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HIGHFIELD ROAD, BUBWITH

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

APRIL 2023

REPORT NO: 21969-FRADS-001

HIGHFIELD ROAD, BUBWITH

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

Ms Carrie-Ann & Mr John Peach

Flood Risk Assessment & Drainage Strategy

CONFIDENTIAL

Project no: 21969-FRADS-001

Date: April 2023

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1 INTRODUCTION

1.1.1 This Flood Risk Statement (FRS) and Drainage Strategy (DS) has been provided at the request of Ms Carrie-Ann & Mr John Peach, hereafter referred to as "the client", to assess the flood risks associated with the proposed development of land off Highfield Road, Bubwith, hereafter referred to as "the site".

1.1.2 The purpose of this FRS and DS is to:

- Identify the possible hazards posed from all major sources of flooding (fluvial, surface water, groundwater, infrastructural and coastal sources);
- Investigate and define any potential drainage impacts associated with the site;
- Conceptually determine and define necessary surface water management controls to ensure no exacerbation of flood risk on the site or to external receptors due to any increase in surface water runoff; and
- Recommend appropriate and necessary mitigation measures and additional assessments that may be required to progress the sustainable development of the site.

1.1.3 The FRA comprises the following:

- A desktop review of publicly available information, including information from the Environment Agency (EA) and East Riding of Yorkshire Council (ERYC) who are the Lead Local Flood Authority (LLFA) for the proposed development area; and
- An assessment and outline design of hydraulic controls and drainage requirements and drainage elements required to support the development of the site.

1.1.4 This report further details the methodologies employed within this study and provides recommendations as to any further work or investigations required to support the development of the site through the planning application process.

1.2 REGULATORY POLICY AND LEGISLATION

1.2.1 This assessment has been carried out in line with the current Government legislation, the National Planning Policy Framework (NPPF) 2021.

1.2.2 It has been assessed with reference to the following documents and legislative guidelines:

- CIRIA 753 The SUDS Manual V6 (2016);
- DEFRA "Flood Risk Assessment Guidance for New Developments" (2006);
- DEFRA "Surface Water Management Plan Technical Guidance" (2010);
- BS 8533 2011 Assessing & Managing Flood Risk in Development Code of Practice (2011);
- BS 8582:2013 Code of practice for surface water management for development Sites (2013);
- National Planning Practice Guidance (2012 – updated 2016);
- C624 Development and Flood Risk – Guidance for the Construction Industry' (2004);
- Design and Construction Guidance for Sewage Sector (DCGSS) (2020);
- Planning Policy Guidance – Flood Risk and Climate Change (2014 and as amended).

1.2.3

1.2.4 In addition to the above, this report has also been informed by the following documents:

- ERYC Level 1 Strategic Flood Risk Assessment (SFRA)
- ERYC Local Plan

1.3 SCOPE OF FLOOD RISK ASSESSMENT

1.3.1 The objective of this analysis and report is to provide an FRA in accordance with local and national guidance.

1.3.2 The detail and complexity of the FRA will reflect the level of risk to the site and consider the appropriateness of the proposed development type. This will also include assessment of potential risk to property and livelihoods, consideration of climate change, and the definition of appropriate flood risk mitigations required to satisfy the planning process.

1.3.3 Based on the assessment of requirements for a site-specific FRA as defined within NPPF 2021 technical guidance, the site is indicated as being located within Flood Zone 1, therefore it is not necessary to provide a site-specific FRA. Flood Zone 1 refers to an area assessed as having less than 1 in 1,000 annual probability (<0.1%) of river or sea flooding in any one year.

1.3.4 Similarly, as the site is indicatively located in an area that may be subject to other assessable sources of flooding, such as pluvial (surface water) flooding, it is necessary to undertake a further site-specific assessment to verify the proposals for development.

1.3.5 Policy ENV6 of the ERYC Local Plan states that all future development must ensure that:

1.3.6 The risk of flooding to development will be managed by applying a Sequential Test to ensure that development is steered towards areas of lowest risk, as far as possible. The Sequential Test will, in the first instance, be undertaken on the basis of the East Riding of Yorkshire Strategic Flood Risk Assessment (SFRA) and the Environment Agency's Flood Map, within appropriate search areas. Where development cannot be steered away from Flood Zone 3, the sub-delineation of Zone 3a, detailed within the relevant SFRA, will be used to apply the Sequential Test, with preference given to reasonably available sites that are in the lower risk/hazard zones. Where necessary, development must also satisfy the Exception Test.

1.3.7 If, following application of the Sequential Test, it has not been possible to successfully steer development to Flood Zone 1 or a sequentially preferable site, a Sequential Approach will be taken to site layout and design, aiming to steer the most vulnerable uses towards the lowest risk parts of the site and upper floors.

1.3.8 Flood risk will be proactively managed by:

- Ensuring that new developments:
  - limit surface water run-off to existing run-off rates on greenfield sites, and on previously developed land reduce existing run-off rates by a minimum of 30%, or to greenfield run-off rate;
  - do not increase flood risk within or beyond the site;
  - incorporate Sustainable Drainage Systems (SuDS) into major development proposals and proposals at risk of flooding, unless demonstrated to be inappropriate;

- do not culvert or otherwise build over watercourses, unless supported by the Risk Management Authority;
- have a safe access/egress route from/to Flood Zone 1 or establish that it will be safe to seek refuge at a place of safety within a development;
- incorporate high levels of flood resistant and resilient design if located in a flood risk area;
- are adequately set-back from all watercourses including culverted stretches; and viii. adhere to other relevant SFRA recommendations.

- Supporting proposals for sustainable flood risk management, including the creation of new and/or improved flood defences, water storage areas and other schemes, provided they would not cause unacceptable adverse environmental, social, or economic impacts.
- Supporting the removal of existing culverting and returning these sections to open watercourse.
- Designating areas of Flood Zone 3b (Functional Floodplain) and safeguarding land for current and future flood risk management, on the Policies Map.

1.3.9 Potential flood risk at the site has been assessed against the site plan (**Appendix A**). Significant changes to the site's developable area may necessitate a further review of this document to ensure that risk of flooding is not exacerbated and has been satisfactorily addressed within the development proposal

1.4 SCOPE OF OUTLINE DRAINAGE STRATEGY

1.4.1 Surface water runoff must be effectively managed to ensure that there is no exacerbation of potential surface water flooding issues on the site, or at any external receptors, due to any potential increases in surface water runoff rates and volumes.

1.4.2 The drainage hierarchy will be applied in determining the most suitable type and point of discharge of surface waters runoff from impermeable areas on the site. This will ensure that surface water is sustainably managed on the site, and that there is no exacerbation of flood risk elsewhere as a result of undertaking the development. This will be undertaken in accordance with industry best practice principles and guidance, such as the C753 SUDS Manual (2016), Design and Construction Guidance for Sewage Sector (DCGSS) (2020) and applicable sections of the Planning Policy Guidance (PPG).

1.4.3 Any increase in surface water runoff rate associated with the development of the site must also be managed in accordance with the guidelines set by LPA, the LLFA for the area.

1.4.4 The Drainage Strategy will identify potential opportunities and locations for attenuation infrastructure, as well as potential connection points and provide calculations of permissible discharge rates for runoff generated on site.

1.4.5 The Drainage Strategy therefore aims to provide surety that any drainage provided as part of the project development can safely and appropriately convey all flows from the site to appropriate discharge locations. This is to ensure sustainable and safe operation within the site, as well as ensuring sustainable operation of any receiving infrastructure. These assessments have been undertaken in accordance with prescribed best practice and building codes, including prioritising the incorporation of SuDS, where appropriate and practicable for the management of surface water.

1.4.6 Following the completion of a final site masterplan the drainage scheme proposed within this report should be reassessed to ensure surface water runoff and foul water drainage can be appropriately managed in accordance with best practise and local and national standard requirements.

2 METHODOLOGY

2.1 INTRODUCTION

2.1.1 This report aims to demonstrate that the proposed development is sustainable and will not be impacted by or exacerbate flood risk elsewhere through the development of the site. This assessment will account for the effects of climate change, as well as identifying further opportunities to reduce the probability and consequences of flooding within the site locality.

2.1.2 This report aims to identify constraints and opportunities for the site based on the development proposals provided by the client (**Appendix A**) and provide recommendations for the sustainable provision of drainage and mitigation of any potential flood risk for the site.

2.1.3 The assessment methodology is as follows:

- Desktop review of the geology, hydrology and other pertinent environmental characteristics of the site, and how these affect flood risk of the proposed development and site drainage.
- Obtain and review existing baseline flood risk and drainage guidance information from relevant environmental authorities (EA, LLFA, etc.) as to site specific flood risk from all applicable sources
- Produce indicative design calculations for the Outline DS to determine the requirements for developing the site's surface water drainage and providing adequate storage in line with local planning policy and guidance. This will include the presentation of drawings with an indicative layout for any additional drainage and attenuation infrastructure located on the site.
- Review the findings from the above and advise on the suitability of developing the site for the proposed development in consideration of the applicable flood risk and drainage and comment on limitations and opportunities for the site, with recommendations of further mitigation where applicable and appropriate

3 PROJECT BACKGROUND

3.1 DEVELOPMENT DESCRIPTION AND LOCATION

3.1.1 Andrew Moseley Associates (AMA) was appointed by Ms Carrie-Ann & Mr John Peach to provide a Flood Risk Assessment and Drainage Strategy in support of a residential development located at land of Highfield Road, Bubwith YO8 6LY

3.1.2 The proposed development is located in the area of Bubwith which is approximately 7 miles east of Selby. Proposals for the site are for a residential development consisting of 33 dwellings with associated infrastructure and landscaping. A site layout plan can be found in **Appendix A**.

3.1.3 The Local Planning Authority for this development is East Riding of Yorkshire Council who are also the Lead Local Flood Authority for the area.

3.1.4 This report has been prepared in accordance with the National Planning Policy Framework (NPPF) and the accompanying technical guidance to assess all forms of flooding including the management of surface water on-site.

3.1.5 The site is referenced in Table 3-1 and **Figure 1** below.

Table 3-1. Site context

Site Name	Highfield Road
Location	Bubwith
NGR (approx.)	SE 71948 36223
Application Site Area (ha)	2.1
General Locality	The site is located on undeveloped Greenfield and borders Highfield Road to the north, and farm land to the sites east, west and south. Pedestrian and vehicular access to the site is provided via Highfield Road to the north of the site.
Development Type	Residential
EA Flood Zone	Flood Zone 1
EA Office	Yorkshire
Local Planning Authority	ERYC

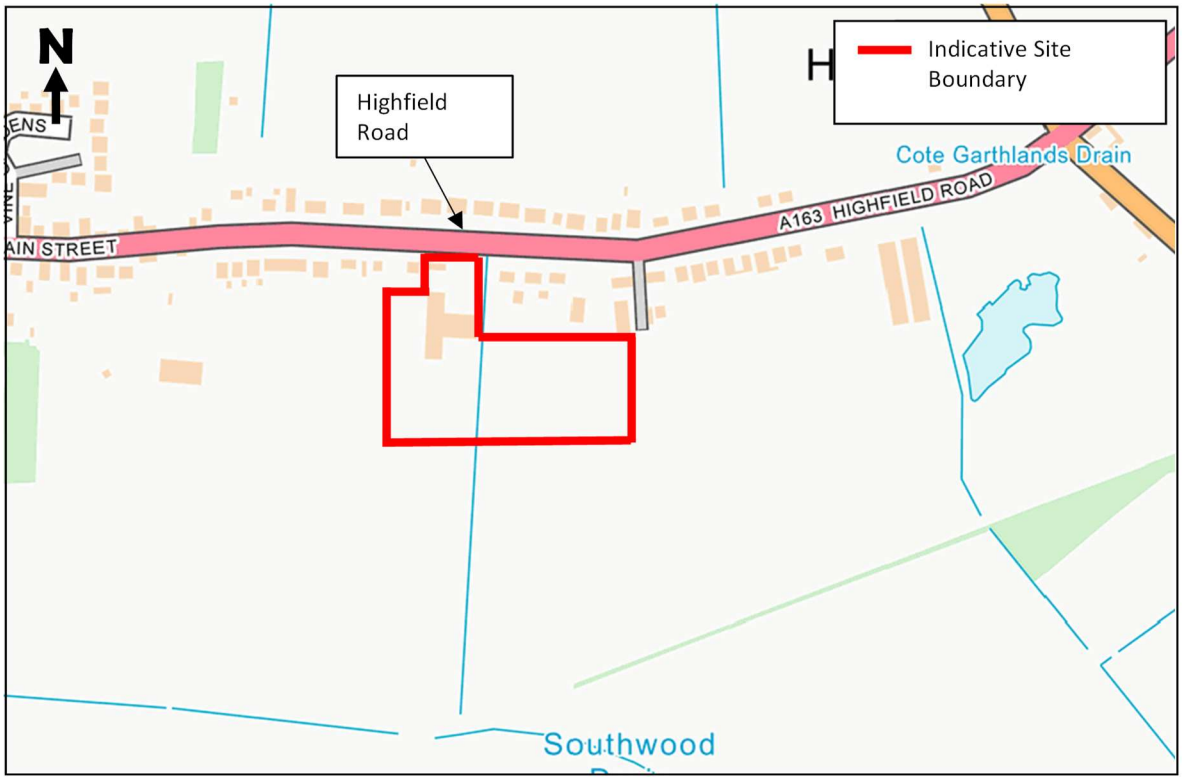

Figure 1. Site location

3.2 CURRENT SITE CONDITIONS

Ground cover and topography

3.2.1 A topographic survey provided by Ms Carrie-Ann & Mr John Peach and undertaken by MET Geo environmental (Ref: P22-01552) and shown in **Appendix B**. The topographic survey shows ground levels at the site are shown to be in the region of 7.11m to 6.20m Above Ordnance Datum (m AOD).

3.2.2 Further review of topographical data shows site levels to be lowest towards the south west of the site, while greatest levels are located towards the north east of the site. A general fall in gradient from north to south is observed across the site.

3.3 GEOLOGY

3.3.1 British Geological Survey (BGS) Open Geoscience website[1] indicates that the entire site is underlain by Sherwood Sandstone Group - Sandstone with overlying superficial deposits of Thorganby Clay Member - Clay, silty.

3.3.2 The BGS website information indicates that there is no borehole record within close proximity to the site.

[1] Available at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html accessed on 18/01/2022

3.4 HYDROGEOLOGY

3.4.1 According to the Department for Environment, Food and Rural Affairs (DEFRA) MAGIC map[2], the site is indicated as not being located in a Groundwater Source Protection Zone (SPZ), as defined by the Environment Agency (EA) for the protection of a potable groundwater supply.

3.4.2 The site is located as being in an area of low ground water vulnerability, and located above a Principal bedrock aquifer as well as a secondary superficial drift aquifer.

3.4.3 Information obtained from the Cranfield University's Soilscape website[3] indicates that the site is located in an area classified as being Soilscape 18, which is defined as having slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

3.5 HYDROLOGY

3.5.1 There are numerous watercourses within close proximity to the site. As shown in **Figure 2**, the Intakefield drain runs through the centre of the site. The watercourses are located within the Ouse & Humber Drainage Board and therefore falls under their jurisdiction.

3.5.2 In addition, along the south of the site there is the Southwood Drain which is also located in the Ouse & Humber Drainage Board

3.5.3 The EA's Catchment Data Explorer website[4] indicates that the site resides within the Derwent Lower Yorkshire Operational Catchment.

[2] Available at: https://magic.defra.gov.uk/MagicMap.aspx?startTopic, accessed on 18/01/2023
[3] Available at: http://www.landis.org.uk/soilscapes/, accessed on 18/01/2022
[4] Available at: https://environment.data.gov.uk/catchment-planning/ , accessed on 18/01/2022

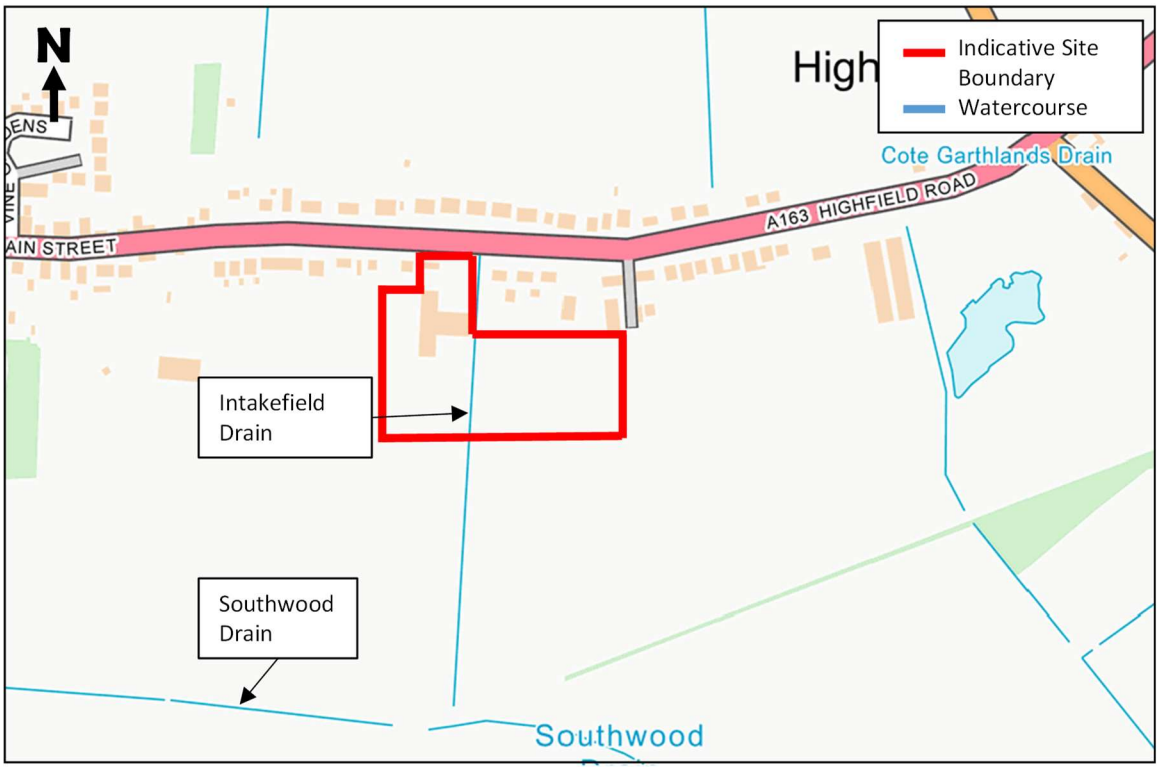

Figure 2. Watercourse location

4 POTENTIAL FLOOD RISK

4.1 SOURCES OF FLOODING

4.1.1 This report is to consider flood risk from all potential sources. Section 5 then discusses in further detail the probability of flooding, any potential impacts and necessary mitigation, where required.

4.1.2 The NPPF (2021) also requires site developers to consider the impact of additional runoff generated by the proposed development on the receiving downstream catchment, and to assess the risk of runoff from the surrounding. This is further discussed in Section 6.

4.2 ENVIRONMENT AGENCY FLOOD ZONES

4.2.1 The EA Flood Map for Planning shows the site is located within Flood Zone 1, i.e. land assessed as having less than 1 in 1,000 annual probability (<0.1%) of river or sea flooding in any one year. This potential fluvial / coastal flood risk to the site has been illustrated in **Figure 3.**

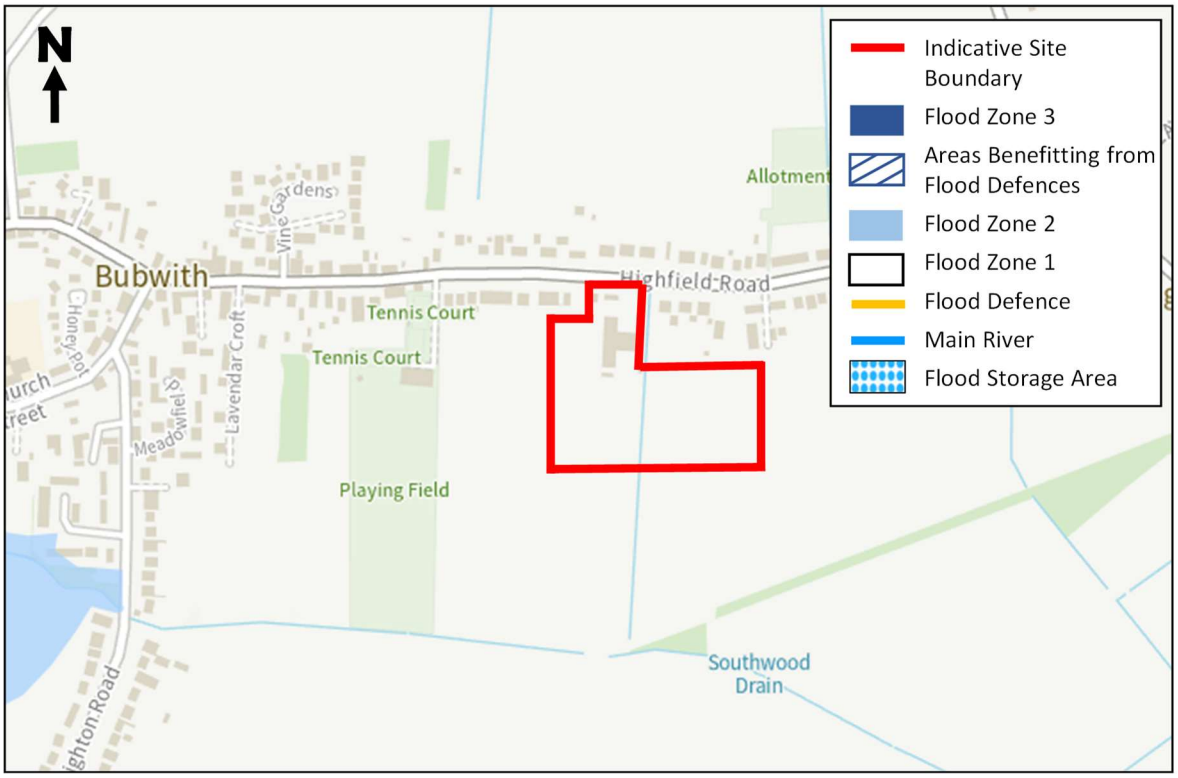

Figure 3. Environment Agency long term flood map for planning - rivers and seas

4.3 FLUVIAL AND COASTAL FLOODING

4.3.1 The EA Long Term Flood Risk Map for fluvial and coastal flooding shown in **Figure 4** indicates that the site is at very low risk of fluvial flooding. As the site is situated 45 miles from the nearest coastline the site is also considered to not be at risk from coastal flooding.

4.3.2 The risk of flooding posed to the proposed development is classed as very low.

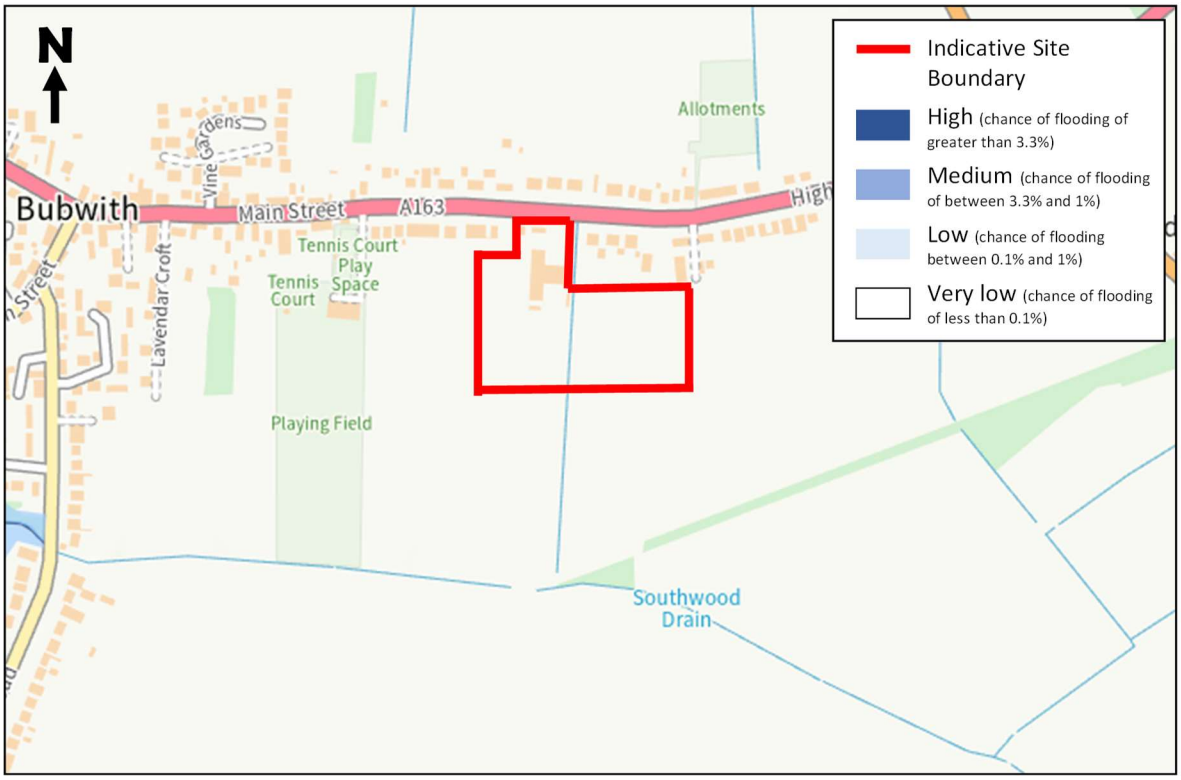

Figure 4. Environment Agency long term flood map – rivers and sea

4.4 PLUVIAL (SURFACE WATER) FLOODING

4.4.1 The EA Long Term Flood Risk Map (**Figure 5**) shows the site is located in an area at very low risk of surface water flooding.

4.4.2 As the proposed development of the site may potentially reduce the overall site permeability and potentially increase surface water runoff rates and volumes, the surface water discharge controls must ensure that any proposal for drainage, or discharge, does not adversely impact upon downstream drainage infrastructure or offsite receptors.

4.4.3 The site is therefore considered to have very low potential risk of flooding from pluvial sources.

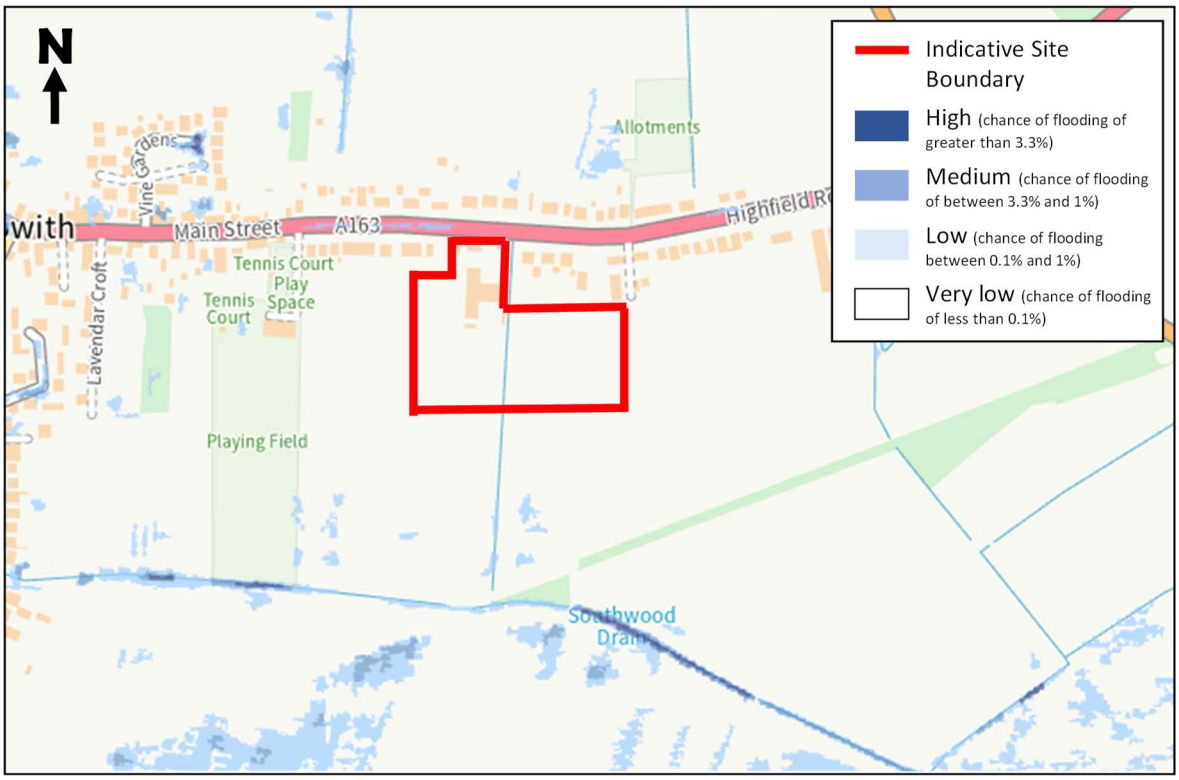

Figure 5. Environment Agency long term flood risk map – pluvial (surface water) flooding

4.5 GROUNDWATER FLOODING

4.5.1 Ground conditions at the site consist of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils, therefore the propensity for ground water emergence at the site is considered to be low.

4.5.2 During long periods of heavy rainfall, the water table within an area can rise above the natural ground level, resulting in groundwater flooding. The site is located above a principal bedrock aquifer. This signifies permeable layers which would allow infiltration of water up through the soil.

4.5.3 However, given the impermeable nature of the proposed site's hardstanding areas subsequent to development, potential elevation of groundwater or groundwater emergence within the superficial geology causing flooding within the site post-development will be largely eliminated.

4.5.4 Site specific investigations should be able to prove the presence of ground water and propose remedial mitigation where required. Flood risk to the proposed development due to groundwater emergence is therefore considered to be low.

4.5.5 Flood risk to the proposed development due to groundwater emergence is considered to be low provided that all reasonable and practicable mitigation measures for any subsurface construction associated with the development are adhered to.

4.6 FLOODING FROM ARTIFICIAL SOURCES

4.6.1 The EA Long Term Flood Risk Map of flood risk from reservoir and canal failure (**Figure 6**) indicates that the site and its surroundings, are not affected by potential flood waters from artificial sources such as dam or canal failure. The figures provided within the EA mapping principally indicate the worst-case flooding extents. Therefore, the potential risk of flooding from reservoir and/or canal failure is considered to be negligible.

4.6.2 In addition to the above reservoirs and canals are regularly maintained by relevant local authorities and failure is extremely unlikely. The site is therefore considered to have very low potential risk of flooding from artificial sources.

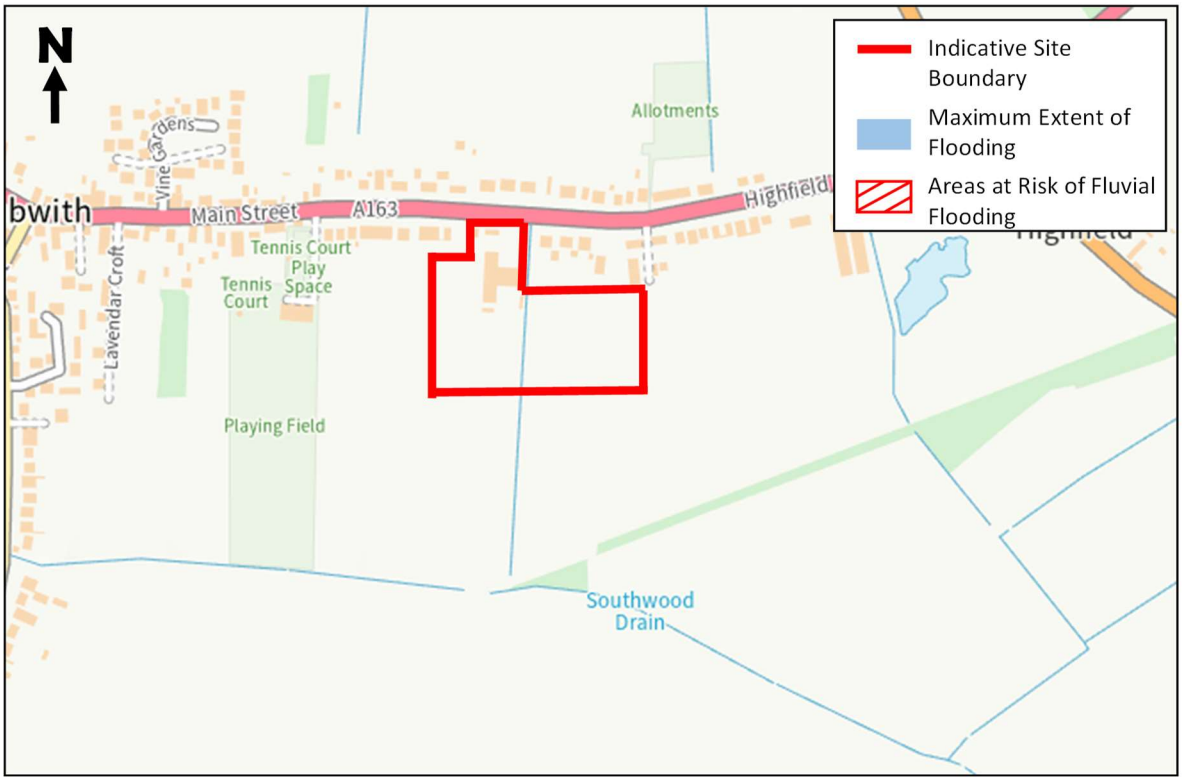

Figure 6. Environment Agency long term flood risk map – artificial sources

4.7 FLOODING FROM SEWERS

4.7.1 The site currently consists of greenfield land and is not identified as having any drainage infrastructure within is boundary. As the site has a drainage ditches running through the centre, any sewer flooding originating off site would be intercepted before it could be conveyed onto and across the site. Furthermore, these drainage ditches would convey any sewer flooding away from the site before building to any significant depth. The site is therefore considered to have very low potential risk of flooding from sewer flooding.

4.8 HISTORIC FLOODING

4.8.1 The EA historic flood map shows the site to not have experienced historic flooding. A review of the local SFRA confirms the EA historic flood mapping and indicates that the site has not experienced any historic flooding.

5 FLOOD RISK ASSESSMENT

5.1 FLOOD RISK PLANNING POLICY

National planning policy framework

5.1.1 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. Planning Practice Guidance is also available online.

5.1.2 The Planning Practice Guidance sets out the vulnerability to flooding of different land uses. It encourages development to be located in areas of lower flood risk where possible and stresses the importance of preventing increases in flood risk off site to the wider catchment area.

5.1.3 The Planning Practice Guidance also states that alternative sources of flooding, other than fluvial (river flooding), should also be considered when preparing a Flood Risk Assessment.

5.1.4 This Flood Risk Assessment is written in accordance with the NPPF and the Planning Practice Guidance.

5.1.5 The EA Flood Map for Planning locates the site within Flood Zone 1, i.e., land assessed as having less than 1 in 1,000 annual probability (<0.1%) of river or sea flooding in any one year.

5.1.6 The flood map extents indicated on this map show the potential for flooding from fluvial and coastal sources, and although they are indicative, they are a key tool in defining the appropriateness of a development type or the requirement for further assessment.

5.1.7 Under the NPPF (2021), Flood Zone 1 is defined as having a low probability flood risk. The proposed development includes the construction of 33 dwellings with associated landscaping and infrastructure, which are defined within Table 2 of the NPPF technical guidance as being 'More Vulnerable'. Therefore, according to the criteria in Table 3 of the NPPF Technical Guidance (Flood Risk Vulnerability and Flood Zone 'Compatibility'), the proposed development may be deemed as 'Appropriate'.

5.2 SEQUENTIAL AND EXCEPTION TEST

5.2.1 Both the NPPG and the SFRA require the 'sequential test' to be applied to ensure that proposed developments are carried out in area that are at the least risk of flooding, before considering development in areas that are at risk of flooding. The proposed site falls within flood zone 1 and is considered to come under the 'more vulnerable' category as a residential development.

5.2.2 Based on Table 3 in the National Planning Practice Guidance for Flood Risk and Coastal Change, the proposed use of the site is acceptable due to it being located in Flood zone 1 and an exception test is not required.

Table 5-1. Development appropriateness based on vulnerability and flood zone

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	✓	Exception test required	✓	✓
Flood Zone 3a	Exception test required	✓	x	Exception test required	✓
Flood Zone 3b	Exception test required	✓	x	x	x

5.3 CONCLUSION

5.3.1 In light of this assessment against the sites applicable flood zone (Flood Zone 1), further assessment against the sequential or exception test is not required.

5.3.2 Table 5-2 summarises the pre mitigation flood risk associated with the site as well as the impacts of the flood risk on the wider catchment prior to mitigation. The mitigation measures proposed to address flood risk issues and ensure the development is appropriate for its location are discussed within Section 3.0.

Table 5-2 Pre-mitigation flood risk summary

Sources	Probability of Flood Risk	Impacts	Description
Tidal	N/A	N/A	Site located inland and not tidally influenced.
Fluvial	Low	Low	Site is not shown to be located in an area susceptible to fluvial flooding.
Surface Water (Pluvial)	Low	Low	The site is not shown to be located in an area susceptible to surface water flooding.
Groundwater	Low	Low	Ground water flood risk is considered to be low.

Artificial Sources	Low	Low	Review of information from multiple sources (EA, LLFA) reveals no evidence of flooding from reservoirs or canals.
Sewers	Low	Low	The risk of flooding from the surcharging of sewers is considered to be low.

5.3.3 Based on the assessable information presented, the site is considered to meet the requirements of the NPPF, given the assessed potential flood risk posed from all applicable sources, the means of adopting suitable mitigation measures to prevent increase in the potential for flood risk and based on the vulnerability of the development type. Further consideration of necessary surface water runoff mitigation measures will be provided, so as to address the potential for increase of surface water arising from the proposed development of the site.

6 FLOOD RISK MITIGATION

6.1 FLOOD RISK MITIGATION

6.1.1 Section 4 has identified the sources of flooding which could potentially pose a risk to the site and the proposed development. This section of the FRA sets out the mitigation measures which are to be considered within the proposed development detail design to address and reduce the risk of flooding to within acceptable levels.

6.2 EFFECT OF DEVELOPMENT ON WIDER CATCHMENT

Development drainage

6.2.1 The current site is considered to be greenfield. The amount of impermeable area will be altered. Therefore, the existing drainage systems will not be suitable to discharge the surface water from the site alongside the additional run off from the proposed development. A sufficient Drainage strategy will be therefore provided by AMA.

6.3 SITE ARRANGEMENTS

Sequential arrangement

6.3.1 The Flood Zone mapping shows the site to be located within Flood Zone 1.

Finished levels

6.3.2 Given the site's location within Flood Zone 1, there are no specific requirements for finished floor levels with regard to flood risk. However, it is recommended that FFL are set at 150mm above ground level.

7 FOUL WATER DRAINAGE

7.1 INTRODUCTION

7.1.1 It is proposed to install a new foul drainage system to serve the proposed residential development.

7.1.2 The foul water system will be designed and constructed in accordance with the current Building Regulations, BS EN:752 'Drainage and Sewer Systems Outside Buildings', the Local Authority Building Control specifications and requirements, Sewers for Adoption 7th Edition and the Civil Engineering Specification for the Water Industry.

7.2 EXISTING SEWERS

7.2.1 AMA attained a Yorkshire Water pre development enquiry which can be found in **Appendix C**. It states that there is a 150mm diameter public foul sewer running along the northern boundary of the site.

7.3 FOUL WATER DISCHARGE RATES

7.3.1 The estimate design Dry Weather Flow (DWF) generated by the proposed development, based on a gravity system, has been calculated as 1.52 litres per second.

7.3.2 This figure is based on 33 dwellings at 4,000 litres per dwelling as prescribed in Sewers for Adoption.

7.4 FOUL WATER CAPACITY AND POINT OF CONNECTION

7.4.1 Yorkshire Water have advised that foul water can discharge to the existing 150mm Foul Water sewer running along the northern boundary of the site. They have not advised of any known capacity issues with the public sewer network in the area which would hinder development at the site.

7.4.2 No depth/ level information is available for these sewers and therefore further survey work in the form of a drainage CCTV and tracing survey will be required to confirm whether a gravity connection will be feasible.

7.4.3 Any proposed connection onto the public recorded sewers will require a S106 connection application.

8 SURFACE WATER DRAINAGE STRATEGY

8.1 INTRODUCTION

8.1.1 The National Planning Policy Framework (NPPF) and accompanying Technical Guidance indicate that surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management.

8.1.2 Consideration should therefore firstly be given to using sustainable drainage (SuDS) techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water run-off from a site. This approach can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements. Approved document Part H of the Building Regulations (2015) sets out a hierarchy for the disposal of surface water which encourages a SuDS approach.

8.2 PRE-DEVLOPMENT SURFACE WATER RUN-OFF

8.2.1 The site is approximately 2.1 ha in area and currently comprises of green field agriculture land.

8.2.2 For the purposes of determining the existing rate of surface water run-off the site is considered to greenfield therefore the run-off will be estimated using the IH124 method.

8.2.3 The table below summarises the existing greenfield runoff rates generated by the development for a range of storm return periods. A calculation summary sheet from the UK SuDS website can be found in **Appendix D**.

Table 8-1. existing run-off rates

Area (Ha)	Q_{BAR} (L/S)	Q_1 (I/S)	Q_{30} (L/S)	Q_{100} (L/S)	Q_{200} (L/S)
2.1	8.45	7.27	14.79	17.57	20.02

8.3 GROUNDWATER PROTECTION

8.3.1 The proposed development site is not identified as being within a groundwater source protection zone (SPZ), as such no special measures are required to prevent risk to drinking water supplies.

8.4 METHODS OF SURFACE WATER MANAGEMENT

8.4.1 There are three methods that have been reviewed for the management and discharge of surface water which are detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority as listed:

- Discharge via Infiltration

- Discharge to a watercourse
- Discharge to Surface Water Sewer or Highway Drain
- Discharge to public sewer

8.5 INFILTRATION

8.5.1 Any impermeable areas that can drain to a soakaway or an alternative method of infiltration would significantly improve the sustainability of any surface water systems.

8.5.2 The British Geological Society (BGS) Geology of Britain Viewer indicates that the entire site is underlain by Sherwood Sandstone Group - Sandstone with overlying superficial deposits of Thorganby Clay Member - Clay, silty.

8.5.3 Information obtained from the Cranfield University's Soilscape website indicates that the site is in an area classified as being Soilscape 18, which is defined as slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

8.5.4 From a desktop review of the geology and soil at the site. It is believed that infiltration would not be an acceptable way of discharging surface water from the site.

8.5.5 Infiltration testing was undertaken by AMA and the test report can be found in **Appendix E**. The conclusion form the test was that infiltration would not be possible at the site and therefore soakaways would not be a viable option of discharging surface water from the site.

8.6 WATERCOURSE

8.6.1 As discussed in section 3.5 there is a watercourse which runs through the centre of the site. Intakefield Drain forms part of the Ouse & Humber Drainage Board. Due to the location of the watercourse in regard to the site, AMA contacted the IDB about discharging surface water into the watercourse.

8.6.2 **Appendix F** below shows the email from the IDB confirming the possibility of discharging surface water from the site into the Intakefield Drain.

8.7 PUBLIC SEWERS

8.7.1 As a last resort and following the hierarchy of surface water, disposal discharge to the public sewer system may need to be considered.

8.7.2 As shown in **Appendix C**, AMA attained a predevelopment enquiry, which states that there are no public surface water and/or combined sewers in close proximity to the site which can accept surface water from the site.

8.8 PROPOSED DISCHARGE RATES

8.8.1 As surface water from the site will be discharged into the Intakefield drain, the IDB have set out the requirements from proposed discharge rates (**Appendix F**).

8.8.2 The IDB state that surface water should be restricted to greenfield QBAR rate. Therefore, as calculated and shown in **Appendix D** surface water will be restricted to 8.45l/s.

8.9 ATTENUATION REQUIREMENTS

8.9.1 As discussed earlier the site will be drained into the Intakefield Drain located in the centre of the site at a discharge rate of 8.45l/s. Therefore, attenuation will be needed to be provided.

8.9.2 Causeway Flow drainage design software has been used to estimate the maximum storage volume required on-site for the 100-year storm event plus 40% (30% allowance for climate change and 10% for urban creep). This calculation can be found in **Appendix G**.

8.9.3 The results below are based on the amount of attenuation needed for the total impermeable area of the site.

Total Impermeable Area

8.9.4 This volume is based on using a single attenuation tank with a discharge limit of 8.45 l/s. The details on the attenuation can be found in table 8-2 bellow.

Table 8-2. Attenuation Volume

Attenuation Volume

Gross area (ha)	Max Discharge (l/s)	Imp. Area (ha)	Q100+40% Volume (m^3)
2.10	8.45	1.20	785.5

9 SUSTAINABLE DRAINAGE SYSTEMS

9.1.1 Where possible, Sustainable drainage (SuDS) systems/techniques should be used to drain the site of surface water runoff. These could be in the form of permeable paving, rainwater harvesting, ponds, and other above ground green systems. Swales could also be incorporated into the layout to convey surface runoff rather than below ground pipes (which tend to have a higher velocity).

9.2 SUSTAINABLE DRAINAGE (OVERVIEW)

9.2.1 Drainage systems can contribute to sustainable development and improve urban design, by balancing the different issues that influence the development of communities. Approaches to manage surface water that take account of water quantity (flooding), water quality (pollution) and amenity issues are collectively referred to as Sustainable Drainage Systems (SuDS).

9.2.2 SuDS mimic nature and typically manage rainfall close to where it falls. SuDS can be designed to slow water down (attenuate) before it enters streams, rivers, and other watercourses, they provide areas to store water in natural contours and can be used to allow water to soak (infiltrate) into the ground or evaporated from surface water and lost or transpired from vegetation (known as evapotranspiration).

9.2.3 SUDS are technically regarded a sequence of management practices, control structures and strategies designed to efficiently and sustainably drain surface water, while minimising pollution and managing the impact on water quality of local water bodies.

9.2.4 SuDS are more sustainable than traditional drainage methods because they:

- Manage runoff volumes and flow rates from hard surfaces, reducing the impact of urbanisation on flooding
- Protect or enhance water quality (reducing pollution from runoff)
- Protect natural flow regimes in watercourses
- Are sympathetic to the environment and the needs of the local community
- Provide an attractive habitat for wildlife in urban watercourses
- Provide opportunities for evapotranspiration from vegetation and surface water
- Encourage natural groundwater/aquifer recharge (where appropriate)
- Create better places to live, work and play.

9.3 SUDS PRINCIPALS

9.3.1 Sustainable drainage is a departure from the traditional approach to draining sites. There are some key principles that influence the planning and design process enabling SuDS to mimic natural drainage by:

- storing runoff and releasing it slowly (attenuation)
- allowing water to soak into the ground (infiltration)
- Slowly transporting (conveying) water on the surface
- filtering out pollutants
- allowing sediments to settle out by controlling the flow of the water
- The above was replicated from www.susdrain.org

9.4 SUDS TECHNIQUES

9.4.1 The following table is a list of SuDS features that may/may not be feasible for the proposed site.

Table 9-1. SuDS feasibility table

SUDS Technique	Can they be feasibly incorporated into the site?	Comments
Green Roofs	×	The sloping roofs of the proposed development would not permit a green-roof design
Basins and Ponds	×	The proposed development could not be designed to incorporate these elements due to site constraints such as the topography.
Filter Strips, Swales and Bio-Retention	×	The proposed development could not be designed to incorporate these elements due to site constraints.
Infiltration techniques	×	Percolation test indicates that infiltration would not be viable at the site.
Permeable surfaces and tree pits	✓	Surfacing of the external areas could be in a permeable material, such as permeable paved access roads and driveways.
Rainwater Harvesting	✓	New roofs could be directed to rainwater harvesting tanks for reuse.
Tanked Systems	✓	Attenuation storage will be provided as IDB have restricted the surface water discharge.

10 SUDS MAINTENANCE PLAN

10.1 SURFACE WATER DRAINAGE MAINTENANCE AND MANAGEMENT SCHEDULE

Attenuation Tank/Basin

Table 10-1. Attenuation Tank/Basin

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action.	Monthly for the first 3 months of operation, then annually.
	Recover debris from catchment surface area where it may cause risk to performance.	Monthly
	Remove sediment and debris from pre-tank system.	Annually
Remedial Actions	Repair inlets/outlets/vents/overflows.	As necessary
Monitoring	Inspect all inlets/outlets and upstream drainage system to ensure they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment and build up and remove if necessary.	Every 5 years

Hydrobrake Manhole

Table 10-2. Hydrobrake Manhole

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove sediment and debris from flow control chambers and upstream manholes.	Monthly for first 12 months, then 6 monthly.
Remedial Actions	Replace or clean hydrobrake if performance deteriorates or failure occurs.	As necessary
Monitoring	Check flow control to ensure emptying is occurring.	Quarterly and post high intensity storm event

11 SUMMARY & CONCLUSION

11.1.1 The site is in an area identified as having a low probability of flooding on the EA Flood Map and is located in Flood Zone 1.

11.1.2 As with any drainage system, blockages within the surface water sewer systems constructed to serve the development has the potential to cause flooding or disruption. Any drainage systems which are not to be offered for adoption to either the Water Company or the Local Authority will have a suitable maintenance regime scheduled and an appropriate management company appointed to carry out the works.

11.1.3 The primary option for surface water disposal is to discharge surface water into the Intakefield Drain.

11.1.4 Surface water disposal through infiltration has been proven to not be viable via a BRE 365 infiltration test.

11.1.5 There is not a suitable public sewer in the vicinity of the site which could be utilised to dispose of the surface water as YW has stated that the sewers do not have capacity.

11.1.6 Attenuation will be required as the means of surface water disposal is into a watercourse at a restricted discharge rate.

11.1.7 Foul Water can discharge to the existing 150mm Foul Water sewer running along the northern boundary of the site.

12 LIMITATIONS

12.1 LIMITATIONS

12.1.1 This report has been prepared for exclusive use by Ms Carrie-Ann & Mr John Peach for the purpose of assisting them in evaluating the potential constraints imposed by flood risk and drainage in making a Planning Application.

12.1.2 AMA accepts no liability for any use of this document other than by its client and only for the purposes, stated in the document, for which it was prepared and provided. No person other than the client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of AMA. Any advice, opinions or recommendations within this document should be read and relied upon only in the context of the document as a whole.

12.1.3 AMA has endeavoured to assess all information provided to them during this appraisal. The report summarises from several external sources and cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon.

12.1.4 This report has been undertaken with the assumption that the site will be developed in accordance with the above proposals without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

12.1.5 A topographic survey has been completed for the site and was supplied to AMA by the client. AMA accepts no liability for the accuracy of this survey, and it is recommended that it is verified on-site prior to the commencement of any construction work.

12.1.6 Existing drainage information is based on third party survey data and record information which is considered to be incomplete. It is therefore recommended that a FULL drainage investigation survey is commissioned to establish the precise alignment, level, and condition of ALL existing drainage within the development site to inform the masterplan and future detailed design proposals.

APPENDICES

APPENDIX A – PROPOSED SITE LAYOUT

APPENDIX B – TOPOGRAPHIC SURVEY

APPENDIX C – YORKSHIRE WATER PRE-DEVELOPMENT ENQUIRY

APPENDIX D – UK SUDS GREENFIELD RUN OFF RATE

APPENDIX E – PERCOLATION TEST REPORT

APPENDIX F – EMAIL FROM THE IDB

APPENDIX G – CAUSEWAY ATTENUATION CALCULATIONS

Appendix A

PROPOSED SITE LAYOUT

Rev	By	Date	Revision Note

Pearce Bottomley LLP

10 High Street
Tadcaster
LS24 9AT

T: 0113 281 2000
E: pbp@pbarchitects.co.uk
W: www.pbarchitects.co.uk

ARCHITECTS

Client
MR J PEACH
HIGHFIELD ROAD, BUBWITH

Project
NEW RESIDENTIAL DEVELOPMENT

Drawing Title
SITE PLAN - PROPOSED

File Name

Status	Scale	Drawn	Checked	Date
FEASIBILITY	1:500@A2	RTA	RTA	MAR 2023

Proj. Ref.	Drawing Number	Revision
5757	(00)10	P03

Appendix B

TOPOGRAPHIC SURVEY

Notes

N

Grid : OS National Grid.
Using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on L1.

Datum : OS Level Datum.
Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections.

Station Listing

Station	Easting	Northing	Level
S1	471894.440	436322.936	7.386
S2	471945.281	436329.507	7.608

KEY

AIR VALVE	AV	JUNCTION BOX	JB
BENCH MARK	BM	KERB OUTLET	KO
BIN	BIN	LAMP POST	LP
BOLLARD	BOL	MANHOLE (CIRCULAR)	MH
BORE HOLE	BH	MANHOLE (RECTANGULAR)	MH
BRITISH TELECOM COVER	BT	MANHOLE (TRIANGULAR)	MH
BUS STOP	BUS	MARKER POST	MKR
CABLE TV COVER	CATV	GULLY	GU
CABLE TV SUPPLY	CA	RODDING EYE	RE
COLUMN	COL	SIGN POST	SIGN
DROPPED KERB	DK	TELECOM COVER	TEL
EARTHING POINT	ER	TELEGRAPH POLE	TP
ELECTRICITY COVER	ELEC	THRESHOLD LEVEL	THL
ELECTRICITY POLE	EP	TRAFFIC LIGHT	TL
FIRE HYDRANT	FH	TRIAL PIT	PIT
GAS VALVE	GAS	WASH OUT	WO
GATE		WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COCK	SC
INSPECTION COVER (RECTANGULAR)	IC	WATER STOP VALVE	SV

COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
-	--/--/----	--	--	--

Met® GEO ENVIRONMENTAL
Southgate House
Pontefract Road
Stourton
Leeds
West Yorkshire
LS10 1SW
T: +44 [0] 1132 008 900
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E: admin@metgeoenvironmental.com
W: www.metgeoenvironmental.com

Client
PEARCE BOTTOMLEY LLP

Site
HIGHFIELD ROAD, A163,
BUBWITH, YO8 6LY

Title
TOPOGRAPHICAL
SURVEY

Surveyed	JS & LD	Drawn	JS
Check	DA	Date	17/01/2023

Scale	Job No	Sheet Size	Rev
1:500	P22-01552	A1	01

DWG Ref

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P22-01552	MET	EXT	XX	TOP	M2	G	001

Appendix C

YORKSHIRE WATER PRE DEVELOPMENT ENQUIRY

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax:

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
George Mullaney on 0345 120 8482

25th January 2023

Andrew Moseley Associates
51 St Paul Street
LS1 2TE
jasmine@amatp.co.uk

Your Ref:
Our Ref: Z000272

Dear Ms Ellenor,

Highfield Road, Bubwith, YO8 6LZ - Pre-Planning Enquiry U909157

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

Existing Infrastructure

There is a 150mm diameter public foul sewer recorded on the site. In this instance, building-over may take place under the control of Part H4 Building Regulations 2010. No trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

YorkshireWater

Foul Water

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul water domestic waste can discharge to the 150 mm diameter public foul sewer recorded crossing the northern portion of the site.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2010. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

There are no adequate public surface water and/or combined sewers available in the vicinity to accept any surface water discharge from this site. If SuDS are not viable, I would therefore, advise you to contact the Environment Agency/local Land Drainage Authority/Internal Drainage Board with a view to establishing a suitable watercourse for discharge.

It is understood that a watercourse is located through the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable). Please note Yorkshire Water cannot provide plans of culverted watercourses or highway drains. To obtain plans please contact the Lead Local Flood Authority for more details.

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

Under the provisions of section 111 of the Water Industry Act 1991 it is unlawful to pass into any public sewer (or into any drain or private sewer communicating with the public sewer

network) any items likely to cause damage to the public sewer network interfere with the free flow of its contents or affect the treatment and disposal of its contents. Amongst other things this includes fat, oil, nappies, bandages, syringes, medicines, sanitary towels and incontinence pants. Contravention of the provisions of section 111 is a criminal offence.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for Code for Adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the Code for Adoption 2021/22, pursuant to an agreement under Section 104 of the Water Industry Act 1991. We are happy to offer pre-development technical advice on any prospective sites that you would like to put forward for adoption, prior to submission of your adoption application.

An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Sewer Adoption, Diversion and Requisition (telephone 0345 120 84 82) or email technical.sewerage@yorkshirewater.co.uk or visit - https://www.yorkshirewater.com/developers/sewerage/sewer-adoptions/ for further information.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

George Mullaney
Development Services Technician

471819 : 436001	Map Name : SE7135NE	Title	Partial Key
		Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS
Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : G Mullaney Contact Tel :		(Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2014. All rights reserved Ordnance Survey Licence number 100022432	Date Req : 25/01/2023, 13:29:10 Source : Sewer Network Enquiry

Date Gen : 25/01/2023, 13:29:28

UPN: Undefined Originator: G Mullaney, ,

Appendix D

UK SUDS GREENFIELD RUN OFF RATES

Print | Close Report

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Aaron Yesudian
Site name:	Highfield Road
Site location:	Bubwith

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:	53.81691° N
Longitude:	0.90839° W
Reference:	6252954
Date:	Apr 03 2023 11:14

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 2.1

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):	599	599
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 30 years:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

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):	8.45	8.45
1 in 1 year (l/s):	7.27	7.27
1 in 30 years (l/s):	14.79	14.79
1 in 100 year (l/s):	17.57	17.57
1 in 200 years (l/s):	20.02	20.02

Appendix E

PERCOLATION TEST REPORT

ANDREW MOSELEY ASSOCIATES
TRANSPORT AND DEVELOPMENT PLANNING CONSULTANTS

HIGHFIELD ROAD, BUBWITH

PERCOLATION TEST REPORT

APRIL 2023

REPORT NO: 21969-PTR-001

HIGHFIELD ROAD, BUBWITH

PERCOLATION TEST REPORT

Ms Carrie-Ann & Mr John Peach

Percolation Test Report

CONFIDENTIAL

Project no: 21969-PTR-001

Date: April 2023

Andrew Moseley Associates

15 St Paul's Street

Leeds, LS1 2JG

www.amatp.co.uk

QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Planning			
Date	April 2023			
Prepared by	AJA			
Checked by	GS			
Authorised by	GS			

PRODUCTION TEAM

Associate	Gavin Shepherd
Engineering Technician	Adam Allenby

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

Appendix A – Site Photos

1 TESTING METHODLOGY

1.1 BRE 365 INFILTRATION TEST

1.1.1 All tests undertaken at the site were excavated following the below instruction as outlined in BRE 365 Digest.

- Excavate a soakage trail pit to the required depth (typically 1.0m - 2.0m deep) using minimum width (0.3m) and length (1.0m). Carefully trim sides and bottom.
- Carefully measure size of pit and note sizes below.
- Fill soakage hole briskly with water (from bowser) to at least three quarters full. Being careful not to wash away the sides. (Note: a 0.3m wide, 1m long, 1.5m deep trench needs at least 350 litres (80 gallons) of water)
- Place straight edge over top of soakage pit and measure (dip) to the top of the water.
- Record time versus dips in table below. Dip every 5 minutes for the first hour and every hour until pit is one quarter full. Repeat test 3 times in total on the same or consecutive days.

2 INTRODUCTION

2.1 INTRODUCTION

2.1.1 This infiltration test report has been prepared by Andrew Moseley Associates (AMA) in relation to the drainage design associated with Highfield Road, Bubwith. The purpose of this document is to supplement the AMA Flood Risk Statement & Drainage Strategy report for the development and construction of residential dwellings located at Highfield Road, Bubwith. This report will focus on:

- Development and site description
- Weather conditions
- Dimensions and properties of the pit
- Results
- Summary

2.2 DEVELOPMENT AND SITE DESCRIPTION

2.2.1 Andrew Moseley Associates (AMA) was appointed by Ms Carrie-Ann & Mr John Peach to provide a Percolation Test Report in support of a residential development, located south of Highfield Road, Bubwith, North Yorkshire, YO8 6LY at approx. NGR SE 71948 36200.

2.2.2 The site is referenced in Table 2-1 and Figure 1 below.

Table 2-1. Site context

Site Name	Highfield Road
Location	Bubwith
NGR (approx.)	SE 71948 36200
Application Site Area (ha)	2.1
General Locality	The site is located on undeveloped Greenfield and borders Highfield Road to the north and farm land to the east, west and south. Pedestrian and vehicular access to the site is provided via Highfield Road to the north of the site.
Local Planning Authority	East Riding of Yorkshire Council (ERYC)

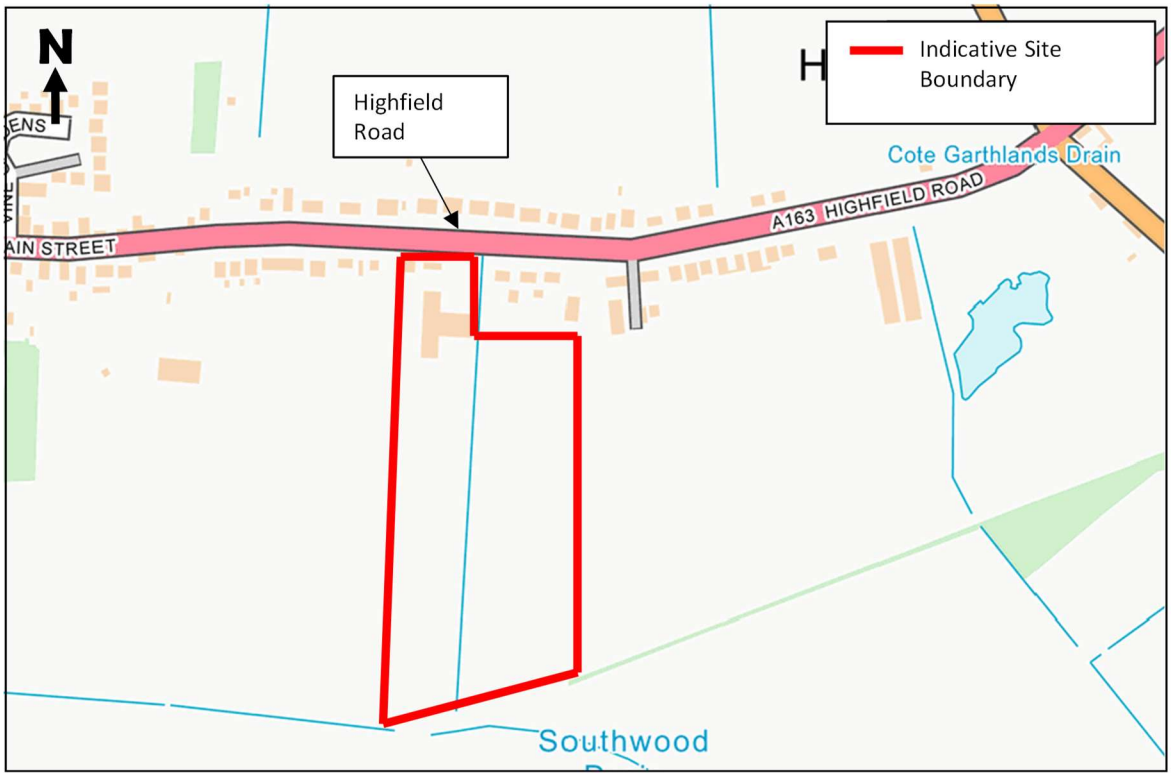

Figure 1. Site location

2.3 GEOLOGY

2.3.1 British Geological Survey (BGS) Open Geoscience website indicates that the entire site is underlain by Sherwood Sandstone Group - Sandstone with overlying superficial deposits of Thorganby Clay Member - Clay, silty.

2.3.2 The BGS website information indicates that there is no borehole record within close proximity to the site.

2.4 HYDROGEOLOGY

2.4.1 According to the Department for Environment, Food and Rural Affairs (DEFRA) MAGIC map , the site is indicated as not being located in a Groundwater Source Protection Zone (SPZ), as defined by the Environment Agency (EA) for the protection of a potable groundwater supply.

2.4.2 The site is located as being in an area of low ground water vulnerability, and located above a Principal bedrock aquifer as well as a secondary superficial drift aquifer

2.4.3 Information obtained from the Cranfield University's Soilscape website indicates that the site is located in an area classified as being Soilscape 18, which is defined as having slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

2.5 WEATHER CONDITIONS

2.5.1 The infiltration test was undertaken on the 3rd of February 2023, throughout the times of 8:30 am to 12:00 pm. The ground was damp and the weather was partly sunny, with no rainfall throughout the infiltration test.

2.6 OBSERVATIONS

2.6.1 The full site comprises of two agricultural fields separated by a ditch called Intakefield Drain and hedgerows. The site is generally flat and the Intakefield Drain is shallow. The owner of the land suggested that the residential dwellings off Highfield Road and Highfield Road itself all discharge surface water to the Intakefield Drain.

2.6.2 The ground consisted of stiff brown clay in both test pit locations and the owner suggested that similar ground conditions can be found across the site.

2.7 DIMENSIONS AND PROPERTIES OF THE PIT

2.7.1 The percolation testing was carried out on the 3rd of February 2023 to establish if infiltration methods were going to be a suitable solution for draining the site.

2.7.2 Two trial holes were formed with the following dimensions

- Test Pit 1: 350 mm x 1900 mm x 1450 mm
- Test Pit 2: 400 mm x 2100 mm x 1450 mm

2.7.3 The water level drop was monitored and recorded.

2.7.4 The test pit photos can be found in **Appendix A.**

2.7.5 The location of each test pit can be seen in Figure 2 below.

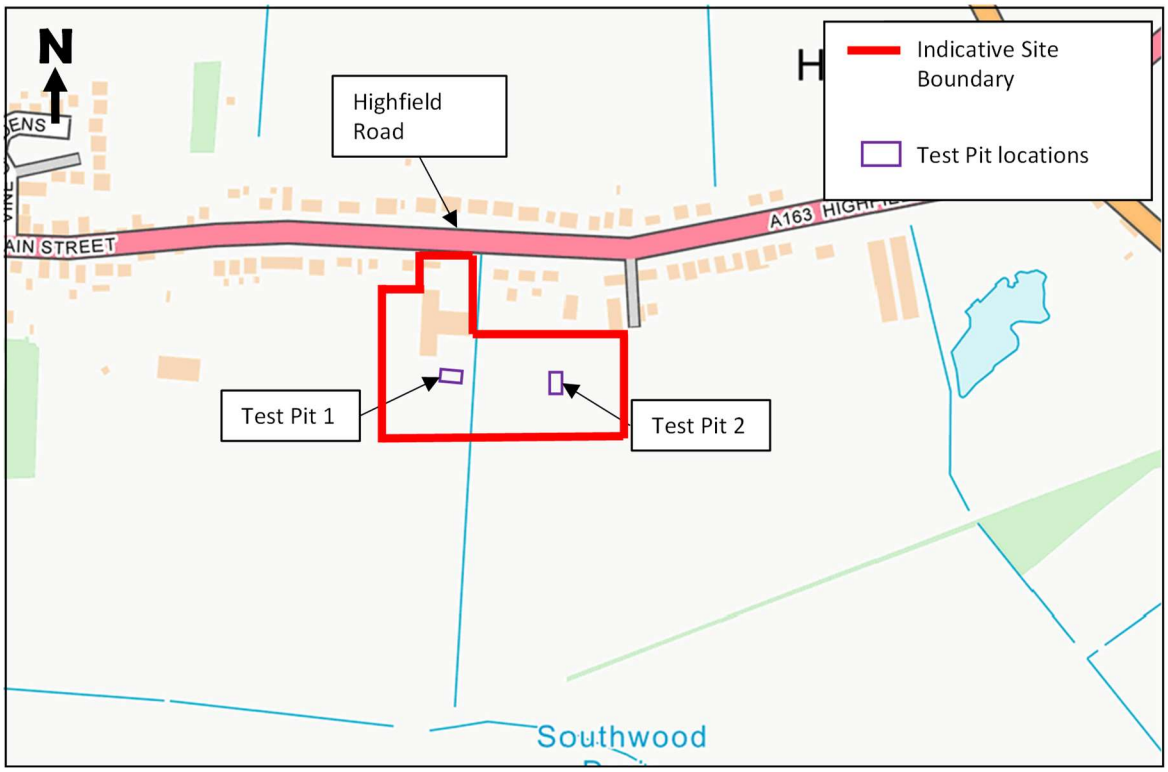

Figure 2. Test Pit Locations

2.8 RESULTS

2.8.1 For the test complete on Test Pit 1, water was filled to a depth of 1200mm, and the water level did not drop over a 60-minute period. This test was abandoned after 60-minutes due to having no visible change to the water height.

2.8.2 For the test complete on Test Pit 2, water was filled to a depth of 1150mm, and the water level did not drop over a 60-minute period. This test was abandoned after 60-minutes due to having no visible change to the water height.

Table 2-2. Test Results

Test Pit 1		Test Pit 2	
Time (mins)	Water height (mm)	Time (mins)	Water height (mm)
0	1200	0	1150
5	1200	5	1150

10	1200	10	1150
15	1200	15	1150
20	1200	20	1150
30	1200	30	1150
40	1200	40	1150
50	1200	50	1150
60	1200	60	1150
-	Abandoned	-	Abandoned

2.9 SUMMARY

2.9.1 The water height did not drop in both test pits over a 60-minute period and therefore the percolation testing was abandoned.

2.9.2 Based on the ground conditions, proximity to a watercourse and percolation testing results shows that soakaways are not a viable strategy for discharging surface water for the proposed residential development.

APPENDICES

APPENDIX A – SITE PHOTOS

Appendix A

PERCOLATION PHOTOGRAPHY

Test pit 1

Test pit 2

Andrew Moseley Associates, 15 St Paul's Street, Leeds, LS1 2JG

www.amatp.co.uk

Appendix F

EMAIL TO THE IDB

Aaron Yesudian

From: Development <Development@yorkshirehumberdrainage.gov.uk>
Sent: 24 March 2023 12:00
To: Aaron Yesudian
Subject: RE: Highfield Road, Bubwith - Surface Water Discharge
Attachments: OH Land Drainage Consent & Guidance.pdf; OH Land Drainage Application Form NEW.pdf; Technical Guidance for Developer and Standing Advice.pdf

Dear Aaron,

Thank you for getting in touch.

For a development such as this we would accept a surface water discharge into the existing watercourse, subject to the granting of Land Drainage Consent. We would require the discharge to be limited to greenfield runoff rate, nominally 1.4l/s per hectare, or Qbar. I have attached our standing advice as well as the Land Drainage Consent documents for further information.

The other aspect to consider is access to the watercourse for maintenance purposes. Land Drainage Byelaws prevent any structures within 9 metres of a watercourse without consent. In this case I believe there is a hedgerow along one side of the watercourse, so we would require a maintenance strip along the accessible side of the watercourse and could consent to a smaller easement on the hedge side, assuming the hedge is to remain. I would assume that estate roads etc will require bridges / culverts at some points on the watercourse, and again these would require consent. We would be happy to give feedback on any outline site plans you have available.

I hope this is helpful at this stage, and I would be happy to discuss further if you have any queries.

Kind regards,

Liam

Liam Plater
Senior Development Control Officer

Yorkshire & Hu
Drainage Boards

Black Drain Drainage Board
Cowick & Snaith Internal Drainage Board
Danvm Drainage Commissioners
Dempster Internal Drainage Board
Ouse & Humber Drainage Board

24 Innovation Drive
Newport
East Riding of Yorkshir
HU15 2FW

01430 430037

From: Aaron Yesudian <aaron@amatp.co.uk>
Sent: Thursday, March 23, 2023 10:21 AM
To: Info <Info@yorkshirehumberdrainage.gov.uk>
Subject: Highfield Road, Bubwith - Surface Water Discharge

Dear Sir Madam,

Hope you are well,

I am emailing regarding a proposal for a new residential development located at land of Highfield Road, Bubwith YO8 6LY NGR: SE 71948 36223 (see attached).

The Intakefield Drain runs through the centre of the site and I'm aware that it forms part of the Ouse & Humber Drainage Board. Following the SuDS hierarchy infiltration has been proven to not be a viable option at the site. AMA were looking at discharging surface water into the Intakefield Drain running through the centre of the site.

Would you be able to provide further information on the possibility of using the Intakefield drain to drain surface water along with the requirements set out by the IDB if this is possible.

Thank you for your time and look forward to hearing from you.

Thanks

Aaron

Aaron Yesudian
Flood Risk and Drainage Consultant

ANDREW MOSELEY ASSOCIATES
TRANSPORT AND DEVELOPMENT PLANNING CONSULTANTS

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NOTE NEW ADDRESS
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Leeds
LS1 2JG

Appendix G

CAUSEWAY ATTENUATION CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
AT	1.260	5.00	100.000	1200	1.500

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	30	10	0

Node AT Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	98.500	Product Number	CTL-SHE-0135-8500-1000-8500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.5	Min Node Diameter (mm)	1200

Node AT Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	98.500	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	25.000	Inf Depth (m)	
Porosity	1.00	Length (m)	21.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	AT	188	98.770	0.270	36.1	135.4944	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	AT	Hydro-Brake®	8.5	175.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	AT	352	99.221	0.721	59.7	380.6618	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	AT	Hydro-Brake®	8.5	238.5

Results for 100 year +30% CC +10% A Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	AT	464	99.963	1.463	87.7	785.5566	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	AT	Hydro-Brake®	10.2	361.6

Andrew Moseley Associates, 51A St Paul's Street, Leeds, LS1 2TE

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