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Civil & Structural Engineering Consultants

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FLOOD RISK ASSESSMENT

ON

**LAND SOUTH OF MOOR LANE,
KIRKBURTON**

FOR

PERSIMMON HOMES

E25/8333/FR01D

Rev E – October 2026

NOVEMBER 2025

1.0 INTRODUCTION

- 1.1 This report is commissioned to investigate and report on the Flood Risk for this site in accordance Planning Practise Guidance- Flood Risk and Coastal Change September 2025 and the proposals for drainage of this site when redeveloped as residential land. The report is based on information supplied by the client and from relevant authorities in both written and verbal format. Some of this information is in verbal form only. No liability can be accepted for information supplied by third parties which is subsequently found to be inaccurate or incorrect.

2.0 THE SITE

- 2.1 The site is located on open grassland located to the south of Moor Lane, Kirkburton and is situated around OS Grid reference SE200133.
- 2.2 The site is approximately rectangular in shape with adoptable highways to the north, east and south of the site and a public footpath to the west, with residential development beyond the highway to the south and west. To the north and east there is open field beyond the adoptable highway. The site area is approximately 7.4ha, 5.6ha of which is to be developed if the POS is discounted.
- 2.3 The site itself is predominantly grassed, with a small collection of buildings including chicken pens and sheds towards the centre of the site. This is also used as a storage area for farming equipment. The site is divided into several smaller fields through dry stone walls, the occasional length of barb wire fence and discontinuous lines of hedging. Overhead wires cross the site from the north west to the south east. A second set of overhead wires meet these from the south west corner of the site.
- 2.4 The site falls from a high point of approximately 171.2m AOD in the south east corner of the site to a low point of approximately 148.3m AOD in the north west corner of the site at an average grade of 1 in 16. There is a gap in the boundary wall in the north west corner which would allow surface water run-off onto Moor Lane, which has a low point and road gully at the north western corner of the site.



View of North Western corner of the site with Moor Lane

- 2.5 Site investigation works have been previously undertaken by Lithos Consulting and are detailed in their report ref: 5439/1 dated October 2025. The investigation works proved the site was overlain by 0.8-1.2m of stiff sandy gravelly clay. In the higher eastern half of the site, this was underlain by a weathered sandstone excavated as gravels and cobbles in a clay matrix. In the lower western half of the site, the clay was underlain by mudstone excavated as clayey gravels becoming interlaminated mudstone, sandstone and siltstone clayey gravels with depth.
- 2.6 The online BGS digital maps at 1:50,000 scale have been consulted and show the site to be underlain by the Pennine Lower Coal Measures consisting of either Mudstone, Siltstone and Sandstone or just Sandstone. Two fault lines are shown to cross the site. (Fig 1.)

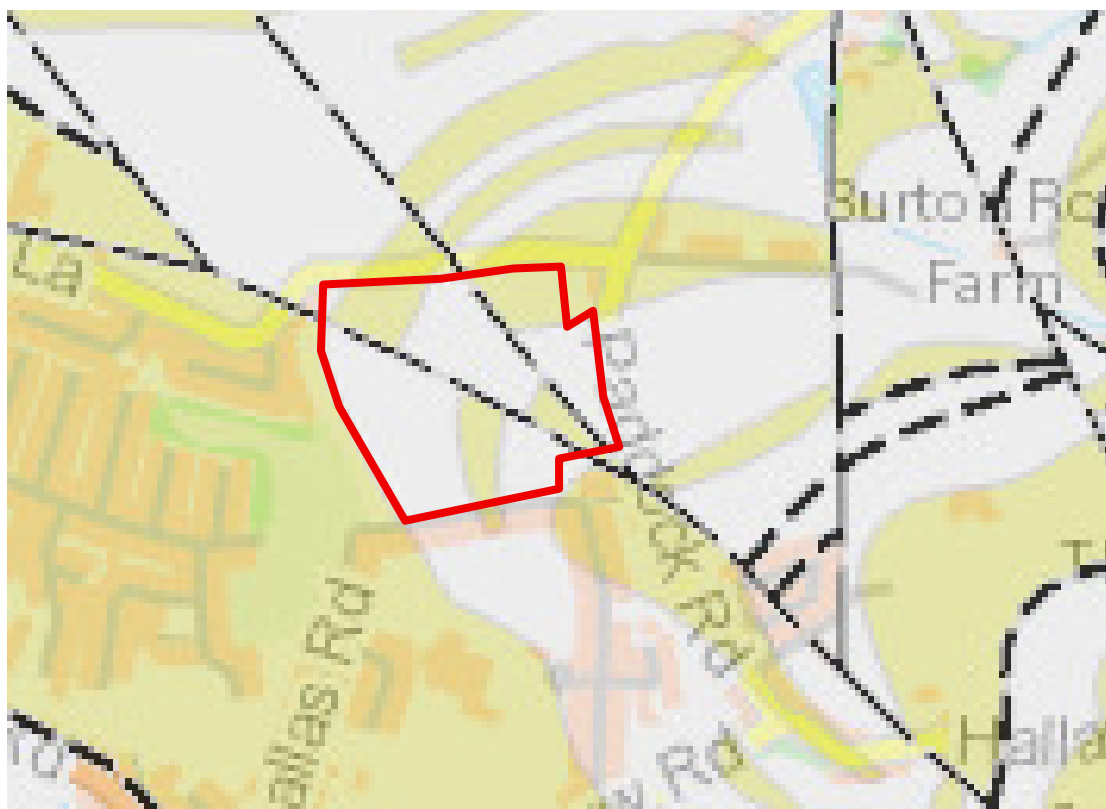


Fig 1 Extract from Online BGS digital maps at 1:50,000 scale

3.0 PROPOSED DEVELOPMENT AND DRAINAGE CONSTRAINTS

- 3.1 It is understood that the proposed development is for a series of detached and semi-detached, houses with associated car parking and access roads. An engineering feasibility site layout is attached in the appendices.
- 3.2 There is no positive drainage recorded serving the existing fields, and surface water run-off would have generally flowed from south east to north west, and then onto Moor Lane through the gap in the boundary wall at the north western corner.
- 3.3 There are no recorded adopted surface water sewers crossing or serving the site. The nearest adopted surface water sewers is a 450mm diameter sewer located in Moor Lane to the north west of the site. This heads northwards across open field and discharges to Belden Brook, approximately 470m north of the site. A 225mm diameter combined sewer is shown running parallel to the surface water sewer in Moor Lane to the north west of the site, and then heading northwards across the fields.
- 3.4 Preliminary site investigation works in the form of soak-a-way testing has been undertaken by Lithos Consulting on site. Four trial pits were excavated throughout the site as shown on the plan in Appendix F. Soil infiltration tests were undertaken in accordance BRE Digest 365: 1991 and the results are included in Appendix F. The soak-a-way tests recorded a drop in water level of 30-230mm over the 4-5 hour duration of the tests, it was therefore not possible to calculate an infiltration rate.
- 3.5 In addition to this, the steep nature of the site, along with the existing residential development at a lower level to the west, means that there is a risk of water re-emergence if infiltration methods are proposed. It is therefore considered that infiltration methods would not be suitable for use on site.
- 3.6 The nearest watercourse is Belden Brook, located approximately 470m north of the site across third party land. Their agreement would be needed to construct a new outfall across the land to the watercourse as Yorkshire Water will not undertake requisitions to watercourses. The

existing adopted 450mm diameter surface water sewer recorded in Moor Lane to the north west of the site currently discharges to Belden Brook.

- 3.7 At present It is proposed to have a restricted discharge to the existing adopted 450mm surface water sewer to the north west corner of the site. Due to the relative levels of the site to the sewer, it will be possible to achieve a gravity connection to the sewer. A discharge rate of 3.5 l/s has been agreed with Yorkshire Water. Please note that this rate is considerably less than the greenfield QBar rate of 32.6 l/s.
- 3.8 The proposed foul sewer will need to connect to the existing 225mm combined sewer shown running adjacent Moor Lane to the north west of the site. Due to the relative levels of the site to the sewer, it should be possible to achieve a gravity connection to the sewer.

4.0 **FLOOD RISK**

- 4.1 On reviewing the Environment Agency websites flood risk maps, the site currently falls within flood zone 1: which is designated as low probability of flooding from sea or rivers less than 0.1% (ie 1 in 1000 year) probability of flooding see Fig 2.

The hierarchy of flood zones are described as:

Flood Zone 1: Low Probability. Land assessed as having a less than 1 in 1000 chance of river and sea flooding in any year (<0.1%).

Flood Zone 2: Medium Probability. Land assessed as having between a 1 in 100 and 1 in 1000 chance of river flooding (1% 0.1%) and between a 1 in 200 and 1 in 1000 chance of sea flooding (0.5% 0.1%) in any year.

Flood Zone 3: High Probability. Land assessed as having a 1 in 100 or greater chance of river flooding (>1%) and 1 in 200 or greater chance of sea flooding (>0.5%) in any year.

The site is therefore considered not to be at risk from fluvial flooding from rivers or sea for the 1 in 100 or 1 in 1000 year flood event. The proposed residential use of the site would be classified as More Vulnerable in NPPF August 2026 Annex F Table 2, which is compatible with Flood Zones 1 and 2 according to Annex F Table 3. In accordance with that table the proposed development would be considered to be appropriate for the site.

- 4.2 The available EA plans indicate that the site not subject to flooding from rainfall directly on site (Fig 3). However, there is an area of flooding shown immediately north west of the site affecting the existing properties on Moor Lane. This is potentially from run-off from the existing fields on site, and to the west.
- 4.3 The site does not appear to fall within an area subject to flooding from reservoirs according to the EA maps. We consider the risk of such a source of flooding would be low. The site does not fall within a flood warning zone.

- 4.4 Due to the size of the development being in excess of 1Ha, it would be necessary to prepare a site specific Flood Risk Assessment for the site.

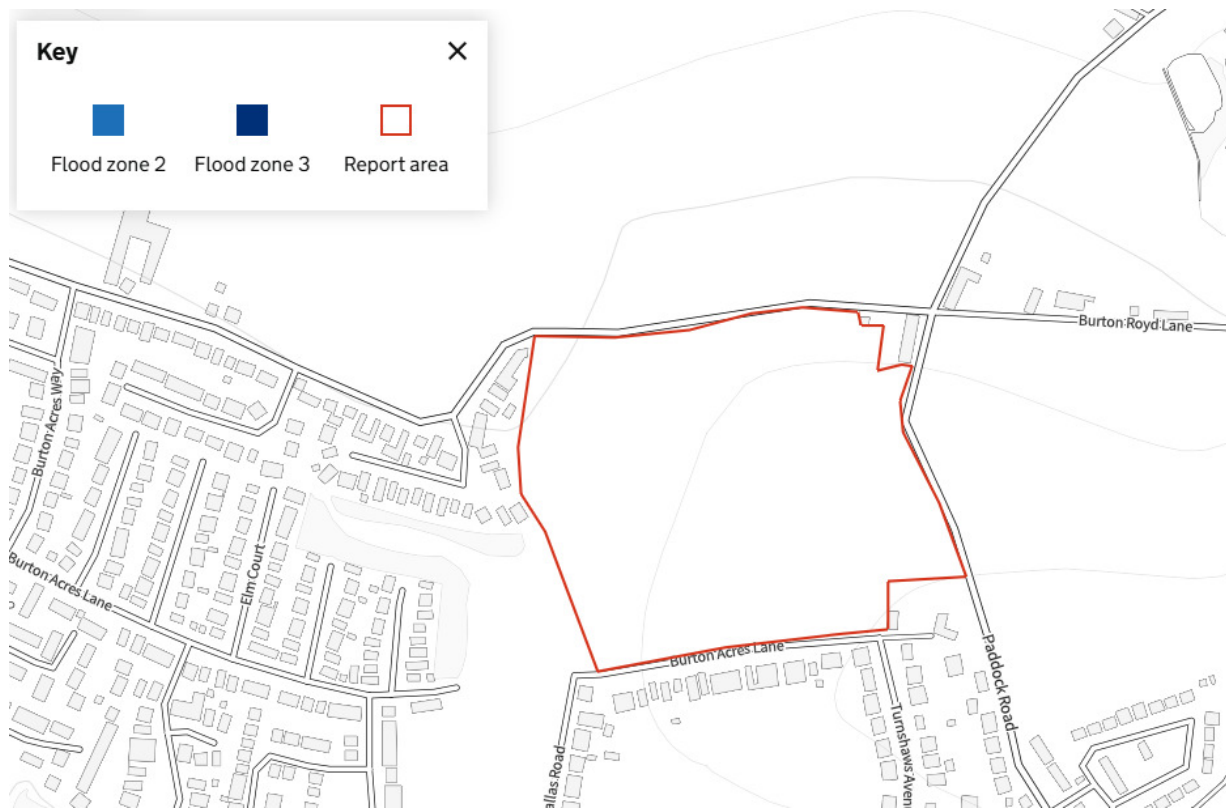


Fig 2 Flood Risk Map – Environment Agency Plan



Fig 3 Surface Water Flood Risk Map

- 4.5 There are a number of potential flooding mechanisms that the Planning Practise Guidance- Flood Risk and Coastal Change September 2025 now requires to be evaluated for each proposed development site. Each method of flooding requires an assessment to be made on its probability relative to the site development. The normal requirement of the document is for no flooding of properties for storms up to a 1% probability or a once in a 100 years storm. The risk assessment also includes for flooding both on site and off site, and the effects of the development on the downstream catchment or the flow regime of the watercourse. NPPG also requires that the effects of severe storms above the normal 1% probability are reviewed together with the effects of climatic change relating to the design life of the development.
- 4.6 It also requires that the effects of climate change are taken into account together with the impacts of extreme events and flood defence failures. Prior to this the Sequential Test, and where necessary, the Exception test as outlined in Planning Practise Guidance- Flood Risk and Coastal Change September 2025, must also be applied to each development site. These aspects are not covered in this report but the proposed site being in Flood Zone 1, would mean these requirements are already met and do not apply.
- 4.7 The Planning Practise Guidance- Flood Risk and Coastal Change September 2025 requires that each flooding mechanism is addressed and levels of risk evaluated. We consider there are three main risks of flooding to the site. The alternative mechanisms are not applicable to this site.
- Inundation from floodwaters leaving watercourses or rivers entering the site. This can include the effects on culverted watercourses and where the risk of blockage can occur and from breach scenarios.
 - Rainwater falling on the site and not being able to leave the site at sufficient rate to prevent flooding on the site.
 - Overland flows from adjacent land sites due to surcharging of sewerage systems or other watercourses.
 - The impact of the developed site on the existing drainage systems and off-site surface water systems must also be assessed as part of this flood risk assessment.

5.0 DISCUSSION OF FLOOD RISKS

5.1 Flood Risk from Watercourses, River & Tidal

- 5.1.1 The proposed site does not fall within the 0.1% or the 1% probability Flood Risk Maps (Zone 2 and 3) as published by the Environment Agency. The site is therefore considered not to be at risk from fluvial flooding for the once in 100 year flood event. We therefore consider the risk of flooding of the site from River and Sea is acceptable for this type of development on this site.

5.2 Risk of Flooding from overland flows from adjacent land.

- 5.2.1 The site lies on an area land sloping from south east to north west. The land to the west generally falls to the north, and the land to the north falls away from the site to the north. The site is bounded by adopted highway with positive drainage to the higher land to the south and east, which would prevent surface water run-off entering the site.
- 5.2.2 The flood maps do not show any areas of surface water flooding in the vicinity of the site to the higher ground to the east and south, there is therefore considered to be little risk of flooding from overland flows from adjacent land.

5.3 Risk of Flooding from Rainwater Falling on Site

- 5.3.1 The existing risk of flooding from water falling on site is shown to be low with no areas of localised flooding. The impermeable area of the site will increase significantly due to the development, and this would increase the run off from the site. This would increase the flood risk to down stream properties unless attenuation measures and restriction of flows took place.

5.3.2 The normal hierarchy for surface water discharge in accordance with current planning and SUDS policies is as follows:

1. The use of infiltration systems such as Soakaways.
2. Discharge to nearby rivers or watercourses with the use of attenuation.
3. Discharge to existing public sewer network with the use of attenuation.

5.3.3 Preliminary site investigation works by Lithos Consulting have proved that soak-a-ways are unsuitable for use on site due to the small drop in water levels during the 4-5 hours infiltration tests undertaken. Additionally, due to the steep nature of the site, and the lower level residential development to the west, there is a risk of surface water re-emergence affecting these properties should infiltration methods be used for the site. In this instance, infiltration methods would not be considered a suitable form of surface water disposal in the long term.

5.3.4 There are no significant existing buildings or paved areas on site, therefore the discharge rate from the site should be reduced to greenfield run-off rates. The 1 in 1 year run-off rate for the developed site area of 5.6ha is calculated as 28.0 l/s using IH124, with a QBar of 32.6 l/s, the calculations are included in the appendices. However, it is understood that it has been agreed to discharge to the existing 450mm diameter surface water sewer located in Moor Lane to the north west of the site at a restricted rate of 3.5 l/s, this is a significant reduction on the existing greenfield run-off rate. Therefore, this lower rate has been considered as the design option for the treatment of the discharge of surface water and storage volumes calculated based upon this discharge rate.

5.3.5 Therefore the development should drain to the existing adopted surface water sewer located to the north west of the site via a gravity connection at a maximum discharge rate of 3.5 l/s with storage provided for the 1 in 100 year + 45% climate change allowance in accordance with KMBC policies.

5.3.6 With attenuation of flows there would have to be a storm-water storage facility. With the recent implementation of the Codes for Adoption, there is greater scope for a regulatory body to adopt and maintain the above ground storage facilities than previously. However there is detailed criteria to be met to able this to take place. For the onsite sewerage system to be adopted there would still be a need for underground tanks to provide sufficient attenuation

storage for the site so that pipework does not surcharge for the 1 in 2 year event. Based on this criteria, the estimated volumes of storage required are shown in the attached calculation sheets. For this run off the storage volumes require 1420 cu.m for the 30 year storm, and 2720 cu.m for the 100 year storm when 45% extra for climatic change is allowed.

- 5.3.7 The use of above storage systems such as swales, detention basins or ponds, would provide the most sustainable urban drainage system. Preliminary designs based on the above volumes to provide a detention basin in the lower north western corner of the site indicate a basin invert level of 149.0m based on existing ground levels, this would result in the top water level of the basin being approximately 1m above the ground levels to 98 Moor Lane to the north west of the site (Fig 4). The property would be at a significant risk of flooding in the event that there is a failure of the perimeter to the detention basin.



Fig 4 – Potential detention basin design

5.3.8 The use of below ground storage facilities on their own, may not provide a suitable level of treatment of the run off from the site and biological systems, at source, may be needed to ensure contaminants are dealt with prior to discharge of site. An assessment of the potential sustainable drainage techniques has been undertaken with regard to providing the required attenuation for the development and is summarised in the table below:

SUDS Feature	Description	Feasibility
Rainwater Harvesting	Rainwater butts fitted to individual plots	Possible – to be considered for individual plots on site
Infiltration Methods	Individual soakaways or adoptable infiltration basin	Infiltration methods not suitable
Detention Basins/Swale	Open water features for attenuation or conveying run-off	The steep nature of the site means that the water detained in these features would be above the level of the properties west of the site, presenting a flood risk in the event of a breach situation.
Rainwater Garden	Filtration system dealing for highway run-off with discharge to the adoptable sewer system	Possible – Adoption and maintenance of the filtration system would need to be agreed. Would provide initial treatment at source.
Permeable Paving	Useful within shared drive areas where maintenance shared	Possible – to be considered for use on suitably flat drives. Would provide initial treatment at source.
Oversized Pipes	Suitability subject to proposed layout and storage requirements	Small size of site, and steep nature of the existing ground, restricts use of oversize pipes
Box Culverts	Suitability subject to proposed layout and storage requirements	Unlikely to be a cost effective solution
Purpose Designed Tank	Can be easily sized to available space and designed to accommodate limited cover	Possible – preferred solution to be put forward for adoption and can be designed to cater for the site conditions. Also allows for greater use of the overlying POS.
Geocellular Systems	Potential for use under parking bays and POS	Yorkshire Water prefer concrete tanks over the use of geocellular systems.

5.3.9 Primary treatment for the roads would therefore be the use of trapped gullies for all hard standings. The use of filter drains adjacent to private drives or permeable paving on private

drives would also provide a first stage treatment of run off from drives and allow a discharge into the top soils on site. The use of permeable paving would therefore facilitate an improvement in water quality in accordance with NPPF August 2026 F8: Sustainable Drainage Systems and Watercourses.

- 5.3.10 The size of the storm water storage facilities would need to be determined accurately in the final detailed designs. These should be all in accordance with the current PPG. The volumes of storage can include flooding to roads and designated areas such as carpark areas or public open space for the 100 year storm with 45% allowance for climate change, but must ensure that no buildings are flooded.
- 5.3.11 The position and levels of the attenuation has been considered to ensure that any failure or blockage of the outfall will not affect any of the new or existing properties. The final discharge rate will be reduced to a maximum of 3.5 l/s. Finally, the position of the attenuation tank has been determined to allow accessibility for future maintenance.
- 5.3.12 During the construction of the site, it is recommended that temporary works are established to prevent surface run-off affecting the existing properties at a lower level and from flooding Moor Lane to the north west.

5.4 **Impact on existing drainage systems.**

- 5.4.1 Attenuation has been provided for a significantly increased return period of 1 in 100 years plus 45% climate change as well as the discharge rate for the development being greatly reduced to the agreed discharge rate of 3.5 l/s, which is significantly below the 32.6 l/s QBar rate for the site. In real terms this would lead to a reduced flood risk offsite due to the restricted flows off-site for these storm events. This will ensure that there should be no increase in the flood risk to properties off site or in the drainage networks downstream of the site.

6.0 **FUTURE MAINTENANCE**

- 6.1 It is proposed for the surface water system serving the development to be adopted by Yorkshire Water or similar approved body under a Section 104 Agreement, this will include the attenuation tanks, flow controls, and outfall sewer.
- 6.2 The maintenance of the attenuation tank should be in line with the SUDS manual (CIRIA C753, 2015) as detailed in table 21.3 below.

Operation and Maintenance Requirements for Attenuation Storage Tanks		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

- 6.3 The maintenance of the proposed permeable paving to the drive will be the responsibility of the respective property owners served by the drive and is as follows:
- The block paving should be regularly swept to keep the jointing clear of debris.
 - Proprietary cleaners should be used to remove lichen and moss. Weedkiller is not to be applied if there is a chance of rainfall within 48 hours due to risk to groundwaters.
 - Jointing to be inspected after heavy storms to ensure there has been no wash-out of the aggregate. Aggregate to be refilled and recompact as required.
 - Should pavements become damaged, new pavements to be installed in accordance with manufacturer's guidance and specifications.
 - Following significant storm events, the outfall location should be inspected to make sure there are no blockages and the soils are not becoming overly saturated.

- 6.4 The developer will be responsible to maintain the drainage systems on site until final adoption by the relevant authority ensuring that they are working effectively in the intervening period between construction and adoption.

7.0 CONCLUSIONS

- 7.1 The area of the site to be developed for residential use currently falls within Flood Zone 1 as defined by the EA Flood maps. The area of the site to be developed is not at risk of flooding from river or tidal water up to a 1% return period. The flood risk is considered to be acceptable for residential development.
- 7.2 Preliminary site investigation works undertaken on site have proved that that infiltration methods would be an unsuitable form of surface water disposal. The use of attenuation systems to reduce the run-off from the site will be required to ensure there is no increase in flood risk to the downstream catchment.
- 7.3 The risk of overland flows entering the site is considered to be low due to the topography of the area around the site. The floor levels of the proposed houses should be a minimum of 300mm above the adjacent road levels or existing ground level, with flood routing provided through the site to the north east.
- 7.4 If the recommendations within this report are adopted for providing attenuation up to and including the 1 in 100 year + 45% climate change storm events and the flow from site restricted to a maximum of 3.5 l/s, there will be a reduction in the flood risk both to the proposed properties on site, as well as the existing properties downstream of the site.



MARTIN HUDDLESTON. MEng

APPENDIX A

LOCATION PLAN



Haigh Huddleston & Associates

Civil Structural Engineering Consultants

t 01924 574074

e martin@haighhuddleston.co.uk

Unit 4
Midgley Business Park
Bar Lane
Midgely
WF4 4JJ

Client : PERSIMMON LEEDS
Job Title: PADDOCK ROAD, KIRKBURTON
Job Number : E25/ 8333

LOCATION PLAN

OS Grid Reference : SE200133
Easting : 420013,
Northing : 413372

Topographical Survey carried out
using GPS.



APPENDIX B

EA FLOOD MAP



Flood map for planning

Your reference
8333 Kirkburton

Location (easting/northing)
420016/413363

Scale
1:2,500

Created
24 Oct 2025 10:15

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area


0 20 40 60m

APPENDIX C

YORKSHIRE WATER CORRESPONDENCE

Flood map for planning

Your reference
8333 Kirkburton

Location (easting/northing)
420016/413363

Created
24 October 2025 10:15

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

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- in an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

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.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2025 AC0000807064. <https://flood-map-for-planning.service.gov.uk/os-terms>



YorkshireWater

Haigh Huddleston & Associates
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Dewsbury
West Yorkshire
WF12 7BU
accounts@haighhuddleston.co.uk

Yorkshire Water Services
Land and Property
Western House
Western Way
Halifax Road
Bradford
BD6 2SZ

Tel: 0345 120 8482

Fax:

Email:

technical.sewerage@yorkshirewater.co.uk

Your Ref:
Our Ref: A/01721

For telephone enquiries ring:
George Mullaney on 0345 120 8482

29th July 2025

Dear Ms Huddleston,

Paddock Road, Kirkburton, Huddersfield HD8 0QR – Pre-Planning Sewerage Enquiry
X015390 – (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:

Foul Water

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

At present the sewer network does not have sufficient available capacity to support the size of development proposed. It is understood that the site is not allocated within the



adopted Kirklees Local Plan and as such the site has not been considered within the current Yorkshire Water Asset Management Plan (AMP) period. Should the site come forward as part of a planning application Yorkshire Water (YWS) would likely not support the proposal.

Should the site benefit from the grant of permission, the closest practicable point of discharge for foul effluent would be the 225 mm diameter combined public sewer running near Moor Lane, to the north 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.

As the proposed 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 (if any nearby) for discharge.

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 online or obtain an application form from our website (www.yorkshirewater.com/developers/sewerage/sewerage-connections/) or by telephoning 0345 120 84 82.

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



YorkshireWater

For further information, please telephone 0345 120 84 82.

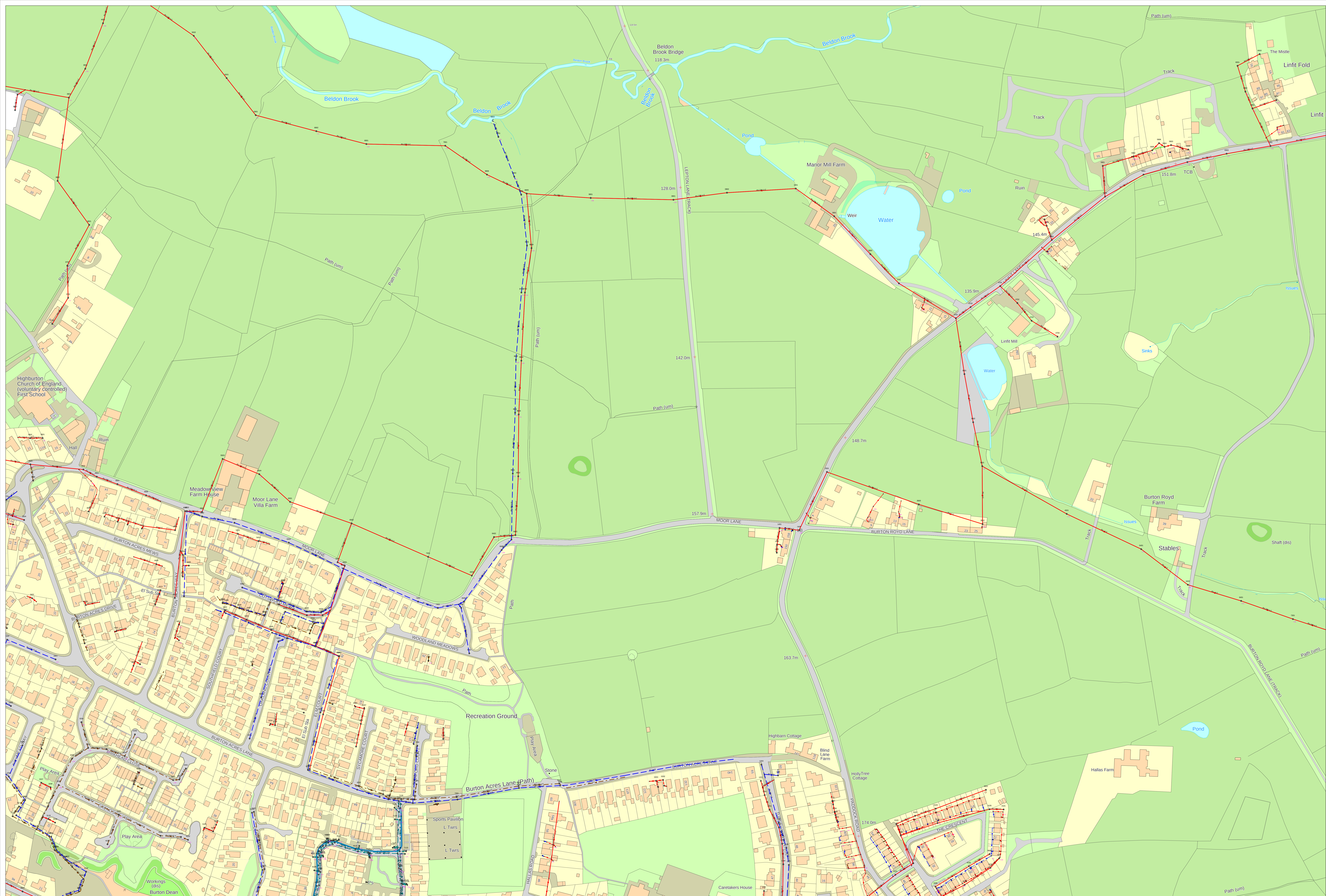
Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the Code for Adoption, pursuant to an agreement under Section 104 of the Water Industry Act 1991. We are happy to offer pre-development technical advice on any prospective sites that you would like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

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

All the above comments are based upon the information and records available at the present time and are valid for a period of 12 months. 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
Town Planning Technician



FW: Paddock Road Kirburton X015390

From Martin Huddleston <martin@haighhuddleston.co.uk>

Date Mon 2025-11-17 14:24

To Michael Dean <m.dean@haighhuddleston.co.uk>

 1 attachment (7 MB)

MULLANEG_rad9370A.PDF;

From: George Mullaney <george.mullaney@yorkshirewater.co.uk>

Sent: 06 November 2025 15:04

To: Martin Huddleston <martin@haighhuddleston.co.uk>

Cc: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>

Subject: RE: Paddock Road Kirburton X015390

Hi Martin,

So sorry for the delay, thanks for the infiltration report I can see that the four test pits did not drain to an adequate depth. Given there isn't a watercourse within a reasonable distance of your development the 450mm diameter surface water sewer in Moor Lane is the next most suitable option. This sewer does discharge to a watercourse to the north, I've attached a zoomed out sewer plan showing it's outfall point.

I've left a voicemail with you, I'll try and get back in touch with you again before 4pm today and we can discuss the drainage strategy for the development.

Kind regards



George Mullaney
Town Planning Technician
Land and Property

0345 120 8482
yorkshirewater.com/developers

From: Martin Huddleston <martin@haighhuddleston.co.uk>

Sent: 06 November 2025 13:34

To: George Mullaney <george.mullaney@yorkshirewater.co.uk>; Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>

Subject: FW: Paddock Road Kirburton

WARNING - EXTERNAL SOURCE

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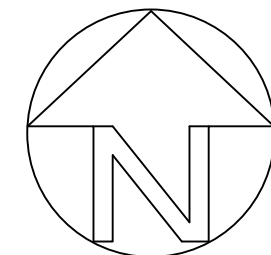
If you suspect that this email is suspicious please report it to the Cyber Security Team using the "Report Message" button.

APPENDIX D

ENGINEERING FEASIBILITY PLAN



RISK ASSESSMENT		
SIGNIFICANT RISKS THAT CANNOT BE DESIGNED OUT		
RISK	LEVEL OF RISK	SUGGESTED ACTION
DEEP EXCAVATIONS ASSOCIATED WITH NEW DRAINAGE WORKS	HIGH	ENSURE ALL EXCAVATIONS HAVE ADEQUATE TRENCH SUPPORTS
TRAVELLING LARGE DIRECTION VEHICLE RISKS AND CIRCULAR PIPES	HIGH	USE CORRECT LIFTING EQUIPMENT AND ENSURE OPERATIVE TRUCKS APPROPRIATELY PROTECTED BY EXCAVATION AND TRENCHING FENCE
CONTACT WITH SERVICE	MED	OPERATIVE TO USE CORRECT TRENCHING EQUIPMENT CORRECT FENCE
NOISE	MED	OPERATIVE TO USE CORRECT EAR PROTECTION CORRECT FENCE
DRAINAGE EXCAVATIONS ADJACENT EXISTING BOUNDARY STRUCTURES	HIGH	ENSURE CORRECT SUPPORTS ARE PROVIDED TO TRENCHES AND BOUNDARIES WHERE REQUIRED
DRAINAGE EXCAVATIONS IN PUBLIC HIGHWAY	HIGH	ENSURE CORRECT USE OF TRENCH SUPPORTS EXCAVATIONS AND BOUNDARIES TO PROTECT MEMBERS OF THE PUBLIC
MAINTAIN ACCESS TO ADJACENT PROPERTIES AND OCCUPANTS	HIGH	ENSURE WORKERS ARE PROTECTED WITH BARRIERS AND SIGNS
DRAINAGE EXCAVATIONS NEAR TO EXISTING SERVICES	HIGH	ENSURE WORKERS ARE PROTECTED WITH BARRIERS AND SIGNS
WORKING IN CONFINED SPACES. WORKING IN DRAINS AND MANHOLES	HIGH	ENSURE WORKERS ARE PROTECTED WITH BARRIERS AND SIGNS
WORKING IN HIGHWAYS / RISKS FROM VEHICLE AND PLANT	HIGH	ENSURE WORKERS ARE PROTECTED WITH BARRIERS AND SIGNS
ROAD AND DRAINAGE CONSTRUCTION	HIGH	ENSURE WORKERS ARE PROTECTED WITH BARRIERS AND SIGNS



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Client
PERSIMMON HOMES

Project
PADDOCK ROAD, KIRK BURTON

Detail
ENGINEERING FEASIBILITY

Drawn
JM

Date
DEC 2025

Scale
1:500@A0

Drawn No.
E25/833/001_01A

A	Updated to suit latest planning layout.	24.07.26	JM
Rev	Description	Date	Initials

APPENDIX E

GREENFIELD RUN-OFF RATE
CALCULATIONS

PRELIMINARY DRAINAGE
CALCULATIONS

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.

Project details

Date	24/10/2025
Calculated by	M DEAN
Reference	8333
Model version	2.2.1

Location

Site name	Paddock Road
Site location	Kirkburton



Site easting (British National Grid)	420020
Site northing (British National Grid)	413360

Site details

Total site area (ha)	5.6	ha
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Greenfield runoff

Method

Method	IH124
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IH124

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	821	mm	821
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	32.6	l/s	

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	3		3
1 year growth factor	0.86		
2 year growth factor	0.94		
10 year growth factor	1.45		
30 year growth factor	1.75		
100 year growth factor	2.08		
200 year growth factor	2.37		

Results

Method	IH124	
Flow rate 1 year (l/s)	28.0	l/s
Flow rate 2 year (l/s)	30.6	l/s
Flow rate 10 years (l/s)	47.2	l/s
Flow rate 30 years (l/s)	57.0	l/s
Flow rate 100 years (l/s)	67.8	l/s
Flow rate 200 years (l/s)	77.2	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.1) developed by HR Wallingford and available at uksuds.com (<https://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 uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	75.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
1	0.095	5.00	164.227	1200	420144.210	413347.067	1.425	162.802
2	0.049	5.00	163.549	1200	420137.485	413364.972	1.587	161.962
3	0.076	5.00	164.072	1200	420097.356	413349.898	2.396	161.676
4	0.035	5.00	163.992	1200	420086.773	413349.618	2.387	161.605
26	0.045	5.00	166.250	1200	420053.580	413255.299	1.425	164.825
27	0.117	5.00	166.551	1200	420061.023	413263.032	1.833	164.718
28	0.101	5.00	165.021	1200	420055.811	413306.884	1.565	163.456
29	0.039	5.00	163.887	1200	420053.496	413335.322	1.647	162.240
5	0.000		163.226	1500	420055.704	413353.410	1.905	161.321
6	0.063	5.00	162.965	1500	420045.368	413354.672	1.852	161.113
7	0.105	5.00	160.682	1500	419987.706	413344.659	1.659	159.023
30	0.052	5.00	162.019	1200	419977.503	413240.105	1.425	160.594
31	0.086	5.00	162.343	1200	419984.949	413247.001	1.850	160.493
32	0.091	5.00	161.455	1200	419976.669	413287.160	1.475	159.980
33	0.145	5.00	160.164	1200	419971.470	413312.379	1.546	158.618
8	0.029	5.00	159.191	1500	419965.748	413340.133	1.738	157.453
9	0.054	5.00	158.250	1500	419951.687	413340.076	1.734	156.516
10	0.000		157.362	1500	419939.005	413346.567	1.796	155.566
34	0.044	5.00	162.257	1200	420068.158	413381.654	1.425	160.832
35	0.037	5.00	162.545	1200	420085.974	413385.761	1.896	160.649
36	0.064	5.00	161.718	1200	420079.210	413415.106	1.445	160.273
37	0.050	5.00	161.139	1200	420073.993	413437.738	1.447	159.692
38	0.135	5.00	159.500	1200	420032.246	413428.115	1.746	157.754
39	0.043	5.00	158.185	1500	420003.235	413421.428	1.651	156.534
40	0.173	5.00	157.883	1500	419981.170	413409.779	1.599	156.284
41	0.145	5.00	157.659	1500	419966.504	413389.413	1.701	155.958
42	0.062	5.00	157.467	1500	419954.109	413376.996	1.684	155.783
11	0.079	5.00	156.890	1500	419929.885	413358.529	1.829	155.061
12	0.263	5.00	154.810	1500	419896.612	413333.164	1.916	152.894
13	0.016	5.00	154.214	1500	419887.121	413325.928	1.917	152.297
15			153.000	1500	419872.919	413340.583	1.723	151.277
16			152.500	1500	419865.434	413353.276	1.550	150.950
17			152.600	1500	419862.023	413372.935	2.274	150.326
18			153.000	1500	419870.918	413385.664	2.829	150.171
43	0.061	5.00	156.105	1200	419931.218	413388.946	1.605	154.500
44	0.000		154.777	1200	419921.089	413401.125	1.597	153.180
45	0.042	5.00	153.697	1200	419905.246	413418.270	1.578	152.119
46	0.096	5.00	153.600	1200	419893.428	413407.293	1.683	151.917
19			151.100	1500	419872.860	413413.450	3.157	147.943
20			150.141	1800	419867.442	413426.658	3.547	146.594
47	0.071	5.00	159.854	1200	420122.494	413449.230	1.425	158.429

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
48	0.081	5.00	160.410	1200	420108.933	413446.104	2.149	158.261
49	0.000		160.132	1200	420106.288	413457.578	1.949	158.183
50	0.063	5.00	159.777	1200	420104.573	413471.349	1.687	158.090
51	0.033	5.00	159.362	1200	420105.743	413487.634	1.544	157.818
52	0.107	5.00	159.500	1200	420056.500	413491.174	2.299	157.201
57	0.068	5.00	157.602	1200	420010.846	413457.323	1.552	156.050
53	0.017	5.00	156.275	1200	420005.494	413480.541	1.624	154.651
54	0.068	5.00	153.783	1200	419951.977	413469.643	1.863	151.920
55	0.068	5.00	152.500	1200	419923.804	413463.906	2.894	149.606
56			151.000	1800	419907.392	413465.884	4.406	146.594
21		5.00	149.500	1800	419875.208	413473.012	3.000	146.500
22			149.000	2100	419876.034	413477.943	2.517	146.483
23			148.785	1200	419876.417	413483.931	2.372	146.413
24			148.622	1200	419864.935	413484.664	2.286	146.336
25			148.704	1200	419857.532	413486.989	2.420	146.284

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	19.126	0.600	162.802	162.037	0.765	25.0	225	5.12	66.1
1.001	2	3	42.867	0.600	161.962	161.676	0.286	150.0	300	5.68	63.2
1.002	3	4	10.587	0.600	161.676	161.605	0.071	150.0	300	5.82	62.5
1.003	4	5	31.300	0.600	161.605	161.396	0.209	150.0	300	6.22	60.6
2.000	26	27	10.733	0.600	164.825	164.718	0.107	100.0	225	5.14	66.0
2.001	27	28	44.161	0.600	164.718	163.456	1.262	35.0	225	5.47	64.2
2.002	28	29	28.532	0.600	163.456	162.315	1.141	25.0	225	5.65	63.3
2.003	29	5	18.222	0.600	162.240	161.396	0.844	21.6	300	5.74	62.9
1.004	5	6	10.413	0.600	161.321	161.113	0.208	50.0	375	6.29	60.3
1.005	6	7	58.525	0.600	161.113	159.023	2.090	28.0	375	6.58	59.0
1.006	7	8	22.420	0.600	159.023	157.528	1.495	15.0	375	6.65	58.7
3.000	30	31	10.149	0.600	160.594	160.493	0.101	100.0	225	5.13	66.0
3.001	31	32	41.004	0.600	160.493	159.980	0.513	80.0	225	5.60	63.6
3.002	32	33	25.749	0.600	159.980	158.693	1.287	20.0	225	5.74	62.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.627	104.5	17.0	1.200	1.287	0.095	0.0	61	1.947
1.001	1.281	90.6	24.6	1.287	2.096	0.144	0.0	106	1.094
1.002	1.281	90.6	37.3	2.096	2.087	0.220	0.0	134	1.221
1.003	1.281	90.6	41.9	2.087	1.530	0.255	0.0	143	1.257
2.000	1.307	52.0	8.0	1.200	1.608	0.045	0.0	59	0.952
2.001	2.218	88.2	28.2	1.608	1.340	0.162	0.0	87	1.981
2.002	2.627	104.5	45.1	1.340	1.347	0.263	0.0	103	2.534
2.003	3.398	240.2	51.5	1.347	1.530	0.302	0.0	94	2.727
1.004	2.567	283.5	91.0	1.530	1.477	0.557	0.0	145	2.294
1.005	3.435	379.4	99.2	1.477	1.284	0.620	0.0	130	2.906
1.006	4.698	518.9	115.4	1.284	1.288	0.725	0.0	120	3.813
3.000	1.307	52.0	9.3	1.200	1.625	0.052	0.0	65	0.997
3.001	1.463	58.2	23.8	1.625	1.250	0.138	0.0	100	1.389
3.002	2.939	116.8	39.0	1.250	1.246	0.229	0.0	89	2.650

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.003	33	8	28.338	0.600	158.618	157.603	1.015	27.9	300	5.90	62.1
1.007	8	9	14.061	0.600	157.453	156.516	0.937	15.0	450	6.70	58.5
1.008	9	10	14.247	0.600	156.516	155.566	0.950	15.0	450	6.74	58.3
1.009	10	11	15.042	0.600	155.566	155.136	0.430	35.0	450	6.82	58.0
4.000	34	35	18.283	0.600	160.832	160.649	0.183	100.0	225	5.23	65.5
4.001	35	36	30.114	0.600	160.649	160.273	0.376	80.0	225	5.58	63.7
4.002	36	37	23.226	0.600	160.273	159.692	0.581	40.0	225	5.76	62.7
4.003	37	38	42.842	0.600	159.692	157.829	1.863	23.0	225	6.02	61.5
4.004	38	39	29.772	0.600	157.754	156.609	1.145	26.0	300	6.18	60.8
4.005	39	40	24.951	0.600	156.534	156.284	0.250	100.0	375	6.41	59.7
4.006	40	41	25.097	0.600	156.284	156.033	0.251	100.0	375	6.64	58.7
4.007	41	42	17.545	0.600	155.958	155.783	0.175	100.0	450	6.79	58.2
4.008	42	11	30.460	0.600	155.783	155.136	0.647	47.1	450	6.96	57.5
1.010	11	12	41.839	0.600	155.061	152.969	2.092	20.0	525	7.10	56.9
1.011	12	13	11.935	0.600	152.894	152.297	0.597	20.0	600	7.13	56.8
1.012	13	15	20.407	0.600	152.297	151.277	1.020	20.0	600	7.20	56.5
1.014	15	16	14.736	0.600	151.277	150.950	0.327	45.0	600	7.26	56.3
1.015	16	17	19.953	0.600	150.950	150.326	0.624	32.0	600	7.34	56.0
1.016	17	18	15.529	0.600	150.326	150.171	0.155	100.0	600	7.45	55.6
1.017	18	19	27.854	0.600	150.171	149.395	0.776	35.9	600	7.56	55.2
5.000	43	44	15.841	0.600	154.500	153.180	1.320	12.0	225	5.07	66.4
5.001	44	45	23.344	0.600	153.180	152.119	1.061	22.0	225	5.21	65.6
5.002	45	46	16.129	0.600	152.119	151.917	0.202	80.0	225	5.39	64.6
5.003	46	19	21.470	0.600	151.917	149.770	2.147	10.0	225	5.48	64.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.003	2.986	211.1	62.9	1.246	1.288	0.374	0.0	112	2.621
1.007	5.269	838.0	178.9	1.288	1.284	1.128	0.0	140	4.227
1.008	5.269	838.0	186.9	1.284	1.346	1.182	0.0	144	4.281
1.009	3.445	547.9	185.9	1.346	1.304	1.182	0.0	180	3.123
4.000	1.307	52.0	7.8	1.200	1.671	0.044	0.0	58	0.944
4.001	1.463	58.2	14.0	1.671	1.220	0.081	0.0	75	1.210
4.002	2.074	82.5	24.7	1.220	1.222	0.145	0.0	84	1.815
4.003	2.740	108.9	32.5	1.222	1.446	0.195	0.0	84	2.398
4.004	3.095	218.8	54.3	1.446	1.276	0.330	0.0	102	2.586
4.005	1.812	200.1	60.4	1.276	1.224	0.373	0.0	141	1.594
4.006	1.812	200.1	86.9	1.224	1.251	0.546	0.0	172	1.749
4.007	2.033	323.3	108.9	1.251	1.234	0.691	0.0	180	1.843
4.008	2.968	472.1	117.3	1.234	1.304	0.753	0.0	152	2.478
1.010	5.024	1087.6	310.7	1.304	1.316	2.014	0.0	191	4.359
1.011	5.461	1544.0	350.4	1.316	1.317	2.277	0.0	193	4.461
1.012	5.461	1544.0	351.3	1.317	1.123	2.293	0.0	193	4.461
1.014	3.636	1028.1	349.7	1.123	0.950	2.293	0.0	241	3.305
1.015	4.314	1219.9	347.9	0.950	1.674	2.293	0.0	218	3.745
1.016	2.435	688.5	345.5	1.674	2.229	2.293	0.0	301	2.438
1.017	4.073	1151.6	342.9	2.229	1.105	2.293	0.0	224	3.576
5.000	3.798	151.0	11.0	1.380	1.372	0.061	0.0	41	2.236
5.001	2.801	111.4	10.8	1.372	1.353	0.061	0.0	47	1.790
5.002	1.463	58.2	18.0	1.353	1.458	0.103	0.0	86	1.293
5.003	4.161	165.5	34.6	1.458	1.105	0.199	0.0	70	3.318

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.018	19	20	14.276	0.600	147.943	147.657	0.286	50.0	600	7.63	54.9
7.000	47	48	13.917	0.600	158.429	158.336	0.093	150.0	225	5.22	65.5
7.001	48	49	11.775	0.600	158.261	158.183	0.078	150.0	300	5.37	64.7
7.002	49	50	13.877	0.600	158.183	158.090	0.093	150.0	300	5.55	63.8
7.003	50	51	16.327	0.600	158.090	157.818	0.272	60.0	300	5.69	63.1
7.004	51	52	49.370	0.600	157.818	157.201	0.617	80.0	300	6.15	60.9
7.005	52	53	52.103	0.600	157.201	154.651	2.550	20.4	300	6.40	59.8
8.000	57	53	23.827	0.600	156.050	154.726	1.324	18.0	225	5.13	66.0
7.006	53	54	54.615	0.600	154.651	151.920	2.731	20.0	300	6.66	58.7
7.007	54	55	28.751	0.600	151.920	149.606	2.314	12.4	300	6.77	58.2
7.008	55	56	16.531	0.600	149.606	147.953	1.653	10.0	300	6.82	58.0
1.020	21	22	5.000	0.600	146.500	146.483	0.017	300.0	900	5.05	66.5
1.021	22	23	6.000	0.600	146.483	146.443	0.040	150.0	225	5.14	66.0
1.022	23	24	11.505	0.600	146.413	146.336	0.077	150.0	255	5.31	65.1
1.023	24	25	7.760	0.600	146.336	146.284	0.052	150.0	255	5.42	64.5

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.018	3.449	975.1	370.9	2.557	1.884	2.492	0.0	256	3.223
7.000	1.065	42.3	12.6	1.200	1.849	0.071	0.0	84	0.931
7.001	1.281	90.6	26.7	1.849	1.649	0.152	0.0	111	1.118
7.002	1.281	90.6	26.3	1.649	1.387	0.152	0.0	110	1.115
7.003	2.033	143.7	36.8	1.387	1.244	0.215	0.0	103	1.708
7.004	1.759	124.3	40.9	1.244	1.999	0.248	0.0	118	1.581
7.005	3.493	246.9	57.5	1.999	1.324	0.355	0.0	98	2.866
8.000	3.098	123.2	12.2	1.327	1.324	0.068	0.0	48	2.002
7.006	3.531	249.6	70.0	1.324	1.563	0.440	0.0	108	3.042
7.007	4.483	316.9	80.2	1.563	2.594	0.508	0.0	102	3.757
7.008	4.999	353.4	90.6	2.594	2.747	0.576	0.0	103	4.214
1.020	1.803	1147.3	0.0	2.100	1.617	0.000	0.0	0	0.000
1.021	1.065	42.3	0.0	2.292	2.117	0.000	0.0	0	0.000
1.022	1.154	59.0	0.0	2.117	2.031	0.000	0.0	0	0.000
1.023	1.154	59.0	0.0	2.031	2.165	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	19.126	25.0	225	Circular_Default Sewer Type	164.227	162.802	1.200	163.549	162.037	1.287
1.001	42.867	150.0	300	Circular_Default Sewer Type	163.549	161.962	1.287	164.072	161.676	2.096
1.002	10.587	150.0	300	Circular_Default Sewer Type	164.072	161.676	2.096	163.992	161.605	2.087
1.003	31.300	150.0	300	Circular_Default Sewer Type	163.992	161.605	2.087	163.226	161.396	1.530
2.000	10.733	100.0	225	Circular_Default Sewer Type	166.250	164.825	1.200	166.551	164.718	1.608

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.003	4	1200	Manhole	Adoptable	5	1500	Manhole	Adoptable
2.000	26	1200	Manhole	Adoptable	27	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.001	44.161	35.0	225	Circular_Default Sewer Type	166.551	164.718	1.608	165.021	163.456	1.340
2.002	28.532	25.0	225	Circular_Default Sewer Type	165.021	163.456	1.340	163.887	162.315	1.347
2.003	18.222	21.6	300	Circular_Default Sewer Type	163.887	162.240	1.347	163.226	161.396	1.530
1.004	10.413	50.0	375	Circular_Default Sewer Type	163.226	161.321	1.530	162.965	161.113	1.477
1.005	58.525	28.0	375	Circular_Default Sewer Type	162.965	161.113	1.477	160.682	159.023	1.284
1.006	22.420	15.0	375	Circular_Default Sewer Type	160.682	159.023	1.284	159.191	157.528	1.288
3.000	10.149	100.0	225	Circular_Default Sewer Type	162.019	160.594	1.200	162.343	160.493	1.625
3.001	41.004	80.0	225	Circular_Default Sewer Type	162.343	160.493	1.625	161.455	159.980	1.250
3.002	25.749	20.0	225	Circular_Default Sewer Type	161.455	159.980	1.250	160.164	158.693	1.246
3.003	28.338	27.9	300	Circular_Default Sewer Type	160.164	158.618	1.246	159.191	157.603	1.288
1.007	14.061	15.0	450	Circular_Default Sewer Type	159.191	157.453	1.288	158.250	156.516	1.284
1.008	14.247	15.0	450	Circular_Default Sewer Type	158.250	156.516	1.284	157.362	155.566	1.346
1.009	15.042	35.0	450	Circular_Default Sewer Type	157.362	155.566	1.346	156.890	155.136	1.304
4.000	18.283	100.0	225	Circular_Default Sewer Type	162.257	160.832	1.200	162.545	160.649	1.671
4.001	30.114	80.0	225	Circular_Default Sewer Type	162.545	160.649	1.671	161.718	160.273	1.220
4.002	23.226	40.0	225	Circular_Default Sewer Type	161.718	160.273	1.220	161.139	159.692	1.222
4.003	42.842	23.0	225	Circular_Default Sewer Type	161.139	159.692	1.222	159.500	157.829	1.446
4.004	29.772	26.0	300	Circular_Default Sewer Type	159.500	157.754	1.446	158.185	156.609	1.276
4.005	24.951	100.0	375	Circular_Default Sewer Type	158.185	156.534	1.276	157.883	156.284	1.224
4.006	25.097	100.0	375	Circular_Default Sewer Type	157.883	156.284	1.224	157.659	156.033	1.251
4.007	17.545	100.0	450	Circular_Default Sewer Type	157.659	155.958	1.251	157.467	155.783	1.234
4.008	30.460	47.1	450	Circular_Default Sewer Type	157.467	155.783	1.234	156.890	155.136	1.304
1.010	41.839	20.0	525	Circular_Default Sewer Type	156.890	155.061	1.304	154.810	152.969	1.316
1.011	11.935	20.0	600	Circular_Default Sewer Type	154.810	152.894	1.316	154.214	152.297	1.317
1.012	20.407	20.0	600	Circular_Default Sewer Type	154.214	152.297	1.317	153.000	151.277	1.123

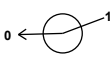
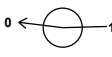
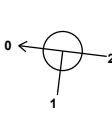
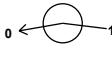
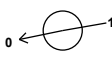
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.001	27	1200	Manhole	Adoptable	28	1200	Manhole	Adoptable
2.002	28	1200	Manhole	Adoptable	29	1200	Manhole	Adoptable
2.003	29	1200	Manhole	Adoptable	5	1500	Manhole	Adoptable
1.004	5	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
1.005	6	1500	Manhole	Adoptable	7	1500	Manhole	Adoptable
1.006	7	1500	Manhole	Adoptable	8	1500	Manhole	Adoptable
3.000	30	1200	Manhole	Adoptable	31	1200	Manhole	Adoptable
3.001	31	1200	Manhole	Adoptable	32	1200	Manhole	Adoptable
3.002	32	1200	Manhole	Adoptable	33	1200	Manhole	Adoptable
3.003	33	1200	Manhole	Adoptable	8	1500	Manhole	Adoptable
1.007	8	1500	Manhole	Adoptable	9	1500	Manhole	Adoptable
1.008	9	1500	Manhole	Adoptable	10	1500	Manhole	Adoptable
1.009	10	1500	Manhole	Adoptable	11	1500	Manhole	Adoptable
4.000	34	1200	Manhole	Adoptable	35	1200	Manhole	Adoptable
4.001	35	1200	Manhole	Adoptable	36	1200	Manhole	Adoptable
4.002	36	1200	Manhole	Adoptable	37	1200	Manhole	Adoptable
4.003	37	1200	Manhole	Adoptable	38	1200	Manhole	Adoptable
4.004	38	1200	Manhole	Adoptable	39	1500	Manhole	Adoptable
4.005	39	1500	Manhole	Adoptable	40	1500	Manhole	Adoptable
4.006	40	1500	Manhole	Adoptable	41	1500	Manhole	Adoptable
4.007	41	1500	Manhole	Adoptable	42	1500	Manhole	Adoptable
4.008	42	1500	Manhole	Adoptable	11	1500	Manhole	Adoptable
1.010	11	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
1.011	12	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.012	13	1500	Manhole	Adoptable	15	1500	Manhole	Adoptable

Pipeline Schedule

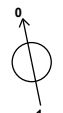
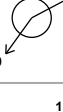
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.014	14.736	45.0	600	Circular_Default Sewer Type	153.000	151.277	1.123	152.500	150.950	0.950
1.015	19.953	32.0	600	Circular_Default Sewer Type	152.500	150.950	0.950	152.600	150.326	1.674
1.016	15.529	100.0	600	Circular_Default Sewer Type	152.600	150.326	1.674	153.000	150.171	2.229
1.017	27.854	35.9	600	Circular_Default Sewer Type	153.000	150.171	2.229	151.100	149.395	1.105
5.000	15.841	12.0	225	Circular_Default Sewer Type	156.105	154.500	1.380	154.777	153.180	1.372
5.001	23.344	22.0	225	Circular_Default Sewer Type	154.777	153.180	1.372	153.697	152.119	1.353
5.002	16.129	80.0	225	Circular_Default Sewer Type	153.697	152.119	1.353	153.600	151.917	1.458
5.003	21.470	10.0	225	Circular_Default Sewer Type	153.600	151.917	1.458	151.100	149.770	1.105
1.018	14.276	50.0	600	Circular_Default Sewer Type	151.100	147.943	2.557	150.141	147.657	1.884
7.000	13.917	150.0	225	Circular_Default Sewer Type	159.854	158.429	1.200	160.410	158.336	1.849
7.001	11.775	150.0	300	Circular_Default Sewer Type	160.410	158.261	1.849	160.132	158.183	1.649
7.002	13.877	150.0	300	Circular_Default Sewer Type	160.132	158.183	1.649	159.777	158.090	1.387
7.003	16.327	60.0	300	Circular_Default Sewer Type	159.777	158.090	1.387	159.362	157.818	1.244
7.004	49.370	80.0	300	Circular_Default Sewer Type	159.362	157.818	1.244	159.500	157.201	1.999
7.005	52.103	20.4	300	Circular_Default Sewer Type	159.500	157.201	1.999	156.275	154.651	1.324
8.000	23.827	18.0	225	Circular_Default Sewer Type	157.602	156.050	1.327	156.275	154.726	1.324
7.006	54.615	20.0	300	Circular_Default Sewer Type	156.275	154.651	1.324	153.783	151.920	1.563
7.007	28.751	12.4	300	Circular_Default Sewer Type	153.783	151.920	1.563	152.500	149.606	2.594
7.008	16.531	10.0	300	Circular_Default Sewer Type	152.500	149.606	2.594	151.000	147.953	2.747
1.020	5.000	300.0	900	Circular_Default Sewer Type	149.500	146.500	2.100	149.000	146.483	1.617
1.021	6.000	150.0	225	Circular_Default Sewer Type	149.000	146.483	2.292	148.785	146.443	2.117
1.022	11.505	150.0	255	Circular_Default Sewer Type	148.785	146.413	2.117	148.622	146.336	2.031
1.023	7.760	150.0	255	Circular_Default Sewer Type	148.622	146.336	2.031	148.704	146.284	2.165

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.014	15	1500	Manhole	Adoptable	16	1500	Manhole	Adoptable
1.015	16	1500	Manhole	Adoptable	17	1500	Manhole	Adoptable
1.016	17	1500	Manhole	Adoptable	18	1500	Manhole	Adoptable
1.017	18	1500	Manhole	Adoptable	19	1500	Manhole	Adoptable
5.000	43	1200	Manhole	Adoptable	44	1200	Manhole	Adoptable
5.001	44	1200	Manhole	Adoptable	45	1200	Manhole	Adoptable
5.002	45	1200	Manhole	Adoptable	46	1200	Manhole	Adoptable
5.003	46	1200	Manhole	Adoptable	19	1500	Manhole	Adoptable
1.018	19	1500	Manhole	Adoptable	20	1800	Manhole	Adoptable
7.000	47	1200	Manhole	Adoptable	48	1200	Manhole	Adoptable
7.001	48	1200	Manhole	Adoptable	49	1200	Manhole	Adoptable
7.002	49	1200	Manhole	Adoptable	50	1200	Manhole	Adoptable
7.003	50	1200	Manhole	Adoptable	51	1200	Manhole	Adoptable
7.004	51	1200	Manhole	Adoptable	52	1200	Manhole	Adoptable
7.005	52	1200	Manhole	Adoptable	53	1200	Manhole	Adoptable
8.000	57	1200	Manhole	Adoptable	53	1200	Manhole	Adoptable
7.006	53	1200	Manhole	Adoptable	54	1200	Manhole	Adoptable
7.007	54	1200	Manhole	Adoptable	55	1200	Manhole	Adoptable
7.008	55	1200	Manhole	Adoptable	56	1800	Manhole	Adoptable
1.020	21	1800	Manhole	Adoptable	22	2100	Manhole	Adoptable
1.021	22	2100	Manhole	Adoptable	23	1200	Manhole	Adoptable
1.022	23	1200	Manhole	Adoptable	24	1200	Manhole	Adoptable
1.023	24	1200	Manhole	Adoptable	25	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	420144.210	413347.067	164.227	1.425	1200				
						0	1.000	162.802	225
2	420137.485	413364.972	163.549	1.587	1200		1	1.000	162.037
						0	1.001	161.962	300
3	420097.356	413349.898	164.072	2.396	1200		1	1.001	161.676
						0	1.002	161.676	300
4	420086.773	413349.618	163.992	2.387	1200		1	1.002	161.605
						0	1.003	161.605	300
26	420053.580	413255.299	166.250	1.425	1200				
						0	2.000	164.825	225
27	420061.023	413263.032	166.551	1.833	1200		1	2.000	164.718
						0	2.001	164.718	225
28	420055.811	413306.884	165.021	1.565	1200		1	2.001	163.456
						0	2.002	163.456	225
29	420053.496	413335.322	163.887	1.647	1200		1	2.002	162.315
						0	2.003	162.240	300
5	420055.704	413353.410	163.226	1.905	1500		1	2.003	161.396
						2	1.003	161.396	300
						0	1.004	161.321	375
6	420045.368	413354.672	162.965	1.852	1500		1	1.004	161.113
						0	1.005	161.113	375
7	419987.706	413344.659	160.682	1.659	1500		1	1.005	159.023
						0	1.006	159.023	375
30	419977.503	413240.105	162.019	1.425	1200				
						0	3.000	160.594	225
31	419984.949	413247.001	162.343	1.850	1200		1	3.000	160.493
						0	3.001	160.493	225

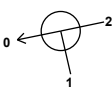
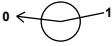
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
32	419976.669	413287.160	161.455	1.475	1200	 1	3.001	159.980	225
33	419971.470	413312.379	160.164	1.546	1200	 1	3.002	159.980	225
8	419965.748	413340.133	159.191	1.738	1500	 1	3.003	157.603	300
9	419951.687	413340.076	158.250	1.734	1500	 1	1.006	157.528	375
10	419939.005	413346.567	157.362	1.796	1500	 1	1.007	157.453	450
34	420068.158	413381.654	162.257	1.425	1200	 1	1.007	156.516	450
35	420085.974	413385.761	162.545	1.896	1200	 1	1.008	156.516	450
36	420079.210	413415.106	161.718	1.445	1200	 1	1.008	155.566	450
37	420073.993	413437.738	161.139	1.447	1200	 1	1.009	155.566	450
38	420032.246	413428.115	159.500	1.746	1200	 0	4.000	160.832	225
39	420003.235	413421.428	158.185	1.651	1500	 1	4.000	160.649	225
40	419981.170	413409.779	157.883	1.599	1500	 0	4.001	160.649	225
41	419966.504	413389.413	157.659	1.701	1500	 1	4.001	160.273	225
						0	4.002	160.273	225
						0	4.002	160.273	225
						0	4.002	159.692	225
						0	4.003	159.692	225
						1	4.003	157.829	225
						0	4.004	157.754	300
						1	4.004	156.609	300
						0	4.005	156.534	375
						1	4.005	156.284	375
						0	4.006	156.284	375
						1	4.006	156.033	375
						0	4.007	155.958	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
42	419954.109	413376.996	157.467	1.684	1500	 1	4.007	155.783	450
						0	4.008	155.783	450
11	419929.885	413358.529	156.890	1.829	1500	 1 2	4.008	155.136	450
						0	1.009	155.136	450
12	419896.612	413333.164	154.810	1.916	1500	 1	1.010	155.061	525
						0	1.010	152.969	525
13	419887.121	413325.928	154.214	1.917	1500	 1	1.011	152.894	600
						0	1.011	152.297	600
15	419872.919	413340.583	153.000	1.723	1500	 1	1.012	152.297	600
						0	1.012	151.277	600
16	419865.434	413353.276	152.500	1.550	1500	 1	1.014	151.277	600
						0	1.014	150.950	600
17	419862.023	413372.935	152.600	2.274	1500	 1	1.015	150.950	600
						0	1.015	150.326	600
18	419870.918	413385.664	153.000	2.829	1500	 1	1.016	150.326	600
						0	1.016	150.171	600
43	419931.218	413388.946	156.105	1.605	1200	 1	1.017	150.171	600
						0	5.000	154.500	225
44	419921.089	413401.125	154.777	1.597	1200	 1	5.000	153.180	225
						0	5.001	153.180	225
45	419905.246	413418.270	153.697	1.578	1200	 1	5.001	152.119	225
						0	5.002	152.119	225
46	419893.428	413407.293	153.600	1.683	1200	 1	5.002	151.917	225
						0	5.003	151.917	225
19	419872.860	413413.450	151.100	3.157	1500	 1 2	5.003	149.770	225
						0	1.017	149.395	600
						0	1.018	147.943	600

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
20	419867.442	413426.658	150.141	3.547	1800	 1	1.018	147.657	600	
47	420122.494	413449.230	159.854	1.425	1200	 0	0	7.000	158.429	225
48	420108.933	413446.104	160.410	2.149	1200	 01	1	7.000	158.336	225
49	420106.288	413457.578	160.132	1.949	1200	 01	0	7.001	158.261	300
50	420104.573	413471.349	159.777	1.687	1200	 01	1	7.001	158.183	300
51	420105.743	413487.634	159.362	1.544	1200	 01	0	7.002	158.183	300
52	420056.500	413491.174	159.500	2.299	1200	 01	1	7.002	158.090	300
57	420010.846	413457.323	157.602	1.552	1200	 0	0	7.003	158.090	300
53	420005.494	413480.541	156.275	1.624	1200	 02	1	7.003	157.818	300
54	419951.977	413469.643	153.783	1.863	1200	 01	0	7.004	157.818	300
55	419923.804	413463.906	152.500	2.894	1200	 01	1	7.004	157.201	300
56	419907.392	413465.884	151.000	4.406	1800	 01	0	7.005	157.201	300
21	419875.208	413473.012	149.500	3.000	1800	 0	0	7.006	151.920	300
						1	1	7.007	151.920	300
						 0	0	7.008	149.606	300
						1	1	7.008	147.953	300
						 0	0	1.020	146.500	900

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
22	419876.034	413477.943	149.000	2.517	2100		1	1.020	146.483	900
23	419876.417	413483.931	148.785	2.372	1200		0	1.021	146.483	225
							1	1.021	146.443	225
24	419864.935	413484.664	148.622	2.286	1200		0	1.022	146.413	255
							1	1.022	146.336	255
25	419857.532	413486.989	148.704	2.420	1200		0	1.023	146.336	255
							1	1.023	146.284	255

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	19.000	Starting Level (m)	
Ratio-R	0.400	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Detailed		

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 %)
2	0	0	0
30	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m ³)	

Node 22 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	146.483	Product Number	CTL-SHE-0075-3500-2100-3500
Design Depth (m)	2.100	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.5	Min Node Diameter (mm)	1200

Node 21 Tank Storage Structure

Invert Level (m)	146.500	Main Channel Length (m)	47.000
Time to half empty (mins)		Main Channel Slope (1:X)	500.0
Analyse flow through structure	✓	Main Channel n	0.012

Inlets

20 | 56

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1465.0	2.000	1465.0	2.001	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	162.864	0.062	16.4	0.1527	0.0000	OK
15 minute winter	2	10	162.067	0.105	24.7	0.1831	0.0000	OK
15 minute winter	3	11	161.827	0.151	37.3	0.2667	0.0000	OK
15 minute winter	4	11	161.756	0.151	42.6	0.2156	0.0000	OK
15 minute winter	26	10	164.886	0.060	7.8	0.1067	0.0000	OK
15 minute winter	27	10	164.804	0.086	27.9	0.2065	0.0000	OK
15 minute winter	28	10	163.562	0.106	44.9	0.2577	0.0000	OK
15 minute winter	29	10	162.339	0.099	50.6	0.1589	0.0000	OK
15 minute winter	5	11	161.493	0.172	93.3	0.3031	0.0000	OK
15 minute winter	6	11	161.250	0.137	103.8	0.3360	0.0000	OK
15 minute winter	7	11	159.155	0.132	121.2	0.3993	0.0000	OK
15 minute winter	30	10	160.657	0.063	9.0	0.1176	0.0000	OK
15 minute winter	31	10	160.596	0.103	23.8	0.2120	0.0000	OK
15 minute winter	32	10	160.072	0.092	39.0	0.2185	0.0000	OK
15 minute winter	33	10	158.735	0.117	63.3	0.3528	0.0000	OK
15 minute winter	8	11	157.615	0.162	188.4	0.3402	0.0000	OK
15 minute winter	9	11	156.675	0.159	197.3	0.3790	0.0000	OK
15 minute winter	10	11	155.782	0.216	197.4	0.3821	0.0000	OK
15 minute winter	34	10	160.890	0.058	7.6	0.1014	0.0000	OK
15 minute winter	35	10	160.723	0.074	13.9	0.1129	0.0000	OK
15 minute winter	36	10	160.360	0.087	24.7	0.1751	0.0000	OK
15 minute winter	37	11	159.778	0.086	32.9	0.1574	0.0000	OK
15 minute winter	38	11	157.861	0.107	55.1	0.2855	0.0000	OK
15 minute winter	39	11	156.687	0.152	62.2	0.3488	0.0000	OK
15 minute winter	40	11	156.475	0.191	90.8	0.7511	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	16.2	1.874	0.155	0.1653	
15 minute winter	2	1.001	3	24.2	0.855	0.267	1.2288	
15 minute winter	3	1.002	4	36.9	1.039	0.408	0.3768	
15 minute winter	4	1.003	5	42.8	1.243	0.472	1.0770	
15 minute winter	26	2.000	27	7.7	0.688	0.148	0.1205	
15 minute winter	27	2.001	28	27.5	1.699	0.311	0.7142	
15 minute winter	28	2.002	29	44.0	2.464	0.421	0.5101	
15 minute winter	29	2.003	5	50.5	2.593	0.210	0.3607	
15 minute winter	5	1.004	6	93.5	2.187	0.330	0.4457	
15 minute winter	6	1.005	7	104.1	2.933	0.274	2.0770	
15 minute winter	7	1.006	8	121.0	3.700	0.233	0.7336	
15 minute winter	30	3.000	31	8.9	0.670	0.171	0.1359	
15 minute winter	31	3.001	32	23.3	1.415	0.401	0.6768	
15 minute winter	32	3.002	33	38.5	2.582	0.329	0.3837	
15 minute winter	33	3.003	8	62.7	2.551	0.297	0.6963	
15 minute winter	8	1.007	9	188.5	3.727	0.225	0.7112	
15 minute winter	9	1.008	10	197.4	3.162	0.236	0.8915	
15 minute winter	10	1.009	11	197.3	2.902	0.360	1.0232	
15 minute winter	34	4.000	35	7.5	0.772	0.144	0.1781	
15 minute winter	35	4.001	36	13.6	1.074	0.234	0.3843	
15 minute winter	36	4.002	37	24.3	1.739	0.295	0.3256	
15 minute winter	37	4.003	38	32.8	2.380	0.301	0.5907	
15 minute winter	38	4.004	39	55.2	2.538	0.252	0.6477	
15 minute winter	39	4.005	40	62.6	1.272	0.313	1.2281	
15 minute winter	40	4.006	41	91.5	1.713	0.457	1.3409	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	41	11	156.162	0.204	115.1	0.7093	0.0000	OK
15 minute winter	42	11	155.951	0.168	125.5	0.4207	0.0000	OK
15 minute winter	11	11	155.273	0.212	335.8	0.5584	0.0000	OK
15 minute winter	12	11	153.140	0.246	378.2	1.1093	0.0000	OK
15 minute winter	13	11	152.514	0.217	380.6	0.4195	0.0000	OK
15 minute winter	15	11	151.582	0.305	380.5	0.5386	0.0000	OK
15 minute winter	16	11	151.209	0.259	379.9	0.4576	0.0000	OK
15 minute winter	17	11	150.689	0.363	378.8	0.6416	0.0000	OK
15 minute winter	18	12	150.434	0.263	376.4	0.4643	0.0000	OK
15 minute winter	43	10	154.540	0.040	10.5	0.0756	0.0000	OK
15 minute winter	44	10	153.226	0.046	10.4	0.0522	0.0000	OK
15 minute winter	45	10	152.209	0.090	17.6	0.1496	0.0000	OK
15 minute winter	46	10	151.988	0.071	33.9	0.1620	0.0000	OK
15 minute winter	19	12	148.272	0.329	407.7	0.5814	0.0000	OK
1440 minute winter	20	1410	147.090	0.496	21.9	0.0000	0.0000	OK
15 minute winter	47	10	158.516	0.086	12.3	0.1839	0.0000	OK
15 minute winter	48	10	158.381	0.120	26.0	0.2258	0.0000	OK
15 minute winter	49	10	158.299	0.116	25.8	0.1316	0.0000	OK
15 minute winter	50	10	158.198	0.108	36.3	0.2026	0.0000	OK
15 minute winter	51	11	157.944	0.126	41.7	0.1968	0.0000	OK
15 minute winter	52	11	157.301	0.100	59.5	0.2055	0.0000	OK
15 minute winter	57	10	156.098	0.048	11.8	0.0957	0.0000	OK
15 minute winter	53	11	154.766	0.115	73.8	0.1538	0.0000	OK
15 minute winter	54	11	152.029	0.109	85.0	0.2022	0.0000	OK
15 minute winter	55	11	149.722	0.116	96.2	0.1855	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	41	4.007	42	115.4	1.864	0.357	1.0870	
15 minute winter	42	4.008	11	125.6	2.446	0.266	1.5641	
15 minute winter	11	1.010	12	335.3	4.321	0.308	3.2481	
15 minute winter	12	1.011	13	378.0	3.775	0.245	1.1961	
15 minute winter	13	1.012	15	380.5	3.238	0.246	2.4032	
15 minute winter	15	1.014	16	379.9	2.926	0.369	1.9166	
15 minute winter	16	1.015	17	378.8	2.569	0.311	2.9402	
15 minute winter	17	1.016	18	376.4	2.543	0.547	2.3032	
15 minute winter	18	1.017	19	378.6	3.462	0.329	3.0477	
15 minute winter	43	5.000	44	10.4	1.972	0.069	0.0839	
15 minute winter	44	5.001	45	10.3	1.021	0.093	0.2410	
15 minute winter	45	5.002	46	17.3	1.361	0.297	0.2064	
15 minute winter	46	5.003	19	33.5	3.196	0.202	0.2250	
15 minute winter	19	1.018	20	409.7	2.948	0.420	1.9843	
1440 minute winter	20	Tank	21	14.2	0.027	0.000		
15 minute winter	47	7.000	48	12.0	0.894	0.284	0.1876	
15 minute winter	48	7.001	49	25.8	1.002	0.285	0.3031	
15 minute winter	49	7.002	50	25.6	1.072	0.283	0.3332	
15 minute winter	50	7.003	51	36.3	1.428	0.252	0.4154	
15 minute winter	51	7.004	52	42.1	1.736	0.339	1.1995	
15 minute winter	52	7.005	53	59.7	2.643	0.242	1.1777	
15 minute winter	57	8.000	53	11.6	1.934	0.094	0.1434	
15 minute winter	53	7.006	54	73.9	3.095	0.296	1.3045	
15 minute winter	54	7.007	55	85.1	3.538	0.268	0.6915	
15 minute winter	55	7.008	56	96.2	4.064	0.272	0.3913	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	56	1410	147.088	0.494	5.0	0.0000	0.0000	OK
1440 minute winter	21	1410	147.086	0.586	14.2	750.8442	0.0000	OK
1440 minute winter	22	1410	147.086	0.603	2.7	2.0903	0.0000	SURCHARGED
120 minute winter	23	100	146.450	0.037	2.6	0.0419	0.0000	OK
120 minute winter	24	100	146.374	0.038	2.6	0.0425	0.0000	OK
120 minute winter	25	100	146.320	0.036	2.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	56	Tank	21	14.2	0.027	0.000		
1440 minute winter	21	1.020	22	2.7	0.122	0.002	2.2235	
1440 minute winter	22	1.021	23	2.6	0.575	0.061	0.0269	
120 minute winter	23	1.022	24	2.6	0.561	0.044	0.0530	
120 minute winter	24	1.023	25	2.6	0.572	0.044	0.0351	49.3

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	162.890	0.088	31.1	0.2170	0.0000	OK
15 minute winter	2	10	162.112	0.150	46.8	0.2615	0.0000	OK
15 minute winter	3	11	161.918	0.242	70.9	0.4278	0.0000	OK
15 minute winter	4	11	161.842	0.237	80.4	0.3375	0.0000	OK
15 minute winter	26	10	164.912	0.087	14.7	0.1538	0.0000	OK
15 minute winter	27	10	164.842	0.124	52.8	0.2979	0.0000	OK
15 minute winter	28	10	163.620	0.164	85.3	0.3981	0.0000	OK
15 minute winter	29	10	162.377	0.137	96.1	0.2199	0.0000	OK
15 minute winter	5	11	161.582	0.261	176.5	0.4606	0.0000	OK
15 minute winter	6	11	161.311	0.198	196.3	0.4845	0.0000	OK
15 minute winter	7	11	159.217	0.194	229.3	0.5876	0.0000	OK
15 minute winter	30	10	160.687	0.093	17.0	0.1733	0.0000	OK
15 minute winter	31	10	160.647	0.154	45.0	0.3180	0.0000	OK
15 minute winter	32	10	160.117	0.137	73.9	0.3250	0.0000	OK
15 minute winter	33	10	158.792	0.174	120.1	0.5224	0.0000	OK
15 minute winter	8	11	157.695	0.242	357.2	0.5081	0.0000	OK
15 minute winter	9	11	156.757	0.241	374.1	0.5766	0.0000	OK
15 minute winter	10	11	155.906	0.340	374.6	0.6008	0.0000	OK
15 minute winter	34	10	160.915	0.083	14.4	0.1451	0.0000	OK
15 minute winter	35	10	160.756	0.107	26.3	0.1628	0.0000	OK
15 minute winter	36	10	160.401	0.128	46.9	0.2574	0.0000	OK
15 minute winter	37	11	159.818	0.126	62.6	0.2295	0.0000	OK
15 minute winter	38	10	157.908	0.154	105.2	0.4111	0.0000	OK
15 minute winter	39	11	156.767	0.233	118.5	0.5330	0.0000	OK
15 minute winter	40	11	156.586	0.302	173.0	1.1854	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	30.7	2.219	0.294	0.2651	
15 minute winter	2	1.001	3	46.1	0.963	0.509	2.0512	
15 minute winter	3	1.002	4	69.6	1.166	0.768	0.6389	
15 minute winter	4	1.003	5	80.7	1.417	0.891	1.7863	
15 minute winter	26	2.000	27	14.6	0.797	0.280	0.1962	
15 minute winter	27	2.001	28	52.2	1.945	0.592	1.1799	
15 minute winter	28	2.002	29	83.5	2.819	0.799	0.8467	
15 minute winter	29	2.003	5	95.9	2.637	0.399	0.6991	
15 minute winter	5	1.004	6	176.9	2.505	0.624	0.7329	
15 minute winter	6	1.005	7	196.9	3.384	0.519	3.4061	
15 minute winter	7	1.006	8	229.6	4.302	0.442	1.1967	
15 minute winter	30	3.000	31	16.8	0.752	0.323	0.2260	
15 minute winter	31	3.001	32	44.2	1.625	0.759	1.1156	
15 minute winter	32	3.002	33	72.8	2.998	0.623	0.6259	
15 minute winter	33	3.003	8	118.7	2.967	0.562	1.1369	
15 minute winter	8	1.007	9	357.4	4.125	0.427	1.2185	
15 minute winter	9	1.008	10	374.6	3.460	0.447	1.5319	
15 minute winter	10	1.009	11	374.9	3.292	0.684	1.7057	
15 minute winter	34	4.000	35	14.2	0.893	0.274	0.2914	
15 minute winter	35	4.001	36	25.9	1.245	0.445	0.6299	
15 minute winter	36	4.002	37	46.2	2.013	0.560	0.5329	
15 minute winter	37	4.003	38	62.2	2.789	0.571	0.9561	
15 minute winter	38	4.004	39	104.5	2.844	0.477	1.0956	
15 minute winter	39	4.005	40	118.9	1.415	0.594	2.0823	
15 minute winter	40	4.006	41	174.0	1.951	0.870	2.2339	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	41	11	156.265	0.307	218.8	1.0655	0.0000	OK
15 minute winter	42	11	156.030	0.247	238.5	0.6175	0.0000	OK
15 minute winter	11	11	155.375	0.314	638.4	0.8269	0.0000	OK
15 minute winter	12	11	153.275	0.381	719.9	1.7182	0.0000	OK
15 minute winter	13	11	152.634	0.337	725.2	0.6512	0.0000	OK
15 minute winter	15	11	151.774	0.497	725.3	0.8789	0.0000	OK
15 minute winter	16	11	151.392	0.442	723.6	0.7815	0.0000	OK
15 minute winter	17	11	150.944	0.617	717.6	1.0910	0.0000	SURCHARGED
15 minute winter	18	12	150.575	0.404	714.1	0.7141	0.0000	OK
15 minute winter	43	10	154.556	0.056	20.0	0.1050	0.0000	OK
15 minute winter	44	10	153.244	0.064	19.9	0.0722	0.0000	OK
15 minute winter	45	10	152.251	0.132	33.5	0.2196	0.0000	OK
15 minute winter	46	10	152.020	0.103	64.4	0.2335	0.0000	OK
15 minute winter	19	12	148.475	0.532	774.4	0.9401	0.0000	OK
1440 minute winter	20	1410	147.567	0.973	37.9	0.0000	0.0000	OK
15 minute winter	47	10	158.555	0.126	23.3	0.2688	0.0000	OK
15 minute winter	48	10	158.440	0.179	49.3	0.3375	0.0000	OK
15 minute winter	49	10	158.355	0.172	48.9	0.1947	0.0000	OK
15 minute winter	50	10	158.251	0.161	68.9	0.3022	0.0000	OK
15 minute winter	51	11	158.004	0.186	79.0	0.2892	0.0000	OK
15 minute winter	52	11	157.343	0.142	112.7	0.2928	0.0000	OK
15 minute winter	57	10	156.114	0.064	22.3	0.1291	0.0000	OK
15 minute winter	53	11	154.818	0.167	139.7	0.2239	0.0000	OK
15 minute winter	54	11	152.078	0.158	161.4	0.2938	0.0000	OK
15 minute winter	55	11	149.780	0.174	182.7	0.2781	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	41	4.007	42	219.4	2.145	0.679	1.7906	
15 minute winter	42	4.008	11	239.1	2.739	0.506	2.6589	
15 minute winter	11	1.010	12	638.7	4.839	0.587	5.5514	
15 minute winter	12	1.011	13	720.2	4.100	0.466	2.0969	
15 minute winter	13	1.012	15	725.3	3.469	0.470	4.2092	
15 minute winter	15	1.014	16	723.6	3.096	0.704	3.4810	
15 minute winter	16	1.015	17	717.6	2.777	0.588	5.0319	
15 minute winter	17	1.016	18	714.1	2.830	1.037	3.7547	
15 minute winter	18	1.017	19	719.7	3.955	0.625	5.0611	
15 minute winter	43	5.000	44	19.9	2.363	0.132	0.1334	
15 minute winter	44	5.001	45	19.7	1.189	0.177	0.3905	
15 minute winter	45	5.002	46	33.0	1.585	0.567	0.3376	
15 minute winter	46	5.003	19	63.9	3.770	0.386	0.3639	
15 minute winter	19	1.018	20	778.0	3.339	0.798	3.2799	
1440 minute winter	20	Tank	21	23.5	0.025	0.000		
15 minute winter	47	7.000	48	22.9	1.047	0.540	0.3039	
15 minute winter	48	7.001	49	48.9	1.142	0.540	0.5043	
15 minute winter	49	7.002	50	48.4	1.216	0.534	0.5571	
15 minute winter	50	7.003	51	68.5	1.631	0.477	0.6858	
15 minute winter	51	7.004	52	79.6	2.025	0.640	1.9400	
15 minute winter	52	7.005	53	113.3	3.098	0.459	1.9054	
15 minute winter	57	8.000	53	22.1	2.121	0.180	0.2898	
15 minute winter	53	7.006	54	140.3	3.604	0.562	2.1268	
15 minute winter	54	7.007	55	161.7	4.050	0.510	1.1478	
15 minute winter	55	7.008	56	183.0	4.693	0.518	0.6445	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	56	1440	147.564	0.970	8.7	0.0000	0.0000	OK
1440 minute winter	21	1440	147.563	1.063	23.5	1417.0420	0.0000	SURCHARGED
1440 minute winter	22	1440	147.563	1.080	2.7	3.7410	0.0000	SURCHARGED
30 minute summer	23	24	146.450	0.037	2.6	0.0419	0.0000	OK
15 minute winter	24	169	146.374	0.038	2.6	0.0425	0.0000	OK
15 minute winter	25	168	146.320	0.036	2.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	56	Tank	21	23.5	0.025	0.000		
1440 minute winter	21	1.020	22	2.7	0.054	0.002	3.1689	
1440 minute winter	22	1.021	23	2.6	0.575	0.061	0.0269	
30 minute summer	23	1.022	24	2.6	0.561	0.044	0.0530	
15 minute winter	24	1.023	25	2.6	0.572	0.044	0.0351	37.9

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	163.062	0.260	58.4	0.6404	0.0000	SURCHARGED
15 minute winter	2	11	162.840	0.878	85.0	1.5346	0.0000	SURCHARGED
15 minute winter	3	11	162.611	0.935	119.0	1.6504	0.0000	SURCHARGED
15 minute winter	4	11	162.415	0.810	138.3	1.1538	0.0000	SURCHARGED
15 minute winter	26	12	165.807	0.982	27.7	1.7307	0.0000	SURCHARGED
15 minute winter	27	12	165.777	1.059	90.3	2.5505	0.0000	SURCHARGED
15 minute winter	28	12	164.596	1.140	134.8	2.7602	0.0000	SURCHARGED
15 minute winter	29	11	162.437	0.197	151.9	0.3163	0.0000	OK
15 minute winter	5	11	161.816	0.495	288.9	0.8747	0.0000	SURCHARGED
15 minute winter	6	11	161.389	0.276	324.1	0.6751	0.0000	OK
15 minute winter	7	13	159.625	0.602	386.3	1.8263	0.0000	SURCHARGED
15 minute winter	30	12	161.512	0.918	32.0	1.7087	0.0000	SURCHARGED
15 minute winter	31	12	161.481	0.988	75.5	2.0360	0.0000	SURCHARGED
15 minute winter	32	12	160.778	0.797	121.7	1.8860	0.0000	SURCHARGED
15 minute winter	33	12	159.496	0.878	199.6	2.6411	0.0000	SURCHARGED
15 minute winter	8	13	158.653	1.200	578.8	2.5217	0.0000	SURCHARGED
15 minute winter	9	12	157.979	1.463	562.7	3.4969	0.0000	FLOOD RISK
15 minute winter	10	12	157.249	1.683	556.2	2.9746	0.0000	FLOOD RISK
15 minute winter	34	12	161.004	0.171	27.1	0.2999	0.0000	OK
15 minute winter	35	12	160.981	0.332	49.5	0.5051	0.0000	SURCHARGED
15 minute winter	36	12	160.794	0.521	87.8	1.0503	0.0000	SURCHARGED
15 minute winter	37	12	160.306	0.614	109.3	1.1183	0.0000	SURCHARGED
15 minute winter	38	12	158.773	1.019	179.2	2.7266	0.0000	SURCHARGED
15 minute winter	39	12	158.048	1.514	193.5	3.4650	0.0000	FLOOD RISK
15 minute winter	40	12	157.795	1.511	290.4	5.9393	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	54.8	2.370	0.525	0.7607	
15 minute winter	2	1.001	3	77.7	1.103	0.858	3.0187	
15 minute winter	3	1.002	4	118.0	1.676	1.303	0.7455	
15 minute winter	4	1.003	5	137.4	1.952	1.518	2.2041	
15 minute winter	26	2.000	27	26.2	0.845	0.504	0.4269	
15 minute winter	27	2.001	28	79.3	2.003	0.899	1.7563	
15 minute winter	28	2.002	29	130.5	3.282	1.250	1.1306	
15 minute winter	29	2.003	5	151.5	2.681	0.631	1.0886	
15 minute winter	5	1.004	6	287.6	2.738	1.014	1.0268	
15 minute winter	6	1.005	7	325.5	3.685	0.858	5.7105	
15 minute winter	7	1.006	8	362.6	4.260	0.699	2.4729	
15 minute winter	30	3.000	31	26.5	0.759	0.510	0.4036	
15 minute winter	31	3.001	32	65.7	1.850	1.129	1.6308	
15 minute winter	32	3.002	33	111.0	3.114	0.950	1.0241	
15 minute winter	33	3.003	8	198.6	3.166	0.941	1.9955	
15 minute winter	8	1.007	9	532.3	4.136	0.635	2.2279	
15 minute winter	9	1.008	10	556.2	3.511	0.664	2.2573	
15 minute winter	10	1.009	11	560.5	3.538	1.023	2.3833	
15 minute winter	34	4.000	35	26.7	1.011	0.514	0.6604	
15 minute winter	35	4.001	36	48.5	1.325	0.833	1.1977	
15 minute winter	36	4.002	37	78.5	2.163	0.952	0.9237	
15 minute winter	37	4.003	38	98.7	3.003	0.906	1.7039	
15 minute winter	38	4.004	39	167.0	2.852	0.763	2.0965	
15 minute winter	39	4.005	40	184.0	1.668	0.919	2.7520	
15 minute winter	40	4.006	41	271.0	2.458	1.355	2.7681	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	41	12	157.255	1.297	360.2	4.5023	0.0000	SURCHARGED
15 minute winter	42	12	156.979	1.196	353.8	2.9939	0.0000	SURCHARGED
15 minute winter	11	12	156.503	1.442	931.8	3.7935	0.0000	SURCHARGED
15 minute winter	12	12	154.488	1.594	1059.5	7.1907	0.0000	SURCHARGED
15 minute winter	13	12	153.849	1.552	1065.0	3.0022	0.0000	SURCHARGED
15 minute winter	15	12	153.000	1.723	1065.3	3.0445	3.0749	FLOOD
15 minute winter	16	12	152.333	1.383	1042.2	2.4432	0.0000	FLOOD RISK
15 minute winter	17	12	151.550	1.223	1035.7	2.1619	0.0000	SURCHARGED
15 minute winter	18	13	150.865	0.694	1029.2	1.2254	0.0000	SURCHARGED
15 minute winter	43	10	154.578	0.078	37.5	0.1476	0.0000	OK
15 minute winter	44	10	153.269	0.089	37.3	0.1006	0.0000	OK
15 minute winter	45	11	152.388	0.269	62.8	0.4473	0.0000	SURCHARGED
15 minute winter	46	11	152.070	0.153	117.2	0.3478	0.0000	OK
15 minute winter	19	12	149.038	1.095	1135.4	1.9352	0.0000	SURCHARGED
1440 minute winter	20	1440	148.502	1.908	70.1	0.0000	0.0000	OK
15 minute winter	47	11	158.862	0.433	43.7	0.9213	0.0000	SURCHARGED
15 minute winter	48	11	158.758	0.497	88.3	0.9372	0.0000	SURCHARGED
15 minute winter	49	11	158.654	0.471	83.1	0.5324	0.0000	SURCHARGED
15 minute winter	50	11	158.540	0.450	118.3	0.8459	0.0000	SURCHARGED
15 minute winter	51	12	158.294	0.476	135.3	0.7413	0.0000	SURCHARGED
15 minute winter	52	11	157.400	0.199	193.4	0.4103	0.0000	OK
15 minute winter	57	10	156.140	0.090	41.8	0.1798	0.0000	OK
15 minute winter	53	11	154.908	0.257	242.3	0.3442	0.0000	OK
15 minute winter	54	11	152.174	0.254	283.3	0.4732	0.0000	OK
15 minute winter	55	11	150.184	0.578	320.5	0.9258	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	41	4.007	42	318.2	2.224	0.984	2.7799	
15 minute winter	42	4.008	11	345.7	2.820	0.732	4.8262	
15 minute winter	11	1.010	12	935.8	4.709	0.860	9.0386	
15 minute winter	12	1.011	13	1057.3	4.073	0.685	3.3618	
15 minute winter	13	1.012	15	1065.3	3.782	0.690	5.7482	
15 minute winter	15	1.014	16	1042.2	3.701	1.014	4.1508	
15 minute winter	16	1.015	17	1035.7	3.677	0.849	5.6203	
15 minute winter	17	1.016	18	1029.2	3.654	1.495	4.3742	
15 minute winter	18	1.017	19	1029.2	4.162	0.894	6.9138	
15 minute winter	43	5.000	44	37.3	2.787	0.247	0.2122	
15 minute winter	44	5.001	45	37.1	1.298	0.333	0.6344	
15 minute winter	45	5.002	46	61.0	1.773	1.048	0.5527	
15 minute winter	46	5.003	19	117.2	4.302	0.708	0.5846	
15 minute winter	19	1.018	20	1135.6	4.032	1.165	4.0211	
1440 minute winter	20	Tank	21	43.6	0.055	0.000		
15 minute winter	47	7.000	48	38.5	1.062	0.909	0.5535	
15 minute winter	48	7.001	49	83.1	1.223	0.917	0.8292	
15 minute winter	49	7.002	50	81.7	1.280	0.902	0.9772	
15 minute winter	50	7.003	51	116.2	1.731	0.808	1.1497	
15 minute winter	51	7.004	52	132.6	2.263	1.066	2.9627	
15 minute winter	52	7.005	53	192.9	3.396	0.781	2.9654	
15 minute winter	57	8.000	53	41.5	2.175	0.337	0.5792	
15 minute winter	53	7.006	54	243.8	3.969	0.977	3.4923	
15 minute winter	54	7.007	55	280.6	4.260	0.885	1.9275	
15 minute winter	55	7.008	56	313.9	4.966	0.888	1.0333	

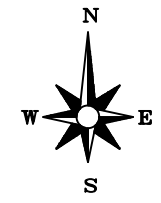
Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	56	1440	148.499	1.905	16.2	0.0000	0.0000	OK
1440 minute winter	21	1440	148.496	1.996	43.6	2717.7340	0.0000	SURCHARGED
1440 minute winter	22	1440	148.496	2.013	3.4	6.9741	0.0000	SURCHARGED
1440 minute winter	23	1440	146.456	0.043	3.4	0.0482	0.0000	OK
1440 minute winter	24	1440	146.379	0.043	3.4	0.0488	0.0000	OK
1440 minute winter	25	1440	146.325	0.041	3.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	56	Tank	21	43.6	0.055	0.000		
1440 minute winter	21	1.020	22	3.4	0.100	0.003	3.1689	
1440 minute winter	22	1.021	23	3.4	0.622	0.080	0.0329	
1440 minute winter	23	1.022	24	3.4	0.604	0.058	0.0648	
1440 minute winter	24	1.023	25	3.4	0.618	0.058	0.0428	270.0

APPENDIX F

SITE INVESTIGATION INFORMATION



- NOTES
- SOAKAWAY LOCATION
 - GRASSED FIELD
 - BUILDING / CABIN
 - GRAZING FIELD
 - DENSE TREES / HEDGEROWS
 - APPROXIMATE SITE BOUNDARY

EXPLORATORY HOLE LOCATIONS BASED ON DATA FROM A HAND-HELD GPS (+/- 3M ACCURACY)

REV.	DESCRIPTION	DATE



info@lithos.co.uk
www.lithos.co.uk
Tel 01937 545330

CLIENT

PERSIMMON
HOMES WEST
YORKSHIRE

JOB TITLE

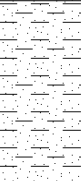
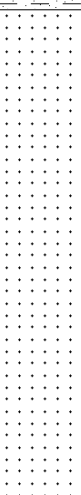
MOOR LANE,
KIRKBURTON

DRAWING TITLE

EXPLORATORY HOLE LOCATIONS

DRAWN	DW	DATE	22 09 25	STATUS	FOR COMMENT ☐
CHECKED	REG	DATE	22 09 25	FOR APPROVAL	☐
				DRAFT	☐
				FINAL	☒

SCALE	1:1500	SHEET	A3	DRAWING NO.	5439/8	REVISION	
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				Trial Pit Log			TrialPit No SA01 Sheet 1 of 1		
Project Name: Moor Lane, Kirkburton				Project No. 5439		Co-ords: 420090.00 - 413289.00 Level:		Date 15/09/2025	
Equipment & Method: JCB 3CX with 0.8m wide toothed bucket.						Dimensions (m): 0.00		Scale 1:20	
Client: Persimmon Homes (West Yorkshire) Ltd						Depth 2.10		Logged GW	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.30			Greyish brown gravelly slightly sandy CLAY. Gravel is angular to subangular fine of mixed lithologies. Frequent rootlets. (TOPSOIL)		
				0.80			Stiff grey mottled orange slightly sandy CLAY. (RESIDUAL SOIL - COAL MEASURES)		
				2.10			Weak thickly laminated to thinly bedded orange fine to medium micaceous SANDSTONE. Recovered as a clayey angular fine to coarse gravel with medium angular cobble content. (COAL MEASURES)		
							From 1.7m, recovered as angular cobbles with some sandy angular fine to coarse gravel.		
						End of Pit at 2.10m			
Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Co-ordinates from hand held GPS, hole not surveyed in.									
Stability: 1. The sides of the trial pit remained stable during excavation.									



SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991



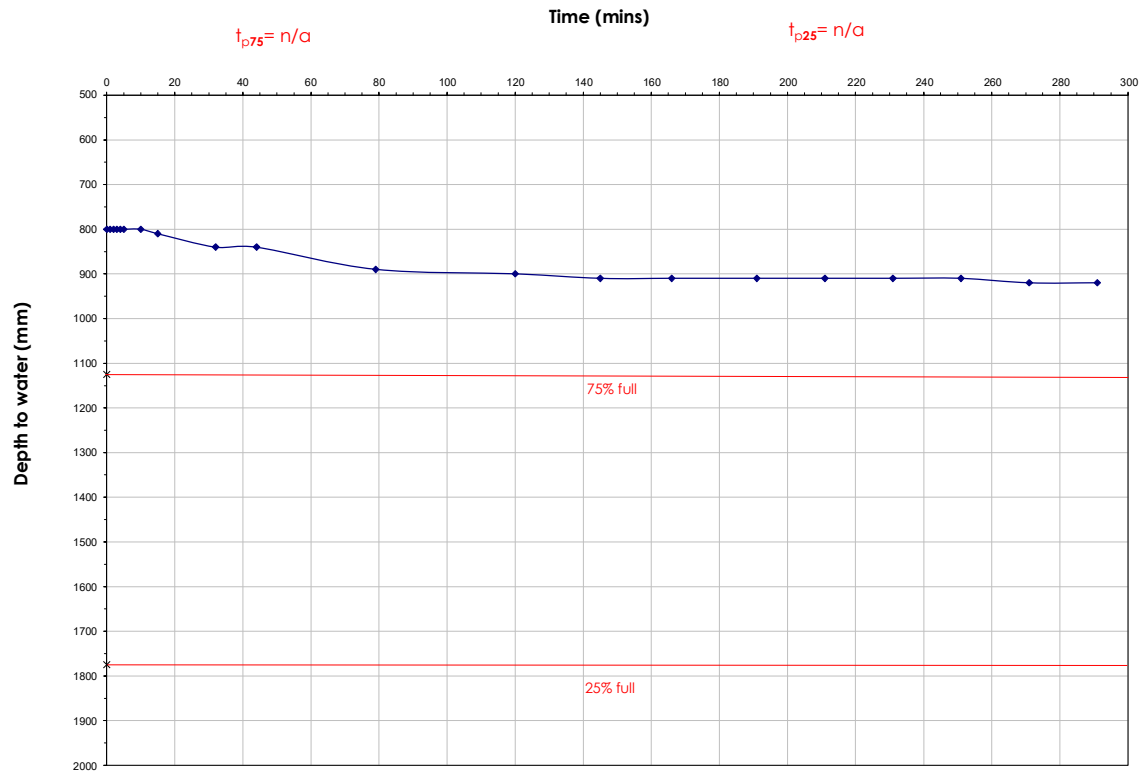
Client:	Persimmon Homes (West Yorkshire) Ltd
Engineer	Geoffrey Warburton
Job Name:	Moor Lane, Kirkburton
Job No.:	5439

Date:	15/09/2025
Trial Pit No.	SA01
Test No.	1

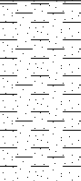
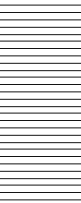
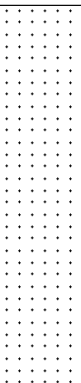
Time	Elapsed Time	Depth to water from ground level	
	(min)	(m)	(mm)
10:09	0	0.80	800
10:10	1	0.80	800
10:11	2	0.80	800
10:12	3	0.80	800
10:13	4	0.80	800
10:14	5	0.80	800
10:19	10	0.80	800
10:24	15	0.81	810
10:41	32	0.84	840
10:53	44	0.84	840
11:28	79	0.89	890
12:09	120	0.90	900
12:34	145	0.91	910
12:55	166	0.91	910
13:20	191	0.91	910
13:40	211	0.91	910
14:00	231	0.91	910
14:20	251	0.91	910
14:40	271	0.92	920
15:00	291	0.92	920

SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	2.50	2500
Width	=	0.90	900
Depth	=	2.10	2100
Effective Depth (% full)		(mm)	(m)
0.25	=	1775	1.78
0.50	=	1450	1.45
0.75	=	1125	1.13
Depth at start of test (mm)		=	800
Depth at end of test (mm)		=	920
Base area of pit		=	2.25
C _{p50} - 50% internal surface area inc. base		=	6.67
V _{p75-25} - Volume 75 - 25%		=	1.4625

Read from the graph:			
t _{p75} (min)	=	n/a	
t _{p25} (min)	=	n/a	



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate

				Trial Pit Log			TrialPit No SA02 Sheet 1 of 1		
Project Name: Moor Lane, Kirkburton				Project No. 5439		Co-ords: 419944.00 - 413264.00 Level:		Date 15/09/2025	
Equipment & Method: JCB 3CX with 0.8m wide toothed bucket.						Dimensions (m): 0.80		Scale 1:20	
Client: Persimmon Homes (West Yorkshire) Ltd						Depth 2.50		Logged GW	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.30			Greyish brown slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine of mixed lithologies. Frequent rootlets. (TOPSOIL)		
				0.80			Stiff grey mottled orange slightly sandy CLAY. (RESIDUAL SOIL - COAL MEASURES)		
				0.90			Very weak thinly laminated dark grey MUDSTONE. Recovered as angular fine to medium gravel. (COAL MEASURES)		
				1.50			Very weak thinly laminated light brown MUDSTONE. Recovered as sandy clayey angular fine gravel. (COAL MEASURES)		
				2.50			Weak thinly interbedded light brown fine to medium SANDSTONE & SILTSTONE. Recovered as slightly sandy clayey angular to subangular fine to coarse gravel with low angular cobble content. (COAL MEASURES)		
						End of Pit at 2.50m			
Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Co-ordinates from hand held GPS, hole not surveyed in.									
Stability: 1. The sides of the trial pit remained stable during excavation.									



SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991



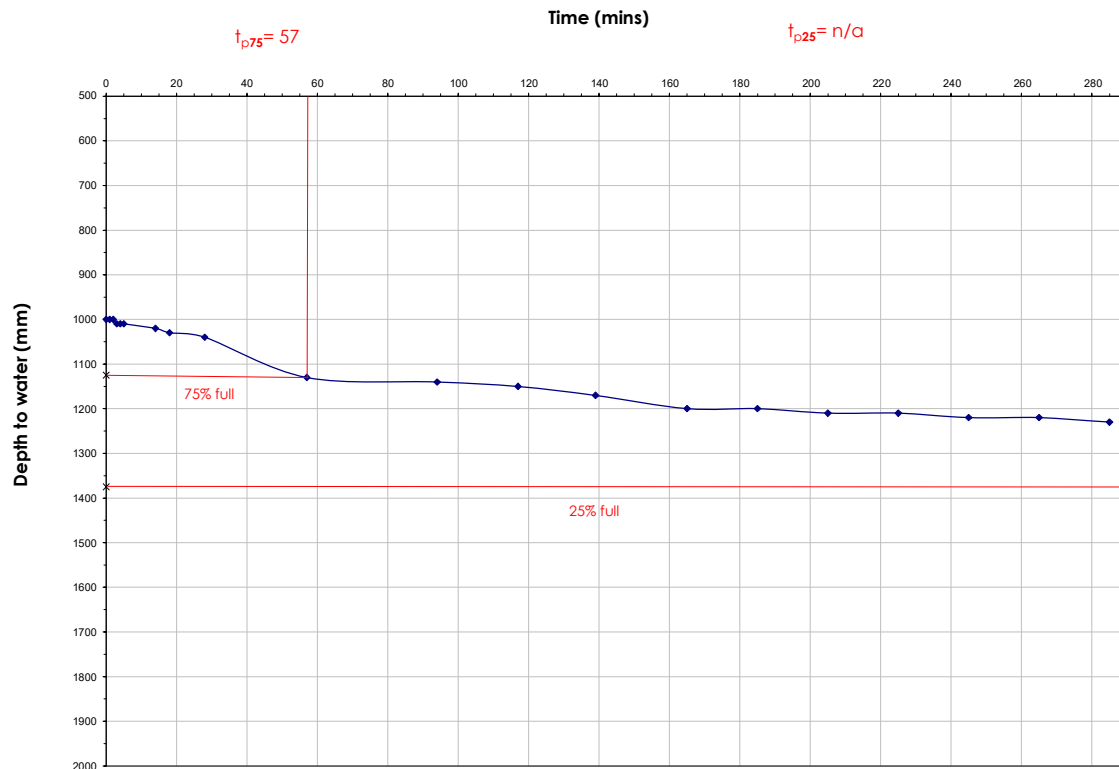
Client:	Persimmon Homes (West Yorkshire) Ltd
Engineer	Geoffrey Warburton
Job Name:	Moor Lane, Kirkburton
Job No.:	5439

Date:	15/09/2025
Trial Pit No.	SA02
Test No.	1

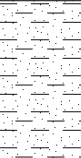
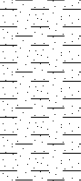
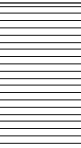
Time	Elapsed Time	Depth to water from ground level	
	(min)	(m)	(mm)
10:31	0	1.00	1000
10:32	1	1.00	1000
10:33	2	1.00	1000
10:34	3	1.01	1010
10:35	4	1.01	1010
10:36	5	1.01	1010
10:45	14	1.02	1020
10:49	18	1.03	1030
10:59	28	1.04	1040
11:28	57	1.13	1130
12:05	94	1.14	1140
12:28	117	1.15	1150
12:50	139	1.17	1170
13:16	165	1.20	1200
13:36	185	1.20	1200
13:56	205	1.21	1210
14:16	225	1.21	1210
14:36	245	1.22	1220
14:56	265	1.22	1220
15:16	285	1.23	1230

SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	2.40	2400
Width	=	0.80	800
Depth	=	1.50	1500
Effective Depth (% full)		(mm)	(m)
0.25	=	1375	1.38
0.50	=	1250	1.25
0.75	=	1125	1.13
Depth at start of test (mm)		=	1000
Depth at end of test (mm)		=	1230
Base area of pit		=	1.92
C_{p50} - 50% internal surface area inc. base		=	3.52
V_{p75-25} - Volume 75 - 25%		=	0.48

Read from the graph:			
t_{p75} (min)	=	57	
t_{p25} (min)	=	n/a	



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate

				Trial Pit Log			TrialPit No SA03 Sheet 1 of 1		
Project Name: Moor Lane, Kirkburton				Project No. 5439		Co-ords: 419906.00 - 413449.00 Level:		Date 15/09/2025	
Equipment & Method: JCB 3CX with 0.8m wide toothed bucket.						Dimensions (m): 2.30 0.80		Scale 1:20	
Client: Persimmon Homes (West Yorkshire) Ltd						Depth 2.10		Logged GW	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.30			Greyish brown sandy slightly gravelly CLAY. Gravel is angular to subangular fine of sandstone and mudstone. Frequent rootlets. (TOPSOIL)		
							Stiff grey mottled orange and rare dark grey slightly sandy CLAY. (RESIDUAL SOIL - COAL MEASURES)		
							From 0.7m, with slightly angular fine gravel of mudstone.		
				1.20			Very weak laminated grey mottled greyish brown MUDSTONE. Recovered as clayey angular to subangular gravel. (COAL MEASURES)		
				1.70			Very weak interlaminated grey and dark grey mottled orange MUDSTONE & SILTSTONE. Recovered as clayey angular fine to coarse gravel. (COAL MEASURES)		
			2.10			End of Pit at 2.10m			
Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Co-ordinates from hand held GPS, hole not surveyed in.									
Stability: 1. The sides of the trial pit remained stable during excavation.									



SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991



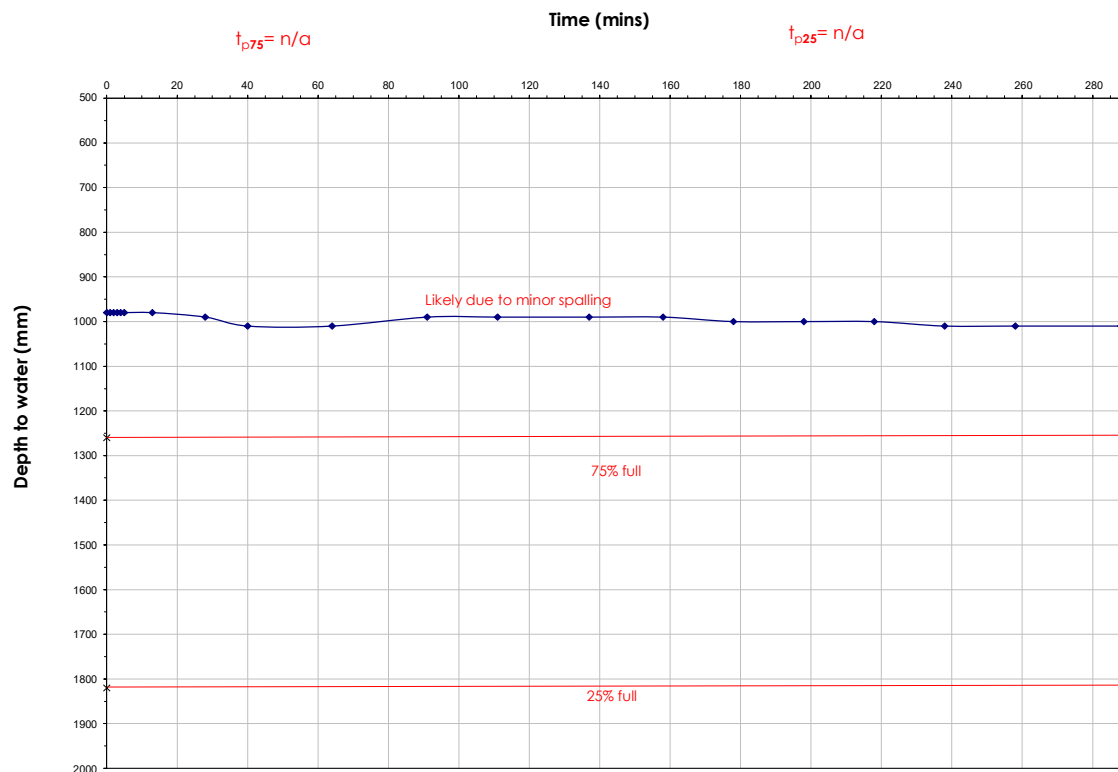
Client:	Persimmon Homes (West Yorkshire) Ltd
Engineer	Geoffrey Warburton
Job Name:	Moor Lane, Kirkburton
Job No.:	5439

Date:	15/09/2025
Trial Pit No.	SA03
Test No.	1

Time	Elapsed Time	Depth to water from ground level	
	(min)	(m)	(mm)
10:51	0	0.98	980
10:52	1	0.98	980
10:53	2	0.98	980
10:54	3	0.98	980
10:55	4	0.98	980
10:56	5	0.98	980
11:04	13	0.98	980
11:19	28	0.99	990
11:31	40	1.01	1010
11:55	64	1.01	1010
12:22	91	0.99	990
12:42	111	0.99	990
13:08	137	0.99	990
13:29	158	0.99	990
13:49	178	1.00	1000
14:09	198	1.00	1000
14:29	218	1.00	1000
14:49	238	1.01	1010
15:09	258	1.01	1010
15:39	288	1.01	1010

SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	2.30	2300
Width	=	0.80	800
Depth	=	2.10	2100
Effective Depth (% full)		(mm)	(m)
0.25	=	1820	1.82
0.50	=	1540	1.54
0.75	=	1260	1.26
Depth at start of test (mm)		=	980
Depth at end of test (mm)		=	1010
Base area of pit		=	1.84
C _{p50} - 50% internal surface area inc. base		=	5.312
V _{p75-25} - Volume 75 - 25%		=	1.0304

Read from the graph:			
t _{p75} (min)	=	n/a	
t _{p25} (min)	=	n/a	



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

Client:	Persimmon Homes (West Yorkshire) Ltd
Engineer:	Geoffrey Warburton
Job Name:	Moor Lane, Kirkburton
Job No.:	5439



Date:	15/09/2025
Trial Pit No.	SA04
Test No.	1

Time	Elapsed Time (min)	Depth to water from ground level (m)	(mm)
11:44	0	0.80	800
11:45	1	0.81	810
11:46	2	0.81	810
11:47	3	0.81	810
11:48	4	0.82	820
11:49	5	0.82	820
11:59	15	0.84	840
12:15	31	0.88	880
12:38	54	0.90	900
13:02	78	0.92	920
13:25	101	0.93	930
13:45	121	0.94	940
14:05	141	0.95	950
14:25	161	0.98	980
14:45	181	0.99	990
15:05	201	1.00	1000
15:36	232	1.01	1010
15:50	246	1.01	1010

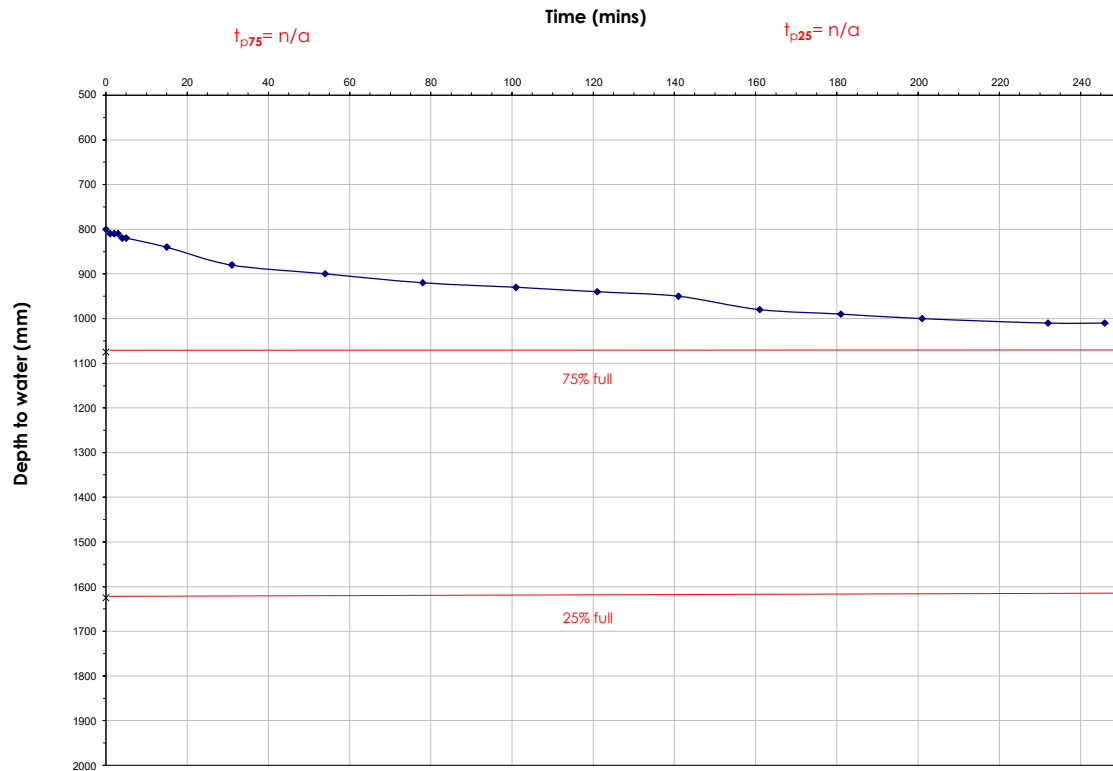
SOAKAWAY TRIAL PIT			
Dimensions		(m)	(mm)
Length	=	2.10	2100
Width	=	0.90	900
Depth	=	1.90	1900

Effective Depth (% full)		(mm)	(m)
0.25	=	1625	1.63
0.50	=	1350	1.35
0.75	=	1075	1.08

Depth at start of test (mm)	=	800
Depth at end of test (mm)	=	1010

Base area of pit	=	1.89
a_{p50} - 50% internal surface area inc. base	=	5.19
V_{p75-25} - Volume 75 - 25%	=	1.0395

Read from the graph:			
t_{p75} (min)	=	n/a	
t_{p25} (min)	=	n/a	



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate