



WOODHEAD HALL FARM,
BARNSELEY

FLOOD RISK
ASSESSMENT &
DRAINAGE STRATEGY

OCTOBER 2022

WOODHEAD HALL FARM, BARNSELEY

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

Rotary Developments Ltd

Flood Risk Assessment & Drainage Strategy

CONFIDENTIAL

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1 INTRODUCTION

- 1.1.1 This Flood Risk Assessment (FRA) and Outline Drainage Strategy (DS) has been provided at the request of Rotary Developments Ltd, hereafter referred to as “the client”, to assess the flood risks associated with the proposed development of Woodhead Hall Farm, hereafter referred to as “the site”.
- 1.1.2 The purpose of this FRA and DS is to:
- ▶ Identify the possible hazards posed from all major sources of flooding (fluvial, surface water, groundwater, infrastructural and coastal sources);
 - ▶ Provide a qualitative assessment of the probability of each potential flood hazard representing a constraint on the proposed development, based on the proposed land use type for the development and likelihood of flood occurrence;
 - ▶ 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 Barnsley Metropolitan Borough Council (BMBC) 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 In addition to the above, this report has also been informed by the following documents:

- ▶ BMBC Local Plan
- ▶ BMBC Level 1 Strategic Flood Risk Assessment (SFRA)
- ▶ BMBC Level 2 SFRA

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 2019 technical guidance, the site is indicated as being located within Flood Zone 1, therefore it is 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 CC3 of the BMBC Local plan states that all future development must ensure that:
- 1.3.6 The extent and impact of flooding will be reduced by:
- 1.3.7 Not permitting new development where it would be at an unacceptable risk of flooding from any sources of flooding, or would give rise to flooding elsewhere;
- 1.3.8 Ensuring that in the Functional Floodplain (Flood Zone 3b), only water compatible development or essential infrastructure (subject to the flood risk exception test) will be allowed. In either case it must be demonstrated that there would not be a harmful effect on the ability of this land to store floodwater;
- 1.3.9 Requiring developers with proposals in Flood Zones 2 and 3 to provide evidence of the sequential test and exception test where appropriate;
- 1.3.10 Requiring site-specific Flood Risk Assessments (FRAs) for proposals over 1 hectare in Flood Zone 1 and all proposals in Flood Zones 2 and 3;
- 1.3.11 Expecting proposals over 1000 m² floor space or 0.4 hectares in Flood Zone 1 to demonstrate how the proposal will make a positive contribution to reducing or managing flood risk; and
- 1.3.12 Expecting all development proposals on brownfield sites to reduce surface water run-off by at least 30% and development on greenfield sites to maintain or reduce existing run-off rates requiring development proposals to use Sustainable Drainage Systems (SuDS) in accordance with policy CC4; and Using flood resilient design in areas of high flood risk.
- 1.3.13 Potential flood risk at the site has been assessed against the site layout plan, which has been provided as **Appendix A** to this report. 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 As indicated in policy CC4 surface water runoff from the site must adhere to the following:
- 1.4.5 All major development will be expected to use Sustainable Drainage Systems (SuDS) to manage surface water drainage, unless it can be demonstrated that all types of SuDS are inappropriate.
- 1.4.6 The Council will also promote the use of SuDS on minor development.
- 1.4.7 To enable the Council to determine the suitability of a proposed SuDS scheme:
- 1.4.8 Outline Planning applications must be supported by a conceptual drainage plan and SuDS design statement; and
- 1.4.9 Detailed Planning applications must be supported by a detailed drainage plan and SuDS design statement, which should contain information on how the SuDS will operate, be managed and maintained for the lifetime of the development. Copy relevant policy requirements
- 1.4.10 The Outline DS 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.
- 1.4.11 The Outline DS 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.

- 1.4.12 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 Rotary Developments Ltd to provide a Flood Risk Assessment and Drainage Strategy in support of a residential development located at Woodhead Hall Farm, Blacker Hill, Barnsley, England, S74 0QT.
- 3.1.2 The proposed development is located in the area of Hoyland, which is approximately 4 miles south of Barnsley. Proposals for the site are for 10 residential dwellings along with associated landscaping and infrastructure. A site plan has been in **Appendix A**.
- 3.1.3 The Local Planning Authority for this development is BMBC 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	Woodhead Hall Farm
Location	Barnsley
NGR (approx.)	SE 37172 02058
Application Site Area (ha)	1.4
General Locality	The site is located on previously developed farm and borders undeveloped land on all sides. Pedestrian and vehicular access to the site is provided via a private road located to the southwest of the site.
Development Type	Residential
EA Flood Zone	Flood Zone 1

EA Office

Yorkshire

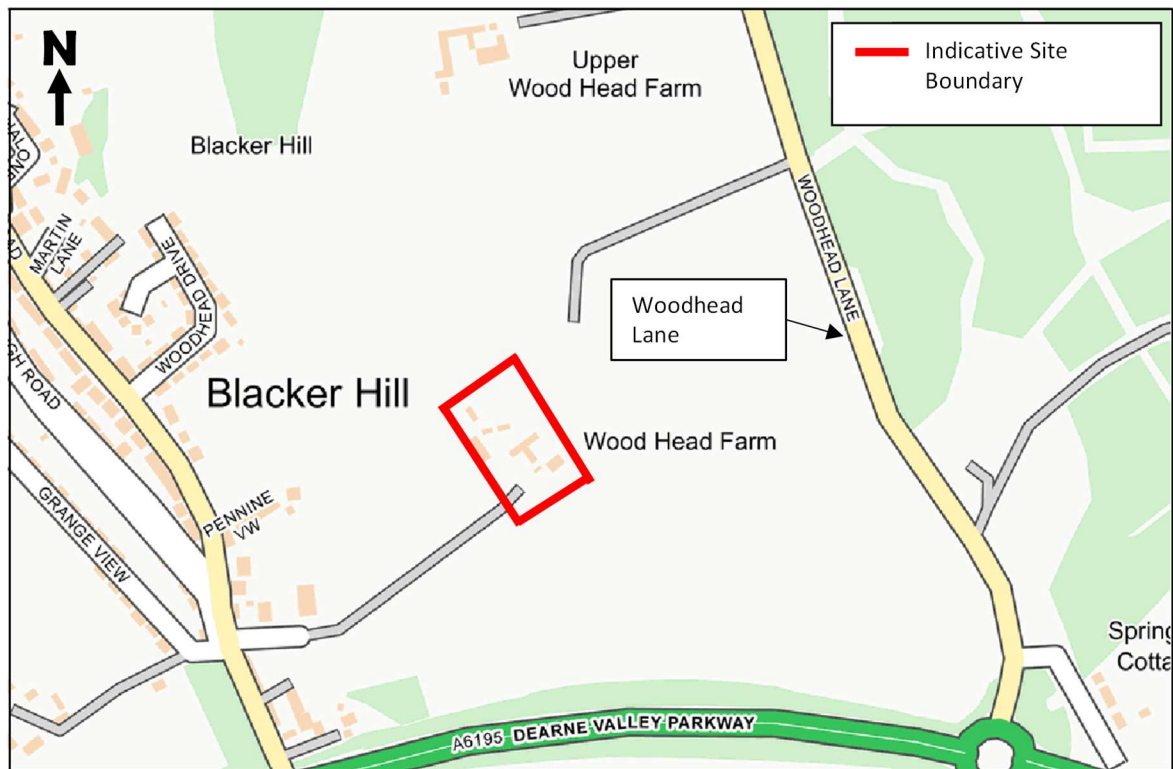


Figure 1. Site Location

3.2 CURRENT SITE CONDITIONS

Ground cover and topography

- 3.2.1 A topographic survey provided by Rotary Developments Ltd and undertaken by Walker DSP Architecture (Ref: 808) shows ground levels at the site are shown to be in the region of 140.93m to 145.0m Above Ordnance Datum (m AOD). The topographic survey can be found in **Appendix B**.
- 3.2.2 Further review of topographical data shows site levels to be lowest towards the northeast of the site with the greatest elevations found towards the northwest of the site. A general fall in gradient from west to east is observed across the site.

3.3 GEOLOGY

- 3.3.1 British Geological Survey (BGS) Open Geoscience website¹ indicates that the entire site is underlain by Woolley Edge Rock – Sandstone.
- 3.3.2 The BGS website information indicates that there is a borehole in close proximity to the site (borehole records Ref: SE30SE36); which is provided in **Appendix C**. The borehole is located approximately 200m east of the site. The borehole record show ground conditions to consist of Siltstone, which is underlain by Sandstone and Mudstone.

3.4 HYDROGEOLOGY

- 3.4.1 According to the Department for Environment, Food and Rural Affairs (DEFRA) MAGIC map², the site is not indicated as 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 high ground water vulnerability and located above a Secondary A bedrock aquifer.
- 3.4.3 Information obtained from the Cranfield University's Soilscape website³ indicates that the site is located in an area classified as being Soilscape 6, which is defined as having freely draining slightly acid loamy soils.

3.5 HYDROLOGY

- 3.5.1 As shown in Figure 2 there are no watercourses located within close proximity of the site.
- 3.5.2 The EA's Catchment Data Explorer website⁴ indicates that the site resides within the Dearne Operational catchment.

¹ Available at: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> accessed on 25/10/2022

² Available at: <https://magic.defra.gov.uk/MagicMap.aspx?startTopic>, accessed on 25/10/2022

³ Available at: <http://www.landis.org.uk/soilscales/>, accessed on 25/10/2022

⁴ Available at: <https://environment.data.gov.uk/catchment-planning/> , accessed on 25/20/2022

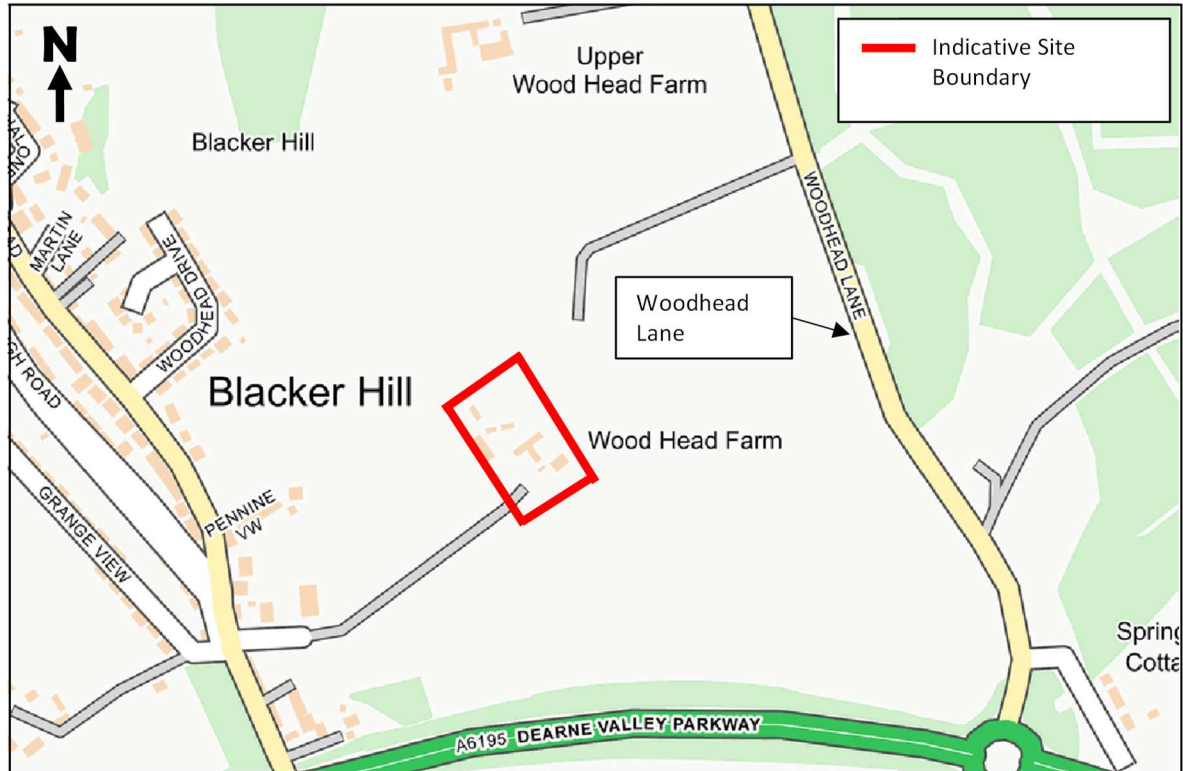


Figure 2. Watercourse Location

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 6.0.

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

4.3 FLUVIAL AND COASTAL FLOODING

- 4.3.1 The EA Long Term Flood Risk Map for fluvial and coastal flooding shown in **Figure 5** indicates that the site is at very low risk of fluvial flooding. As the site is situated 55 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. This is because there are no watercourses in close proximity to the site.

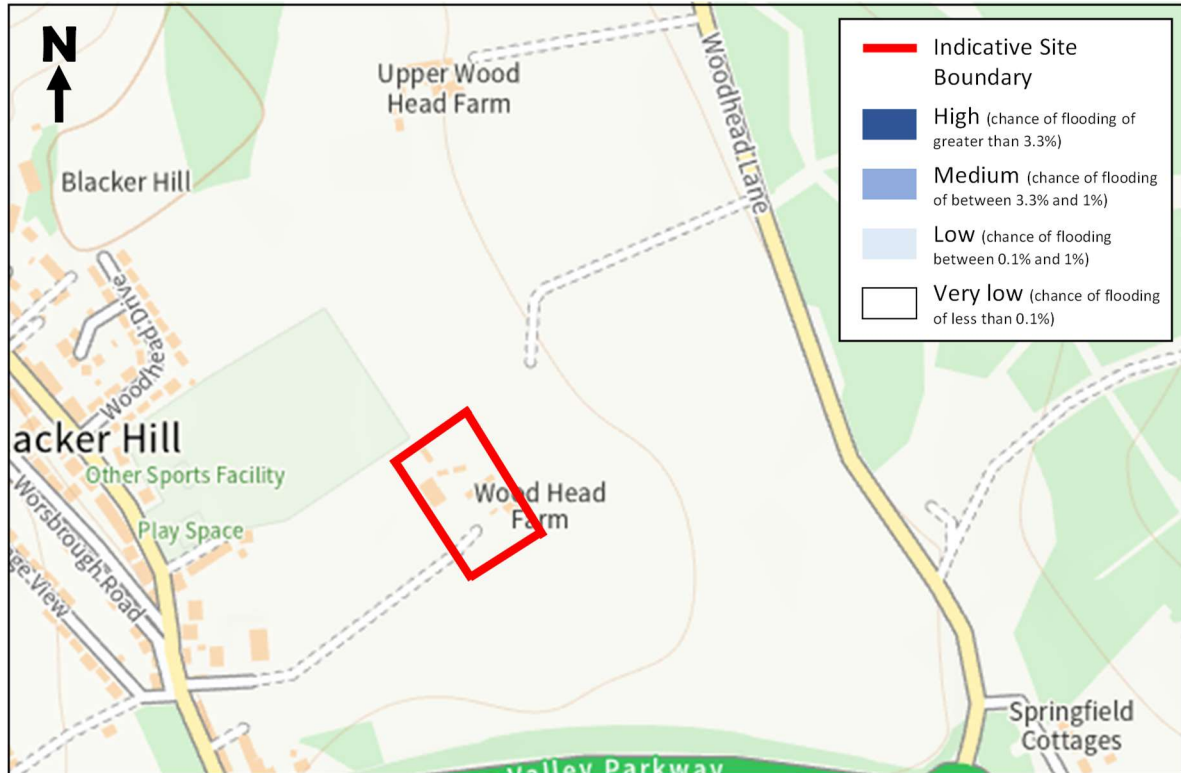


Figure 4. Environment Agency Long Term Flood Map – Rivers and Sea

4.4 PLUVIAL (SURFACE WATER) FLOODING

- 4.4.1 The EA Long Term Flood Risk Map (**Figure 6**) shows the site is located within an area at very 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.

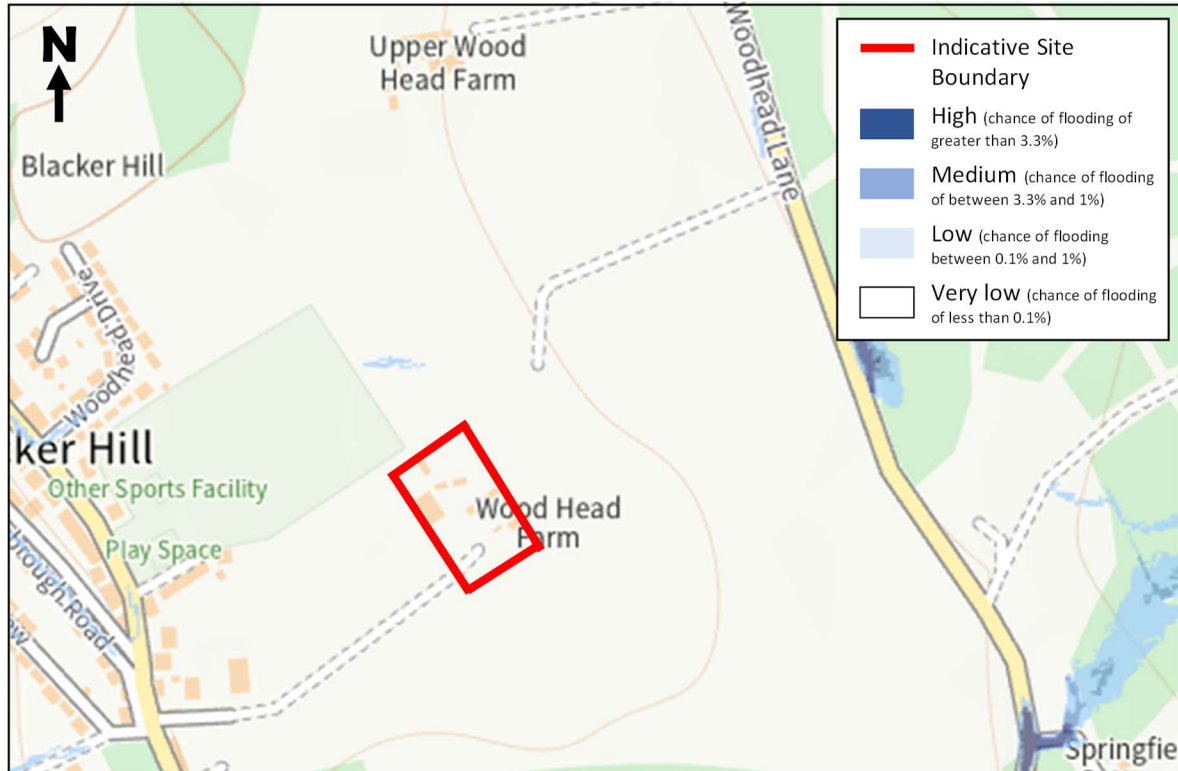


Figure 5. Environment Agency Long Term Flood Risk Map – Pluvial (Surface Water) Flooding

4.5 GROUNDWATER FLOODING

- 4.5.1 Ground conditions at the site consist of freely draining slightly acid loamy soils, therefore the propensity for ground water emergence at the site is considered to be medium.
- 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 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.

4.7 FLOODING FROM SEWERS

- 4.7.1 The site currently is a farm and does have existing drainage infrastructure within the site boundary. However according to both the client and the local SFRA the site has never experienced 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 residential dwellings, 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 is 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	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 4.0 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 brownfield. 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. It is recommended that FFL be set at 150mm.

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 D**. They state that there are no public sewers located within the site boundary. However, there are private drainage infrastructure within the site boundary which can be seen in **Appendix B**.

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 0.462 litres per second.
- 7.3.2 This figure is based on 10 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 225 mm diameter public combined sewer recorded in Grange View, at a point to the southwest of 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-DEVELOPMENT SURFACE WATER RUN-OFF

- 8.2.1 The site is approximately 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 E**.

Table 8-1. Existing Run-Off Rates

Area	Q_{BAR}	Q_1	Q_{30}	Q_{100}	Q_{200}
(Ha)	(L/S)	(l/s)	(L/S)	(L/S)	(L/S)
1.4	2.34	2.01	4.09	4.87	5.54

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 Woolley Edge Rock – Sandstone.
- 8.5.3 Information obtained from the Cranfield University's Soilscape website indicates that the site is in an area classified as being Soilscape 6, which is defined as freely draining slightly acid loamy soils.
- 8.5.4 From a desktop review of the geology and soil at the site. It is believed that infiltration would be an acceptable way of discharging surface water from the site.
- 8.5.5 To further confirm the findings of the desktop review a BRE 365 infiltration test was carried out on site. The results of the test can be found in Appendix F. The test shows that infiltration would work at location C.

8.6 WATERCOURSE

- 8.6.1 As indicated in Figure 2 of this report there are no watercourses in close proximity to the site.

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 In the Yorkshire Water Pre-Development Enquiry (**Appendix D**) they state that if other methods of surface water disposal are not viable, and shown via evidence, surface water can discharge to the public sewer and will be restricted by 30%.

8.8 PROPOSED DISCHARGE RATES

- 8.8.1 Discharge via infiltration has been shown to be viable at the site. Therefore, infiltration will be used to discharge surface water from the site via soakaways. Consequently, there is no need for a proposed discharge rate.

8.9 ATTENUATION REQUIREMENTS

- 8.9.1 As discussed earlier the site benefits from a freely draining ground conditions, therefore it is possible to use soakaways as a source of discharging surface water.
- 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). The results of these calculations can be found in **Appendix G**.
- 8.9.3 A drainage layout drawing has been provided in **Appendix H**.

Total Impermeable Area

- 8.9.4 This volume is based on using a single soakaway with no discharge limit. The details on the attenuation of the soakaway can be found in **Table 8-2** below.

Table 8-2. Attenuation Volume

Attenuation Volume

Gross area (ha)	Max Discharge (l/s)	Imp. Area (ha)	Q100+40% Volume (m ³)
0.012	N/A	0.12	81.6

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 drain surface water efficiently and sustainably, 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	✓	Desktop review of the available data indicate that infiltration would be feasible 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 could be provided if a restricted discharge is required by the LLFA.

10 SUDS MAINTENANCE PLAN

10.1 SURFACE WATER DRAINAGE MAINTENANCE AND MANAGEMENT SCHEDULE

Permeable paving

Table 10-1. Permeable paving

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 or as necessary
Remedial Actions	If ponding is occurring, joints shall be unblocked by sweeping or vacuuming the areas affected. Contaminated aggregate to be removed and replaced.	As necessary
	Remove any vegetation growing in the joints or treat with a glyphosate-based weed killer.	As necessary
Monitoring	Inspect all inlets/outlets and upstream drainage system to ensure they are in good condition and operating as designed	Annually

Geo-Cellular soakaway system

Table 10-2. Geo-Cellular soakaway system

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	Annually, or as required
Remedial Actions	Repair inlets/outlets/vents/overflows	Annually, or as required
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, or as necessary

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 use infiltration.
- 11.1.4 Surface water disposal through infiltration has been shown to work via a BRE 365 infiltration test on site to confirm the ground conditions could support infiltration.
- 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 should not be required as the means of surface water disposal is through infiltration. Furthermore, there will be no need for a discharge limit.
- 11.1.7 There is a formal point of connection into a YW public foul water sewer in close proximity to the site. Foul water domestic waste can discharge to the 225 mm diameter public combined sewer recorded in Grange View, at a point to the southwest of the site.

12 LIMITATIONS

12.1 LIMITATIONS

- 12.1.1 This report has been prepared for exclusive use by Rotary Developments Ltd 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 – BGS BOREHOLE RECORDS

APPENDIX D – YORKSHIRE WATER PRE-DEVELOPMENT ENQUIRY

APPENDIX E – UK SUDS GREENFIELD RUN OFF RATES

APPENDIX F – INFILTRATION TEST REPORT

APPENDIX G – CAUSEWAY SOAKAWAY RESULTS

APPENDIX H – DRAINAGE LAYOUT DRAWING

Appendix A

PROPOSED SITE LAYOUT



Proposed Block Plan Scale 1:200

CDM REGULATIONS

Safety, Health + Environmental Information

In addition to the hazards / risks typically associated with the types of work detailed on this drawing, please NOTE the following advisory statements. Notes may relate to CONSTRUCTION, MAINTENANCE + CLEANING, and / or DEMOLITION; however this list is not exhaustive.

rev	description	date	dr by	app by

It is assumed that all works are to be carried out by a competent contractor working, where appropriate to an approved method statement.

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Cease all construction work immediately if any protected species is suspected to be present within an existing building or new development site. A qualified ecologist must be consulted to carry out the relevant survey and provide mitigation advice prior to (re)commencing construction.

- Notional property entrances
- Existing stone walls
- New garden wall type 1: Drystone
- New estate fence
- Cobble kerb / stone sets
- Paving 1: Stone flags
- Paving 2: Block
- Existing track / cleared historic floor surface
- New gravel
- Soft landscaping planting
- Grass

- Trees retained
- Trees / Vegetation removed
- New trees

rev	description	date	dr by	app by
original by	--	04.05.22		MW

PLANNING

Walker Dsp Architects

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Tel: +44(0)1904 659900
www.walkerdsp.com

client

project

Woodhead Hall Farm
Hoyland
Barnsley, S74 9SX

drawing title

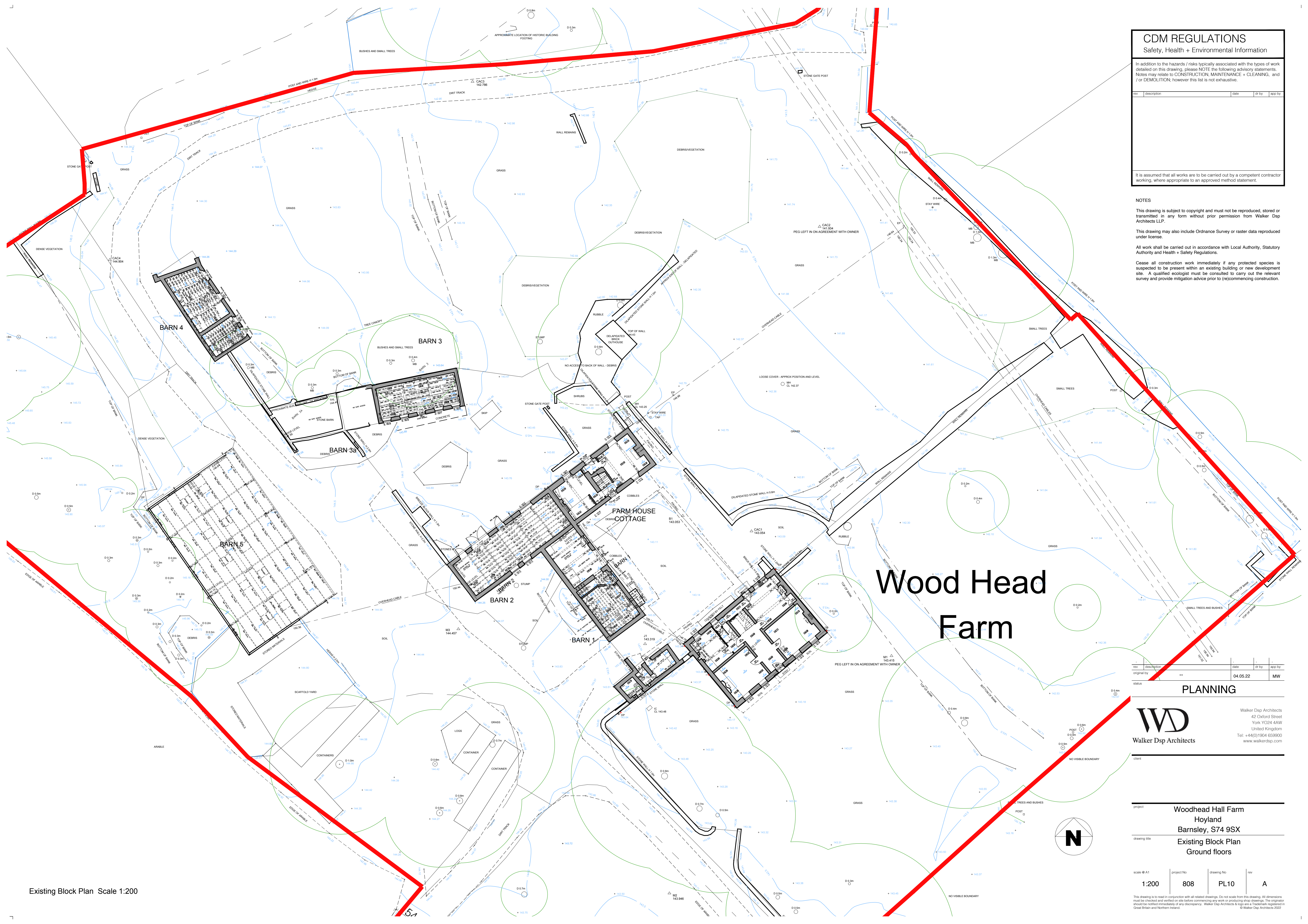
Proposed Block Plan
Ground floor plans

scale @ A1	project No	drawing No	rev
1:200	808	PL110	E

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Appendix B

TOPOGRAPHIC SURVEY



CDM REGULATIONS

Safety, Health + Environmental Information

In addition to the hazards / risks typically associated with the types of work detailed on this drawing, please NOTE the following advisory statements. Notes may relate to CONSTRUCTION, MAINTENANCE + CLEANING, and / or DEMOLITION; however this list is not exhaustive.

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Wood Head Farm

rev	description	date	dr by	app by

status: PLANNING



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client:

project: Woodhead Hall Farm
Hoyland
Barnsley, S74 9SX

drawing title: Existing Block Plan
Ground floors

scale	project No	drawing No	rev
1:200	808	PL10	A

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Existing Block Plan Scale 1:200

Appendix C

BGS BOREHOLE RECORDS



British
Geological
Survey

Version 2.0.6.6

BGS ID: 84472 : BGS Reference: SE30SE36
British National Grid (27700) : 437342,402116

[Report an issue with this borehole](#)

<<

< Prev

Page 1 of 2 ▾

Next >

>>

FORM P 70
SERIES 680

Section of ROCKINGHAM COLLIERY -

No. 10 Underground Borehole

Purpose To prove the strata below the Low Fenton Seam

Exact Site O.S. N.G.R. SE/37342/02116

Level at which ~~shaft~~ bore commenced relative to O.D. 917.9 ~~metres~~ ft*

Date of sinking or boring December 1976

Sinker or borer N.C.B.

Cores, other than coal, examined by R. I. Jeffery.

6-INCH MAP	B/H REGD. No.
Yorks. 283 NW (County, Sheet and Qtr.)	
SE 30 SE / 36 (Nat. Grid, Sheet & Qtr.)	
Attach tracing from a map or sketch map if possible	

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH	
		m-ft*	cm-in*	m-ft*	cm-in*
	Fine grey siltstone-seatearth		8		8
	Compact grey silty mudstone-seatearth		10	1	6
	Fine grey siltstone-seatearth, fine sandy laminae in middle	1	1	2	7
	Pale grey sandstone, well cemented	2	11	5	6
	Very fine grained grey siltstone	1	0	6	6
	Grey siltstone		9	7	3
	Interlaminated sands and silts		7	7	10
	Pale grey sandstone, numerous dark grey micaceous partings		6	8	4
	Grey silty mudstone		10	9	2
	Fine grey siltstone		5	9	7
	Grey silty mudstone	1	9	11	4
	Very hard well cemented, fine grained sandstone		10	12	2
	Very hard well cemented grey sandstone	3	6	15	8
	Grey siltstone, fine sandy laminae, ripple bedded		9	16	5
	Fine grey siltstone		5	16	10
	Grey silty mudstone	5	8	22	6
	Pale grey sandstone, numerous dark grey micaceous partings		7	23	1
	Interlaminated sands and silts		7	23	8
	Grey siltstone		11	24	7
	Interlaminated sands and silts, contorted bedding		6	25	1
	Pale grey sandstone, well cemented		7	25	8
	Grey siltstone, fine sandy laminae near base	1	5	27	1
	Pale grey sandstone, banded near top	2	10	29	11
	Fine grey siltstone	1	8	31	7
	Interlaminated silts and sands		7½	32	2½
	Pale grey sandstone, banded in parts	1	4½	33	7
	Grey mudstone		11	34	6
	Grey silty mudstone	4	4	38	10
	Fine grey siltstone	1	2	40	0
	Dark grey mudstone	5	3	45	3
	Very dark grey mudstone		3	45	6
	COAL (broken core)	1	6	47	0
	Dark grey mudstone-seatearth, rootlets, coal streaks	2	3	49	3
	LOST CORE		9	50	0
	Black carbonaceous mudstone-seatearth		5	50	5
	COAL	3	11	54	4
			1	54	8

PARKGATE RIDER

FARRGATE	}	Dirt		7	55	4
		COAL		8	55	4
		Black carbonaceous shaly mudstone-seatearth		9	56	1
		Dark grey mudstone-seatearth		3	56	4
		Grey mudstone-seatearth	1	2	57	6
British Geological Survey						

Appendix D

YORKSHIRE WATER PRE DEVELOPMENT ENQUIRY



YorkshireWater

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

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

Tel: 0345 120 8482
Fax:

Your Ref:
Our Ref: Y012808

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
George Mullaney on 0345 120 8482

14th October 2022

Dear Mr Yesudian,

Woodhead Hall Farm, Blacker Hill, Barnsley, S74 0QT - Pre-Planning Enquiry U797490

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:

Foul Water

Development of the site should take place with separate systems for foul and surface water drainage. The separate system should preferably extend to the public sewer.

Foul water domestic waste can discharge to the 225 mm diameter public combined sewer recorded in Grange View, at a point to the southwest 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.

If other methods of surface water disposal are not viable and subject to providing satisfactory evidence as to why they have been discounted, curtilage surface water discharges to the public sewer will be restricted to the level of run-off – i.e. same rate of discharge – to that from the existing use of the site less a 30% reduction in the existing discharge. Any discharge of surface water from the site should discharge to similar points of connection to that of the existing use of the site. You will need to demonstrate positive drainage, based on a 1 in 1 year storm, to the public sewer to Yorkshire Water by means of investigation and calculation carried out at your expense.

To do this, Yorkshire Water requires to see existing and proposed drainage layouts with pipe sizes, gradients, gullies, downpipes and connection points, measured impermeable areas of the present and proposed use of the site, along with the calculations that show the existing and proposed discharge rate from the site to the public sewer.

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



YorkshireWater

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 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

Appendix E

UK SUDS GREENFIELD RUN OFF RATES



Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Aaron Yesudian

Site name: Woodhead Hall Farm

Site location: Hoyland

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: 53.51411° N

Longitude: 1.44084° W

Reference: 256228481

Date: Oct 28 2022 11:16

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.4

Methodology

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

SPR estimation method: Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	650	650
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):	2.34	2.34
1 in 1 year (l/s):	2.01	2.01
1 in 30 years (l/s):	4.09	4.09
1 in 100 year (l/s):	4.87	4.87
1 in 200 years (l/s):	5.54	5.54

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix F

INFILTRATION TEST REPORT



PERCOLATION TEST

WOODHEAD HALL FARM
BARNSELY

OCTOBER 2022

Percolation Test Report

WOODHEAD HALL FARM
BARNSELY

Rotary Developments Ltd

Confidential

Project no: 21230

Date: 24.10.22

Andrew Moseley Associates

51A St Paul's Street

Leeds, LS1 2TE

www.amatp.co.uk

Q U A L I T Y M A N A G E M E N T

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	DRAFT			
Date	24.10.22			
Prepared by	A Allenby			
Checked by	T Moorhouse			
Authorised by	T Moorhouse			

1 TESTING REPORT

The Percolation Testing was carried out on site on 8th October 2022 to establish if infiltration methods were going to be a suitable solution for draining the site.

3 Trial Holes were formed with the following dimensions; Test Pit 1 2000mm x 600mm x 2000mm deep.

The water level drop was monitored and recorded (see **Appendix A**)

For Test Pit 1, test 1, the hole was filled to a depth of 1920mm and dropped to a depth of 1310mm within a 3 hour period.

For Test Pit 1, test 2, the hole was filled to a depth of 1920mm and dropped to a depth of 1380mm within a 3 hour period.

For Test Pit 2, test 1, the hole was filled to a depth of 1960mm and dropped to a depth of 150mm within a 3 hour period.

For Test Pit 2, test 2, the hole was filled to a depth of 1960mm and dropped to a depth of 150mm within a 3 hour period.

For Test Pit 2, test 3, the hole was filled to a depth of 1960mm and dropped to a depth of 130mm within a 3 hour period.

For Test Pit 3, test 1, the hole was filled to a depth of 1720mm and dropped to a depth of 480mm within a 3 hour period.

For Test Pit 3, test 2, the hole was filled to a depth of 1720mm and dropped to a depth of 800mm within a 3 hour period.

For Test Pit 3, test 3, the hole was filled to a depth of 1720mm and dropped to a depth of 890mm within a 3 hour period.

Infiltration rates have been calculated and are shown in **Appendix B**.

Appendix B shows that the infiltration rates are suitable at the location of Test Pit 2 and 3, and do satisfy BRE 365 requirements. Therefore, Infiltration methods of drainage will be viable for this site and strategy, given the soakaway is located near Test Pit 2 and 3, preferably Test Pit 2 given this produced the best infiltration rate.

2 TESTING METHOD

The test pits 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.

Site Location	Woodhead Farm
Date of Test	08/10/2022
Weather Conditions	Dry - Cloudy
Engineer Name	Jack Elliott

APPENDICES

[Appendix A – Percolation results](#)

[Appendix B – Infiltration rate calculation](#)

APPENDICES

Appendix A

Percolation results

PERCOLATION TEST FORM

METHOD (from BRE Digest 365)

- Excavate a soakage trial 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.

DETAILS

Site Location	WOODHEAD FARM
Date of Test	8/10/22
Weather Conditions	DRY - CLOUDY
Engineer Name	JACK ELLIOTT.

PERCOLATION TEST FORM

SIZE OF PIT 1

Length	Width	Depth
2000 mm	600 mm	2000 mm

TEST PIT 1 - RESULTS

Time (mins)	Dip (mm)	Time (mins)	Dip (mm)	Time (mins)	Dip (mm)
0	80	0	80	0	
5	160	5	140	5	
10	230	10	190	10	
15	245	15	220	15	
20	265	20	240	20	
25	300	25	280	25	
30	320	30	315	30	
35	340	35	330	35	
40	375	40	375	40	
45	400	45	390	45	
50	430	50	415	50	
55	450	55	440	55	
60	475	60	485	60	
90	535	90	520	90	
120	610	120	590	120	
180	690	180	620	180	

PERCOLATION TEST FORM

SIZE OF PIT 2

Length	Width	Depth
2000 mm	600 mm	2000 mm

TEST PIT 2 - RESULTS

Time (mins)	Dip (mm)	Time (mins)	Dip (mm)	Time (mins)	Dip (mm)
0	40	0	40	0	40
5	300	5	310	5	300
10	850	10	540	10	540
15	750	15	750	15	720
20	930	20	920	20	925
25	1010	25	1000	25	1000
30	1120	30	1110	30	1110
35	1220	35	1200	35	1210
40	1320	40	1300	40	1300
45	1400	45	1400	45	1390
50	1480	50	1475	50	1470
55	1580	55	1570	55	1575
60	1600	60	1600	60	1610
90	1720	90	1750	90	1730
120	1790	120	1800	120	1795
180	1850	180	1900	180	1870

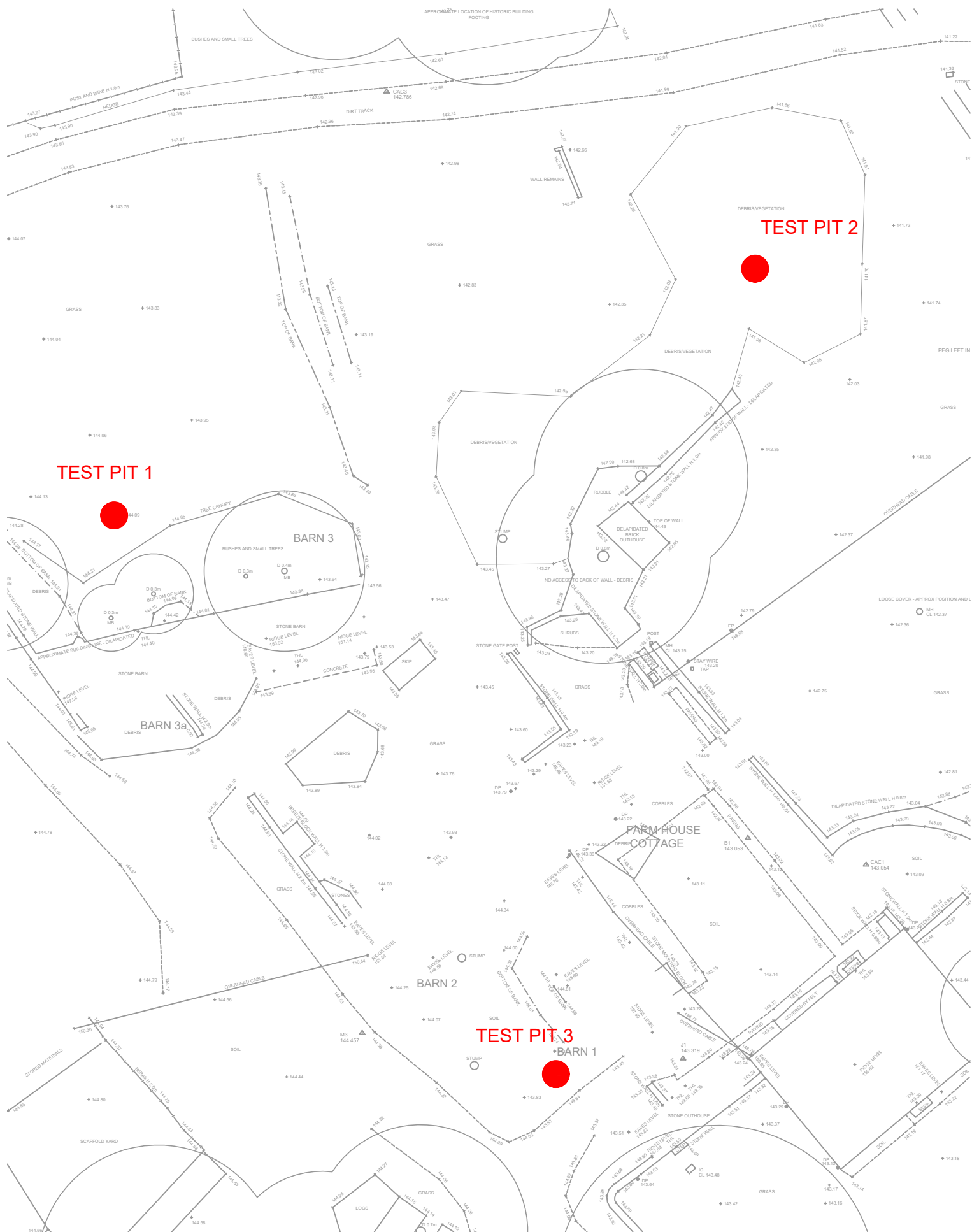
PERCOLATION TEST FORM

SIZE OF PIT 3

Length	Width	Depth
2000 mm	600 mm	1800 mm

TEST PIT 3 - RESULTS

Time (mins)	Dip (mm)	Time (mins)	Dip (mm)	Time (mins)	Dip (mm)
0	80	0	80	0	80
5	200	5	180	5	175
10	290	10	270	10	260
15	340	15	300	15	290
20	420	20	350	20	330
25	500	25	400	25	390
30	570	30	440	30	425
35	610	35	480	35	460
40	690	40	510	40	490
45	740	45	525	45	510
50	790	50	590	50	540
55	830	55	630	55	600
60	890	60	660	60	630
90	1010	90	800	90	750
120	1200	120	890	120	850
180	1320	180	1000	180	910



Appendix B

Infiltration rate calculation

Site Name: Woodhead Hall Farm, Barnsley

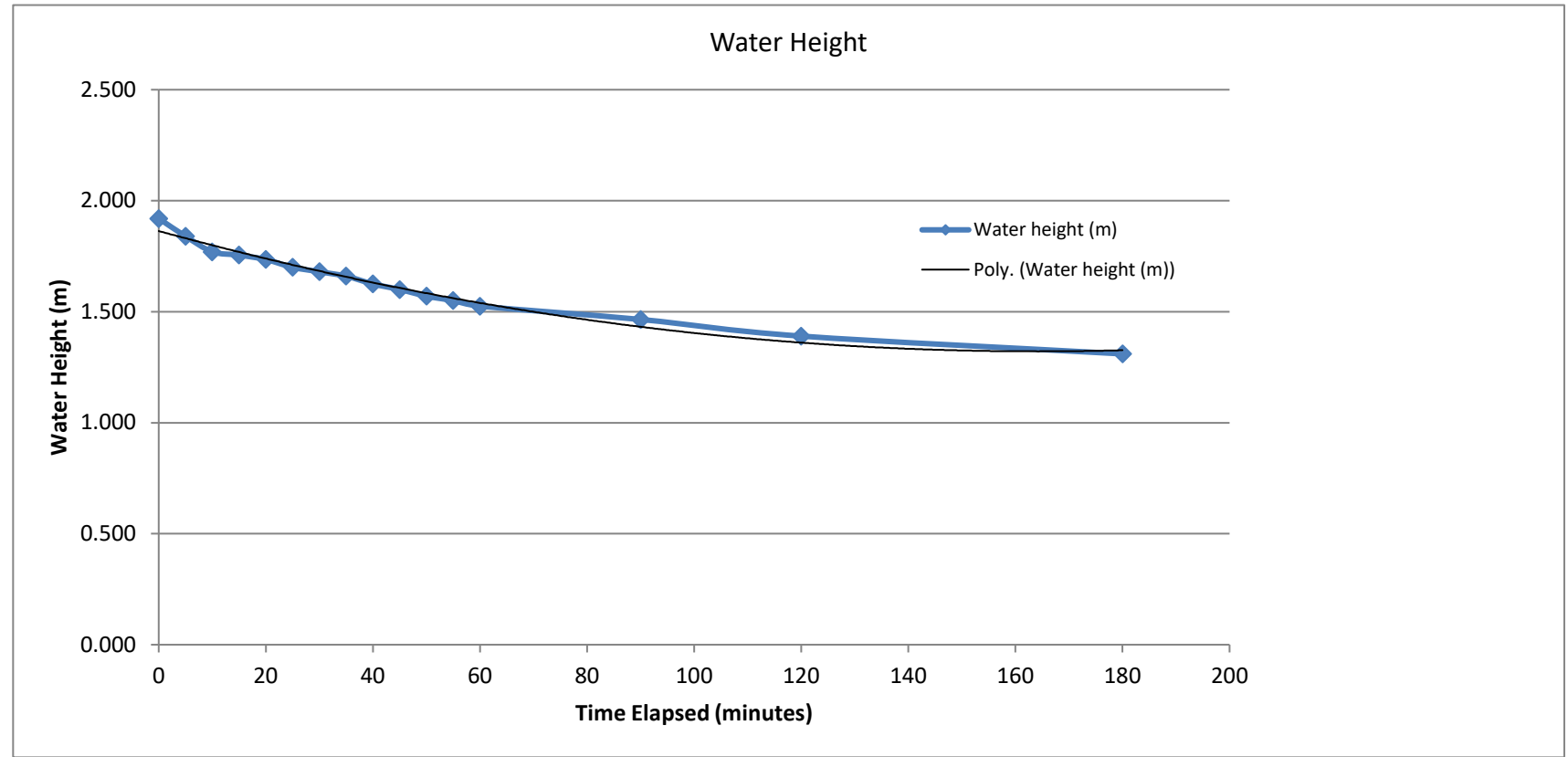
Soakaway Test Data

Pit no: 01 Test no: 01

Real Time	Time elapsed (days hh:mm)	Time elapsed (minutes)	Depth to Water (m)	Water Height	Comment
		0	0.080	1.920	
		5	0.160	1.840	
		10	0.230	1.770	
		15	0.245	1.755	
		20	0.265	1.735	
		25	0.300	1.700	
		30	0.320	1.680	
		35	0.340	1.660	
		40	0.375	1.625	
		45	0.400	1.600	
		50	0.430	1.570	
		55	0.450	1.550	
		60	0.475	1.525	
		90	0.535	1.465	75%
		120	0.610	1.390	
		180	0.690	1.310	
		388		0.500	25% (Extrapolated)

Total depth	2.00
H (m)	2.00
H _{75%} (m)	1.50
H _{50%} (m)	1.00
H _{25%} (m)	0.50

Site Name: Woodhead Hall Farm, Barnsley



A _{P50}	
Side (Square)	9.984
Base	1.2
A_{P50}	9.585

Square Section	
Length	2.000
Width	0.600
Height	2.000
water height	1.920

V_{p75-25}	1.158
---------------------------	--------------

t _{p75}	5400	seconds
t _{p25}	23271	
t_{p75-25}	17871	

Soil infiltration rate, f (m/s)	6.76E-06
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Site Name: Woodhead Hall Farm, Barnsley

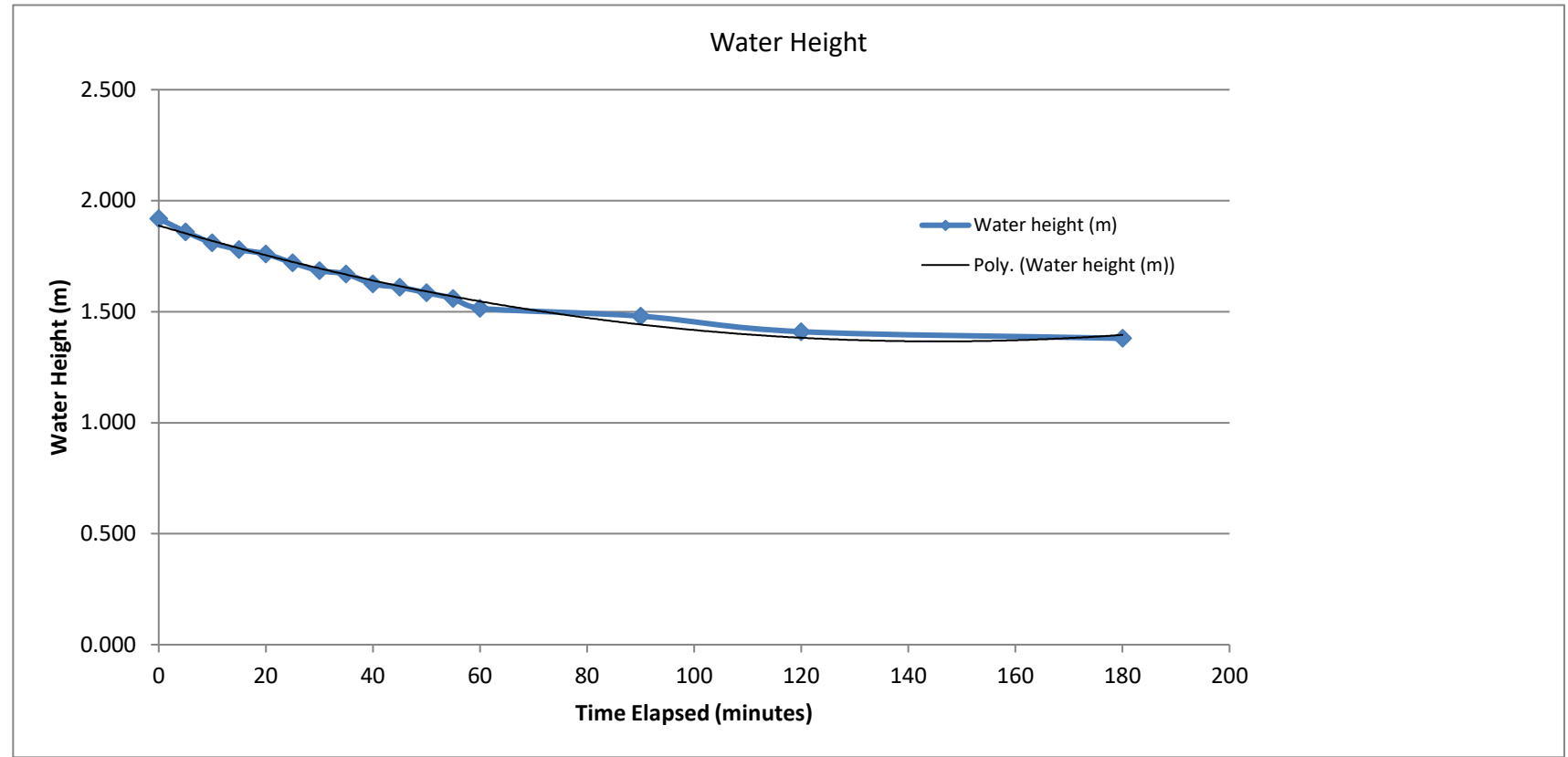
Soakaway Test Data

Pit no: **01** Test no: **02**

Real Time	Time elapsed (days hh:mm)	Time elapsed (minutes)	Depth to Water (m)	Water Height	Comment
		0	0.080	1.920	
		5	0.140	1.860	
		10	0.190	1.810	
		15	0.220	1.780	
		20	0.240	1.760	
		25	0.280	1.720	
		30	0.315	1.685	
		35	0.330	1.670	
		40	0.375	1.625	
		45	0.390	1.610	
		50	0.415	1.585	
		55	0.440	1.560	
		60	0.485	1.515	
		90	0.520	1.480	75%
		120	0.590	1.410	
		180	0.620	1.380	
		385		0.500	25% (Extrapolated)

Total depth	2.00
H (m)	2.00
H _{75%} (m)	1.50
H _{50%} (m)	1.00
H _{25%} (m)	0.50

Site Name: Woodhead Hall Farm, Barnsley



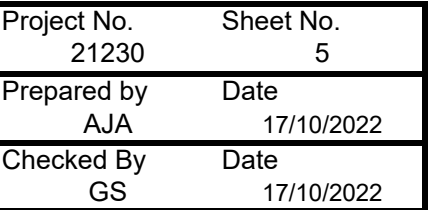
A _{P50}	
Side (Square)	9.984
Base	1.2
A_{P50}	9.585

Square Section	
Length	2.000
Width	0.600
Height	2.000
water height	1.920

V_{p75-25}	1.176
---------------------------	--------------

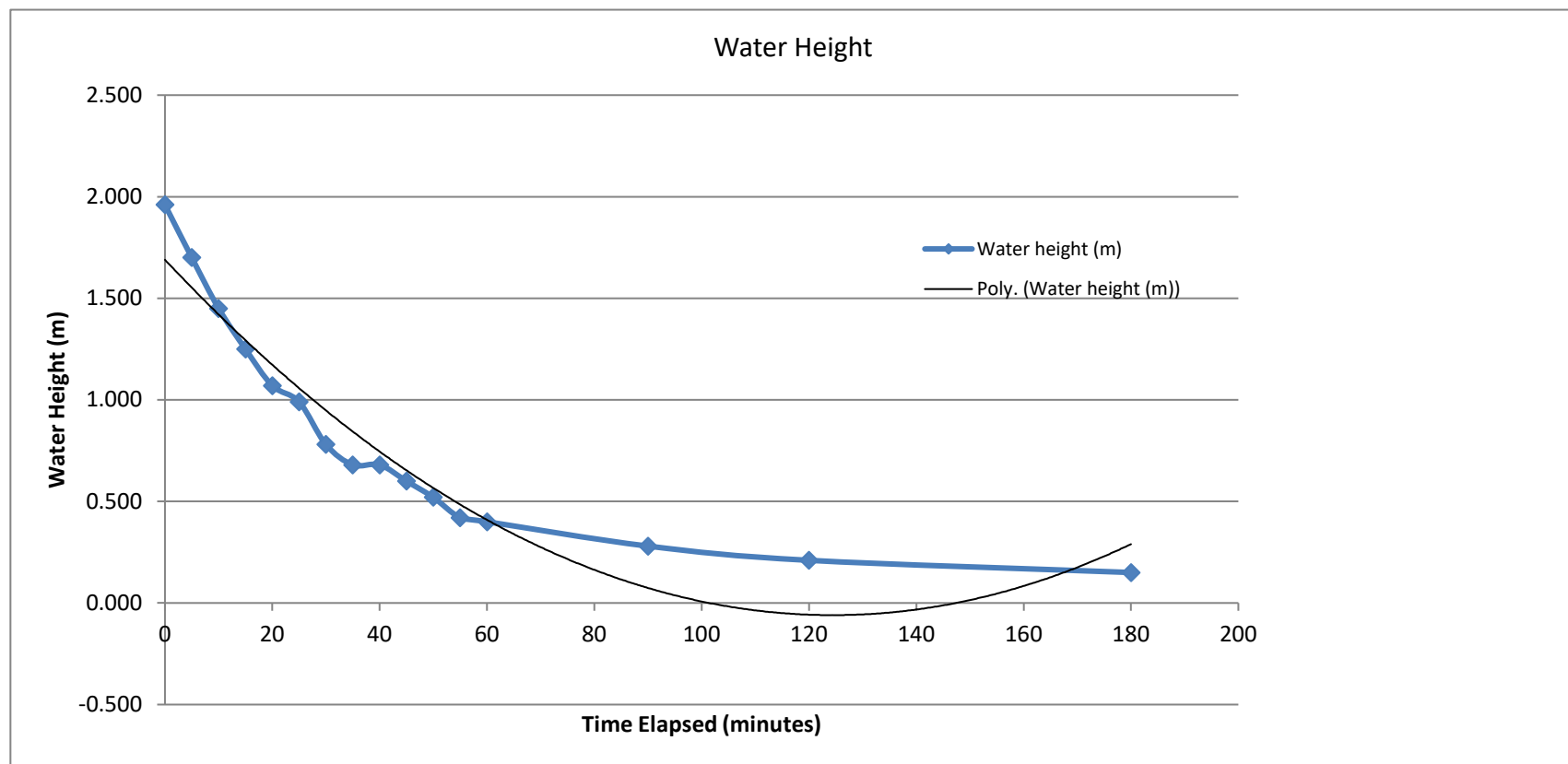
t _{p75}	5400	seconds
t _{p25}	23106	
t_{p75-25}	17706	

Soil infiltration rate, f (m/s)	6.93E-06
------------------------------------	----------



Total depth	2.00
H (m)	2.00
H _{75%} (m)	1.50
H _{50%} (m)	1.00
H _{25%} (m)	0.50

Site Name: Woodhead Hall Farm, Barnsley



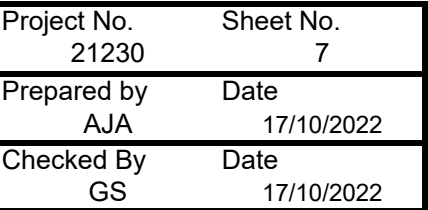
A_{P50}	
Side (Square)	10.192
Base	1.2
A_{P50}	9.988

Square Section	
Length	2.000
Width	0.600
Height	2.000
water height	1.960

V_{p75-25}	1.236
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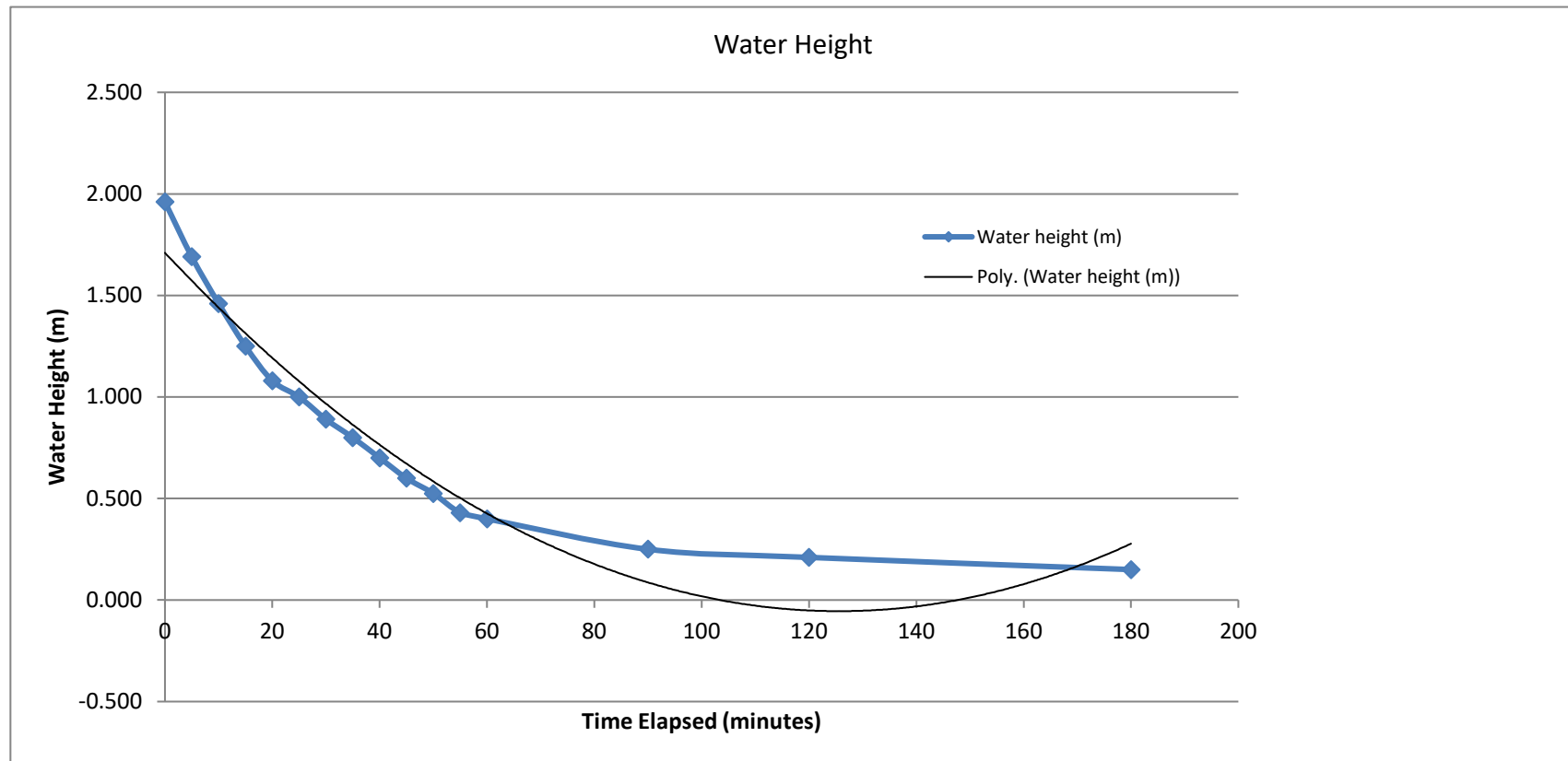
t_{p75}	600
t_{p25}	3300
t_{p75-25}	2700

Soil infiltration rate, f (m/s)	4.58E-05
--------------------------------------	----------



Total depth	2.00
H (m)	2.00
H _{75%} (m)	1.50
H _{50%} (m)	1.00
H _{25%} (m)	0.50

Site Name: Woodhead Hall Farm, Barnsley



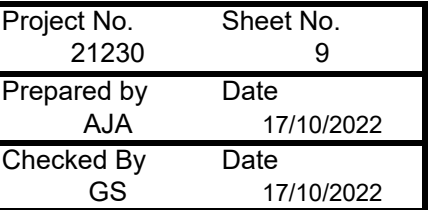
A_{P50}	
Side (Square)	10.192
Base	1.2
A_{P50}	9.988

Square Section	
Length	2.000
Width	0.600
Height	2.000
water height	1.960

V_{p75-25}	1.236
--------------------------------	--------------

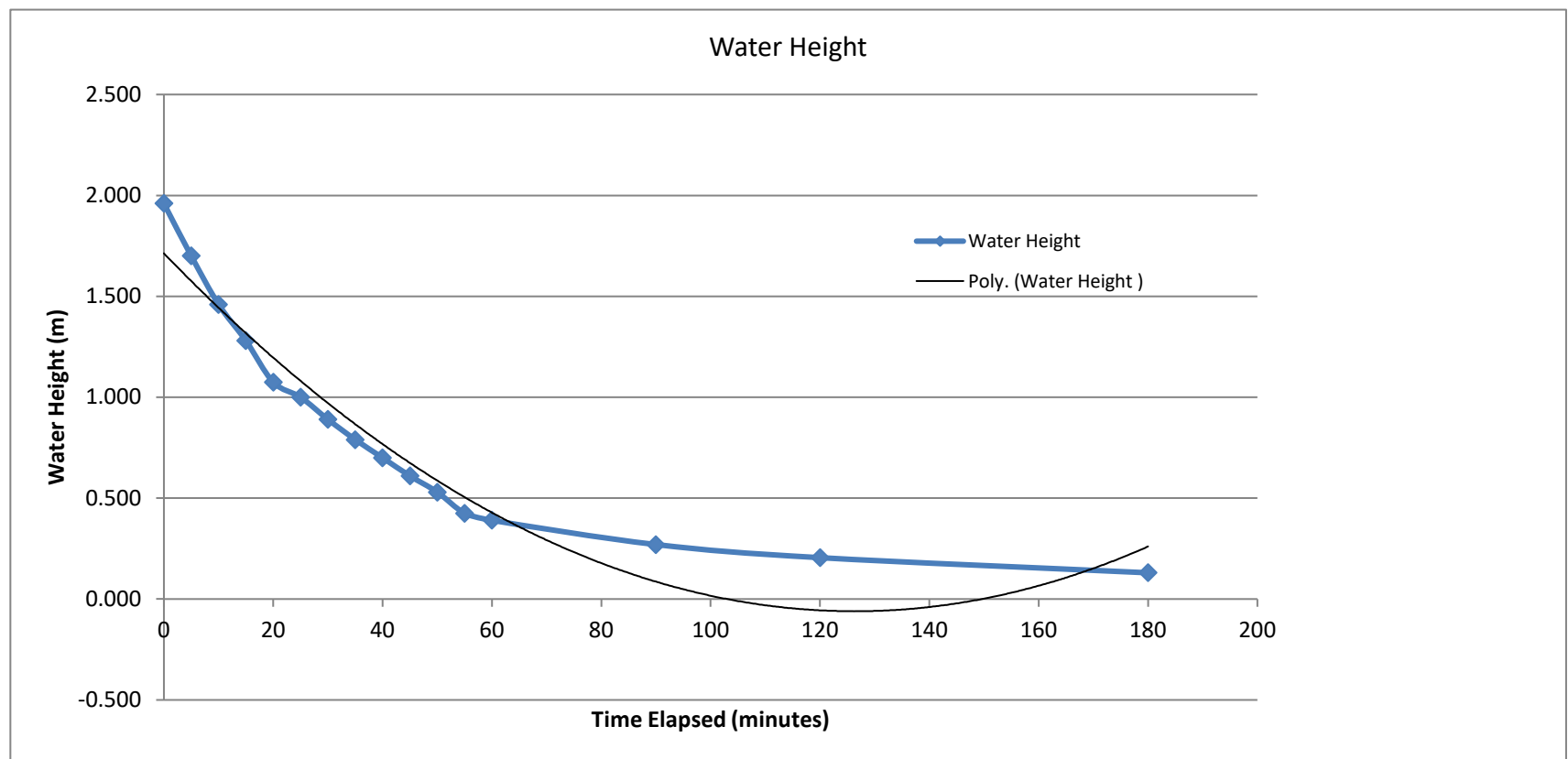
t_{p75}	600
t_{p25}	3300
t_{p75-25}	2700

Soil infiltration rate, f (m/s)	4.58E-05
--------------------------------------	----------



Total depth	2.00
H (m)	2.00
H _{75%} (m)	1.50
H _{50%} (m)	1.00
H _{25%} (m)	0.50

Site Name: Woodhead Hall Farm, Barnsley



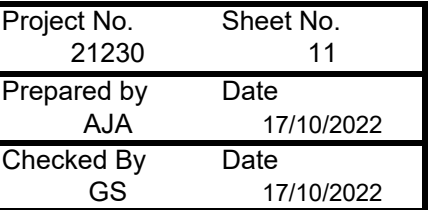
A_{P50}	
Side (Square)	10.192
Base	1.2
A_{P50}	9.988

Square Section	
Length	2.000
Width	0.600
Height	2.000
water height	1.960

V_{p75-25}	1.242
--------------------------------	--------------

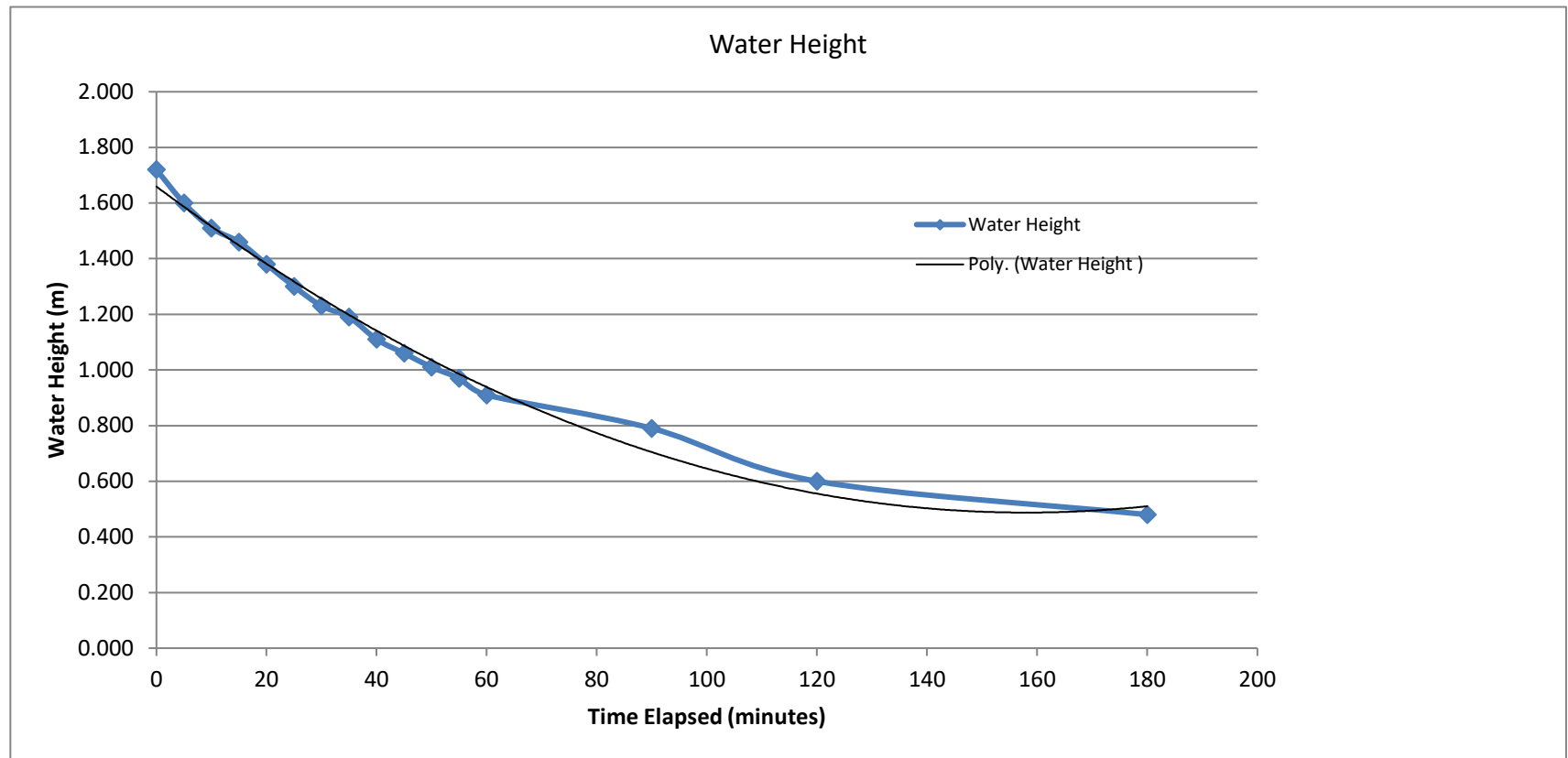
t_{p75}	600
t_{p25}	3300
t_{p75-25}	2700

Soil infiltration rate, f (m/s)	4.61E-05
--------------------------------------	----------



Total depth	1.80
H (m)	1.80
H _{75%} (m)	1.35
H _{50%} (m)	0.90
H _{25%} (m)	0.45

Site Name: Woodhead Hall Farm, Barnsley



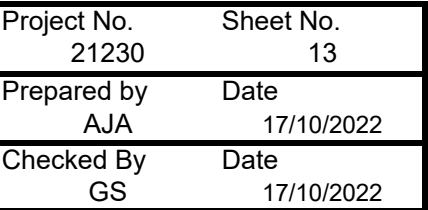
A_{P50}	
Side (Square)	8.944
Base	1.2
A_{P50}	7.692

Square Section	
Length	2.000
Width	0.600
Height	1.800
water height	1.720

V_{p75-25}	1.080
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t_{p75}	1200
t_{p25}	10800
t_{p75-25}	9600

Soil infiltration rate, f (m/s)	1.46E-05
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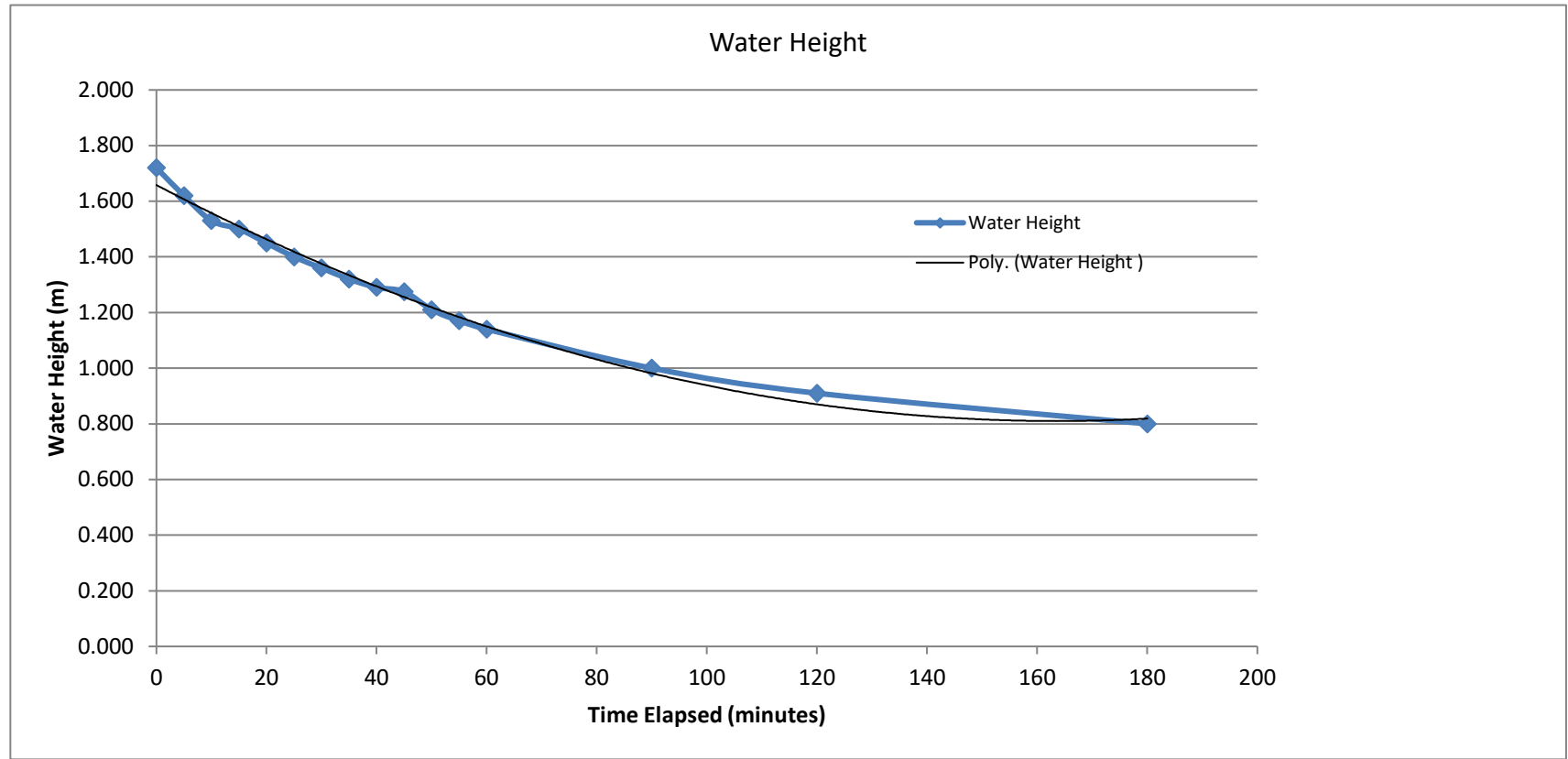


Soakaway Test Data

Pit no: **03** Test no: **02**[illegible]

Total depth	1.80
H (m)	1.80
H _{75%} (m)	1.35
H _{50%} (m)	0.90
H _{25%} (m)	0.45

Site Name: Woodhead Hall Farm, Barnsley



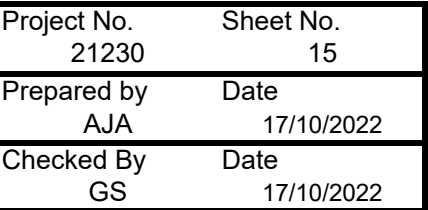
A _{P50}	
Side (Square)	8.944
Base	1.2
A_{P50}	7.692

Square Section	
Length	2.000
Width	0.600
Height	1.800
water height	1.720

V_{p75-25}	1.104
---------------------------	--------------

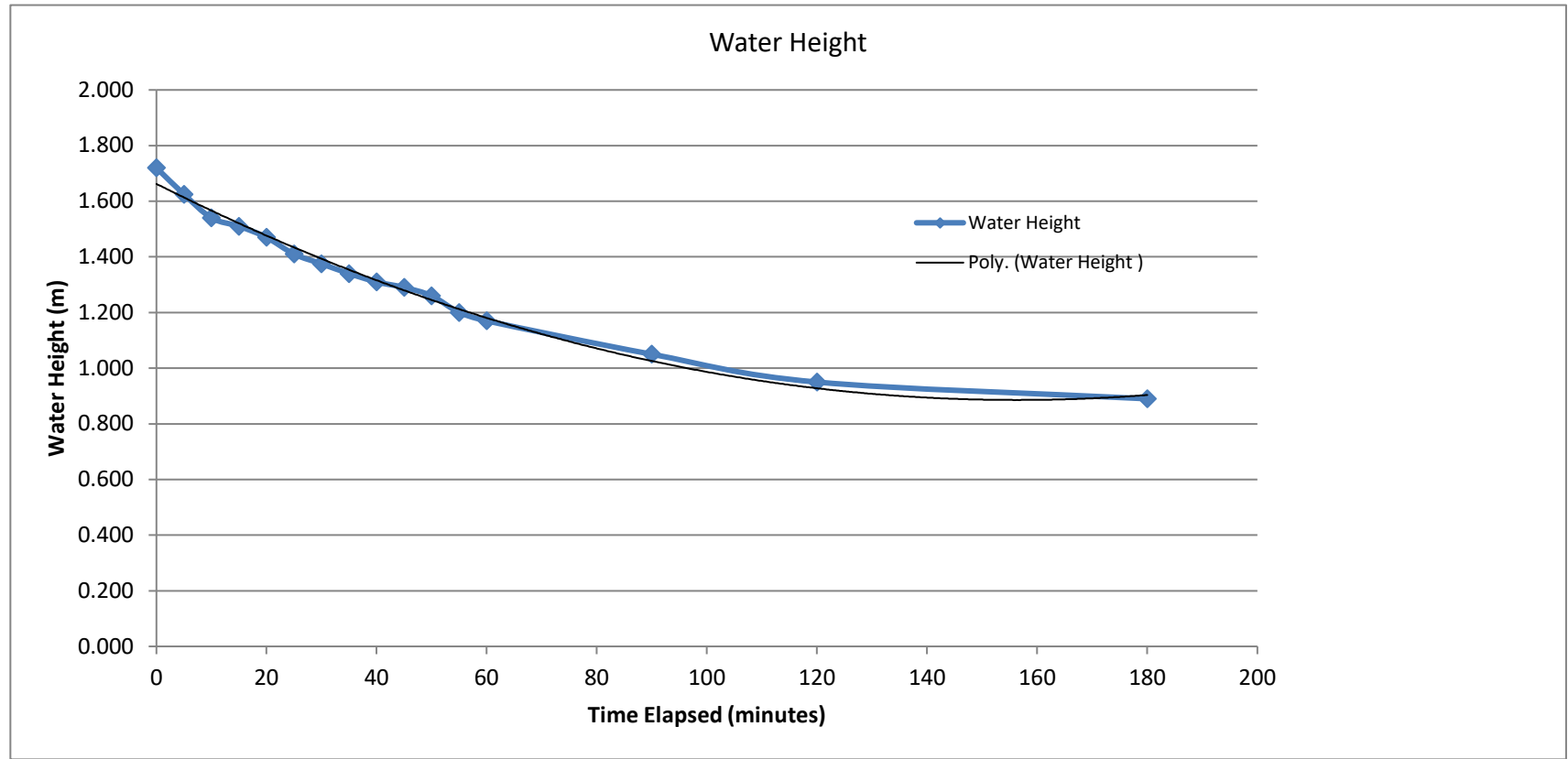
t _{p75}	0
t _{p25}	10800
t_{p75-25}	10800

Soil infiltration rate, f (m/s)	1.33E-05
------------------------------------	----------



Total depth	1.80
H (m)	1.80
H _{75%} (m)	1.35
H _{50%} (m)	0.90
H _{25%} (m)	0.45

Site Name: Woodhead Hall Farm, Barnsley



A _{P50}	
Side (Square)	8.944
Base	1.2
A_{P50}	7.692

Square Section	
Length	2.000
Width	0.600
Height	1.800
water height	1.720

V_{p75-25}	1.068
---------------------------	--------------

t _{p75}	2100
t _{p25}	16500
t_{p75-25}	14400

Soil infiltration rate, f (m/s)	9.64E-06
------------------------------------	----------



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Appendix G

CAUSEWAY SOAKAWAY RESULTS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	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	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Soakaway	0.121	6.00	142.000	1200	2.000

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	0.300	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
2	0	0	0
30	0	0	0

Node Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.16488	Safety Factor	2.0	Invert Level (m)	140.000
Side Inf Coefficient (m/hr)	0.16488	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	70.0	0.0	1.200	70.0	0.0	1.201	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
1440 minute winter	Soakaway	1440	140.601	0.601	1.2	41.3998	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)
15 minute summer	Soakaway	Infiltration	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
1440 minute winter	Soakaway	1440	140.716	0.716	1.4	49.3197	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)
15 minute summer	Soakaway	Infiltration	0.0

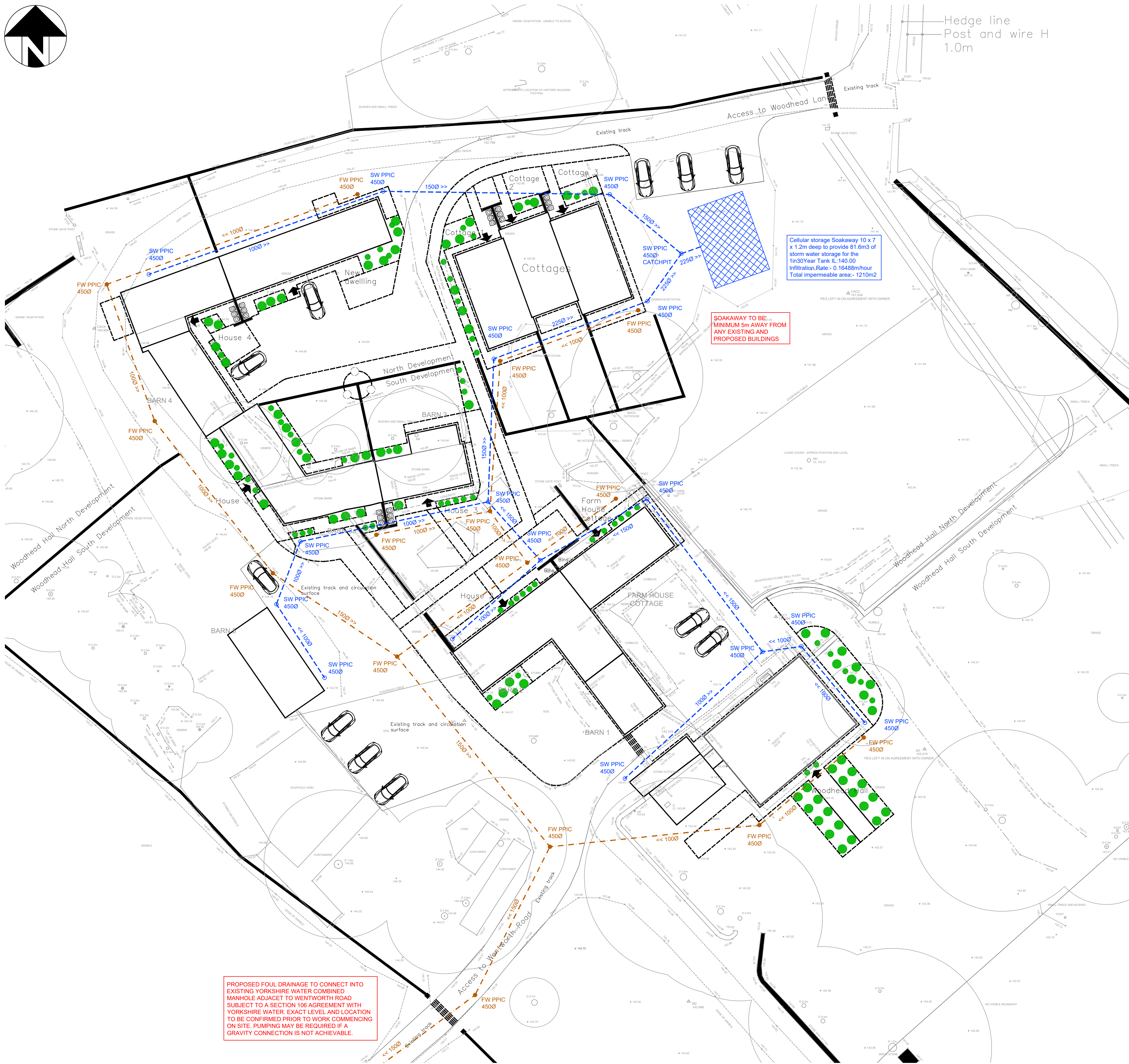
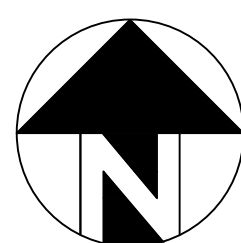
Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
1440 minute winter	Soakaway	1470	141.186	1.186	2.4	81.6298	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)
15 minute summer	Soakaway	Infiltration	0.0

Appendix H

DRAINAGE LAYOUT DRAWING



Proposed Drainage Strategy (1:250)

Key:

Proposed Surface Water Drainage

Proposed Foul Water Drainage

RWP AND SVP/FOUL CONNECTIONS
ARE SUBJECT TO FINAL
CONFIRMATION BY ARCHITECT

 OVERLAND FLOOD ROUTE

Drainage Strategy

Please refer to AMA Flood Risk Summary.

Under SuDs guidance the first point of discharge for surface water is percolation via soakaway. Infiltration testing was carried out 8th October 2022 and is proven infiltration works for test pit 2. So is a viable option for draining the site.

Surface Water:

The proposed impermeable area is 1210m². Based on a infiltration rate of 0.16488m/hr and modeling using Causeway Flow software the attenuation requirement for a peak return period of 1 in 30year is **81.6m3**.

Attenuation to be provided via **GEO-CELLULAR SOAKAWAY TANK**
10x7x1.2m DEEP WITH 95% VOID RATIO.

Access roads and parking bays to be constructed of permeable material.

Foul Water:

Foul water from the proposed new site will connect into the existing combined Yorkshire Water sewer adjacent to Wentworth Road, subject to a section 106 agreement with Yorkshire Water . Exact level and location to be confirmed prior to work commencing on site.

Notes:

Pipe sizes are indicative and are subject to detailed design.



Proposed Impermeable Area = 1210m²

NOTES					
P1	Preliminary - Initial Issue			28.10.22	TM
REV	DESCRIPTION			DATE	BY
					
Project: Woodhead Hall Farm, Barnsley					
Client: Rotary Developments Ltd					
Drawing: Drainage Strategy					
Drawn By: TM		Date: 08/08/2022			
Checked: GS		Scale: As Shown @ A1		A1	
Drawing No. AMA/21450/D/500				Rev: P1	

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