



Flood Risk Assessment and Drainage Strategy

Redrow Homes Yorkshire Limited

**Proposed Residential Development,
Blackmoorfoot Road, Huddersfield**

July 2021

Client	Redrow Homes Yorkshire Limited
Project	Proposed Residential Development, Blackmoorfoot Road, Huddersfield
Report Title	Flood Risk Assessment and Drainage Strategy
Report Ref.	0487/3/FRA

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1	Final	21-7-21	Minor text amendments	JT		TAM	

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Yorkshire Water

1 Introduction

1.1 Appointment

Egorum Limited was appointed by Redrow Homes Yorkshire Limited in May 2021 to undertake a Flood Risk Assessment (FRA) and Drainage Strategy study for a proposed residential development at Blackmoorfoot Road, Huddersfield.

1.2 Scope

The scope of the study was to collate and review information from searches and consultation with the key flood risk and drainage bodies, identify flood risk and drainage constraints and potential mitigation measures.

Design of the proposed drainage and mitigation measures has been undertaken by Redrow Homes Limited.

1.3 Methodology

The study consisted of data collection and review, desk based research and consultation with regulatory bodies and third parties in relation to flood risk and drainage.

The study provides a risk based assessment of potential flooding to the site and as a result of development from all sources, including fluvial, tidal, surface water / pluvial, groundwater, surcharged sewers and other man made sources. Mitigation measures are identified to address the flood risk to the site and any potential increase in flood risk to other land.

The impact of climate change on flood risk and drainage requirements is also assessed.

1.4 Limitations

The report is based on the interpretation and assessment of data provided by third parties. Egorum Limited cannot guarantee the reliability of the third party information obtained. The conclusions and findings of the report may change if the third party data is subsequently amended or updated.

The report and findings have been prepared for the client and purpose stated in paragraph 1.1. The report should not be relied upon or transferred to any third parties without the written authorisation of Egorum Limited.

2 Existing Site

2.1 Location

The site is located north of Blackmoorfoot Road, between Standard Drive and Crossland Hill Road, approximately 3km southwest of Huddersfield. The OS grid reference for the approximate centre of the site is 411664, 414710.

A site location plan is in **Appendix A**.

2.2 Description

Site Area		Approximately 3.3 ha
Topography		The site falls from the west to the east. Levels range typically from 213.6m in the north west to 198.0m on Crossland Hill Road.
Land use		Currently occupied by motorhome and caravan retailer.
Boundaries	north	Agricultural fields and residential areas.
	south	Blackmoorfoot Road, beyond which are commercial areas.
	east	Residential areas.
	west	Standard Drive, beyond which is unused land / former quarry.

2.3 Waterbodies

There are no waterbodies in the vicinity of the site. Blackmoorfoot Reservoir is located approximately 2.3km south west of the site.

2.4 Drainage

Public Sewers

Yorkshire Water sewer records show the following public sewer infrastructure in the vicinity of the site:

- A 225mm dia. public combined sewer in Blackmoorfoot Road.
- Separate foul and surface water systems in the Mason Court / Grey Stone residential area to the north of the site, connecting to:
- A 225mm dia. public combined sewer in Crossland Hill Road.

There are no public sewers recorded crossing the site.

The law regarding responsibility for drains and sewers changed on the 1st October 2011. From this date the Government transferred the majority of drainage pipes that are either outside a property's boundary or are shared with other buildings to the sewage/water companies. The sewer records may not show all the transferred sewers.

Private Drainage

Approximately 0.60 ha of impermeable area at the site is positively drained via gullies and channel drains. Run-off from approximately 0.40 ha of impermeable area drains onto Blackmoorfoot Road or Crossland Hill Road.

The remainder of the site is either gravel / unsurfaced area or impermeable areas that drain to gravelled areas.

Refer to **Appendix A** for public sewer record drawings and **Appendix C** for an initial assessment of the surface water run-off from the existing site.

A drainage connectivity survey is being undertaken, however the survey results were not available at the time of drafting this report.

2.5 Flood Mapping

The site is in Flood Zone 1 - low risk.

The Environment Agency flood risk from surface water mapping shows that there are localised areas of surface water flooding on site – associated with low areas in the topography. There are no overland flow paths shown crossing through the site.

The site is not in an area at risk from flooding from failure of a major reservoir.

Refer to **Appendix B** for flood mapping.

2.6 Ground Conditions

A Lithos Geoenvironmental Appraisal report dated March 2021 was made available for review during preparation of this FRA.

The Lithos report states that:

The site was formerly occupied by two sandstone quarries, associated roads and buildings. The quarries were filled by 1982, with possible landfill occurring c. 1960.

Made Ground reaches depths of between c. 11m and 23m within the footprints of former sandstone quarries. Made Ground reaches between c. 1.6m and 2.3m beyond the former quarries, typically comprising Sub-Base over Quarry Infill.

Whilst a significant proportion of degradable materials has not been encountered to date, given reference on old OS maps to “refuse tipping”, it cannot be discounted that the Quarry Infill does not include ‘undesirable’ materials within its make-up.

Given the significant thickness of made ground present across about 75% of the site soakaways will not provide a suitable means of surface water disposal and alternative means of drainage will be required.

Refer to **Appendix A** for extract from the ground investigation report.

3 Proposed Development

3.1 Development Layout

The proposed development is for residential use. A master plan layout is included in **Appendix C**.

3.2 Consultation

Consultation with Kirklees Borough Council Flood Risk Management Team, as Lead Local Flood Authority, and Yorkshire Water has been undertaken.

Copies of responses are included in **Appendix D** and are summarised below.

Summary of Consultation Responses	
Kirklees FRM	No watercourses on their records. Older maps show open fields with regular boundaries, not hinting at the presence of an open stream. No flood incidents reported. A full survey of existing drainage will be required. Run-off should be based on existing run-off @ 50mm / hr less 30% betterment.
Yorkshire Water	Foul water can discharge to the 225mm dia public combined sewer in Blackmoorfoot Road. Subject to confirmation that soakaways are not viable, surface water can discharge to the public sewer system at similar points of connection at a restricted rate. The rate is to be calculated based on 1 in 1 in year run-off from the existing positively drained areas less 30%. Calculations and survey results to be provided to YW.

4 Flood Risk Sources and Extent

4.1 Summary

Flood risk to the site from all sources is low. Refer to **Appendix B** for flood risk mapping.

Summary of the Sources and Extent of Flood Risk	
Source	Risk Level
Fluvial	low
Tidal	Not applicable
Surface Water / Pluvial	low
Groundwater	low
Surcharged Sewers	low
Other Man Made Sources	low

4.2 Fluvial and Tidal

The site is in Flood Zone 1; fluvial and tidal flood risk is low.

4.3 Surface Water / Pluvial

The Environment Agency flood risk from surface water mapping shows that there are localised areas of surface water flooding on site – associated with low areas in the topography. There are no overland flow paths shown crossing through the site.

Overall, the risk of flooding from surface water is low.

4.4 Groundwater Flooding

The Lithos Geoenvironmental Appraisal report states that no significant inflows of groundwater were encountered during the investigation. The highest recorded groundwater level was 3.53m below ground level, within backfilled Quarry waste.

Based on available information, the risk of groundwater flooding is considered to be low.

4.5 Surcharged Sewers

Consultation responses have not highlighted flooding from sewers to be an issue in the vicinity of the site.

Given the topography at the site, the risk of flooding from surcharged sewers is low.

4.6 Other Man Made Sources

The site is not in an area at risk from flooding from a major failure of a reservoir and there are no other known artificial sources of flood risk that could affect the site.

4.7 Climate Change

Climate change allowances have been included in the drainage calculations.

5 Flood Risk Mitigation

5.1 Flood Risk Mitigation Measures

Flood risk from all sources is low.

5.2 Surface Water Flood Risk

The flood risk from surface water mapping shows that there are localised areas of surface water flooding on site, associated with low areas in the topography. However, such risk will be removed through redevelopment of the site.

Floor levels will be set typically 150mm above proposed immediate surrounding ground levels which will provide mitigation against any overland surface water flooding from extreme events.

5.3 Surface Water Drainage Strategy

Discharge by Infiltration

The use of soakaways is not viable due to the significant amount of made ground at the site.

Discharge to Watercourse

There is no watercourse available for the connection of a restricted surface water discharge.

Discharge to Sewer

Subject to calculations and survey, Yorkshire Water has confirmed that surface water can discharge to the public sewer system at similar points of connection to the existing site. The discharge is to be restricted to the equivalent 1 in 1 year run-off from positively drained areas of the existing site less 30%.

A drainage CCTV and connectivity survey is being undertaken, however it was not available at the time of drafting this report.

An initial assessment of the 1 in 1 year run-off from the existing site has been undertaken based on positively drained areas only (refer to **Appendix A**).

Surface water storage will be provided on site such that there is no flooding for the 1 in 30 and all flows are retained on site for up to the 1 in 100 plus climate change critical design storm.

Based on an impermeable area of 1.49 ha and a maximum restricted discharge of 47.7 l/s, between 457m³ and 739m³ of storage is required for the 1 in 100 + 30% climate change design storm.

Refer to **Appendix C** for preliminary surface water storage calculations and drainage drawing.

5.4 Sustainable Drainage

Ground investigation at the site confirms that infiltration SuDS techniques will not be viable.

Non infiltration SuDS devices could be provided, subject to detailed design and adoption.

Drainage Method	Description/Suitability	Proposal/Feasibility
1. Infiltration.	Not possible due to ground conditions.	Not applicable.
2. Ponds and wetlands.	Steep topography is an issue, with potential overland flow problems from extreme events. Adopting bodies have safety concerns over permanently wet ponds	Not applicable.
3. Infiltration Basins.	Not possible due to ground conditions.	Not applicable.
4. Detention Basins.	Steep topography is an issue, with potential overland flow problems from extreme events	Not Applicable.
5. Swale.	Shallow conveyance swales could be used subject to detailed design.	Applicable.
6. French/Filter drain.	Possible use as cut off land drains.	Applicable.
7. Pervious/Permeable Pavement.	Lined pavements suitable, however adoption and maintenance issues and storage design requirements.	Applicable.
8. Geocellular Systems/Tank systems.	Subject to detailed design and adoption requirements.	Applicable.
9. Oversized pipes.	Suitable – subject to detailed design	Applicable.
10. Box culverts.	Suitable – subject to detailed design	Applicable.
11. Purpose designed tanks.	Suitable – subject to detailed design	Applicable.

5.5 Foul Drainage

Yorkshire Water has confirmed that foul flows can discharge to the public combined sewer in Blackmoorfoot Road.

6 Residual Risks and Management

6.1 Residual Risks

To mitigate against surface water / overland flow flood risk from extreme events, floor levels will be set typically 150mm above immediate surrounding ground levels and a surface water drainage system and storage, designed to current standards, will be provided.

The surface water drainage system and external levels will be designed for no flooding for the 1 in 30 year and to retain all flows on site for up to the 1 in 100 year plus climate change critical design storms.

The drainage systems will be designed and constructed to adoptable standards, for adoption by Yorkshire Water.

Careful design of external levels will be undertaken to ensure that overland flow from extreme events, from within and outside of the site, are not channelled and directed towards proposed development, buildings or third party land. Cut-off land drainage should be provided along boundaries where topography slopes towards development. A detailed assessment of exceedance routes will be undertaken as part of the detailed drainage design.

7 Conclusions

7.1 Existing Site

The site is in Flood Zone 1 and flood risk from all sources is low. There are no public sewers recorded crossing the site.

The site was formerly occupied by two sandstone quarries, associated roads and buildings. The quarries were filled by 1982, with possible landfill occurring c. 1960.

Given the significant thickness of made ground present, soakaways will not provide a suitable means of surface water disposal.

7.2 Flood Risk Mitigation and Drainage Strategy

Floor levels will be set typically 150mm above immediate surrounding ground levels which will provide mitigation against any overland surface water flooding from extreme events. Design of external levels will be undertaken to ensure that extreme event overland flows from within site are not channelled and directed towards proposed development or third party property.

The proposed surface water management strategy is to restrict flows to the equivalent 1 in 1 year run-off rate from the existing positively drained areas, less 30%. Surface water storage will be provided such that there is no flooding for the 1 in 30 and all flows are retained on site for up to the 1 in 100 year plus climate change design storms.

Yorkshire Water has confirmed that foul flows can discharge to the public combined sewer in Blackmoorfoot Road.

Appendices

Appendix A Existing Site

Location Plan

Topographical Survey

Yorkshire Water Sewer Records

Extract from Geo-Environmental Report







411521 : 414591		Map Name : SE1114NW	Title	Partial Key	
		Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : G Mullaney Contact Tel :	Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS	
			(Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2014. All rights reserved Ordnance Survey Licence number 100022432	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 : 10/06/2021, 11:53:17	Date Gen : 10/06/2021, 11:53:18
				Source : Sewer Network Enquiry	

A photograph showing a cross-section of a soil bank. The top layer is dark brown soil with some green grass. Below this is a layer of light-colored, possibly sandy or silty, soil. At the base of the bank, there is a layer of yellowish-brown, possibly organic or mineral-rich, material. The text "Geoenvironmental Appraisal" is overlaid in white.

Geoenvironmental Appraisal

Land at Crosland Hill, Huddersfield For Redrow Homes

Report no: 3649/2A

Date: March 2021



SUMMARY OF GEOENVIRONMENTAL ISSUES

Job No.	3649	Site area/ha	3.3 ha
Client:	Redrow Homes	NGR:	SE 116 146
Site:	Crosland Hill, Huddersfield	Nearest postcode:	HD4 5NE

The site is located north of Blackmoorfoot Road, between Standard Drive and Crosland Hill Road, approximately 3km southwest of Huddersfield, and is currently occupied by Lowdhams, a retailer of caravans and motorhomes.

The site was formerly occupied by two sandstone quarries, associated roads and buildings. The quarries were filled by 1982, with possible landfill occurring c. 1960. The site has been annotated as a depot since 1982.

Lithos were commissioned by Redrow to provide a geoenvironmental appraisal of the site which it is understood is to be redeveloped with two storey domestic dwellings; a proposed layout has been provided.

Lithos' investigation included a review of 3rd party reports, the site's history and environmental setting, and a ground investigation comprising 35 trial pits, 28 rotary open probeholes and 10 'groups' of stitched probeholes.

A summary of salient geoenvironmental issues is provided in the table below:

Issue	Remarks
Mining	The site is located beyond the CA's defined coalfields and no shallow coal is anticipated. No evidence of underground sandstone mining has been found.
Quarrying	The site was occupied by sandstone quarries (Spinkwell, Waterhouse & Manor House Quarries) from c. 1890 to 1960. Quarries have been subsequently backfilled. Backfilled quarries occupy about 75% of the total site area and reach depths of between c. 11m and 23m; average 17m. Highwalls have been found at 6 locations and are very steep/vertical. Two 'ramps' have been found close to the quarry floors. The extent of quarrying proven by drilling to date correlates well with that shown on old OS maps. There are areas of un-quarried ground in the north-west and south-east, and a "ridge" in the centre. The quarries targeted Rough Rock Sandstone which was used as a construction material.
Made ground	Typically comprises the following succession: - Veneer of macadam/gravel Hardstand & sandstone/limestone Sub-Base over; - Quarry Infill – made ground placed during tipping over; - Quarry Arisings – site won materials left over from quarrying operations. This material includes large boulders which increase in frequency with depth. Made Ground reaches depths of between c. 11m and 23m within the footprints of former sandstone quarries. Made Ground reaches between c. 1.6m and 2.3m beyond the former quarries, typically comprising Sub-Base over Quarry Infill. Whilst a significant proportion of degradable materials has not been encountered to date, given reference on old OS maps to "refuse tipping", it cannot be discounted that the Quarry Infill does not include 'undesirable' materials within its make-up.
Natural ground	Natural Ground comprises Residual Soils (predominantly sandy gravel of sandstone, occasionally firm brown clay) over Sandstone bedrock. Residual Soils were only encountered outside of the former quarries.
Issues relating to deep backfill	Deep quarry backfill is prone to both ongoing creep, associated with self-weight, and settlement caused by any new loading. It is considered that the presence of deep backfill will have implications for foundations, drainage, new utilities and highways.
Preparatory & remediation works	Turnover of uppermost 3m to 4m of made ground. Isolation of made ground beneath clean cover comprising 150mm of Topsoil & 450mm of Subsoil over a 150mm hard dig layer. It would be prudent to allow for excavation & screening/treatment/removal of some grossly contaminated soils. Site regrade to create level development terraces is anticipated.

SUMMARY OF GEOENVIRONMENTAL ISSUES

Job No.	3649	Site area/ha	3.3 ha
Client:	Redrow Homes	NGR:	SE 116 146
Site:	Crosland Hill, Huddersfield	Nearest postcode:	HD4 5NE

Issue	Remarks
Foundations	Plots beyond quarries are expected to be founded on strip/trench footings seated in Residual Soils or bedrock. Plots within former quarries are expected to be founded on piles seated in bedrock. Given the presence of boulders, piles are expected to require pre-boring.
Highways	Where made ground is present its full thickness (up to a maximum of 2m - from existing ground level or proposed highway formation, whichever is the lower) should be excavated and either replaced with suitable aggregate or be screened to allow selection of suitable material, before being replaced in engineered layers. Where the made ground is re-engineered it is considered that a CBR value of at least 3% should be achievable. However, this should be verified by field trials. If any new highway spans a quarry 'high-wall' two layers of Tensar Triax TX160 (or equivalent) geogrid sandwiched within at least 300mm of suitable aggregate should be placed beneath the full width of the highway at least 1.0m below the deepest sewer invert. A specification will need to be agreed with the adopting authority.
Contamination	All made ground types have been found to contain relatively minor concentrations of inorganic contaminants as well as free fibres of asbestos and ACM. Given reference on old OS maps to "refuse tipping", it is possible that more onerous contamination than that encountered to date is present.
Hazardous gas	Known areas of landfill and historical quarries are located within, and within 250m of, the site's boundary and deep made ground is present across about 75% of the site's area. Wells have been installed in 14 boreholes and monitoring is ongoing. A gas risk assessment will be issued on completion of the gas monitoring in August 2021.
Groundwater & excavations	Excavations through made ground are likely to be unstable and encounter overbreak where oversize materials (cobbles & boulders) are encountered. Significant groundwater ingress is not expected. However, localised groundwater inflows may be encountered in deep excavations through the made ground.
Flooding & drainage	The site is located in a Flood Zone 1 where the risk of flooding from rivers and the sea is classified as low. Given the significant thickness of made ground present across about 75% of the site soakaways will not provide a suitable means of surface water disposal and alternative means of drainage will be required.

Significant developer abnormalities relating to geoenvironmental issues at the site are:

- Demolition of existing buildings/foundations and grubbing up of hardstand.
- Ground improvement – turnover of the made ground, in order to deal with contamination, remove buried obstructions.
- Piled foundations within former quarries; piles are likely to require pre-boring.
- Highwalls may have an impact on the proposed layout.
- Site topography will result in the need for some levels regrade with possible underbuild, retaining structures etc.

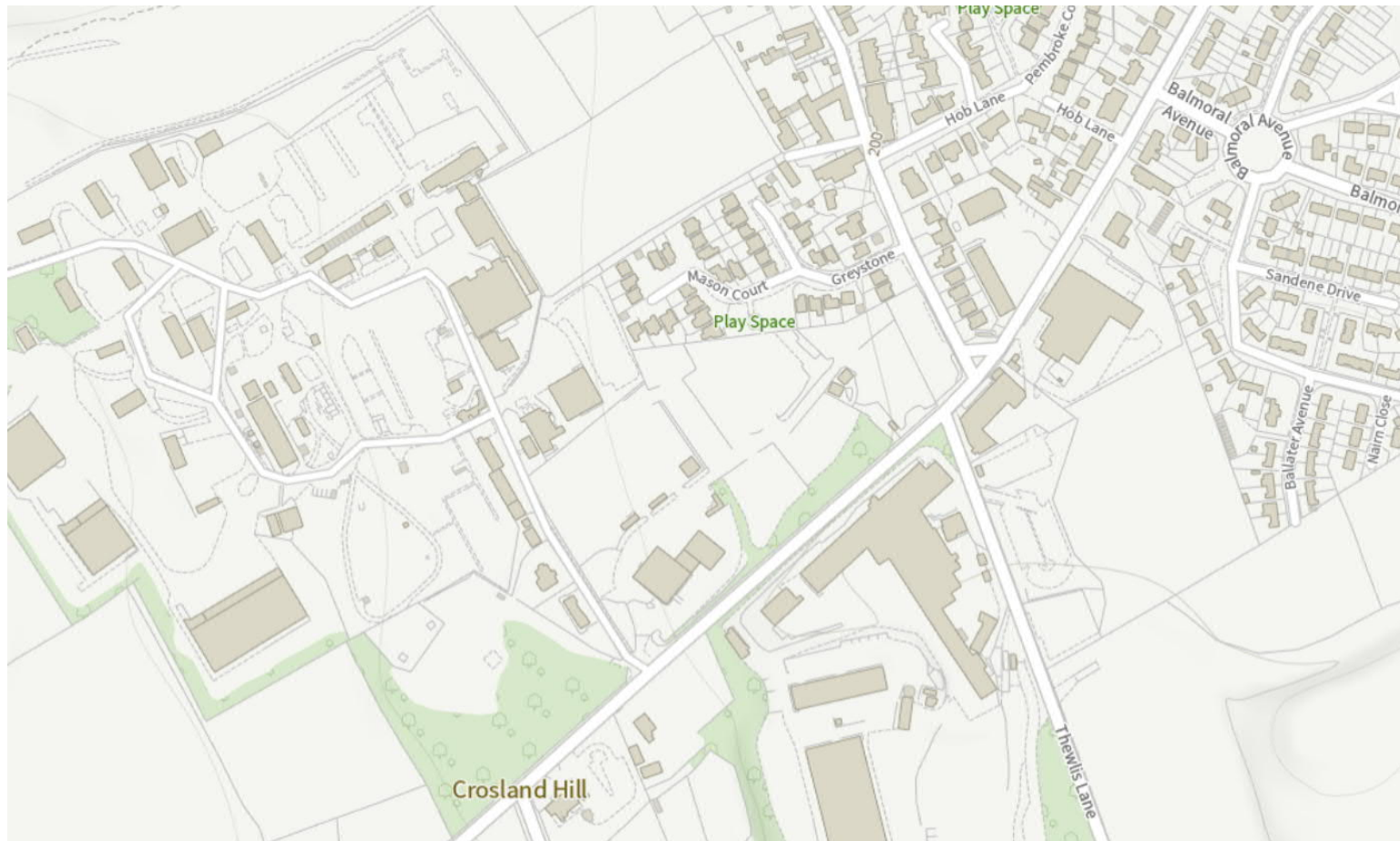
Some further work is required, most notably:

- Supplementary post demolition ground investigation (trial pits beneath existing buildings & areas with restricted access & probeholes to delineate highwalls & determine the profile of quarry floors).
- Piling contractors may require rotary cored boreholes to inform pile design.
- Preparation of a remediation strategy and materials management plan.
- Completion of the hazardous gas risk assessment (monitoring ongoing).

Appendix B Flood Risk Mapping

Flood Zone Mapping

Surface Water Flood Risk Mapping



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

PROPOSED DEVELOPMENT, BLACKMOORFOOT ROAD, HUDDERSFIELD

EXTRACT FROM ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

NOT TO SCALE





Extent of flooding from surface water

● High ● Medium ● Low ○ Very low

PROPOSED DEVELOPMENT, BLACKMOORFOOT ROAD, HUDDERSFIELD
EXTRACT FROM ENVIRONMENT AGENCY MAPPING
FLOOD RISK FROM SURFACE WATER

NOT TO SCALE

egorum


Appendix C Proposed Development

Master Plan

Surface Water Storage – Preliminary Calculations

	INDICATES 'OPPOSITE' HANDING.		EXISTING TREE/HEDGE TO BE REMOVED.
	INDICATES DWELLING ENTRANCE POINT.		INDICATIVE LANDSCAPING REFER TO EXTERNAL LANDSCAPING DRAWINGS
	EXISTING TREE/HEDGE TO BE RETAINED.		INDICATES CYCLE STORE
	INDICATES PROPOSED REPOSITIONING OF DRY STONE WALL.		INDICATES INFORMAL PARKING SPACES
	INDICATES BIN COLLECTION POINTS		

THE PROPOSED DEVELOPMENT WILL HAVE A SPEED LIMIT IN PLACE OF 20mph WITH SIGNAGE LOCATED AT THE SITE ENTRANCE.

Play Area

LARGER SIDE GARDEN DUE
TO ASPECT DISTANCES OF
EXISTING PROPERTIES

INDICATIVE LOCATION OF
ATTENUATION TANK

TREES TO BE REMOVED DUE TO
RESTORATION OF FAILING STONE WALL.
NEW WOODLAND PLANTING TO BE
LOCATED HERE. EXISTING VEGETATION
TO BE RETAINED WHERE POSSIBLE

PROPOSED POSITION OF
NEW DRYSTONE WALL

TREES TO BE REMOVED DUE TO
RESTORATION OF FAILING STONE WALL.
NEW WOODLAND PLANTING TO BE
LOCATED HERE. EXISTING VEGETATION
TO BE RETAINED WHERE POSSIBLE

RETENTION OF TPO TREES

FOOTPATH CONNECTION

REV	DATE	BY	DESCRIPTION	APPROV



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MARKETING NAME	
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PROJECT:

BLACKMOORFOOT ROAD
CROSLAND MOOR

TITEL 5:

PROPOSED PLANNING LAYOUT

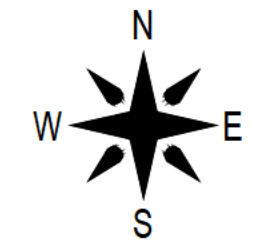
SCALE @ A1: 1:500	DESIGN-DRAWN: DH	APPROVED: CP	DATE 04.06.21
PROJECT No: BRCM	DRAWING No: BRCM-16-02-01	REV: -	

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IM2 Feasibility Project/Crosland Moor/Blackmoorfoot Road/1/Drawings/1/Interim Drainage Strategy/16-06-201 - Proposed Drainage Strategy/16-06-201 - 1:500



DO NOT SCALE



NOTES

1. THIS DRAWING IS BASE UPON REDROW HOMES DRAWING REFERENCE: BCM-16-02-01 - PROPOSED SITE LAYOUT DATED JUNE 21 AND TOPOGRAPHICAL SURVEY REFERENCE: 7965A/1 UNDERTAKEN BY ELLAM LAND SURVEYS DATED MAY 21.

KEY

- DEVELOPMENT BOUNDARY
- EXISTING PUBLIC SURFACE WATER DRAINAGE
- EXISTING PUBLIC FOUL WATER DRAINAGE
- EXISTING PUBLIC COMBINED WATER DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE - S104
- PROPOSED PUBLIC FOUL WATER DRAINAGE - S104
- PROPOSED PUBLIC COMBINED WATER DRAINAGE - S104
- PROPOSED DRAINAGE EASEMENT

REV	DATE	BY	DESCRIPTION	APPROVED



Redrow House, Brunel Road, Wakefield 41 Industrial Estate, WF2 0XG
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PROJECT NAME:	
PROJECT: BLACKMOORFOOT ROAD CROSLAND MOOR	
TITLE: PROPOSED DRAINAGE STRATEGY	

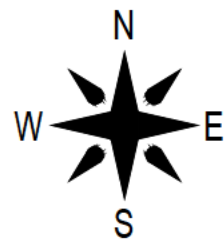
SCALE @ A1	DESIGN DRAWN	APPROVED	DATE
1:500	MM	MM	JULY 2021
PROJECT No:	DRAWING No:	REV	
4609	4609-16-06-901	-	

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IN2 Feasibility Project/Crosland Moor, Blackmoorfoot Road1, Drawing1 Internal Engineering/4609-16-06-902, Exceedance Overland Flow Route Aug 20 Jul 2021, 6:18pm



DO NOT SCALE



NOTES

1. THIS DRAWING IS BASE UPON REDROW HOMES DRAWING REFERENCE: BRCM-16-02-01 - PROPOSED SITE LAYOUT DATED JUNE 21 AND TOPOGRAPHICAL SURVEY REFERENCE: 7965A/1 UNDERTAKEN BY ELLAM LAND SURVEYS DATED MAY 21.
2. THIS DRAWING HAS BEEN PRODUCED TO DEMONSTRATE THE FLOOD MITIGATION MEASURES THAT HAVE BEEN CONSIDERED AS PART OF THE ENGINEERING DESIGN.
3. IN ACCORDANCE WITH BUILDING REGULATIONS PART H, SECTION 2.10 STATES THAT IN ORDER TO MITIGATE FLOOD RISK: 'SUFFICIENT PROTECTION FOR THE BUILDING MAY BE POSSIBLE BY THE PROVISION OF A GULLY OUTSIDE THE BUILDING AT LEAST 75mm BELOW THE FLOOR LEVEL'. IN ALL INSTANCES ON THIS SCHEME THE PROPOSED LEVELS OF THE DWELLINGS ARE AT LEAST 150mm ABOVE EXTERNAL GROUND LEVELS AND SO THIS CRITERIA IS ACHIEVED.

KEY

- - - - - DEVELOPMENT BOUNDARY
- FFL 123.00 PROPOSED FINISHED FLOOR LEVEL
- CAPACITY FAILURE FLOOD ROUTE
- BLOCKAGE FAILURE FLOOD ROUTE
- PROPOSED SURFACE WATER DRAINAGE - S104
- PROPOSED PUBLIC FOUL WATER DRAINAGE - S104
- PROPOSED PUBLIC COMBINED WATER DRAINAGE - S104
- EXISTING PUBLIC SURFACE WATER DRAINAGE
- EXISTING PUBLIC FOUL WATER DRAINAGE
- EXISTING PUBLIC COMBINED WATER DRAINAGE

REV	DATE	BY	DESCRIPTION	APPROVED



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MARKETING NAME: -

PROJECT: BLACKMOORFOOT ROAD
CROSLAND MOOR

TITLE: EXCEEDANCE OVERLAND FLOW ROUTE

SCALE @ A1	DESIGN DRAWN	APPROVED	DATE
1:500	JUN	MMJ	JULY 2021
PROJECT No.	DRAWING No.	REV	
4609	4609-16-06-902	-	

Project Blackmoorfoot Road, Huddersfield				Status Prelim		
Calcs: By TXM Checked	Date 21-07-21	Project ref. 0487/2	Calc no.	Sheet no.	Rev 1	
Title Surface Water Storage – Preliminary Calculations						

Infiltration

The use of soakaways is not viable due to the significant amount of made ground at the site.

Watercourse

There is no watercourse available for the connection of a restricted surface water discharge.

Public Sewer

Subject to calculations and survey, Yorkshire Water has confirmed that surface water can discharge to the public sewer system at similar points of connection to the existing site. The discharge is to be restricted to the equivalent 1 in 1 year run-off from positively drained areas of the existing site less 30%.

A drainage CCTV and connectivity survey is being undertaken, however it was not available at the time of drafting this report.

An initial assessment of the 1 in 1 year run-off from the existing site has been undertaken based on positively drained areas only, which gives a restricted discharge of 47.7 l/s.

Surface Water Storage

Attenuation storage will be provided such that there is no flooding for the 1 in 30 and all flows are retained on site for up to the 1 in 100 year plus climate change design storms.

The Micro Drainage Quick Storage Estimate module has been used to estimate the amount of surface water storage required.

Grid ref 417 415
M5-60 19.00
R 0.339

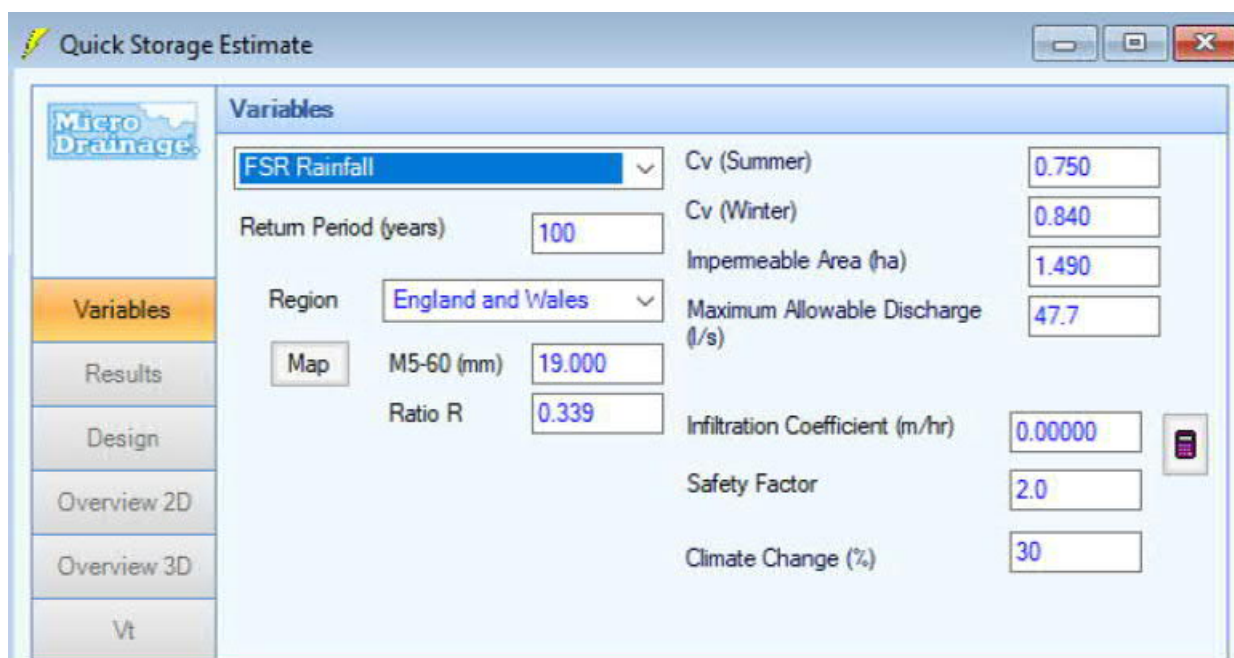
Developable area 2.70 ha
Impermeable area 2.70 ha x 55% impermeability = 1.49 ha

Based on an impermeable area of 1.49 ha and a maximum restricted discharge of 47.7 l/s, between 457m³ and 739m³ of storage is required for the 1 in 100 + 30% climate change design storm.

It is envisaged that the storage would be provided in a below ground storage tank.

The final configuration of the storage and surface water drainage would be determined at the detailed design stage taking into account Yorkshire Water adoption requirements.

Project Blackmoorfoot Road, Huddersfield				Status Prelim		
Calcs: By TXM Checked <i>AT</i>	Date 21-07-21	Project ref. 0487/2	Calc no.	Sheet no.	Rev 1	
Title Surface Water Storage – Preliminary Calculations						



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years) 100

Region England and Wales

Map M5-60 (mm) 19.000

Ratio R 0.339

Cv (Summer) 0.750

Cv (Winter) 0.840

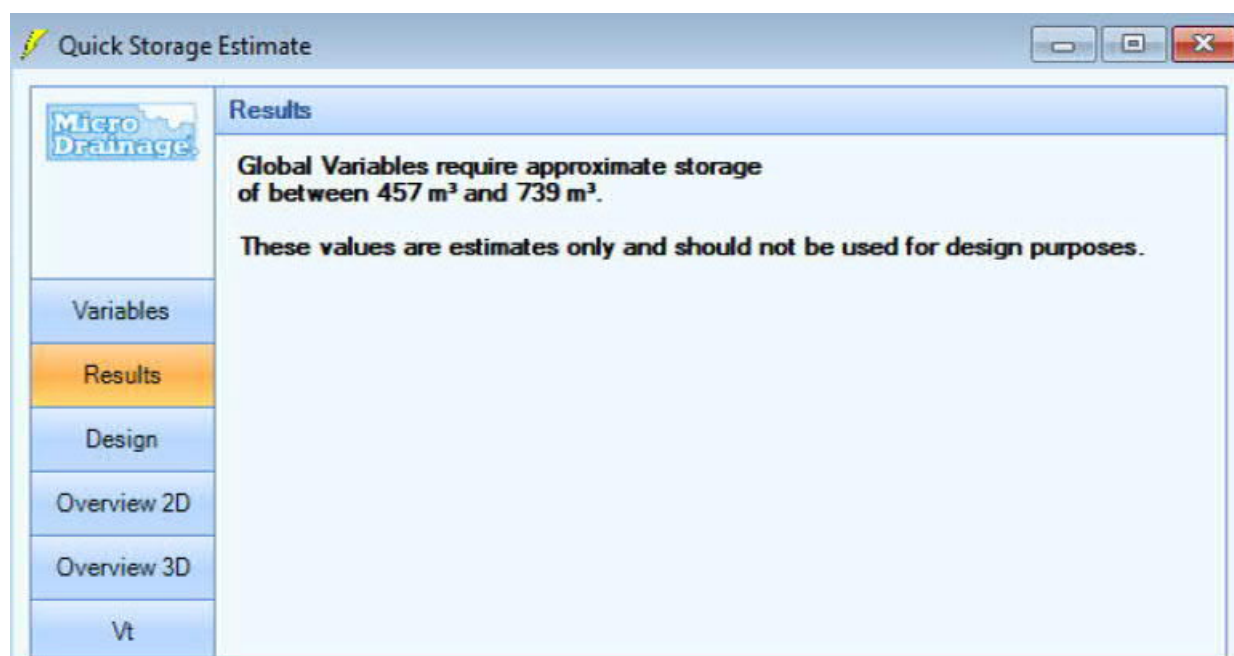
Impermeable Area (ha) 1.490

Maximum Allowable Discharge (l/s) 47.7

Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 30



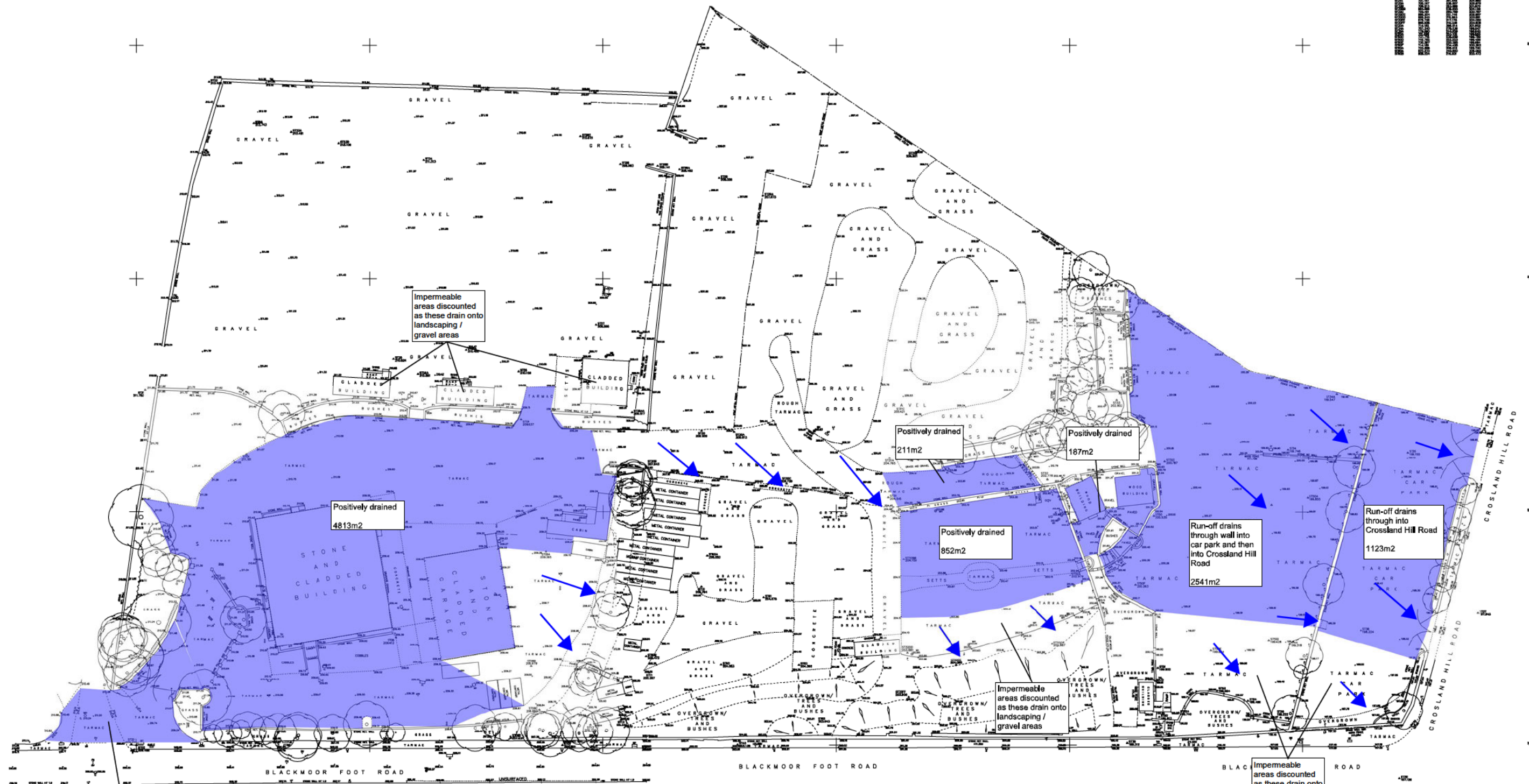
Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 457 m³ and 739 m³.

These values are estimates only and should not be used for design purposes.



Positively drained
 4813m²
 211
 852
 187
 Total 6063m²
 1 year = approx 40.4 mm/hr = 68.1 l/s
 less 30% = 47.7 l/s

Run-off onto highway
 392m²
 2541
 1123
 Total 4056m²
 (discounted from calculation of existing run-off)

Appendix D Consultation Responses

Kirklees Council Flood Risk Management

Yorkshire Water

Tim Morley

From: Paul Farndale <Paul.Farndale@kirklees.gov.uk>
Sent: 21 June 2021 21:34
To: Tim Morley
Subject: RE: Proposed residential development, Blackmoorfoot Road, Huddersfield

Hello Tim,

No watercourse on our records, although the former quarry is called Spinkwell Quarry. Older maps show open fields with regular boundaries, not hinting at the presence of an open stream.

No flood incidents reported to our knowledge. Surface water flood risk regarding depressions in the land can be taken out with the development.

A full survey of existing drainage will be required so you can get a 30% betterment using Lloyd Davies 2.78 x drained area (ha) x 50mm. Answer less 30%.

Don't include any former buildings demolished over 3 years. Do not include soft landscaped areas or hardstanding that runs to soft landscaped areas or off site. It has to be proved positive drainage.

The design needs to consider flood routing around the road network and open space so as not to affect property or curtilage. No basins where extreme events or blockages may result in water filling up and putting property at risk.

Site falls west to east so I expect a clear run through of water to Crossland Hill Road/Blackmoorfoot Road where it would go now if there were problems.

Kind regards,

Paul Farndale
Kirklees LLFA



YorkshireWater

Tim Morley
Egorum Limited
West Field House
Bray Gate
Bishop Wilton
York
YO42 1SA
tim.morley@egorum.com

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

Tel: 0345 120 8482

Fax:

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
George Mullaney on 0345 120 8482

Your Ref:
Our Ref: X010544

10th June 2021

Dear Mr Morley,

Former caravan dealership site, Blackmoorfoot Road, Huddersfield, HD4 7AE - Pre Planning Sewerage Enquiry U270008

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

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

Foul Water

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

Foul water domestic waste can discharge to the 225 mm diameter public combined sewer recorded in Blackmoorfoot Road, at a point to the south of the site.



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.

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

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

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

Other Observations

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the Codes for Adoption 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.

An off-site foul and surface water sewer may be required which may be provided by the



YorkshireWater

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.

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.

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

Yours sincerely

George Mullaney
Development Services Technician

egorum

