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FLOOD RISK ASSESSMENT

ON

LAND TO THE OFF KERESFORTH ROAD, BARNSLEY

FOR

KEEPMOAT HOMES

E21/7774/FR01

DECEMBER 2021

M.Huddleston MEng.

Haigh Huddleston Associates is the trading name of Haigh Huddleston Associates Limited
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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 July 2021 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 land to the north of Keresforth Road, Dodworth and lies around OS Grid Reference 432390 405010. The proposed development is irregular in shape and occupies an area of approximately 7.73ha. A site location plan is attached in Appendix A at the rear of the report.

2.2 The main body of the site consists of two agricultural fields used primarily for grazing of livestock. The two fields slope to form a wooded valley which bisects the centre of the site. A small stream runs through this valley area flowing from east to west where it adjoins a larger watercourse along the western boundary of the southern portion of the site. A number of tracks and paths are evident through the centre of each field.

2.3 The immediate field boundaries are defined by mature trees and hedges. The M1 Motorway, including a the slip road to junction 37 is situated parallel to the eastern boundary within a small cutting. Residential properties are situated along the southern and western site boundaries. The properties to the west are separated from the site via a strip of woodland approximately 20m in width. To the north there is a small open grassed recreation park.

2.4 The topographic survey indicates that the northern site area slopes from 130m AOD at the northern boundary to the central watercourse at around 101.0m AOD. The southern field area generally falls from east to west a high point of 115.0m AOD to 95.0m AOD. Although there are undulations within this land area. In addition to the above the site also falls at a slope of 1 in 3 to the residential properties along the southern site boundary.

3.0 PROPOSED DEVELOPMENT AND DRAINAGE CONSTRAINTS

3.1 It is understood that the proposed development is for a series of detached, semi-detached, terraced town houses (totalling approximately 215 units) with associated car parking and access roads. The access to the development is proposed off Keresforth Road to the south of the site.

3.2 The site investigation report confirms the ground consists of topsoils / clays, re-engineered clays overlying a weathered mudstone and sandstone strata. Occasional thin bands of immature coal were also noted to outcrop across the site. Coal has previously been extracted from a large portion of the central northern field area in the form of open cast mining to a depth of up to 9m below current site. The backfill strata consists primarily of a re-engineered sandy clay gravel. Infiltration testing has been undertaken on site outside of the opencast area which has proved the soakaways would not be a suitable method of surface water drainage for the development.

3.3 There are no existing public foul and surface water sewers crossing the main body of the development land. However a 225mm surface water crosses the site close to the southern boundary, this serves the small number of properties on Wood End Court and outfalls into the watercourse. There are an adopted foul and surface water sewers are located in the residential development to the east and a foul sewer in Keresforth Road to the south. A copy of the Yorkshire Water records for the site are in the appendices at the rear of the report.

3.4 The OS plans indicate a watercourse crossing the central portion of the site and running parallel with the western site boundary. The watercourse is culverted below Keresforth Road.

3.5 Yorkshire Water have confirmed that there is no capacity within adjacent adopted surface water systems to service the site. They have recommended that surface water is discharged to the adjacent watercourse on the western boundary of the site. This will require a right of discharge in perpetuity to the existing watercourse which will need to be agreed with the current landowner. Due to the site being open field a greenfield discharge will need to be agreed with the LLFA. The development site is greenfield and therefore a maximum discharge Q_{bar} rate of 38l/s based upon the IH124 greenfield discharge rate calculation.

3.6 Due to the slope of the land it's likely that a gravity connection for the surface water should be feasible. However due to the topography of the site some deep drainage is expected.

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.
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 use of the site would be classified as More Vulnerable in Table 2: Flood Risk Vulnerability Classification in the Planning Practise Guidance- Flood Risk and Coastal Change April 2015. In accordance with that table the proposed development would be considered to be appropriate for the site.

Fig 1 A copy of the Environment Agency Flood Risk Maps for Planning

Fig 2 A copy of the Environment Agency overland Surface Water Plan

Fig 3 A copy of the Environment Agency overland Surface Water Plan – High Risk Depth

4.2 The site does fall partially within an area subject to surface water flooding according to the EA maps see Fig 2 and 3 above.

4.2.1 High risk means that each year this area has a chance of flooding of greater than 3.3%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

4.2.2 Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

4.2.3 Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

4.2.4 Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

4.2.5 The surface water flooding maps show some ingress into the site along the eastern boundary and through the central valley from the land to the north of the site. These indicate that the largest ingress will be from low risk and medium risk events. The line of the fluvial flooding is aligned with the proposed road pattern and therefore a flood route should be provided through the site. Floor levels adjacent the access road will need to be raised slightly to facilitate a flood route through the site. There will be a low spot on the access road to enable any overland flows to enter the watercourse.

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.

4.5 There are a number of potential flooding mechanisms that the Planning Practise Guidance- Flood Risk and Coastal Change July 2021 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 July 2021, 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 July 2021 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 development area 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 of sloping land, with residential development to the western and southern boundaries these are typically at a lower level to the development site. To the eastern boundary is the M1 this is situated in a slightly cutting and therefore will not represent a problem in relation to overland flows to the development site. A small area of open grassed recreational land is located directly to the north of the proposed site at a slightly elevated level. A fluvial overland flood route is indicated to run along the eastern boundary of the

northern field prior to joining the watercourse running centrally through the site. The overland flood levels are indicated as medium to low risk in terms of depth. The proposed planning layout indicates the new highway to run along the eastern boundary with adjoining plots being raised at least 300mm above footpath levels, these properties will also be served by a proposed public drainage systems.

5.2.2 The existing watercourse running centrally across the site and along the western boundary is shown not to affect the development on the flood risk maps for planning published by the Environment Agency. There is no hydrological modelling available for this watercourse to accurately quantify the level of flood risk, further to a site visit the watercourse is situated within a relatively deep channel with steep banks to the development site. Based upon the level difference between the watercourse and development site it is extremely unlikely that floodwaters would inundate the development site and flooding form this source is classed as extremely low risk. In addition to the above no new properties are indicated within the central lower lying valley area and the proposed road network will be considerably elevated as it crosses the central region of the site, to enable appropriate culverting of the watercourse to be achieved. This should provide sufficient level of protection to the new proposed construction on site.

5.2.3 Flooding from sewers – the existing drainage system to the west and south of the site is not considered a risk to the proposed development due to the current topography. The proposed site will be served by a system of new adopted sewers, and blockages and exceedance storm events should be considered as part of the design proposals for the new site.

5.2.4 We would recommend that an overland flood routes is provided through the site to cater for extreme events and in addition to any blockage failure of new drainage systems on site. As is normal under the sewers for adoption criteria and floor levels are to be based a minimum of 300mm above existing ground levels.

5.3 **Risk of Flooding from Rainwater Falling on Site**

5.3.1 The risk of flooding from water falling on site and not being able to leave the site is relatively high. 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 downstream 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 Infiltration testing has previously been undertaken on site which has proved unsuccessful. In addition to this a large proportion of the site consists of re-engineered clays due to former open cast coal mining. The soakaway testing confirmed that soakaways will not be a viable method of dealing with surface water discharge from the site.

5.3.4 Therefore the development should drain to the identified watercourse located to the western boundary of the site. Due to the topography of the site separate outfalls are proposed to the watercourse from both the northern and southern parcels of land. Storm water attenuation systems should be utilised to ensure the flows from the site are reduced to agricultural run-off rates or as otherwise agreed with the Barnsley Land Drainage Authority.

5.3.5 There are no significant existing buildings or paved areas on site. In conjunction with infiltration systems not being suitableand based upon an overall site area of 8.0ha greenfield discharge Q_{bar} rate of 38l/s has been proposed for the overall development into the existing culverted watercourse. This has been calculated using the IH124 greenfield runoff estimation provided by HR Wallingford. Therefore, this 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 should be spilt between the two parcels of land and the proposed separate outfalls. Negotiations would be required with the authorities and current landowners to secure permission to discharge in perpetuity together with easements etc. for the construction of a new sewers and connecting headwalls onto the watercourse. Any run off from the site post development would have to be limited to 38lit/s overall for the development.

5.3.6 With attenuation of flows there would have to be a storm-water storage facility. The use of above storage systems such as swales, detention basins or ponds, would provide the most sustainable urban drainage system and possibly the most economic but this would entail significant land up take and potentially large, commuted sums. With the recent implementation of the Codes for Adoption by Yorkshire Water 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.

i. **North Site**

Based upon a discharge rate of 10l/s approximate surface water attenuation for 1 in 100yr return period and 40% climate change in the range of 1320m^3 to 1830m^3.

ii. **South Site**

Based upon a discharge rate of 28l/s approximate surface water attenuation for 1 in 100yr return period and 40% climate change in the range of 660m^3 to 960m^3

5.3.7 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. The use of open swales and ponds would allow the use of reed beds and other organic systems to be employed so should still be considered in the final designs. Primary treatment for the roads would 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. Rainwater butts may also be provided to enable some recycling of run off from the roofs and paved areas. The use of green roofs is not considered appropriate in this development. We understand that open space to the south of the site has been designated as a possible area to locate surface water attenuation. Due to the above requirements an off line basin is proposed which is unlikely to provide the same water quality benefits as an on line system. Please note Yorkshire Water will require an easement and access for future maintenance.

5.3.8 The size of the storm water storage facilities would need to be determined accurately in the final detailed designs. 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 40% allowance for climate change, but must ensure that no buildings are flooded.

5.3.9 The proposed discharge point and discharge rates from the site needs to be formally agreed with Yorkshire Water, the Environment Agency and the Local Land Drainage Authority prior to detailed design being undertaken.

5.4 **Impact on existing drainage systems.**

5.4.1 If the site is developed with attenuation systems and an agreed discharge rate of 38l/s reduced to agricultural rates of discharge, there should be no increase in the flood risk to properties off site or in the drainage networks downstream of the site. In real terms there would be slight reduction in flood risk to adjacent land due to the attenuation provided on site for the 1 in 100 year storms with the discharge rate cut to below the current estimated 1 in 1 year storm agricultural discharge rate.

5.4.2 The existing site topography slopes steeply towards the existing houses off Wood End Court and therefore surface water management will need to be considered carefully during and within the final designs to avoid any overland surface water flows affecting these properties.

5.4.3 The maintenance of the onsite proposed SUDS basin would be carried out by Yorkshire Water as part of the Section 104 Agreement and they would adopt the underground oversized pipework and manholes. The maintenance of any on or off site above ground storage systems will need to be resolved satisfactorily in perpetuity either with Yorkshire Water, a management company or Barnsley MBC. This may mean commuted sums being paid for such an agreement.

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

6.0 CONCLUSIONS

6.1 The area of the site to be developed 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.

6.2 The development of the site utilising infiltration techniques is not considered suitable. A surface water attenuation system should be designed to reduce the run-off from the site to an agricultural discharge rate of 38l/s for the overall development site, to ensure there is no increase in flood risk to the downstream catchment. The use of a combination of underground storage and above ground surface water attenuation is proposed. The location of the final outfall to the watercourse will require further investigation on site.

6.3 The risk of overland flows entering the site is considered to be low due to the topography of the area around the site. The risk can be further minimised by providing a flood water route through the site to ensure flood water flows are directed away from the existing and proposed housing. We would recommend that the floor levels of the proposed houses should be a minimum of 300mm above the existing ground/road levels.

MARTIN HUDDLESTON. MEng
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APPENDIX A

PROPOSED SITE PLAN

Key

- Application site boundary
- Existing (retained) trees & hedgerow (TBC)
- Indicative proposed planting
- Open space
- Indicative surface water attenuation basin
- Existing Public Right of Way
- Re-directed Public Right of Way
- Indicative development cell
- Potential locations of landmark buildings
- Proposed street
- Proposed block paving
- Private drive

0 10 50 m

Keepmoat Homes

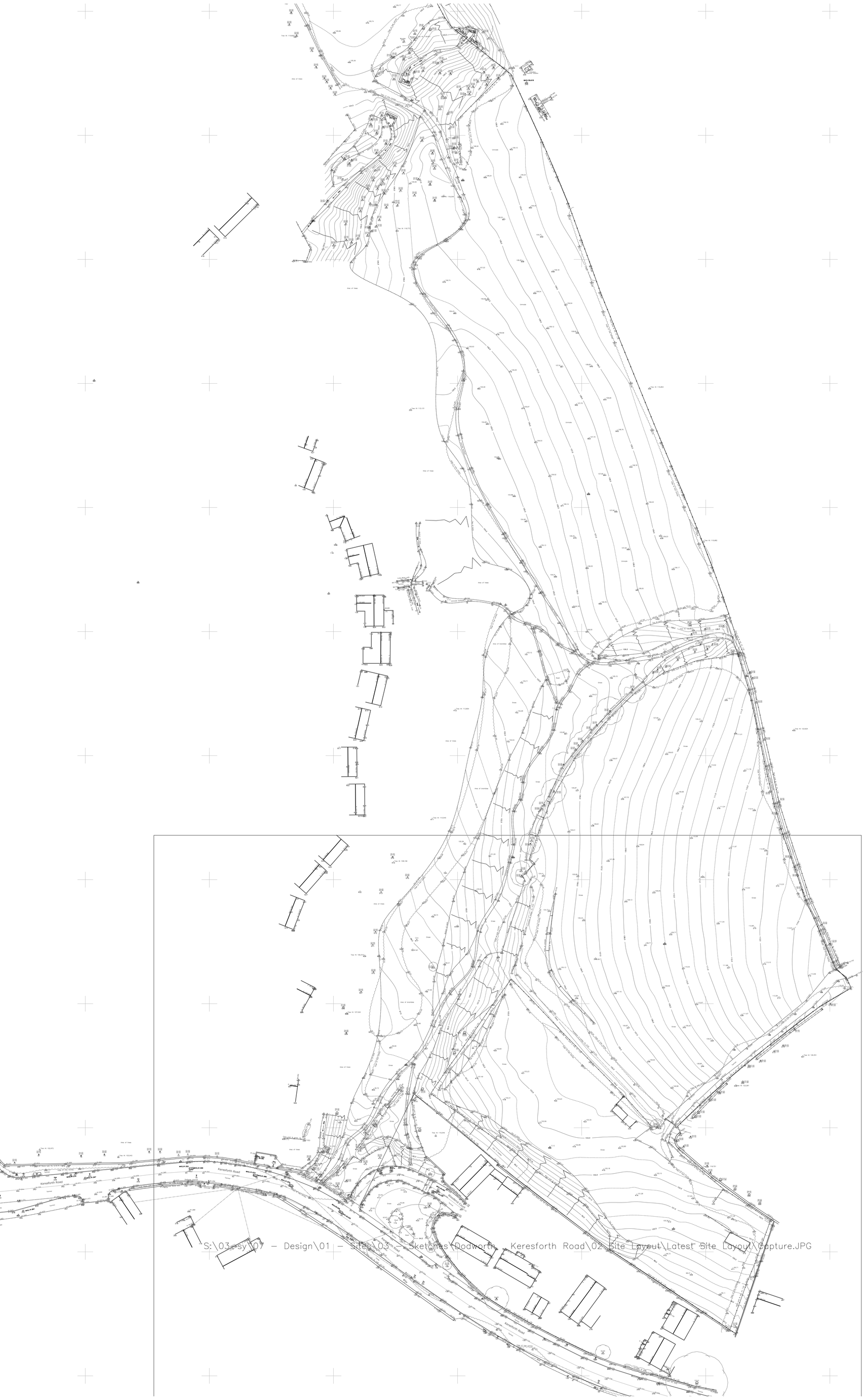
Project
Keresforth Road, Dodworth

Drawing Title
Masterplan

Project Code	Drawing Nr	Rev
n1664	005	A
Date	Drawing Scale	
15.12.2021	1:1,000 @ A1	

APPENDIX B

TOPOGRAPHICAL SURVEY


Keresforth Road
Keresforth Road
Keresforth Road
S:\03-sy\07 - Design\01 - Site\03 - Sketches\Dodworth - Keresforth Road\02 Site Layout\Latest Site Layout Capture.JPG

APPENDIX C

YORKSHIRE WATER

PRE-PLANNING ENQUIRY

YorkshireWater

Mr C MacDonald
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Firth Buildings
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Dewsbury
WF12 7BU
c.macdonald@haighhuddleston.co.uk

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

Tel: 0345 120 8482
Fax:

Email:
technical.sewerage@yorkshirewater.co.uk

Your Ref:
Our Ref: W015769

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

25th November 2020

Dear Mr MacDonald,

Keresforth Road, Barnsley, S75 3QY - Pre-Planning Sewerage Enquiry U040647

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

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

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

points of discharge to be agreed.

Existing Infrastructure

There is a 225 mm diameter public surface sewer recorded on the site. In this instance, building-over may take place under the control of Part H4 Building Regulations 2000. No trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

There is a wastewater outfall to watercourse, under the control of Yorkshire Water, located near to/within the site. Vehicular access, including with large tankers, could be required at any time.

Foul Water

The closest practicable point of discharge for foul will be the 150 mm foul public sewer in Keresforth Road, but at present there is no spare capacity available to accept the foul discharge from all the proposed development. Further investigation in the form of modelling, at the developers cost, will be required to understand the impact on the public sewer network along with a build programme of the development. Please contact us on the above number to discuss this further.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

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

As the 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 for discharge.

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

Other Observations

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

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

YorkshireWater

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991.
An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

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

yours sincerely

Chris Roberts
Development Services Technician

432265 : 405201	Map Name : SE3104NE	Title

Yorkshire Water,
PO Box 500,
Halifax Road,
Bradford BD6 2LZ
Contact Name :
YorMap Advisor C ROBERTS
Contact Tel : 87 2582

Notes

Partial Key
Foul Sewer = F
Combined Sewer = C
Surface Water Sewer = SW
Trade Sewer = TD
Partially Separate = PS

This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.

Date Req : 24/11/2020, 19:33:30
Date Gen : 24/11/2020, 19:34:04
Source : Sewer Network Enquiry

UPN: Undefined Originator: C ROBERTS, YorMap, 87 2582

APPENDIX D

GREENFIELD RUN-OFF RATE CALCULATION AND PRELIMINARY ATTENUATION CALCULATION

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Martin Huddleston
Site name:	Keresforth Road
Site location:	Dodworth

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.54110° N
Longitude:	1.51109° W
Reference:	3833677120
Date:	Dec 09 2021 12:33

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 8.0

Methodology

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

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	696	696
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 30 years:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

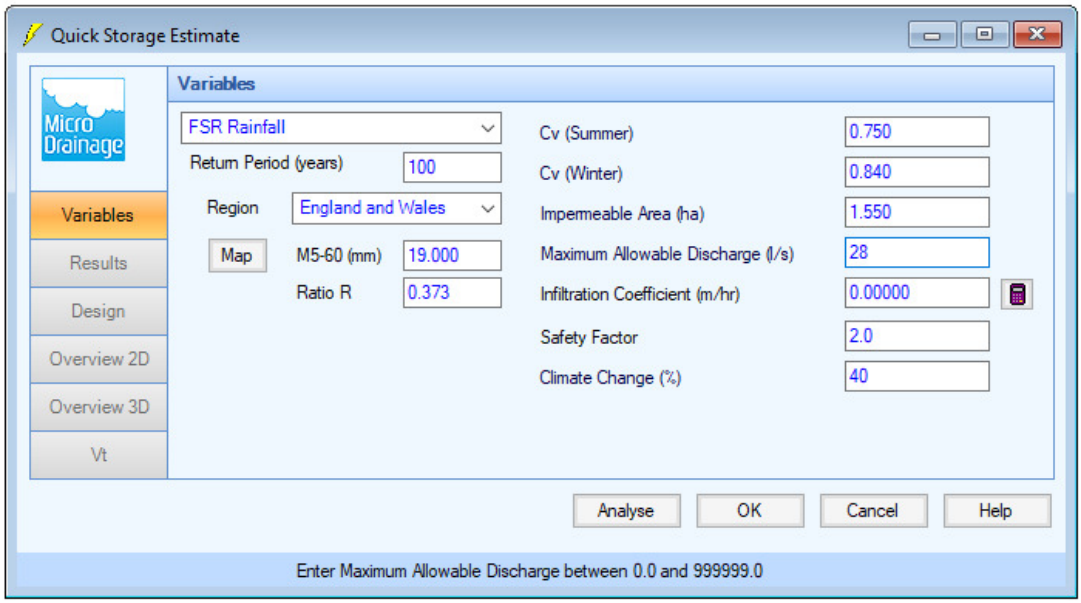
(2) Are flow rates < 5.0 l/s?

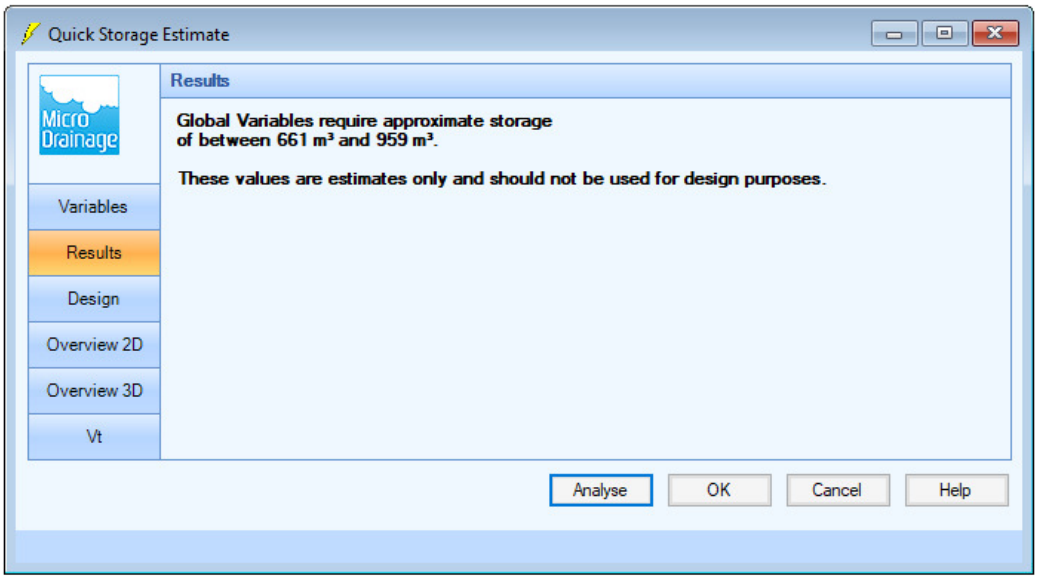
Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	38.36	38.36
1 in 1 year (l/s):	32.99	32.99
1 in 30 years (l/s):	67.14	67.14
1 in 100 year (l/s):	79.8	79.8
1 in 200 years (l/s):	90.92	90.92

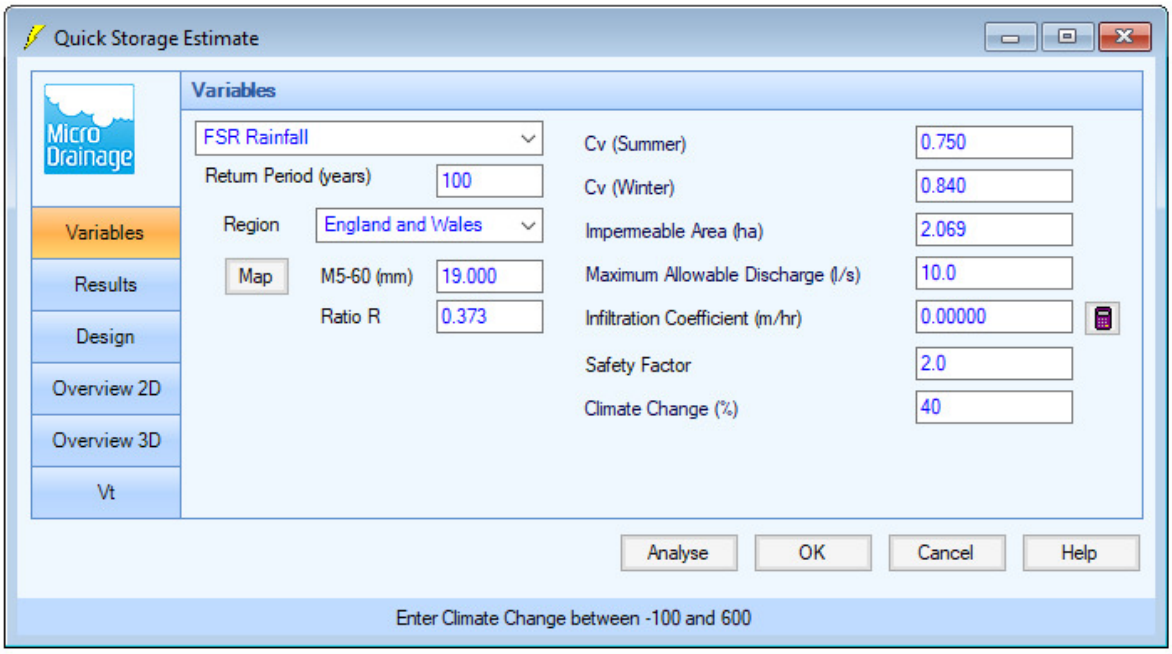


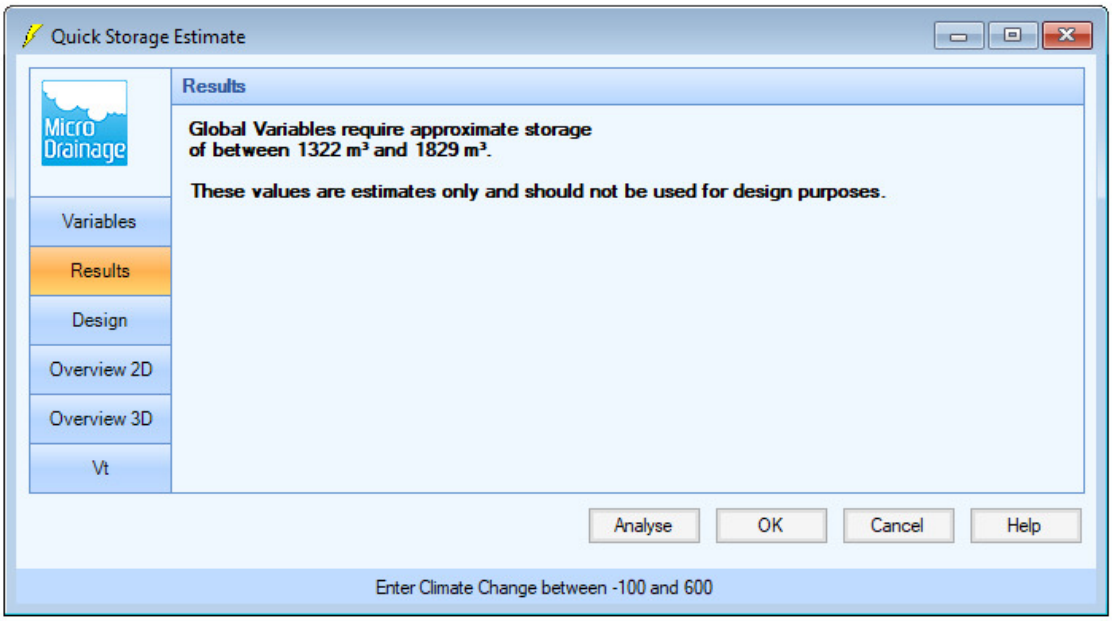


KEEPMOAT HOMES

7774 KERESFORTH ROAD, BARNSLEY

SOUTH SITE STORAGE ESTIMATE





KEEPMOAT HOMES

7774 KERESFORTH ROAD, BARNSLEY

NORTH SITE STORAGE ESTIMATE

APPENDIX E

SITE INVESTIGATION INFORMATION

To reduce the effects of the potential settlement of external areas in relation to the piled plots within the backfill, extra facings, flexible service connections and generous falls on drain runs should be allowed for.

7.8 Excavation Problems

Significant obstructions were not encountered during the site investigation. Some boulders were encountered within the opencast backfill material.

Outside of the opencast areas, strong mudstone was encountered in three locations in the north of the site, at between 2.3 m and 2.6 m bgl. Strong sandstone was encountered in two locations in the south of the site at between 1.6 m and 2.1 m.

Loose material and side collapse was noted within the opencast material. Outside of the opencast the trial pits were found to be generally stable. During the soakaway tests, occasional minor side collapse was observed. Support will be required in accordance with current Health & Safety Regulations wherever access is required to trenches deeper than 1.2 m or less where there is risk of collapse.

7.9 Surface Water Drainage

Infiltration tests were carried out in seven soakaway pits, referenced SA1 to SA7. Tests were generally carried out within clay or weathered mudstone, with the exception of SA7 which encountered weathered sandstone. The locations of the pits are indicated on the Exploratory Hole Location Plan in Appendix 1. The soakaway logs are in Appendix 3 and the test results and infiltration calculations are provided in Appendix 4.

The water within SA1 to SA6 did not drain over the monitoring period of at least 1.5 hours.

The tests in SA7 drained quickly due to fractures within the sandstone, recording infiltration rates of between 1500 and 910 x 10^{-6} m/s

Based on these results, although the tests carried out in SA7 drained rapidly, this sandstone is not expected to be extensive across the site and regulators are unlikely to accept both a piped and soakaway drainage system. Soakaways are therefore not considered to be a suitable method of surface water drainage at the site.

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Trialpit No
SA1
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Land off Keresforth Road	38633	Level: 129.80 m AOD	01/04/2016
Location: Dodworth		Dimensions: - Depth 2.10m	Scale 1:25
Client: Strata Homes			Logged By LED

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D					TOPSOIL: Brown slightly sandy clay with vegetative and occasional brick and coal fragments
			0.30	129.50		Reworked firm orange mottled grey CLAY
			0.60	129.20		Firm grey mottled orange slightly gravelly CLAY. Gravel is fine to coarse subangular of mudstone
0.80	D					
2.00	D					
			2.10	127.70		Trialpit Complete at 2.10 m

Remarks:

Groundwater: None encountered.

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Trialpit No
SA2
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Land off Keresforth Road	38633	Level: 125.15 m AOD	01/04/2016
Location: Dodworth		Dimensions: -	Scale 1:25
		Depth 2.00m	Logged By LED
Client: Strata Homes			

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D					TOPSOIL: Brown slightly sandy clay with vegetative and occasional brick and coal fragments
			0.30	124.85		Reworked firm orange mottled grey CLAY
0.50	D					
			0.70	124.45		Stiff grey mottled orange slightly gravelly CLAY. Gravel is fine to coarse subangular of mudstone
1.10	IPP 1	350				
1.10	IPP 2	425				
1.10	IPP 3	325				
1.10	IPP 4	450				
1.10	D					
			1.70	123.45		Weathered moderately weak grey MUDSTONE recovered as clayey gravel
			1.90	123.25		COAL recovered as fine to medium angular gravel
			2.00	123.15		Trialpit Complete at 2.00 m

Remarks: IPP = Penetrometer readings given as unconfined compressive strength in kN/m2.

Groundwater: None encountered.

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Trialpit No
SA3
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Land off Keresforth Road	38633	Level: 121.35 m AOD	01/04/2016
Location: Dodworth		Dimensions: - Depth 1.90m	Scale 1:25
Client: Strata Homes			Logged By LED

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D					TOPSOIL: Brown slightly sandy clay with vegetative and occasional coal fragments
			0.30	121.05		Reworked firm orange mottled grey CLAY
0.50	D					
			0.70	120.65		Stiff grey mottled orange slightly gravelly CLAY. Gravel is fine to coarse subangular mudstone.
1.40	D					
			1.50	119.85		Weathered moderately weak grey MUDSTONE recovered as clayey gravel
			1.90	119.45		Trialpit Complete at 1.90 m

Remarks:

Groundwater: None encountered.

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Trialpit No
SA4
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Land off Keresforth Road	38633	Level: 104.85 m AOD	01/04/2016
Location: Dodworth		Dimensions: -	Scale 1:25
		Depth 2.00m	Logged By LED
Client: Strata Homes			

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D					TOPSOIL: Brown slightly sandy clay with vegetative and occasional coal fragments and gravel of mudstone
			0.30	104.55		Stiff orange mottled grey CLAY
1.00	D					
			1.80	103.05		Weathered moderately weak grey MUDSTONE with occasional thin sandstone intebeds recovered as clayey gravel
			2.00	102.85		Trialpit Complete at 2.00 m

Remarks:

Groundwater: None encountered.

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Trialpit No
SA5
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Land off Keresforth Road	38633	Level: 106.80 m AOD	05/04/2016
Location: Dodworth		Dimensions: - Depth 1.20m	Scale 1:25
Client: Strata Homes			Logged By LED

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D					TOPSOIL: Brown slightly gravelly clay with coal fragments. Gravel is fine to coarse of mudstone.
			0.30	106.50		
0.50	D					Firm red orange slightly sandy gravelly CLAY. Gravel is fine to medium angular of sandstone
			0.70	106.10		
						Moderately strong light orange SANDSTONE recovered as clayey sandy gravel and cobbles
			1.00	105.80		
						Firm grey mottled orange gravelly CLAY. Gravel is fine to medium subangular of mudstone.
			1.20	105.60		
						Trialpit Complete at 1.20 m

1
2
3
4

Remarks:

Groundwater: None encountered.

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Trialpit No
SA6
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Land off Keresforth Road	38633	Level: 111.45 m AOD	05/04/2016
Location: Dodworth		Dimensions: -	Scale 1:25
		Depth 1.90m	Logged By LED
Client: Strata Homes			

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D					TOPSOIL: Brown slightly gravelly clay with coal fragments. Gravel is fine to coarse of mudstone.
			0.30	111.15		Reworked firm slightly sandy orange mottled grey CLAY
			0.50	110.95		Firm orange mottled grey CLAY
			1.20	110.25		COAL recovered as fine to medium angular gravel
			1.60	109.85		Firm grey mottled orange CLAY
1.80	D					
			1.90	109.55		Trialpit Complete at 1.90 m

Remarks: Depth of coal shown for east pit face. Coal in west pit face from 0.9 to 1.3 m bgl. Coal therefore dipping towards the east.

Groundwater: None encountered.

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Trialpit No
SA7
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Land off Keresforth Road	38633	Level: 106.15 m AOD	05/04/2016
Location: Dodworth		Dimensions: - Depth 1.55m	Scale 1:25
Client: Strata Homes			Logged By LED

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D					TOPSOIL: Brown sandy slightly gravelly clay. Gravel is fine to medium of sandstone
			0.20	105.95		Weathered orange brown moderately strong SANDSTONE recovered as slightly clayey sandy fine to coarse angular gravel and cobbles.
			1.55	104.60		Trialpit Complete at 1.55 m

Remarks:

Groundwater: None encountered.

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PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. **SA1**

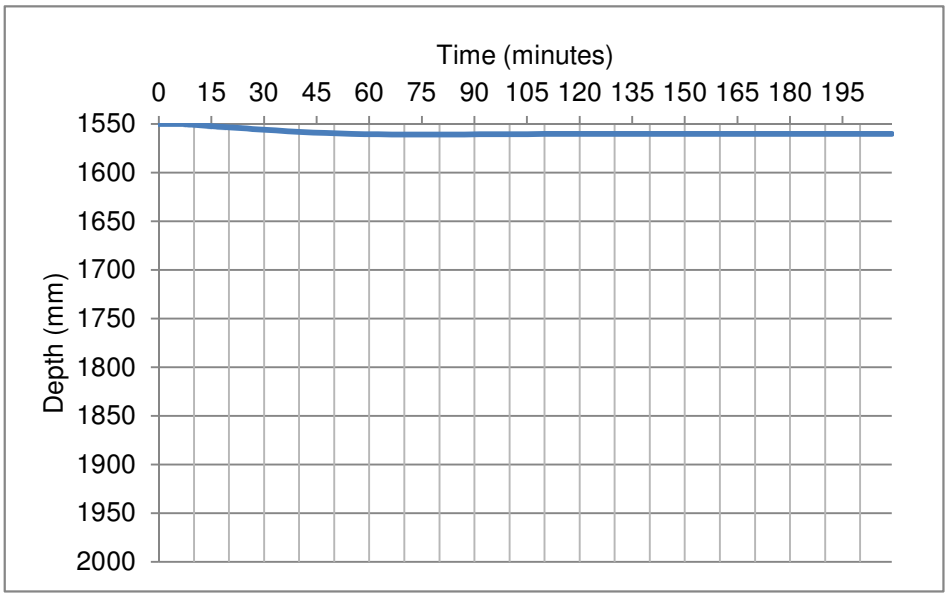
Test Pit Dimensions

Length = **1300** mm
Width = **700** mm
Depth = **2000** mm (Total depth)

Plan area = **0.91** m²

Approximate time to discharge water into the hole: **120** Seconds
Depth to water after completion of pumping: **1550** mm

Time (min)	Depth (mm)
0	**1550**
1	**1550**
2	**1550**
4	**1550**
6	**1550**
7	**1550**
55	**1560**
124	**1560**
209	**1560**



Test Pit Log

Depth (m)	Description
0.0-0.3	TOPSOIL: Brown slightly sandy clay with vegetative and occasional brick and coal fragments
0.3-0.6	Reworked firm orange mottled grey CLAY
0.6-2.1	Firm grey mottled orange slightly gravelly CLAY. Gravel is fine to coarse subangular of mudstone

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. SA1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1550** mm
Start time = **0** min

Average water depth: **445** mm

Change in water depth: **10** mm

Final parameters

Depth to water = **1560** mm
End time = **55** min

Time interval: **55** min

Effective Storage Volume of Water in the Trial Pit = **0.4095** m³
75% Effective Depth = **1663** mm from ground level
25% Effective Depth = **1888** mm from ground level
Time at 75% Effective Depth = **N/A** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.20** m³

a_{p50} = **1.81** m²

t_{p75-25} = **0** sec

f = **#DIV/0! m/sec**

Average Soakaway Rate = **2.8E-06** m³/sec
Average soakaway area = **2.69** m² (sides + base)

BR365 Soil Infiltration Rate = #DIV/0! m/sec
Average Infiltration Rate = 1.0E-06 m/sec

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. **SA2**

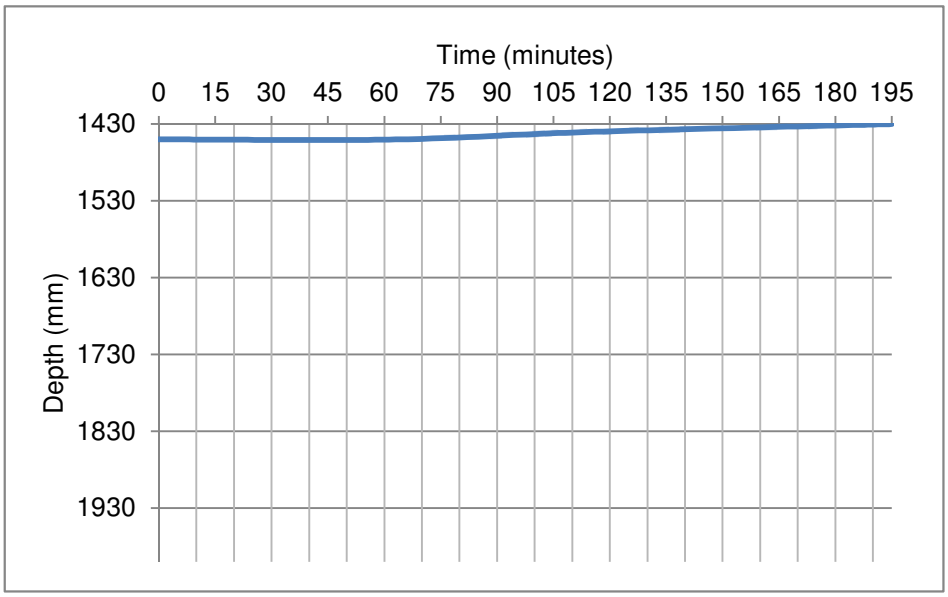
Test Pit Dimensions

Length = **1200** mm
Width = **650** mm
Depth = **2000** mm (Total depth)

Plan area = **0.78** m²

Approximate time to discharge water into the hole: **180** Seconds
Depth to water after completion of pumping: **1450** mm

Time (min)	Depth (mm)
0	**1450**
2	**1450**
3	**1450**
6	**1450**
63	**1450**
116	**1440**
195	**1430**



Test Pit Log

Depth (m)	Description
0.0-0.3	TOPSOIL: Brown slightly sandy clay with vegetative and occasional brick and coal fragments
0.3-0.7	Reworked firm orange mottled grey CLAY
0.7-1.7	Stiff grey mottled orange slightly gravelly CLAY. Gravel is fine to coarse subangular of mudstone
1.7-1.9	Weathered moderately weak grey MUDSTONE recovered as clayey gravel
1.9-2.0	COAL recovered as fine to medium angular gravel

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. SA2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1450** mm
Start time = **0** min

Average water depth: **550** mm

Change in water depth: **0** mm

Final parameters

Depth to water = **1450** mm
End time = **63** min

Time interval: **63** min

Effective Storage Volume of Water in the Trial Pit = **0.429** m³
75% Effective Depth = **1588** mm from ground level
25% Effective Depth = **1863** mm from ground level
Time at 75% Effective Depth = **N/A** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.21** m³

a_{p50} = **1.80** m²

t_{p75-25} = **0** sec

f = **#DIV/0! m/sec**

Average Soakaway Rate = **0.0E+00** m³/sec
Average soakaway area = **2.82** m² (sides + base)

BR365 Soil Infiltration Rate = #DIV/0! m/sec
Average Infiltration Rate = 0.0E+00 m/sec

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. **SA3**

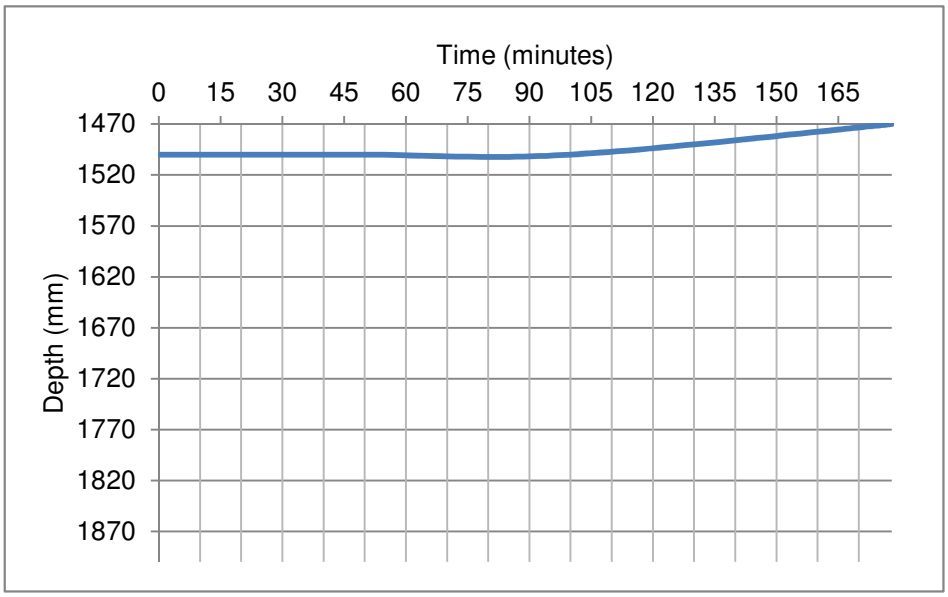
Test Pit Dimensions

Length = **1800** mm
Width = **700** mm
Depth = **1900** mm (Total depth)

Plan area = **1.26** m²

Approximate time to discharge water into the hole: **120** Seconds
Depth to water after completion of pumping: **1500** mm

Time (min)	Depth (mm)
0	**1500**
2	**1500**
5	**1500**
7	**1500**
49	**1500**
100	**1500**
178	**1470**



Test Pit Log

Depth (m)	Description
0.0-0.3	TOPSOIL: Brown slightly sandy clay with vegetative and occasional brick and coal fragments
0.3-0.7	Reworked firm orange mottled grey CLAY
0.7-1.5	Stiff grey mottled orange slightly gravelly CLAY. Gravel is fine to coarse subangular of mudstone
1.5-1.9	Weathered moderately weak grey MUDSTONE recovered as clayey gravel

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. SA3

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1500** mm
Start time = **0** min

Average water depth: **400** mm

Change in water depth: **0** mm

Final parameters

Depth to water = **1500** mm
End time = **0** min

Time interval: **0** min

Effective Storage Volume of Water in the Trial Pit = **0.504** m³
75% Effective Depth = **1600** mm from ground level
25% Effective Depth = **1800** mm from ground level
Time at 75% Effective Depth = **N/A** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.25** m³

a_{p50} = **2.26** m²

t_{p75-25} = **0** sec

f = **#DIV/0! m/sec**

Average Soakaway Rate = **#DIV/0!** m³/sec
Average soakaway area = **3.26** m² (sides + base)

BR365 Soil Infiltration Rate = #DIV/0! m/sec
Average Infiltration Rate = #DIV/0! m/sec

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. **SA4**

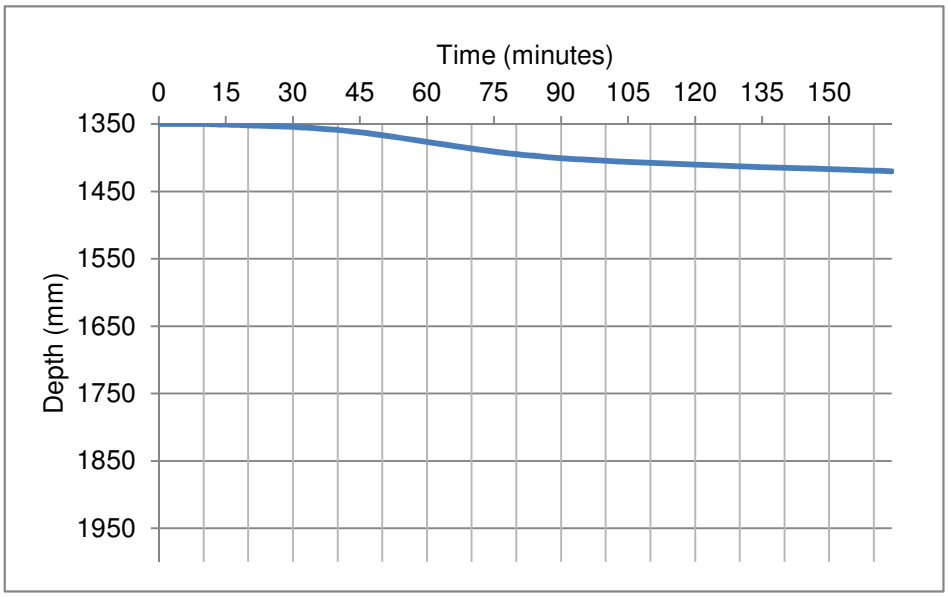
Test Pit Dimensions

Length = **1400** mm
Width = **700** mm
Depth = **2000** mm (Total depth)

Plan area = **0.98** m²

Approximate time to discharge water into the hole: **120** Seconds
Depth to water after completion of pumping: **1350** mm

Time (min)	Depth (mm)
0	**1350**
3	**1350**
8	**1350**
11	**1350**
42	**1360**
89	**1400**
164	**1420**



Test Pit Log

Depth (m)	Description
0.0-0.3	TOPSOIL: Brown slightly sandy clay with vegetative and occasional coal and gravel of mudstone
0.3-1.8	Stiff orange mottled grey CLAY
1.8-2.0	Weathered moderately weak grey MUDSTONE with occasional thin sandstone interbeds recovered as clayey gravel

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. SA4

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1350** mm
Start time = **0** min

Average water depth: **615** mm

Change in water depth: **70** mm

Final parameters

Depth to water = **1420** mm
End time = **164** min

Time interval: **164** min

Effective Storage Volume of Water in the Trial Pit = **0.637** m³
75% Effective Depth = **1513** mm from ground level
25% Effective Depth = **1838** mm from ground level
Time at 75% Effective Depth = **N/A** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.32** m³

a_{p50} = **2.35** m²

t_{p75-25} = **0** sec

f = **#DIV/0! m/sec**

Average Soakaway Rate = **7.0E-06** m³/sec
Average soakaway area = **3.56** m² (sides + base)

BR365 Soil Infiltration Rate = #DIV/0! m/sec
Average Infiltration Rate = 2.0E-06 m/sec

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. **SA5**

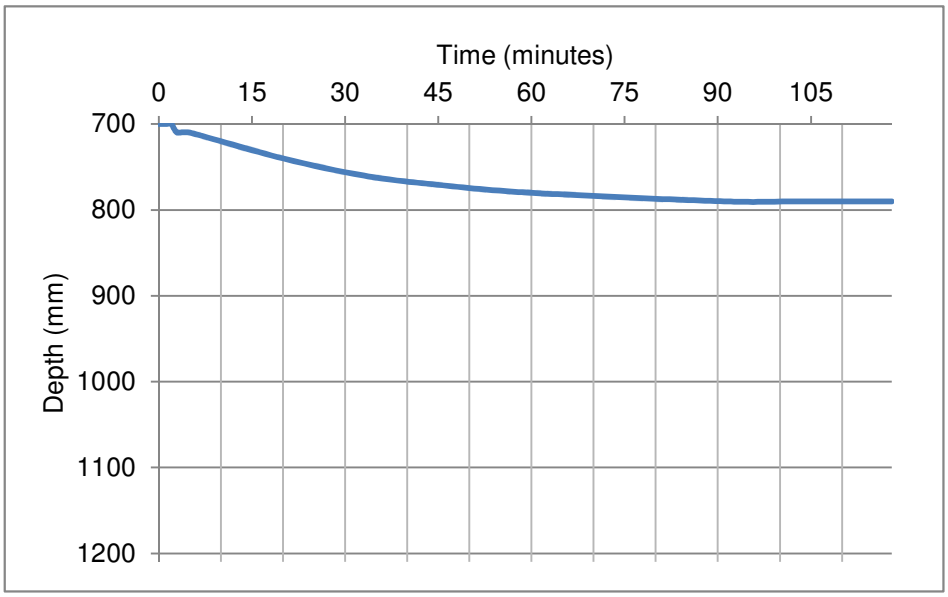
Test Pit Dimensions

Length = **1750** mm
Width = **700** mm
Depth = **1210** mm (Total depth)

Plan area = **1.225** m²

Approximate time to discharge water into the hole: **30** Seconds
Depth to water after completion of pumping: **700** mm

Time (min)	Depth (mm)
0	**700**
1	**700**
2	**700**
3	**710**
5	**710**
20	**740**
33	**760**
44	**770**
60	**780**
91	**790**
103	**790**
118	**790**



Test Pit Log

Depth (m)	Description
0.0-0.3	TOPSOIL: Brown slightly gravelly clay with coal fragments. Gravel is fine to coarse of mudstone.
0.3-0.7	Firm red orange slightly sandy gravelly CLAY. Gravel is fine to medium angular of sandstone
0.7-1.0	Moderately strong light orange SANDSTONE recovered as clayey sandy gravel and cobbles
1.0-1.2	Firm grey mottled orange gravelly CLAY. Gravel is fine to medium subangular of mudstone

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. SA5

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters
Depth to water = **700** mm
Start time = **0** min

Final parameters
Depth to water = **780** mm
End time = **60** min

Average water depth: **470** mm
Change in water depth: **80** mm
Time interval: **60** min

Effective Storage Volume of Water in the Trial Pit = **0.62475** m³
75% Effective Depth = **828** mm from ground level
25% Effective Depth = **1083** mm from ground level
Time at 75% Effective Depth = **N/A** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.31** m³

a_{p50} = **2.47** m²

t_{p75-25} = **0** sec

f = **#DIV/0! m/sec**

Average Soakaway Rate = **2.7E-05** m³/sec
Average soakaway area = **3.53** m² (sides + base)

BR365 Soil Infiltration Rate = #DIV/0! m/sec
Average Infiltration Rate = 7.7E-06 m/sec

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. **SA6**

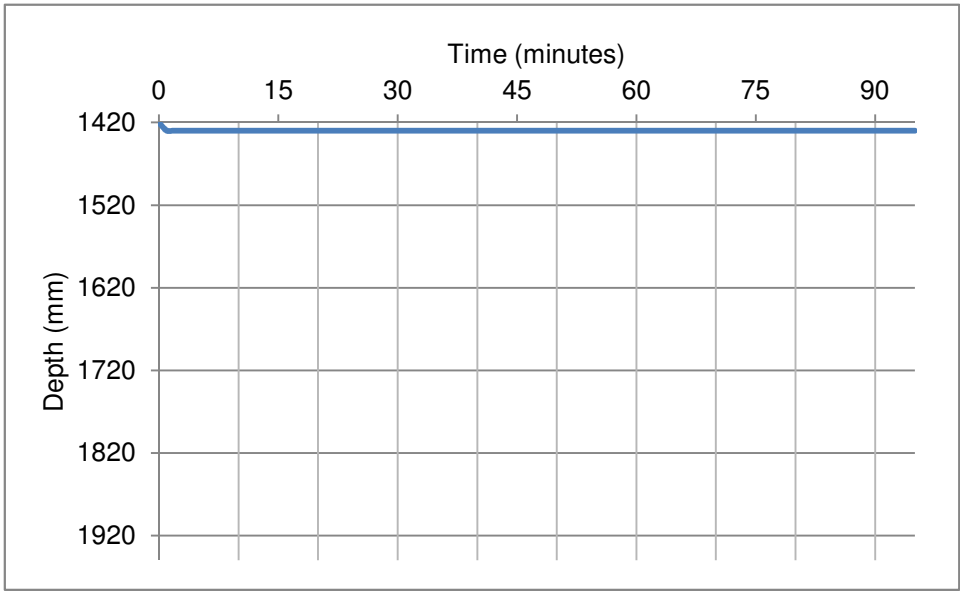
Test Pit Dimensions

Length = **1500** mm
Width = **600** mm
Depth = **1950** mm (Total depth)

Plan area = **0.9** m²

Approximate time to discharge water into the hole: **30** Seconds
Depth to water after completion of pumping: **1420** mm

Time (min)	Depth (mm)
0	**1420**
1	**1430**
2	**1430**
10	**1430**
25	**1430**
37	**1430**
49	**1430**
65	**1430**
95	**1430**



Test Pit Log

Depth (m)	Description
0.0-0.3	TOPSOIL: Brown slightly gravelly clay with coal fragments. Gravel is fine to coarse of mudstone.
0.3-0.5	Reworked firm slightly sandy orange mottled grey CLAY
0.5-1.2	Firm orange mottled grey CLAY
1.2-1.6	COAL recovered as fine to medium angular gravel
1.6-1.9	Firm grey mottled orange CLAY

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. SA6

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1420** mm
Start time = **0** min

Average water depth: **525** mm

Change in water depth: **10** mm

Final parameters

Depth to water = **1430** mm
End time = **95** min

Time interval: **95** min

Effective Storage Volume of Water in the Trial Pit = **0.477** m³
75% Effective Depth = **1553** mm from ground level
25% Effective Depth = **1818** mm from ground level
Time at 75% Effective Depth = **N/A** minutes
Time at 25% Effective Depth = **N/A** minutes

V_{p75-25} = **0.24** m³

a_{p50} = **2.01** m²

t_{p75-25} = **0** sec

f = **#DIV/0! m/sec**

Average Soakaway Rate = **1.6E-06** m³/sec
Average soakaway area = **3.11** m² (sides + base)

BR365 Soil Infiltration Rate = #DIV/0! m/sec
Average Infiltration Rate = 5.1E-07 m/sec

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Test No. **SA7(1)**

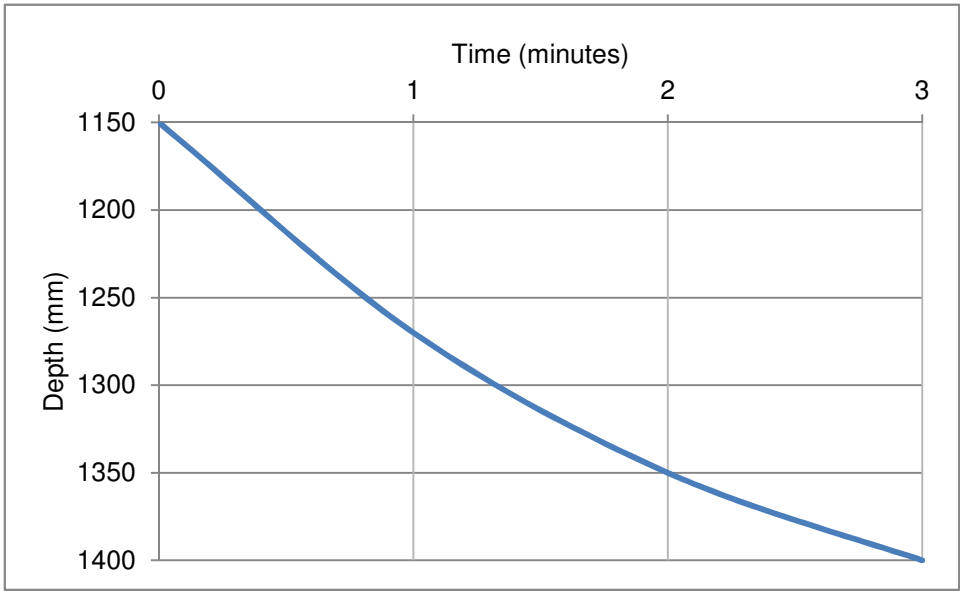
Test Pit Dimensions

Length = **1800** mm
Width = **1000** mm
Depth = **1400** mm (Total depth)

Plan area = **1.8** m²

Approximate time to discharge water into the hole: **180** Seconds
Depth to water after completion of pumping: **1150** mm

Time (min)	Depth (mm)
0	**1150**
1	**1270**
2	**1350**
3	**1400**



Water level did not rise past around 1.15 m bgl. Flowed out as quick as it was filling
Some side collapse during filling

Test Pit Log

Depth (m)	Description
0.0-0.2	TOPSOIL: Brown sandy slightly gravelly clay. Gravel is fine to medium of sandstone
0.2-1.55	Weathered orange brown moderately strong SANDSTONE recovered as slightly clayey sandy fine to coarse angular gravel and cobbles

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Test No. SA7(1)

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1150** mm
Start time = **0** min

Final parameters

Depth to water = **1400** mm
End time = **3** min

Average water depth: **125** mm

Change in water depth: **250** mm

Time interval: **3** min

Effective Storage Volume of Water in the Trial Pit	=	**0.45**	m³
75% Effective Depth	=	**1213**	mm from ground level
25% Effective Depth	=	**1338**	mm from ground level
Time at 75% Effective Depth	=	**1**	minutes
Time at 25% Effective Depth	=	**2**	minutes

V_{p75-25} = **0.23** m³

a_{p50} = **2.50** m²

t_{p75-25} = **60** sec

f = **1.5E-03 m/sec**

Average Soakaway Rate = **2.5E-03** m³/sec
Average soakaway area = **2.50** m² (sides + base)

BR365 Soil Infiltration Rate = 1.5E-03 m/sec
Average Infiltration Rate = 1.0E-03 m/sec

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Test No. **SA7(2)**

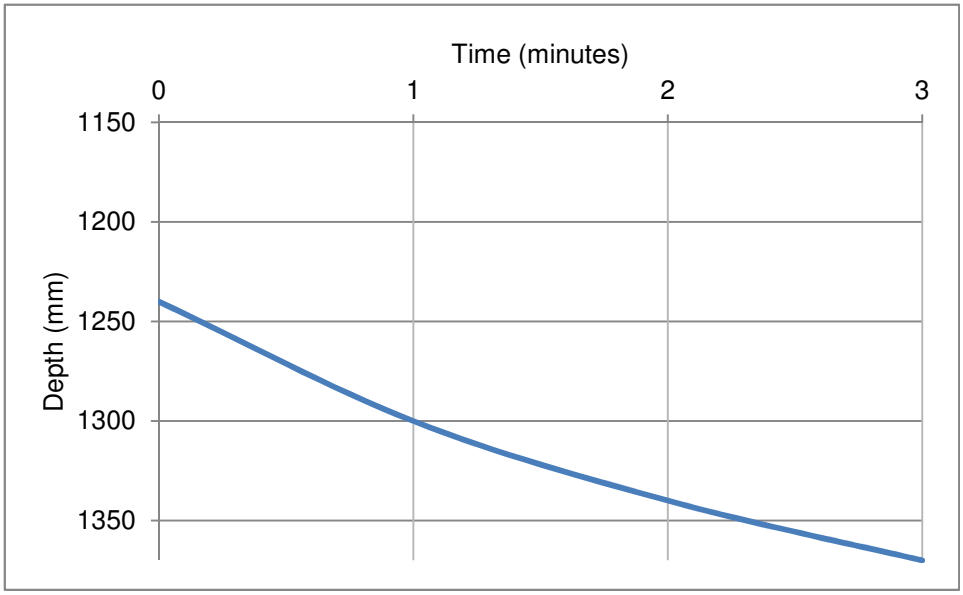
Test Pit Dimensions

Length = **1800** mm
Width = **1100** mm
Depth = **1370** mm (Total depth)

Plan area = **1.98** m²

Approximate time to discharge water into the hole: **180** Seconds
Depth to water after completion of pumping: **1150** mm

Time (min)	Depth (mm)
0	**1240**
1	**1300**
2	**1340**
3	**1370**



Water level did not rise past around 1.15 m bgl. Flowed out as quick as it was filling. Flow rate from tanker slowed after around 120 seconds and water level began to drop.
Approximately 2000 gallons of water put into SA7 over the two tests. No water remianing for third test.

Test Pit Log

Depth (m)	Description
0.0-0.2	TOPSOIL: Brown sandy slightly gravelly clay. Gravel is fine to medium of sandstone
0.2-1.55	Weathered orange brown moderately strong SANDSTONE recovered as slightly clayey sandy fine to coarse angular gravel and cobbles

PROJECT:	Keresforth Road, Dodworth	Job No. 38633	Date 19.04.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared LED	Checked KE

Test No. SA7(2)

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} x t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1240** mm
Start time = **0** min

Average water depth: **65** mm

Change in water depth: **130** mm

Final parameters

Depth to water = **1370** mm
End time = **3** min

Time interval: **3** min

Effective Storage Volume of Water in the Trial Pit = **0.2574** m³
75% Effective Depth = **1273** mm from ground level
25% Effective Depth = **1338** mm from ground level
Time at 75% Effective Depth = **1** minutes
Time at 25% Effective Depth = **2** minutes

V_{p75-25} = **0.13** m³

a_{p50} = **2.36** m²

t_{p75-25} = **60** sec

f = **9.1E-04 m/sec**

Average Soakaway Rate = **1.4E-03** m³/sec
Average soakaway area = **2.36** m² (sides + base)

BR365 Soil Infiltration Rate = 9.1E-04 m/sec
Average Infiltration Rate = 6.1E-04 m/sec