

Prepared on behalf of

Radcliffe Developments (Farnley) Ltd

FLOOD RISK ASSESSMENT

**Penistone Road (Phase 1)
Fenay Bridge, Huddersfield, West Yorkshire**

Flood Risk Assessment

Acknowledgements:

Disclaimer

The methodology adopted and the sources of information used by Sanderson Associates (Consulting Engineers) Ltd in providing its services are outlined within this Report.

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1 Introduction

- 1.1 Sanderson Associates (Consulting Engineers) Ltd has been appointed to undertake a Flood Risk Assessment and Drainage Strategy for Phase 1 of a residential development located at land off Penistone Road, Fenay Bridge, Huddersfield, West Yorkshire.
- 1.2 The aim of this assessment is to discuss the flood risk to the site from a number of sources. The report will also assess the existing and proposed drainage mechanisms of the site and considers drainage requirements to ensure a suitable and acceptable strategy for surface and foul water discharge.
- 1.3 This Flood Risk Assessment has been undertaken in accordance with the National Planning Policy Framework (NPPF) March 2012 and the associated Planning Practice Guidance, 2014 (PPG,14).
- 1.4 Consultation with Yorkshire Water has taken place to obtain a Pre-Development Enquiry for the site. Environment Agency (EA) mapping confirms the site is mainly situated in Flood Zone 1, therefore further formal consultation with the EA has not taken place in regards to flood risk. This Flood Risk Assessment has been undertaken taking into account current EA standing advice for developments in Flood Zone 1 and with reference to Environment Agency mapping. Received Yorkshire Water consultation and Environment Agency Flooding mapping are included in **Appendix A** of this report. Data from the Department for Environment, Food and Rural Affairs (DEFRA), The British Geological Survey (BGS) and Kirklees Metropolitan Borough Council has also been reviewed and referred to within this report. Percolation Testing has also been undertaken and the full report included at **Appendix B**.

2 Existing Situation

2.1 *Existing Site Description*

- 2.1.1 The development site is located in the Fenay Bridge area of Huddersfield, West Yorkshire on land to the east of the A629 Penistone Road and is situated approximately 4.81km to the southeast of Huddersfield Town Centre. The site is identified on a location plan contained within **Appendix C** of this report.
- 2.1.2 The site is currently undeveloped/agricultural Greenfield land. A review of historic mapping shows that the site historically formed part of a wider agricultural field network.
- 2.1.3 The site is bound to the north by the B6433 Rowley Lane. To the east by a commercial development and residential properties. To the south by a commercial development and to the west by the A629 Penistone Road.
- 2.1.4 Existing access to the site is gained via agricultural accesses to facilitate the existing/historic use. There is currently no direct public vehicular access to the development site.
- 2.1.5 The closest watercourses are Beldon Brook and Fenay Beck. Beldon Brook is located 130m to the south of site and generally flows from east to west. Fenay Beck is located 120m to the west and generally flows from south to north. Beldon Brook outfalls into Fenay Beck at a location to the west of the development site. An assessment of the existing topography suggests that a route to Beldon Brook would be difficult to achieve due to the adjacent (existing) development site.

2.2 *Existing Site Analysis*

- 2.2.1 The overall area of the development site is 47,525m² (4.753Ha) taken from information provided by the client. Of the 47,525m² some 6,110m² is existing highway and is considered to be impermeable. The remaining 41,415m² is considered to be permeable/naturally drained (not positively drained). Therefore the site is considered to be 12.9% impermeable and 87.1% permeable/non-positively drained.

- 2.2.2 The estimated Greenfield runoff rate from the site has been assessed using WinDES Source Control software. The QBAR run off rate has been calculated at 2.50l/s/Ha or 11.88l/s for the site area above (IH124 Method requires calculations based on 50Ha reduced to the site area). The WinDES output file is contained within **Appendix D**.

3 Background Data

- 3.1 Environment Agency and local authority mapping confirms the site is wholly contained within Fluvial Flood Zone 1. Fluvial Flood Zone 1 is land, that flood modelling exercises show, has less than a 1 in 1000 annual probability of flooding in any one year (<0.1%) from fluvial sources (no tidal mechanism in this area). This is the lowest risk flood zone classification as per the definitions set out in PPG, 14
- 3.2 There is no requirement to formally consult with the EA regarding this development. As the site area is greater than 1Ha in area, the Environment Agency standing advice is referred to and followed for development sites in Flood Zone 1 greater than 1 ha. This standing advice directs developers and consultants to look at the control of surface water from the development site so not to increase flood risk elsewhere and improve if possible.
- 3.3 DEFRA groundwater mapping confirmed the site is not located within a receptor sensitive Groundwater Source Protection Zone. These are defined areas around a sensitive aquifer or source of groundwater abstraction that are sensitive to the leeching of pollutants.
- 3.4 DEFRA groundwater mapping shows the site's underlying strata consists of an undesignated/unproductive superficial (drift) aquifer and a Secondary A bedrock aquifer. A Secondary A aquifer are described as strata that have a level of water storage/void capacity and may support base river flow on a local rather than strategic scale. Secondary A aquifers were previously designated as minor aquifers. An undesignated/unproductive aquifer are layers that generally have a very low water bearing capacity/void ratio.

Yorkshire Water (YW)

- 3.5 Yorkshire Water have provided a plan showing their drainage apparatus in the area and a preplanning advice letter. Their response is contained in **Appendix A** of this report.

- 3.6 Yorkshire Water confirm that the site should be developed with a separate drainage system for foul and surface water to the point of outfall.
- 3.7 Yorkshire Water state that firstly SUDs should be investigated for use at the site in line with Requirement H3 of the Building Regulations 2000, then a connection to a local watercourse and finally a connection to the local sewer.
- 3.8 The received Yorkshire Water consultation will be discussed further in Section 8 of this report.

4 Proposed Development

- 4.1 It is proposed that site is developed for residential use. Based on the current preliminary development specification it is understood that the development will contain 75 residential dwellings and will also have associated garden/green areas, access and parking facilities. The received layout is contained in **Appendix C** of this report. It should be noted that as this is a preliminary layout, unit numbers and drained/undrained areas are not currently fixed.
- 4.2 On assessing the current preliminary site layout, the phase 1 site area has been calculated at 47,525m² (4.753Ha). From received development plans it is understood that 1.195Ha will be developed and 2.056Ha will be garden or open green areas. There is existing highway covering 6.110Ha and there are future plans for an access road that will cover 5.300Ha, noting that this is additional to the figures above, and not to be taken from the existing permeable area.
- 4.3 It is proposed that a surface water discharge rate for the development will be limited to 5l/s/Ha for the developable area of the site (impermeable/drained areas) and maintained for storm events up to and including those with a 1 in 100 year + 40% probability of occurring.
- 4.4 The final drainage layout should be confirmed as part of the detailed drainage design and consultations held with the Local Highway Authority and Yorkshire Water with regards to the final design details and future adoption of the drainage techniques to be utilised.

5 Sequential and Exception Tests

5.1 *Sequential Approach*

- 5.1.1 The development site is shown on both Environment Agency and Kirklees strategic flood mapping to lie within Fluvial Flood Zone 1, as defined previously in this report.
- 5.1.2 The site is currently agricultural/open greenfield land. In accordance with Table 2 of PPG 2014 its current/last use is classed as being 'Less Vulnerable/water compatible' in terms of flood risk.
- 5.1.3 The proposed residential use of the site, in accordance with Table 2 of PPG 2014 is classed as being 'More Vulnerable' in terms of flood risk.
- 5.1.4 In accordance with Table 3 of PPG 2014 a 'More Vulnerable' development in Flood Zone 1 is an appropriate development in terms of flood risk, therefore the Exception Test would not be required as part of a planning application for this development.
- 5.1.5 As the development area is located in Flood Zone 1 and of a suitable vulnerability classification there can be no other sites in the area with a lower risk from fluvial flooding based upon the Flood Zone classification outlined in PPG 2014. Therefore in line with current planning policy the full Sequential Test does not need to be applied as part of a planning application and the developed can be deemed to be sequentially acceptable.

6 Assessment of Flood Risk

6.1 Surface Water Flooding

6.1.1 The main risk of flooding from overland flow comes from the local highway network, impermeable areas within the vicinity of the site and land at a higher elevation.

6.1.2 Environment Agency surface water flood mapping shows that the site is located in an area that has generally a very low risk of surface water flooding. A very low risk area is land that has a less than 1 in 1000 annual probability of surface water flooding in any given year. Areas at an elevated risk are shown to the north in Rowley Lane and to the west in Penistone Road. The areas of flooding at an elevated risk are contained wholly within the limits of the associated carriageways with water in Rowley Lane directed west to Penistone Road. It should be noted that at this location the site is approximately 3m to 6m above Rowley Lane carriageway levels, providing an effective barrier to surface water being directed towards the site.

6.1.3 The mitigation measures recommended in Section 7 will to be put in place to deal with any residual risk from this source. The site's drainage system/layout should be designed to meet the requirements of approving authorities and should include attenuation to maintain a greenfield flow rates for low probability storm events up to and include a 1 in 100 year event + 40% climate change.

6.2 Fluvial Flooding

6.2.1 As discussed in Section 3, the site is located within Flood Zone 1. This is land with flood modelling shows has a less than a 1 in 1000 (<0.1%) annual probability of flooding from a fluvial Source in any given year. Therefore the risk to the site from a fluvial source is very low/negligible.

6.3 *Flooding from Sewers*

- 6.3.1 If any of the sewers/drainage apparatus adjacent to the site were to surcharge and flood, it is likely that any floodwaters would be shallow, and contained within the limits of the carriageway.
- 6.3.2 At the time of writing the report there was no evidence available to suggest the site has been directly affected from flooding from overloaded sewers/drainage apparatus in the past; therefore the risk of flooding from sewers would be considered low.
- 6.3.3 The mitigation measures proposed for the development as discussed in section 7 will also protect against any flooding from this source should the risk increase over the lifetime of the development.

6.4 *Flooding from Groundwater*

- 6.4.1 The potential for groundwater flooding has been assessed with the aid of groundwater mapping from DEFRA and British Geological Survey records.
- 6.4.2 DEFRA groundwater mapping confirms the site is not located within a receptor sensitive Groundwater Source Protection Zone.
- 6.4.3 DEFRA mapping shows the site's underlying strata consists of an undesignated/unproductive superficial (drift) aquifer and a Secondary A bedrock aquifer. A Secondary A aquifer is described as strata that has a level of water storage/void capacity and may support base river flow on a local rather than strategic scale. Secondary A aquifers were previously designated as minor aquifers. An undesignated/unproductive aquifer are layers that generally have a very low water bearing capacity/void ratio.
- 6.4.4 The British Geological Survey geological map of the UK has been reviewed and shows an undesignated superficial strata (indicative of a shallow rockhead) and a bedrock strata of the Pennine Lower Coal Measure and Kirkburton Sandstone

formation. The British Geological Survey also hold borehole records that were excavated to the north of the site as part of the development of Woodsome Park. The boreholes show a shallow superficial strata of mainly clay to various makeups overlaying mudstone and shale to a depth of approximately 13.0m to 14.0m below ground level. All reviewed boreholes remained dry or note that encountered groundwater was in the form of seepage/damp areas. The strata type are generally consistent with the Environment Agency aquifer designations for both the superficial and bedrock strata.

6.4.5 Due to the impermeable nature of the site's underlying superficial strata, which is predominantly made up of clay. It is unlikely that groundwater would be an issue at this location. No significant areas of groundwater was exposed in reviewed boreholes.

6.4.6 The mitigation measures recommended to protect the development from other sources of flooding would also protect against groundwater emergence should the risk increase in the future or should groundwater emerge remote from the site and flow overland.

6.5 *Flooding from Climate Change*

6.5.1 It is generally considered that the intensity of rainfall will increase by up to 30% by the year 2085 and that winter months will become proportionately wetter.

6.5.2 Peak river flows are anticipated to increase by up to 20% due to climate change. As the site is in Flood Zone 1 the anticipated increase in river flows are not considered to pose any increased risk to the site.

6.5.3 These factors have been considered in the assessment of flood risk from all sources including watercourses.

7 Flood Mitigation

- 7.1 It is important that any proposed development that has the potential to change the flood mechanisms on a site is designed such that there is no increased flood risk to the site itself, or sites upstream and downstream of the development. Below is a list of possible mitigation measures that will be required to ensure the development.
- 7.2 Footways should be constructed to naturally fall towards and into garden/green areas to encourage the informal percolation of surface water runoff from these areas.
- 7.3 External surfaces should fall away from properties and properties should have a finished floor level higher than development carriageway levels and external levels to prevent potential surface water flooding of the dwellings.
- 7.4 Drains within the limits of the site should be regularly inspected and cleared where necessary to reduce the risk of blockages and flooding.

8 Drainage Design Considerations

8.1 *Foul Drainage*

8.1.1 The site's foul system should be constructed in line with 'Sewers for adoption - a design and construction guide for developers' 6th edition. (Potentially superseded by 7th edition by the adopting authority).

8.1.2 Yorkshire Water have confirmed in their preplanning response that foul water domestic waste from the site can should discharge to the 225 mm diameter public combined sewer recorded in Penistone Road, at a point to the west of the site.

8.1.3 Foul and surface water drainage apparatus within the development should be separated and extend to the points of discharge.

8.2 *Methods of Surface Water Treatment*

8.2.1 The current building regulations, Part H3, detail the favoured hierarchy of surface water disposal being in order of preference, to ground by infiltration, to watercourse and then to sewer.

1. Infiltration

2. Watercourse

3. Sewer

Infiltration Drainage

8.2.2 Infiltration methods of drainage such as soakaways and filter drains percolate surface water runoff allowing it to permeate into the subsoil at its natural rate, mimicking the natural process of drainage and as such are subject to the local ground conditions.

8.2.3 DEFRA groundwater mapping shows the site's underlying strata consists of an undesignated/unproductive superficial (drift) aquifer and a Secondary A bedrock aquifer. A Secondary A aquifer are described as strata that have a level of water

storage/void capacity and may support base river flow on a local rather than strategic scale. Secondary A aquifers were previously designated as minor aquifers. An undesignated/unproductive aquifer are layers that generally have a very low water bearing capacity/void ratio.

- 8.2.4** The British Geological Survey geological map of the UK has been reviewed and shows an undesignated superficial strata and a bedrock strata of the Pennine Lower Coal Measure and Kirkburton Sandstone formation. The British Geological Survey also hold borehole records that were excavated to the north as part of the development of Woodsome Park. The boreholes show a shallow superficial strata of mainly clay to various makeups overlaying mudstone and shale to a depth of approximately 13.0m to 14.0m below ground level, where the excavations terminated. All reviewed boreholes remained dry or note that encountered groundwater was in the form of seepage/damp areas. The strata type are generally consistent with the Environment Agency aquifer designations for both the superficial and bedrock strata.
- 8.2.5** Due to the topography of the site which grade from east to west, falling towards Penistone Road, there is potential that if soakaways were promoted, re-emergence could occur further down slope than the installed apparatus.
- 8.2.6** Percolation was undertaken on the site on 3rd April 2020. The results are detailed in **Appendix B**. The investigation included the investigation of five pits. The soils encountered were logged in general accordance with BS 5930: 1990, as amended in 2007. The soils encountered beneath the site were found to be very clayey and represent the weathered fraction of the underlying. During the soakaway test the water did not achieve a fall from 75% to 25% of the effective depth of the surface volume. The conclusion from the percolation testing is that shallow soakaways could not be recommended at this site.

Discharge to Watercourse

- 8.2.7 The closest watercourses to the site are Beldon Brook and Fenay Beck. Beldon Brook is located 130m to the south of the site. Beldon Brook outfalls into Fenay Beck at a location to the west of the development site. Fenay Beck is located 120m to the west of the site. Fenay Brook in the vicinity of the site generally flows from south to north.
- 8.2.8 As advised in paragraph 2.1.5 above, an assessment of the existing topography suggests that a route to Beldon Brook would be difficult to achieve due to the adjacent (existing) development site.
- 8.2.9 The connection to Fenay Beck would require either the requisition of a connection across 3rd party land or via the public highway that lies between the site and the receiving watercourse. It should be noted that an existing surface water sewer is located to the north of the site which is shown in Rowley Lane prior to crossing Penistone Road towards Fenay Beck. As this sewer appears to discharge to Fenay Beck a connection to this apparatus prior to a watercourse outfall would mitigate the requirement for an independent connection across 3rd party land, although this does not accord with the pre-planning enquiry response from Yorkshire Water and would have to be developed further at the preliminary drainage design stage.
- 8.2.10 Due to the proximity of Fenay Beck to the development area connection to this location should be pursued in the first instance, either directly or via local highway. As outlined above an identified Yorkshire Water surface water sewer located to the north of the development site, which plans suggest outfalls into Fenay Beck would remove the requirement for 3rd party land crossing whilst providing a watercourse outfall.

Discharge to Sewer

- 8.2.11 Yorkshire Water has confirmed that they require investigation into alternative methods of surface water disposal such as infiltration techniques or a discharge to a watercourse in accordance with the surface water management hierarchy as outlined in Building Regulations Part H, prior to accepting a positive discharge to public sewer. Percolation testing has been undertaken and the conclusion reached that shallow soakaways could not be recommended at this site.
- 8.2.12 Based on the above evidence there is the potential for a connection into Fenay Beck. As outlined in the above paragraphs, a connection to Fenay Beck via the identified surface water sewer would limit the requirement for a 3rd party land crossing whilst still providing a watercourse outfall.

8.3 *Attenuation Options****Attenuation in ponds/basin and open water features***

- 8.3.1 Having an open water structure to store rainwater within the site poses a risk to the safety of the potential occupants of the site especially children. The residual risk of such a system requires careful thought before implementation.
- 8.3.2 It is considered that attenuation in ponds/basins and open water features is something that will be considered further, but will be restricted in volume due to the limited space available to accommodate such a feature and the associated earthworks relating to introducing such a feature based on the topography of the site.

Attenuate in Underground Tanks/Pipes

- 8.3.3 Attenuating the surface water runoff into oversized pre-cast concrete pipes underneath the proposed highways is considered to be another option for the site.
- 8.3.4 This form of storage could be in the form of pre cast concrete culverts, oversized pipes or other techniques such as Geo-cellular systems under open spaces or car parking areas to provide the storage required to accommodate the 1 in 100 year storm event + a 40% allowance for climate change/uncertainty.

-
- 8.3.5 In line with current guidance, attenuation should be provided to ensure that the system does not flood during a 1 in 30 year storm event and for a 1 in 100 year storm event + 40% climate change the system can flood but the surcharge must not flood properties and be kept within the site's boundary.
- 8.3.6 Due to the topography of the site it would be difficult to only attenuate up to the 1 in 30 year event whilst managing overburden, on the surface, within the boundary of the site. Therefore at this location the provision of attenuation up to a 1 in 100 year storm event + 40% climate change would be required. Preliminary calculations as detailed in **Appendix D** show that an attenuated volume of 2,275 cubic metres will need to be provided to facilitate this.

9 Proposed Surface Water Drainage Strategy

- 9.1 The purpose of the outline Drainage Strategy is to detail the principle of a drainage strategy. The final details should be designed and confirmed at the detailed design stage and following consultations with the Local Planning, Highway and Drainage Authority.
- 9.2 It is clear that there is an opportunity to provide a level of SuDs techniques appropriate for the new site which will contribute to a sustainable development and improve urban design, by balancing the different issues that influence the development.
- 9.3 In regards to proposed surface water discharge the below with outline the findings of this desktop study:
- 9.4 Desktop and site based evidence confirm that infiltration drainage techniques would be unviable at this location.
- 9.5 Based on the above and in line with Part H3 of the Building Regulations a watercourse outfall should be promoted in the first instance. This should be limited 5l/s/Ha for the drained area of each site up to and including storm event with a 1 in 100 year + 40% probability of occurring.
- 9.6 Attenuation to limit the discharge into the watercourse will be developed from the capacity to provide a pond or water feature on the site, together with underground storage, whether culverted, or cellular tank. These options will need to have a combined storage volume of 2,275 cubic metres.

10 Conclusion

- 10.1 This report serves to review and assess the sources of potential flooding to the site/development, to review existing and proposed runoff rates from the site and to investigate potential drainage measures to ensure an acceptable strategy for foul and surface water run-off.
- 10.2 The Sequential and Exception Tests have been assessed, in accordance with NPPF, and it is concluded that the development is suitable for this location.
- 10.3 Suitable mitigation measures have been recommended in Section 7 that will reduce this risk to acceptable levels for the end user should a flood event occur.
- 10.4 Desktop/site based evidence has been assessed and recommendations for a suitable drainage strategy have been set out within the report.
- 10.5 This report concludes that the site can be developed without increasing flood risk to the site itself and other sites in the vicinity and also without unacceptable residual risk of flooding, with the implementation of suitable mitigation measures and that a suitable drainage strategy is pursued that will meet with the requirements of approving and overseeing authorities.

APPENDIX A
Consultation Responses

Flood map for planning

Your reference
Radcliffe Dev

Location (easting/northing)
418740/414479

Created
8 Jul 2020 12:44

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

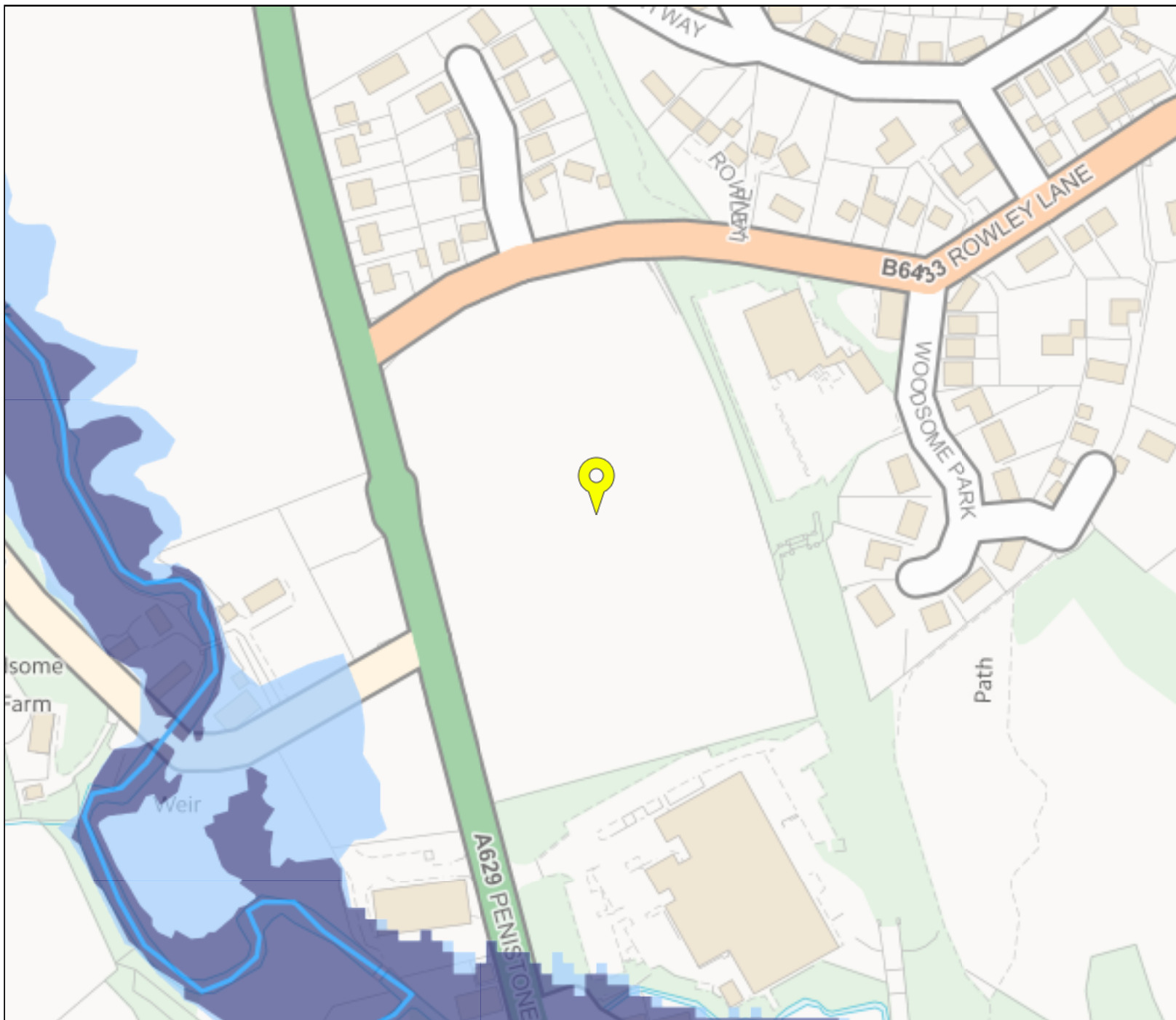
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>



Flood map for planning

Your reference
Radcliffe Dev

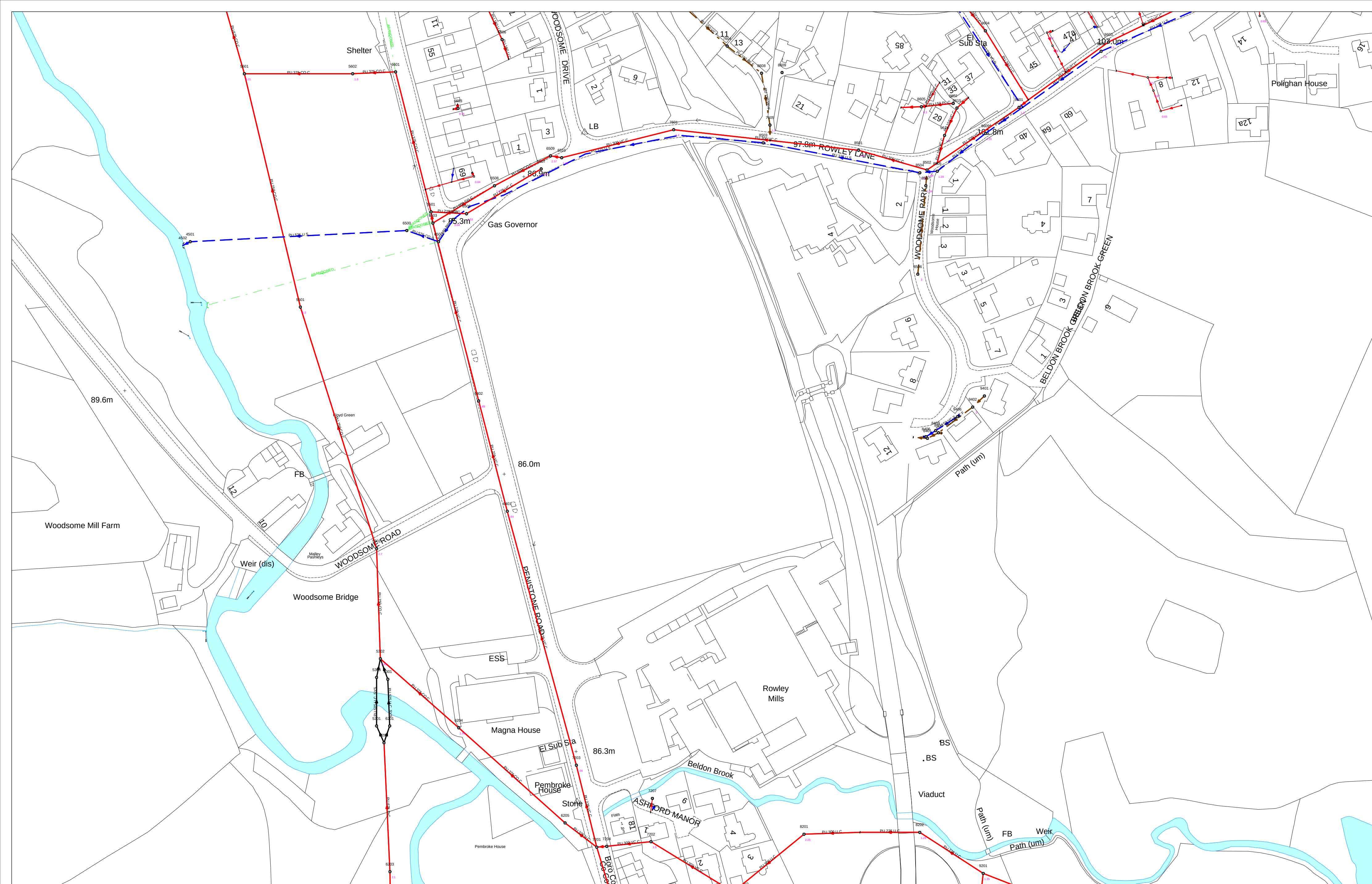
Location (easting/northing)
418740/414479

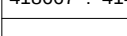
Scale
1:2500

Created
8 Jul 2020 12:44

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

0 20 40 60m



418667 : 414372	Map Name : SE1814SW	Title	Partial Key	This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of no excavations or other works made in the vicinity of public sewers. No house or property connections are shown.
	Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : YorMap Advisor C ROBERTS Contact Tel : 87 2582	Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS	
		(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 : 15/05/2020, 11:13:31	Date Gen : 15/05/2020, 11:16:51
			Source : Sewer Network Enquiry	



YorkshireWater

Mr T Walker
Sanderson Associates LTD
Sanderson House
Jubilee Way
Huddersfield
WF4 4TD

Yorkshire Water Services
Developer Services
Sewerage Technical Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax: (01274) 372 834

Your Ref:
Our Ref: W005625

Email:
Technical.Sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

15th May 2020

Dear Mr Walker,

Penistone Road, Fenay Bridge, Huddersfield, HD8 0LE - Pre-Planning Sewerage Enquiry - T813160 - RESIDENTIAL

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.

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

Site C & Site D

I would have no objection to foul for both areas discharging foul water to the public 225 mm sewer in Penistone Road.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. 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.

As the proposal site is currently undeveloped no surface water is known to have previously discharged to the public sewer network



As such, the local public sewer network does not have capacity to accept any surface water from the proposed site. If SuDS are not viable, the developer is advised 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 to the west and south of the sites. This appears to be the obvious place for surface water disposal (if SuDS are not viable).

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 obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water drain* sewer may be required which may be provided by the developer and considered 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 WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

The public sewer network is for domestic sewage purposes. This generally means foul water for domestic purposes and, where a suitable surface water or combined sewer is available, surface water from the roofs of buildings together with surface water from paved areas of land appurtenant to those buildings. Land and highway drainage have no automatic right of connection to the public sewer network. No land drainage to be connected/discharged to public sewer.

As a last resort, highway drainage may be accepted under certain circumstances. If it can be demonstrated, through satisfactory evidence, that SuDS are not a viable option, there are no watercourses or highway drains available and if capacity is available within the public sewer network, highway drainage discharges to the public sewer network may be permitted. In this event, the developer may be required to enter into a formal agreement with Yorkshire Water Services under Section 115 Water Industry Act 1991 to discharge non-domestic flows into the public sewer network.

The site is within an area that may be affected by river, coastal or estuarine flooding. We would advise you to contact the Environment Agency for details.

All the above comments are based upon the information and records available at the present time. 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.



YorkshireWater

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

A handwritten signature in black ink, appearing to read 'Chris Roberts'.

Chris Roberts
Pre-Development Technician
Developer Services
Yorkshire Water Services Limited

APPENDIX B
Percolation Test Results

Our Ref: YG 0158-20

16th April 2020

Radcliffe Developments (Farnley) Ltd
Radcliffe House
Queens Square
Leeds Road
Huddersfield
HD2 1XN

For the attention of Radcliffe Developments (Farnley) Ltd,

Ref: Penistone Road, Lepton, Huddersfield,

We thank you for your request to undertake permeability testing at the above-mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 3rd April 2020 in accordance with your instruction to proceed. This letter describes the work undertaken, presents the data obtained and discusses the results of the tests.

Geology

An examination of the available British Geological Survey data of the area for the site has been examined and indicates that the site is underlain by solid geology deposits comprising the Grenoside Sandstone of the Pennine Lower Coal Measures.

Fieldworks

The programme of this investigation included the excavation of five trial pits. The location of the soakaway tests were positioned where access was achievable with the machine and where water could be pumped.

During this work, the soils encountered were logged in general accordance with BS 5930: 1990, as amended in 2007, and full descriptions are given on the borehole records, which are also appended to this letter.

Soakaway Tests

During the soakaway test the water did not achieve a fall from 75% to 25% of the effective depth of the storage volume. The results obtained from the soakaway tests are summarised below:

Table 1: Soakaway Test Results

WS	Soakage Area Dimensions (m)	Depth (m)	Soil Description (Base of TP)	Infiltration Rate (m/sec)	Drainage Characteristics
TP01 test1	1.20 x 0.3	1.50m	Orange brown sandy very clayey cobbly GRAVEL.	None	None
TP02 test1	1.50 x 0.3	1.40m	Orange brown sandy very clayey cobbly GRAVEL.	None	None

TP03 test1	1.80 x 0.3	1.70m	Orange brown sandy very clayey cobbly GRAVEL.	None	None
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Discussion

The soils encountered beneath the site were found to be very clayey and represent the weathered fraction of the underlying. A site investigation previously undertaken by WSP indicates similar clayey conditions overlying the weathered sandstone deposits. The tests undertaken did not show appreciable soakage rates with little or no drop in level was observed during the tests. Therefore, in this instance shallow soakaways could not be recommended at this site and alternative drainage systems should be employed. It may be possible to achieve soakage within the rock at depth (Significant machinery would be required to excavate through the rock to facilitate this) or alternatively it may be possible to utilise adjacent fields and shallow drainage systems in the nearby flood plain areas.

References

Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.

British Standards Institution (1999) BS5930: *Code of practice for site investigations*, B.S.I., London.

British Standards Institution (2007), Amendment No 1, BS5930: *Code of practice for site investigations*, B.S.I., London.

We trust that this information is of interest and should you have any other requirements do not hesitate to contact us.

For and on behalf of

YourEnvironment

Yours Faithfully,



Rob Lewis BSc(Hons) FGS

Principal Engineer

Enc.

Site Investigation Plan

Trial Pit Logs

Soakaway Test Results



Title: Investigation Location Plan

Site Name:
Penistone Road

Job No:
YG 0158-20

Trial Pit Log

TrialPit No

TP01

Sheet 1 of 1

Project Name: Penistone Road

Project No.
YG0158-20

Co-ords: -
Level:

Date
03/04/2020

Location: Penistone Road, Lepton, Huddersfield

Dimensions
(m):

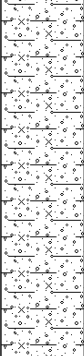
Scale
1:25

Client: Radcliffe Developments (Farnley) Ltd

Depth
1.50

0.30

Logged
RL

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			TOPSOIL (Soft brown sandy gravelly clayey TOPSOIL. Gravel is fine to coarse of mudstone. sandstone and siltstone.)
							Orange brown sandy very clayey GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of predominantly Sandstone and Mudstone.
				1.50		End of Pit at 1.50m	

Remarks:	Trial Pit dry.
----------	----------------

Stability:



Trial Pit Log

TrialPit No
TP02
Sheet 1 of 1

Project Name: Penistone Road

Project No.
YG0158-20

Co-ords: -
Level:

Date
03/04/2020

Location: Penistone Road, Lepton, Huddersfield

Dimensions (m):	0	1.50
-----------------	---	------

Scale
1:25

Client: Radcliffe Developments (Farnley) Ltd

Depth
1.40

0.30

Logged
RL

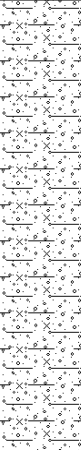
[illegible]

Remarks: Trial Pit dry.

Stability:



TP03				Trial Pit Log				TrialPit No TP03 Sheet 1 of 1	
Project Name: Penistone Road				Project No. YG0158-20		Co-ords: - Level:		Date 03/04/2020	
Location: Penistone Road, Lepton, Huddersfield						Dimensions (m): Depth 1.70		1.80 Scale 1:25 Logged RL	
Client: Radcliffe Developments (Farnley) Ltd									
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.30			TOPSOIL (Soft brown sandy gravelly clayey TOPSOIL. Gravel is fine to coarse of mudstone. sandstone and siltstone.)		
							Orange brown sandy very clayey GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of predominantly Sandstone and Mudstone.		
				1.70			End of Pit at 1.70m		
							1		
							2		
							3		
							4		
							5		
Remarks: Trial Pit dry.									
Stability:									
									

TP04				Trial Pit Log				TrialPit No TP04 Sheet 1 of 1	
Project Name: Penistone Road				Project No. YG0158-20		Co-ords: - Level:		Date 03/04/2020	
Location: Penistone Road, Lepton, Huddersfield						Dimensions (m): Depth 1.80		Scale 1:25 Logged RL	
Client: Radcliffe Developments (Farnley) Ltd						0.30			
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.30			TOPSOIL (Soft brown sandy gravelly clayey TOPSOIL. Gravel is fine to coarse of mudstone. sandstone and siltstone.)		
				1.80			Orange brown sandy very clayey GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of predominantly Sandstone and Mudstone.		
							End of Pit at 1.80m		
							1		
							2		
							3		
							4		
							5		
Remarks: Trial Pit dry.									
Stability:									



Trial Pit Log

TrialPit No
TP05
Sheet 1 of 1

Project Name: Penistone Road

Project No.
YG0158-20

Co-ords: -
Level:

Date
03/04/2020

Location: Penistone Road, Lepton, Huddersfield

Dimensions
(m):

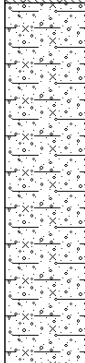
Scale
1:25

Client: Radcliffe Developments (Farnley) Ltd

Depth
1.50

0.30

Logged
RL

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.30			TOPSOIL (Soft brown sandy gravelly clayey TOPSOIL. Gravel is fine to coarse of mudstone. sandstone and siltstone.)	1	
							Orange brown sandy very clayey GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded of predominantly Sandstone and Mudstone.		
				1.50		End of Pit at 1.50m			2
									3
									4
									5

Remarks:	Trial Pit dry.
----------	----------------

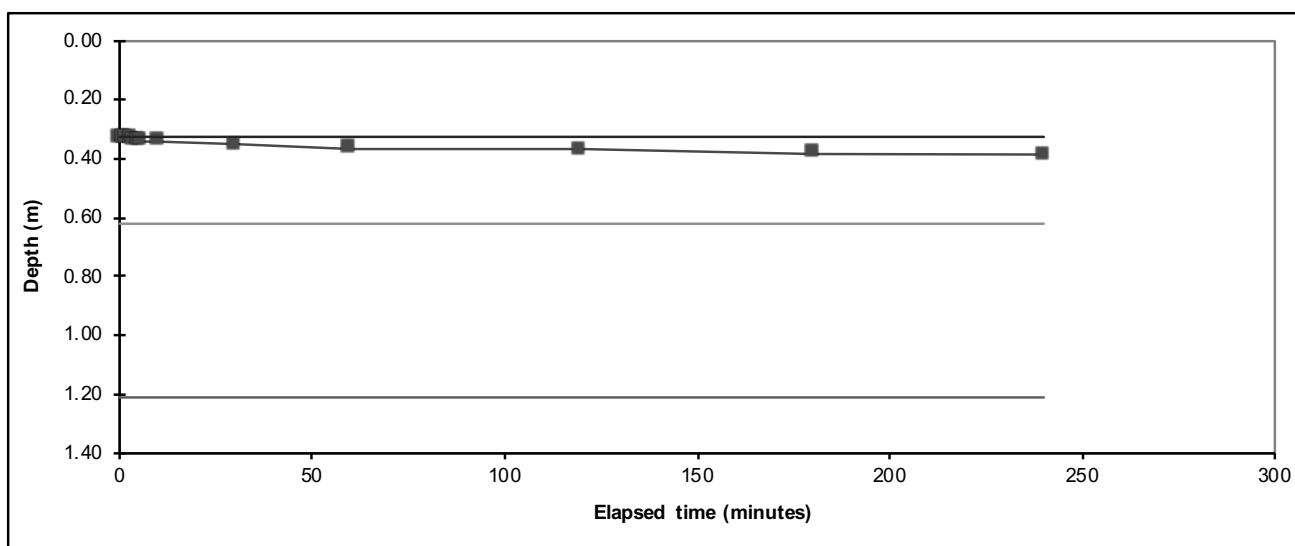
Stability:



Your Environment

Soakaway Test

Trial Pit No:	TP1	Test No:	1	Date:	03.04.2020
Length (m):	1.200	Datum Height:			0.00 m agl
Width (m):	0.30	Granular infill:	None		
Depth (m):	1.50	Porosity of infill:	1	(assumed)	
Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)		
0	0.325				
1	0.328				
2	0.330				
3	0.332				
4	0.335				
5	0.337				
6	0.339				
10	0.339				
30	0.352				
60	0.365				
120	0.369				
180	0.383				
240	0.385				



Start water depth for analysis (mbgl):	0.33	Elapsed time (mins):	#N/A
75% effective depth (mbgl):	0.62		
50% effective depth (mbgl):	0.91	Elapsed time (mins):	#N/A
25% effective depth (mbgl):	1.21		
Base of soakage zone (mbgl):	1.50		

Volume outflow between 75% and 25% effective depth (m³):

Mean surface area of outflow (m²): 2.13
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):	Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.
-------------------------------	---

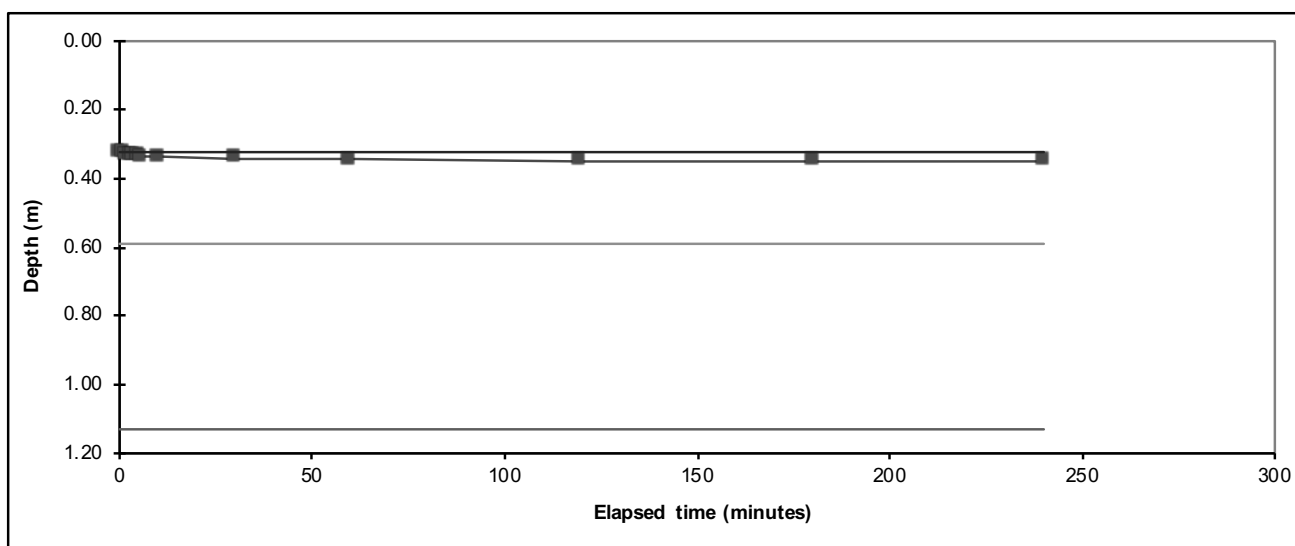
Remarks Results processed following BRE 365 (2007).

Client:	Radcliffe Developments (Farnley) Ltd	TP1
Site:	Penistone Road	

Your Environment

Soakaway Test

Trial Pit No:	TP2	Test No:	1	Date:	03.04.2020
Length (m):	1.500	Datum Height:			0.00 m agl
Width (m):	0.30	Granular infill:	None		
Depth (m):	1.40	Porosity of infill:	1	(assumed)	
Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)		
0	0.323				
1	0.325				
2	0.330				
3	0.330				
4	0.332				
5	0.335				
6	0.337				
10	0.338				
30	0.341				
60	0.345				
120	0.347				
180	0.347				
240	0.350				



Start water depth for analysis (mbgl):	0.32	Elapsed time (mins):	#N/A
75% effective depth (mbgl):	0.59		
50% effective depth (mbgl):	0.86	Elapsed time (mins):	#N/A
25% effective depth (mbgl):	1.13		
Base of soakage zone (mbgl):	1.40		

Volume outflow between 75% and 25% effective depth (m³):

Mean surface area of outflow (m²): 2.39
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):	Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.
-------------------------------	---

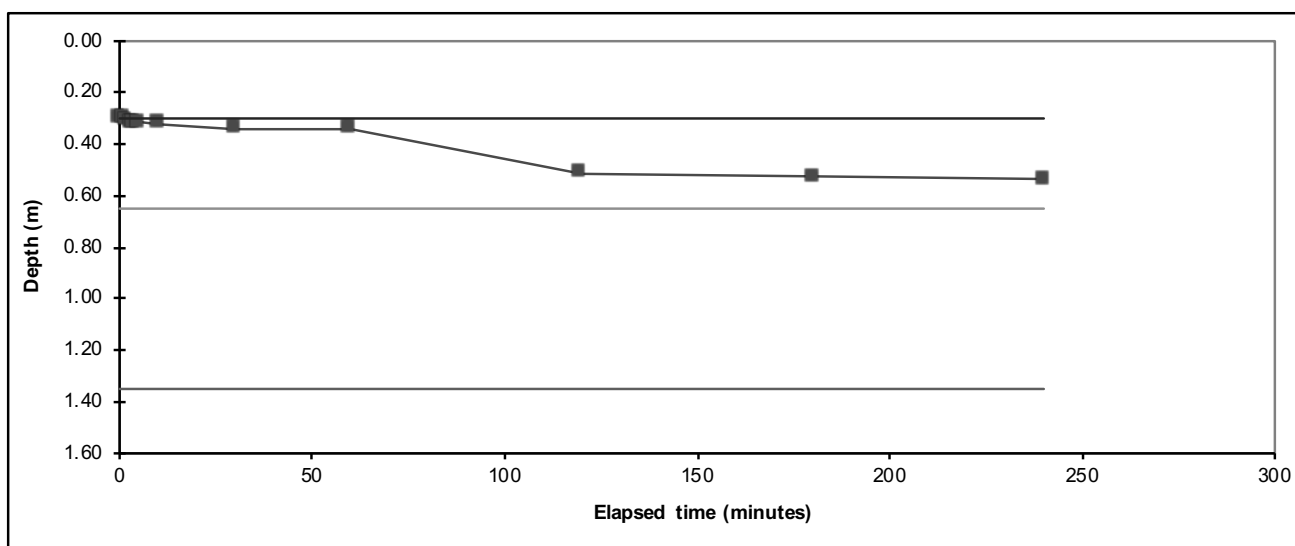
Remarks Results processed following BRE 365 (2007).

Client:	Radcliffe Developments (Farnley) Ltd	TP2
Site:	Penistone Road	

Your Environment

Soakaway Test

Trial Pit No:	TP3	Test No:	1	Date:	03.04.2020
Length (m):	1.800	Datum Height:			0.00 m agl
Width (m):	0.30	Granular infill:	None		
Depth (m):	1.70	Porosity of infill:	1	(assumed)	
Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)		
0	0.300				
1	0.302				
2	0.308				
3	0.315				
4	0.315				
5	0.317				
10	0.320				
30	0.338				
60	0.341				
120	0.515				
180	0.527				
240	0.535				



Start water depth for analysis (mbgl):	0.30	Elapsed time (mins):	#N/A
75% effective depth (mbgl):	0.65	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.00	Elapsed time (mins):	#N/A
25% effective depth (mbgl):	1.35	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.70		

Volume outflow between 75% and 25% effective depth (m³):

Mean surface area of outflow (m²): 3.48
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

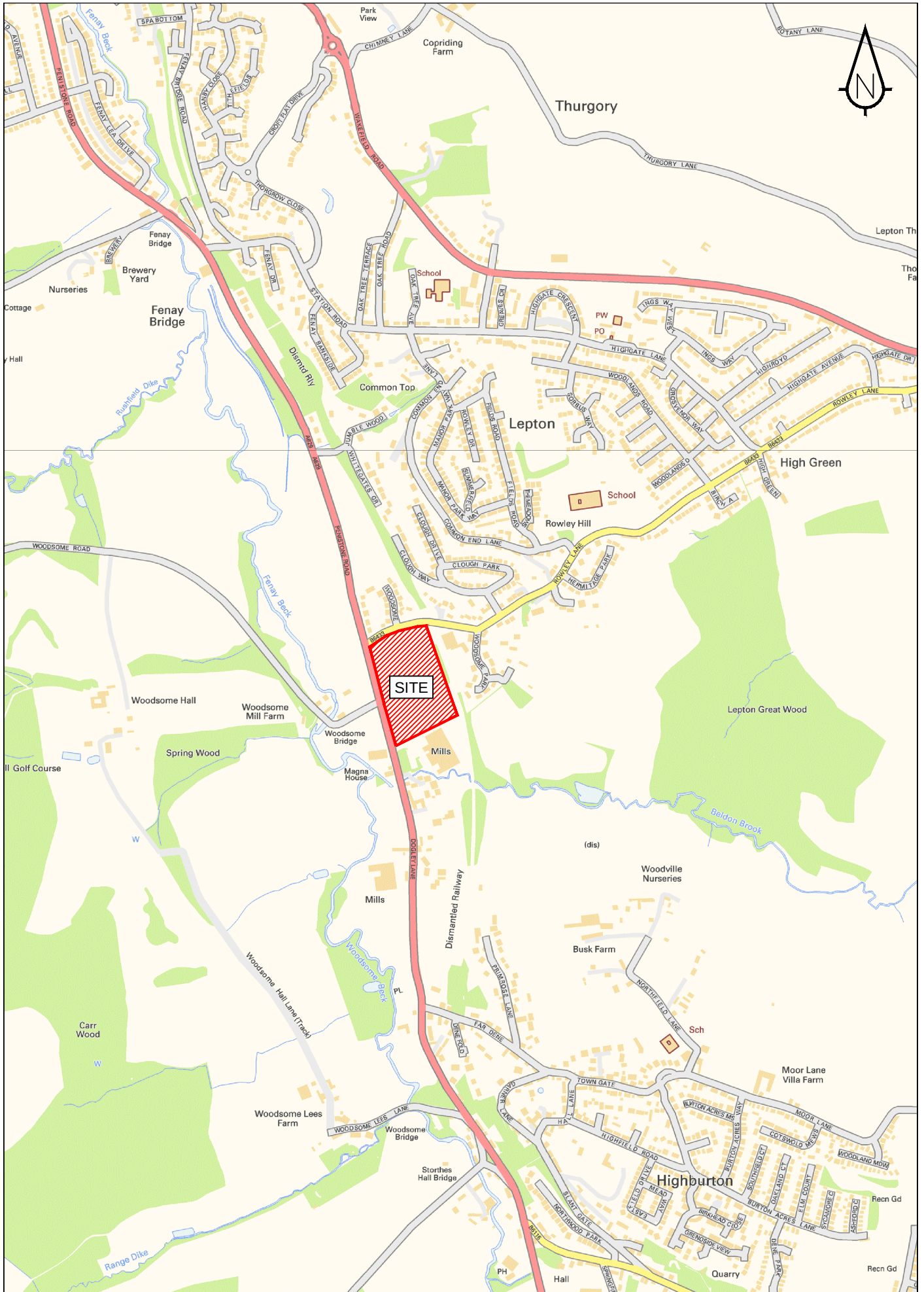
Soil infiltration rate (m/s):	Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.
-------------------------------	---

Remarks Results processed following BRE 365 (2007).

Client:	Radcliffe Developments (Farnley) Ltd	TP3
Site:	Penistone Road	

APPENDIX C

Drawings





- Sanderson Associates (Consulting Engineers) Ltd ("the consultant"), has not checked or verified, and shall have no liability whatsoever for any inaccuracies which may be attributable to any data, reports, base plan(s) and drawings provided by the client, or purchased by the consultant on the client's behalf, that may have been utilised within this drawing.
- The consultant shall not be liable for the use by any person of any document for any purpose other than that for which the same were provided by the consultant.
- No liability whatsoever is accepted by the consultant for any error or omissions.
- The consultant accepts no liability for any vehicle specification errors within the vehicle track software used and / or it's vehicle libraries.
- The locations of utilities apparatus, if shown, is reproduced from plans supplied to the consultant, although care has been taken when duplicating this information. These locations are approximate only and no guarantee can be given for their accuracy. It is the client's or it's appointed agent/contractors responsibility to verify the exact locations on site by hand dug trial holes or other appropriate means prior to mechanical excavation.
- Service connections are not shown but their presence should be anticipated.
- Reference to any third party equipment shown on this drawing was only relevant at the time the drawing was prepared.
- It is the client's responsibility to ensure that any equipment ordered meets the design.

Areas		
	Existing Hardstanding	6,110 sqm
	Proposed Hardstanding	11,949 sqm
	Future Hardstanding	5,300 sqm
	Buildings	3,614 sqm
Total		26,963 sqm
	Permeable/Undrained Areas	20,562 sqm
Total Area		47,525 sqm

Rev	Amendment	Drawn	Date	Checked



sanderson
associates
(consulting engineers) ltd
Highways | Traffic | Transportation | Water

T 01924 844080 mail@sandersonassociates.co.uk
F 01924 844081 www.sandersonassociates.co.uk

Client	Radcliffe Developments (Farnely) Ltd		
Project Title	Penistone Road Huddersfield		
Drawing Title	PROPOSED DRAINED AREAS		
Scale	1:500 @ A1	Drawn By	LOB
Drawing Size	A1	Checked By	PJM
Date	07/07/2020	Approved By	PJM
Drawing Number		11469-001	Rev -

APPENDIX D
WinDES Calculations

Sanderson Associates		Page 1
Sanderson House Jubilee Way Huddersfield, WF4 4TD		
Date 13/11/2018 13:41 File	Designed by thomas.walker Checked by	
Micro Drainage Source Control 2018.1.1		

IH 124 Mean Annual Flood

Input

Return Period (years)	1	Soil	0.300
Area (ha)	50.000	Urban	0.000
SAAR (mm)	917	Region Number	Region 10

Results l/s

QBAR Rural 125.0
QBAR Urban 125.0

Q1 year 108.7

Q1 year	108.7
Q2 years	116.4
Q5 years	148.7
Q10 years	172.5
Q20 years	196.5
Q25 years	205.0
Q30 years	211.9
Q50 years	231.2
Q100 years	260.0
Q200 years	294.9
Q250 years	306.2
Q1000 years	379.9

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Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics

Total site area (ha):	4.753
Significant public open space (ha):	0
Area positively drained (ha):	4.753
Impermeable area (ha):	2.697
Percentage of drained area that is impermeable (%):	57
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	4.75
Net impermeable area for storage volume design (ha):	2.99
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:

Urban creep allowance factor:

Volume control approach:

Interception rainfall depth (mm):

Minimum flow rate (l/s):

Methodology

esti:

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	61
Rainfall 100 yrs 12 hrs:	--	83.22
FEH / FSR conversion factor:	1.14	1.14
SAAR (mm):	839	839
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.3	0.3
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 10 year:	1.45	1.45
Growth curve factor 30 year:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Q_{BAR} for total site area (l/s):	28.36	28.36
Q_{BAR} for net site area (l/s):	28.36	28.36

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	24.4	24.4
1 in 30 years (l/s):	49.6	49.6
1 in 100 year (l/s):	59	59

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	2275	2275
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	2275	2275

This report was produced using the storage estimation 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 <http://www.uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. 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 these data in the design or operational characteristics of any drainage scheme.