPOSITE
PVC	POLYVINYL CHLORIDE
RPM	REINFORCED PLASTIC MATRIX
SI	SPUN (GREY) IRON
ST	STEEL
U	UNKNOWN
VC	VITRIFIED CLAY
XXX	OTHER

CATEGORIES

W	WEIR
C	CASCADE
DB	DAMBOARD
SE	SIDE ENTRY
FV	FLAP VALVE
BD	BACK DROP
S	SIPHON
D	HIGHWAY DRAIN
S104	SECTION 104

SHAPE

C	CIRCULAR
E	EGG SHAPED
O	OTHER
R	RECTANGLE
S	SQUARE
T	TRAPEZOIDAL
U	UNKNOWN

PURPOSE

C	COMBINED
E	FINAL EFFLUENT
F	FOUL
L	SLUDGE
S	SURFACE WATER

Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0345 601 6616

SEWER RECORD (Tabular)

O/S Map Scale: 1:2,500 **This map is centred upon:**

Date of Issue: 02-04-20 **X:** 450982.72 **Y:** 317527.91

APPENDIX D
LLFA ENQUIRY RESPONSE

Matthew Genn

From: Jack Harriman <Jack.Harriman@leics.gov.uk>
Sent: 21 October 2020 14:33
To: Matthew Genn
Subject: RE: ADC1905 - Land off Leconfield Road, Nanpantan - LLFA Ref; 2020-1905-02-FEN

Hi Matthew,

The LLFA was previously consulted on this development by Charnwood Borough Council under reference P/18/2309/2 in December 2018. I have duplicated the response below. All I would add is if you are proposing to discharge surface water drainage into the sewer as indicated; the LLFA would require the developer enquiry response from STW as well as the discharge rate they have specified to be part of the drainage strategy be submitted in any planning application the LLFA is consulted on. Note that where the rate specified by STW is greater than the recommended rate required by the LLFA, the LLFA's rate should be used.

Thank you for request for pre-application advice. Following review of the submitted documents, I can confirm the following.

The applicant is looking to develop the land to situate 25no. residential dwellings and associated infrastructure.

The applicant has not provided any information with regards to flood risk and drainage therefore we can advise the applicant of the following:

When determining planning applications, Charnwood Borough Council as the local planning authority should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where informed by a site specific flood risk assessment (FRA) confirming it will not put the users of the development at risk. Where an FRA is applicable this should be undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF) and accompanying Planning Practice Guidance (PPG).

According to data held by the County Council there are no historical incidents of flooding close to the proposed site.

From review of the Flood Map for Planning, there is an unnamed ordinary watercourse approx. 300m west of the proposed site. The site falls under the Wood Brook catchment of the River Soar.

According to Environment Agency (EA) data the Flood Risk from Surface Water Map also shows the southwest corner of the site adjacent to the Burleigh Wood is at high risk of surface water flooding; however there are no properties proposed at that area on the material provided.

The Flood Risk from Reservoirs Map identifies no risk of flooding from reservoirs at the proposed location.

According to EA data the site falls under Fluvial Flood Zone 1.

The LLFA would then expect a sequential approach to masterplan development, locating development in areas at lowest risk of flooding. For development within the Flood Zone 2 or 1 in 1,000 year surface water extents, the LLFA would also expect finished floor levels to be set at a minimum of the highest level of the following;

- 300mm above the general ground level of the site OR
- 600mm above the Flood Zone 2 water level.
- Basement rooms to have unimpeded access internally to an upper level

In order to deliver safe development we advise that single storey buildings or ground floor subdivisions with no access to higher floors, should have access to a refuge set above the 1 in 1,000 annual probability (0.1%) in any year flood level including an allowance for climate change.

From review of the submitted masterplan, the proposed development does identify the use of any sustainable drainage (SuDS) features for surface water drainage with an open balancing pond in the northeast of the proposed development. Given the currently undeveloped nature of the site, the LLFA would expect surface water runoff from the site to be suitably managed as per best practice guidance given in the CIRIA C753 The SuDS Manual.

In the first instance, the LLFA would expect any surface water drainage system to infiltrate to the below ground strata unless demonstrated to be unfeasible. Such demonstration should include infiltration testing in accordance with BRE Digest 365 Soakaway Design.

Should this not be appropriate, the LLFA would expect runoff from site to be discharge to the next most appropriate receptor at rates and volumes no greater than the event specific greenfield values. If there are any works proposed as part of an application which are likely to affect flows in a watercourse or ditch, then the applicant may require consent under Section 23 of the Land Drainage Act 1991. This legislation is separate from the planning process.

Over the lifetime of a residential development, it is possible that the overall impermeable area contributing to surface water runoff within the site could significantly increase (known as ‘urban creep). Sensitivity testing of a 10% increase in impermeable area should therefore be included, to ensure that surface water drainage designs can cope with future changes to impermeable areas on new residential developments.

Further to this, as the River Soar is classified as EA Main River, the applicant should consult with the EA to ascertain their requirements which would inform the masterplan.

The LLFA would expect any future surface water drainage scheme to assess the use of SuDS options, including but not limited to swales, attenuation basins and permeable paving, in line with CIRIA C753 The SuDS Manual. Such above ground SuDS structures would also provide one of the required treatment trains to manage water quality. It should be noted that the LLFA do not consider the use of underground storage tanks or oversize pipes as SuDS features.

Any surface water drainage features should be located within the areas at lowest risk of flooding to ensure such features remain operational during an extreme event. Any drainage features should also consider how an extreme event may constrain the discharge from any proposed drainage system and ensure the drainage infrastructure can adequately manage surface water runoff regardless of any possible reduction in discharge rate.

When submitted, the flood risk assessment and associated drainage strategy should also provide outline operation and maintenance information along with an indicative proposal of who will maintain any SuDS features over the lifetime of the development.

If you have any further questions, please do not hesitate to contact us.

Jack Harriman

Technician (Flood Risk Management)

Infrastructure Planning

Leicestershire County Council

Tel: 0116 305 2261

Please Note: In line with Government Guidance for COVID-19, all site visits including face-to-face meetings must adhere to current social distancing rules. If the guidelines are unable to be met, the meeting must be conducted electronically (skype etc.). There is also a likelihood of a delay in providing a response to your query or concern at this time due to the impact of the COVID-19 restrictions. More details on the Council's policy on social distancing and how it will affect services can be found here.

www.flooding@leics.gov.uk

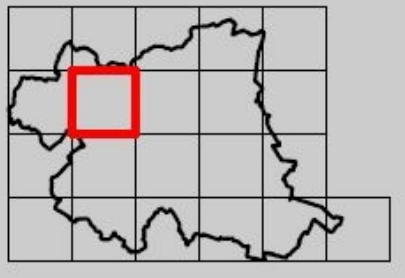
www.leicestershire.gov.uk/planning-and-environment/flooding-and-drainage

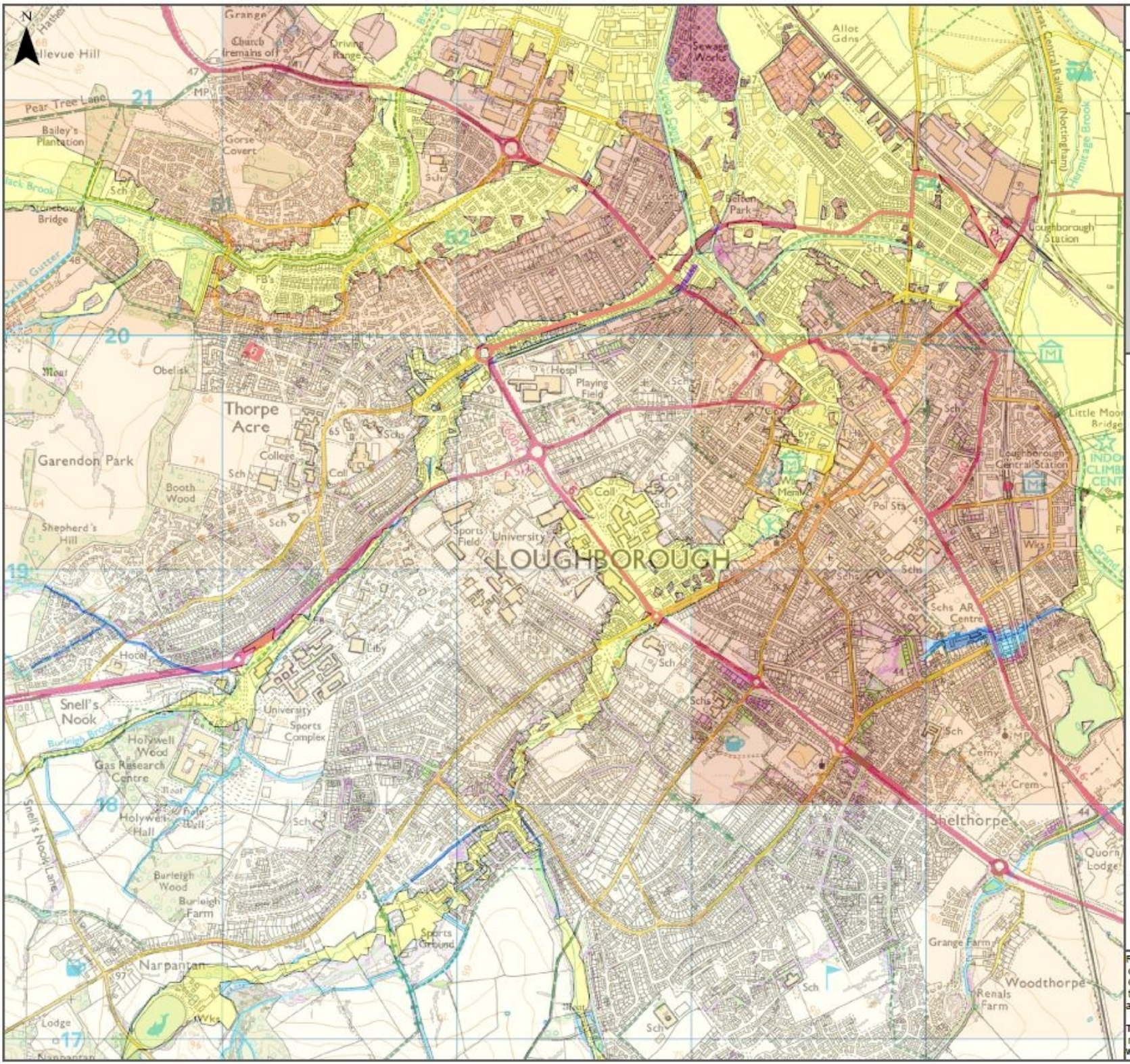
APPENDIX E
AREAS SUSCEPTIBLE TO GROUNDWATER FLOODING MAP

CHARNWOOD BOROUGH COUNCIL LEVEL 1 STRATEGIC FLOOD RISK ASSESSMENT

APPENDIX A: GEO PDF FLOOD RISK MAPPING

INDEX GRID: B2





Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Council Boundary
- Main Rivers
- Detailed River Network

Flood Zones

- Flood Zone 3b
- Indicative Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

Surface Water

- RoFfSW 3.3% AEP
- RoFfSW 1% AEP
- RoFfSW 0.1% AEP

Emergency Planning

- Flood Alert Areas
- Flood Warning Areas

Climate Change

- Climate Change Lower
- Climate Change Central
- Climate Change Upper
- Indicative Flood Zone 2

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Defences

- Demountable Defence
- Embankment
- Flood Gate
- Wall

Historical Flooding

- Historic Flooding

0 5 10 20 30 40 Km

APPENDIX F
SURFACE WATER RUNOFF CALCULATIONS

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Matthew Genn
Site name:	Land off Leconfield Road
Site location:	Nanpantan

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:	52.75314° N
Longitude:	1.24658° W
Reference:	3930120222
Date:	Nov 06 2020 14:51

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.20

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):	680	680
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):	5.6	5.6
1 in 1 year (l/s):	4.65	4.65
1 in 30 years (l/s):	11.2	11.2
1 in 100 year (l/s):	14.39	14.39
1 in 200 years (l/s):	17.02	17.02

APPENDIX G
SEVERN TRENT DEVELOPER ENQUIRY RESPONSE

WONDERFUL ON TAP

Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

Tel: 0345 266 7930
www.stwater.co.uk

Email:
Net.Dev.East@SevernTrent.co.uk

Our ref: 8402014

ADC Infrastructure,
Suite 3A,
King Edward Court,
King Edward Street,
Nottingham,
NG1 1EW.

FAO: Matthew Genn

2nd April 2020

Dear Mr Genn,

Proposed Residential Development (21 New Dwellings) at: Land West of Leaconfield Road, Nanpantan, Loughborough, Leicester, LE11 3SB.

X: 4509947 / Y: 317559

I refer to your Development Enquiry Request submitted in respect of the above site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) referred to below.

Public Sewers in Site – Required Protection

There are no public sewers crossing the proposed development site.

Please Note: On 1st October 2011 many private sewers were transferred into the ownership of Severn Trent Water as public sewers, where two or more properties in separate ownership are served by those sewers. Most of these former private sewers will not be shown on the public sewer records, therefore a full site survey should be carried out prior to any layout design or construction works to identify where these sewers may be and to avoid later delays and possible added costs.

Foul Water Drainage

Sewer records show a 225mm foul water sewer east of the development on Leaconfield Road. According to our calculations, a foul discharge for a proposed 21 dwellings is approximately 0.3 l/s. A gravity foul connection for this can be accommodated in this sewer at a new or existing manhole (MH0507) subject to a 106 approval.

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If this is not practical and no watercourse is available as an alternative, the use of sewerage should be considered. In addition, other sustainable drainage methods should also be explored before a discharge to the public sewerage system is considered.

If these are found to be unsuitable, satisfactory evidence will need to be submitted. The evidence should be either percolation test results or by the submission of a statement from the SI consultant (extract or a supplementary letter).

Subject to the above, the 225mm surface water sewer east of the development on Leaconfield Road will be able to accept green-field runoff rate flows of 5 l/sec/ha to a new or existing manhole (MH0508). Severn Trent would advise that all surface water drainage for the proposed development should be discussed with the LLFA, who are the lead flood and surface water authority, in addition to our requirements. Please refer to “Severn Trent Surface Water Guidance Notes” submitted with this response for further information.

Any flows exceeding the proposed rates would need to be appropriately attenuated on site and discharged at a controlled rate. Please submit surface water drainage proposals based on these comments for review when available.

New Connections

For any new connections including the use, reuse and indirect to the public sewerage system, the developer will need to submit Section 106 application. Our Developer Services department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 707 6600 or download from www.stwater.co.uk

Please quote the above reference number in any future correspondence (including e-mails) with STW Limited. Please send **all correspondence** to the net.dev.east@severntrent.co.uk email inbox address, a response will be made within 15 days.

If you require a VAT receipt for the application fee please email MISCINCOME.NC@SEVERNTRENT.CO.UK quoting the above Reference Number.

Please note that Developer Enquiry responses are only valid for 6 months from the date of this letter.

Yours sincerely,

Emma Nowak.
Asset Protection East.
Asset Management.
Wholesale Operations.

APPENDIX H
SURFACE WATER STORAGE CALCULATIONS

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	79.442	0.392	4.2	139.4	O K
30 min Summer	79.538	0.488	4.2	182.5	O K
60 min Summer	79.628	0.578	4.2	225.7	O K
120 min Summer	79.707	0.657	4.2	266.4	O K
180 min Summer	79.744	0.694	4.2	286.3	O K
240 min Summer	79.763	0.713	4.2	297.2	Flood Risk
360 min Summer	79.778	0.728	4.2	305.5	Flood Risk
480 min Summer	79.780	0.730	4.2	306.6	Flood Risk
600 min Summer	79.775	0.725	4.2	303.7	Flood Risk
720 min Summer	79.766	0.716	4.2	298.6	Flood Risk
960 min Summer	79.748	0.698	4.2	288.5	O K
1440 min Summer	79.710	0.660	4.2	268.1	O K
2160 min Summer	79.648	0.598	4.2	235.6	O K
2880 min Summer	79.587	0.537	4.2	205.6	O K
4320 min Summer	79.476	0.426	4.2	154.3	O K
5760 min Summer	79.381	0.331	4.2	114.1	O K
7200 min Summer	79.305	0.255	4.2	84.8	O K
8640 min Summer	79.250	0.200	4.1	64.4	O K
10080 min Summer	79.210	0.160	3.9	50.6	O K
15 min Winter	79.481	0.431	4.2	156.7	O K
30 min Winter	79.587	0.537	4.2	205.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	126.830	0.0	142.0	30
30 min Summer	83.383	0.0	186.8	44
60 min Summer	52.299	0.0	237.2	74
120 min Summer	31.753	0.0	288.1	132
180 min Summer	23.426	0.0	318.9	190
240 min Summer	18.779	0.0	340.8	248
360 min Summer	13.642	0.0	371.3	366
480 min Summer	10.873	0.0	394.5	484
600 min Summer	9.115	0.0	413.4	600
720 min Summer	7.889	0.0	429.2	670
960 min Summer	6.276	0.0	454.9	784
1440 min Summer	4.539	0.0	492.2	1042
2160 min Summer	3.278	0.0	537.3	1432
2880 min Summer	2.600	0.0	568.1	1820
4320 min Summer	1.872	0.0	613.1	2564
5760 min Summer	1.482	0.0	648.2	3288
7200 min Summer	1.235	0.0	675.4	3968
8640 min Summer	1.064	0.0	698.0	4600
10080 min Summer	0.938	0.0	717.2	5256
15 min Winter	126.830	0.0	159.1	30
30 min Winter	83.383	0.0	209.2	44

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
60 min Winter	79.684	0.634	4.2	254.6	O K
120 min Winter	79.770	0.720	4.2	301.0	Flood Risk
180 min Winter	79.811	0.761	4.2	324.3	Flood Risk
240 min Winter	79.834	0.784	4.2	337.6	Flood Risk
360 min Winter	79.853	0.803	4.2	349.1	Flood Risk
480 min Winter	79.859	0.809	4.2	352.5	Flood Risk
600 min Winter	79.857	0.807	4.2	351.4	Flood Risk
720 min Winter	79.850	0.800	4.2	347.3	Flood Risk
960 min Winter	79.828	0.778	4.2	334.5	Flood Risk
1440 min Winter	79.783	0.733	4.2	308.3	Flood Risk
2160 min Winter	79.707	0.657	4.2	266.3	O K
2880 min Winter	79.612	0.562	4.2	217.8	O K
4320 min Winter	79.441	0.391	4.2	139.3	O K
5760 min Winter	79.307	0.257	4.2	85.2	O K
7200 min Winter	79.220	0.170	4.0	53.9	O K
8640 min Winter	79.172	0.122	3.7	37.8	O K
10080 min Winter	79.156	0.106	3.3	32.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	52.299	0.0	265.8	72
120 min Winter	31.753	0.0	322.7	130
180 min Winter	23.426	0.0	357.1	186
240 min Winter	18.779	0.0	381.7	244
360 min Winter	13.642	0.0	415.8	358
480 min Winter	10.873	0.0	441.7	472
600 min Winter	9.115	0.0	462.7	584
720 min Winter	7.889	0.0	480.3	692
960 min Winter	6.276	0.0	508.8	892
1440 min Winter	4.539	0.0	549.2	1110
2160 min Winter	3.278	0.0	601.9	1580
2880 min Winter	2.600	0.0	636.3	1984
4320 min Winter	1.872	0.0	686.9	2724
5760 min Winter	1.482	0.0	726.1	3360
7200 min Winter	1.235	0.0	756.5	3968
8640 min Winter	1.064	0.0	781.9	4576
10080 min Winter	0.938	0.0	803.5	5160

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.608

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.152	4	8	0.152	8	12	0.152	12	16	0.152

Model Details

Storage is Online Cover Level (m) 80.050

Tank or Pond Structure

Invert Level (m) 79.050

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	290.0	1.000	690.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0097-4200-1000-4200
Design Head (m)	1.000
Design Flow (l/s)	4.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	79.050
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	4.2
Flush-Flo™	0.299	4.2
Kick-Flo®	0.635	3.4
Mean Flow over Head Range	-	3.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.6	3.000	7.0	7.000	10.4
0.200	4.1	1.400	4.9	3.500	7.5	7.500	10.8
0.300	4.2	1.600	5.2	4.000	8.0	8.000	11.1
0.400	4.1	1.800	5.5	4.500	8.5	8.500	11.5
0.500	4.0	2.000	5.8	5.000	8.9	9.000	11.8
0.600	3.6	2.200	6.0	5.500	9.3	9.500	12.1
0.800	3.8	2.400	6.3	6.000	9.7		
1.000	4.2	2.600	6.5	6.500	10.1		

APPENDIX I
ADC1905/DR/050
PROPOSED DRAINAGE LAYOUT PLAN

Proposed detention basin location in eastern side of site to suit onsite topography and development layout.

The design of the detention basin is based on an impermeable area of 0.608ha estimated from the current masterplan, which includes a 10% allowance for urban creep.

Bed level (m AOD) - 80.050
Top of bank level (m AOD) - 79.050
Approximate storage volume = 355m^3 for up to a 1 in 100 year plus 40% climate change.

Internal embankment to be constructed at 1 in 3 gradient.

Permanent swale/wetland feature to be incorporated into basin design to help convey runoff and provide an additional treatment train for surface water flows generated by the development.

Proposed gravity connection into adopted surface water sewer in Leconfield Road at the proposed rate of 4.2l/s. Subject to a Section 106 approval from Severn Trent, following granting of planning consent.

0508
CL 79.750
IL 78.080

0505

0507
CL 79.820
IL 77.760

Proposed gravity connection into adopted foul sewer in Leconfield Road. Subject to a Section 106 approval from Severn Trent, following granting of planning consent.

Key

- Site Boundary
- Impermeable Surfaces - 0.608ha
- Proposed Detention Basin
- Swale
- Proposed foul water sewer
- Proposed surface water sewer

Drainage Notes

1. All adoptable surface and foul water drainage works to be carried out in accordance with 'Sewers for Adoption 7th edition' and any specific requirements of the adopting authority/sewerage undermaker.
2. All adoptable highway drainage works to be carried out in accordance with the Local Highway Authority requirements and the DfT MCHW specification for highway works.
3. All private drainage works are to be carried out in accordance with Building Regulations Part H, BS EN 752, the Civil Engineering Specification for the Water Industry.
4. Where applicable the contractor shall allow free and full access to the drainage works for the local/highway authority, drainage authority or the overseeing organisation.
5. The exact position, level, line, size and use of existing drainage is to be confirmed on site. Any discrepancies to be reported to the engineer prior to the commencement of works.
6. All temporary works associated with the construction of the drainage works shall be the responsibility of the contractor, including the protection of any uncovered/shallow pipework against construction traffic.
7. The Contractor is responsible for obtaining and paying for all necessary permissions to enable construction of the works to be undertaken, including but not limited to licences for street works and connections to existing sewers. This includes Section 106 applications when connecting directly or indirectly to the public sewerage network (complete application to be made at least 3 weeks prior to the planned outfall construction works).
8. All proposed chamber covers are to be marked permanently with "SWS" (or equiv.) on surface water sewers and "FWS" (or equiv.) on foul sewers. all covers to be in accordance with BS EN 124.
9. Finished floor levels shown are indicative and subject to detailed design and co-ordination with site levels design.
10. Works in proximity to the watercourse will be subject to gaining the necessary consent and approval from the Lead Local Flood Authority.

Rev	Description	Date
P2	Masterplan updated	18/11/2020
P1	Preliminary issue	06/11/2020

Client:
Bowbridge Homes Limited

Project:
Proposed Residential Development
Land off Leconfield Road, Nanpantan

Title:
Proposed Drainage Layout Plan

ADC INFRASTRUCTURE

Drg Size:	Scale:	Date:
A1	1:250	18/11/2020

Drg No: ADC1905/DR/050
Rev: P2