Queensberry
DESIGN LIMITED
RESIDENTIAL AND COMMERCIAL DESIGN CONSULTANTS

Keepmoat Yorkshire

Phase 2, Thurnscoe

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

QD814

July 2017

Head Office: Suite 2A, Metro House, Metro Centre, Gateshead, NE11 9NH

ISSUE SHEET

Prepared	Date		Checked	Date
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1. Introduction

1.1 Queensberry Design Ltd has been commissioned by Keepmoat Homes, Yorkshire to undertake a Flood Risk Assessment (FRA) regarding a proposed residential development at Thurnscoe Phase 2, Rotheram.

1.2 The development proposes approximately 129 residential dwellings on brownfield land previously residential housing. Paving slabs and access roads are all that remain from the previous development on site.

1.3 This FRA has been produced to demonstrate how flood risk from all sources of flooding, and flood risk to others from the development will be managed, in order to satisfy the requirements, set out in *'National Planning Policy Framework, and Technical Guidance to the National Planning Policy Framework'.*

1.4 A full assessment of the flood risk to the site and consideration of the surface water management as a result of the development is to be considered in this investigation.

1.5 Consultation has been undertaken with the Environment Agency (EA), Yorkshire Water Limited (YWL).

1.6 Data has also been gathered from a number of other sources including; aerial photographs, Ordnance Survey (OS), the British Geological Society (BGS), National Soil Research Institute (NSRI), aerial photographs, Sewers for Adoption, SuDS Manual (C753) and anecdotal evidence obtained from the internet.

2. Site Description

2.1 The overall site is approximately 4.9 hectares in size and is in the North East of Thurnscoe, approximately 15km to the North East of Rotheram.

2.2 The site compromises of rough open ground and has undergone demolition and clearance of former residential housing. The site is bound to the North by Lingamore Lane and East by School street. Keepmoat are currently developing land to the East and North with new residential properties. Existing residential properties form the southern and western boundaries respectively.

2.3 The existing Willow Road forms the main access route through the proposed development to School Street to the East and Lingamore Lane to the North West. A secondary access road is also proposed at School Street to the North East and Lingamore Lane to the North West.

2.4 Please refer to appendix 1 for the proposed site location, titled C5393/01.

Site Levels

2.5 A topographical survey was carried out by Haycock & Todd in April 2013 and can be viewed in Appendix 2.

2.6 The site slopes generally upward from South West to North East from approximately 46m AOD along the Western Site boundary to approximately 51m AOD along the eastern boundary. Giving a rough fall of 5m across the site.

Hydrology

2.7 A culverted watercourse is present running through a small part of the proposed development in the North-West corner of the site in the form off a 750 dia surface water pipe. The culvert ultimately discharges to the Thurnscoe Dike located approximately 1,000m away to the South West.

2.8 These features are at lower ground levels than the development.

Hydrogeology

2.9 The bedrock beneath the site is classified as a Secondary A Aquifer. Capable of supporting water supplies at a local rather than a strategic scale.

2.10 The site does not lie within a source protection zone.

Existing Drainage Infrastructure

2.11 Existing public sewer records have been obtained from Yorkshire Water Ltd, they are shown in Appendix 3 of this report.

2.12 As this was previously a residential development foul and surface water infrastructure is present throughout the site mainly through Willow Road. A separate sewer network serves the adjacent development running along Manor way and Eastfield.

2.13 Two surface water sewers run south of Oak Road bell mouth, one running west through Willow Road eventually tying into an unnamed YWL MH in the T junction to Lingamore Lane to the north. The other runs north through School Street, then West tying into the same unnamed manhole at the junction mouth to Willow Road. From here the surface water runs 10m west of the junction tying into the existing 750 dia culvert running through the north-west boundary of the development.

2.14 There are two foul runs feeding the previous development. One to the north approximately 10m off Lingamore Lane in the grassed area, running west and then south down the proposed site boundary tying into an unnamed manhole to south west corner of the development. The second runs north of School Street set off approximately 10m from the existing road in a hard-grassed area, running south along the eastern boundary then moving west along the southern boundary tying into the same unnamed foul manhole as the first.

3. Flood Risk Assessment

3.1 National Planning Policy Framework requires that: "A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall." NPPF March 2012 par 102 p24.

3.2 A site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding. NPPF March 2012 footnote 20 p24.

3.3 The Planning Practice Guidance was published in March 2014. The new Guidance is intended to reflect and support (but not replace) the National Planning Policy Framework (the NPPF) published on 27 March 2012 and the core policy principles of the presumption in favour of sustainable development, the introduction of neighbourhood planning and recent changes in legislation.

3.4 The publication contains a section regarding Flood Risk and Costal Change and states that the tests as set out in the NPPF should be followed and where the tests are not met national policy is clear that new development should not be allowed. In summary, the key elements of the policy are designed to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

Sources of Flooding

3.5 Flood risk has been assessed from the following sources; tidal and fluvial, surface water and flooding from the land, groundwater, sewer flooding and artificial sources (i.e. canals, reservoirs etc.).

Tidal and Fluvial Flooding

3.6 Inspection of the Environment Agency / Government flood map indicates that the site is located within flood zone 1 and so is considered to have the lowest probability of flooding from rivers and the sea.

3.7 The site is not located in a flood warning area.

3.8 Based on the available information flood risk from this source is considered LOW.

Groundwater

3.9 Groundwater flooding occurs by water originating from beneath the ground surface from permeable strata through a natural process, usually after periods of higher than average rainfall.

3.10 An intrusive ground investigation was completed by Sirius Geotechnical and Environmental LTD June 2013. During the site investigation/ monitoring of boreholes, no groundwater was recorded.

3.11 Based on the available information flood risk from this source to the completed development is considered LOW.

Sewer Flooding

3.12 The existing sewers present on site served the now redundant previous development with no external sources coming flows.

3.13 The culverted watercourse running through the north-west boundary shows no flooding on the Environment Agencies website and is shown to lie within flood zone 1.

3.14 Based on the available information flood risk from this source is considered LOW.

Overland Flow

3.15 Flood risk from overland flow is generated from water flowing over the ground surface which has failed to reach a natural or artificial drainage feature. Flooding from overland flow can become a risk to any development if flooding occurs at a higher level than the development site.

3.16 Levels generally fall from north east and south west with over 5m of fall across the site. The surrounding development is served by a positive drainage network which will intercept flows generated on that area. Levels typically fall away from the site.

3.17 Inspection of EA surface water flooding maps shows that there is a flow of low risk (less then 300mm) flooding which forms onsite along the north-west boundary travelling onto Lingamore

Lane and the North of Willow Road Drive. The available maps shown the flow retained within the existing road. There is also a small isolated flow gathered in a depression area to the South of Lingamore Lane also of low risk. Apart from the aforementioned records indicate no other flow paths affecting the development site.

3.18 Best practice measures will be applied to the development:

1) Any land drainage which may be encountered during the development should be repaired and diverted through the site, using its existing outfall where possible.
2) Land drainage / infiltration trenches can be installed at site boundaries to collect any overland flow.
3) Proposed level design should consider existing flow paths, allowing flow to pass the site.
4) Proposed floor levels should be a minimum of 150mm above external ground level.
5) Construction of new 'Sewers for Adoption' compliant drainage network.

3.19 With best practice implemented and based on available information flood risk from this source is considered low.

Land Drainage

3.20 In the event of any land drainage being discovered during excavations on site, it is recommended that the drain is repaired or diverted. Should this not be possible due to layout constraints, then it is recommended that the land drain is further investigated by the development engineer, to determine if the drain is still required post development.

3.21 Due to the topography of the site, some retaining features may be required. The detailed design of these features will include adequate land drainage to prevent ground water emerging at the structures.

3.22 Based on the available information flood risk from this source is considered LOW.

Artificial Sources

3.23 Inspection of EA maps indicate that the development is not at risk of flooding from reservoir failure.

3.24 Based on available information, flood risk from this source is considered low.

4. Summary of Flood Risk

4.1 Table 1 below summarises the sources of possible flooding which have been investigated, and indicates any mitigation requirements.

Flood Risk Source	Current Risk Level	Mitigation Requirement during detailed design	Risk Level Following Mitigation
Tidal and Fluvial Flooding	LOW	Not Required.	LOW
Groundwater	LOW	Not Required.	LOW
Sewer Flooding	LOW	Not Required.	LOW
Overland Flow	LOW	Not Required. Apply best practice measures as described in section 3.20	LOW
Land Drainage	LOW	Any land drainage encountered during construction is to be repaired.	LOW
Artificial Sources	LOW	Not Required.	LOW

4.2 Table 1 – Summary of Flood Risk

5. Proposed Development

5.1 Development of the site is proposed for residential use, compromising of 129 residential dwellings, car parking and highways. The proposed site layout can be viewed in Appendix 5.

Planning Context

5.2 The EA flood maps for the region show that the residential part of the development sits within FLOOD ZONE 1, which has a low probability of flooding 1 in 1000 in any one year (0.1%). This is illustrated in Figure 1.

5.3 The proposed development will comprise residential dwellings. Therefore, in accordance with NPPF tables 1 and 2:

5.4 The residential development is classified as 'more vulnerable' as illustrated in Figure 1.

5.5 The classification parameters are illustrated in Figure 2 and 3.

5.6 Thus, given that site is situated in FLOOD ZONE 1 and the vulnerability classification in accordance with the NPPF compatibility matrix, the scheme is classified as appropriate for development.

Table 1 Flood Risk Probability

Flood Zone	Flood Probability	Explanation
Flood Zone 1	Low Probability	This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
Flood Zone 2	Medium Probability	This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
Flood Zone 3a	High Probability	This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Flood Zone 3b	Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood

5.7 Figure 1 - NPPF Flood Zone Probability Extract

Table 2 Flood Risk Vulnerability	
Category	**Explanation**
Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.
More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	• Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment plants. • Sewage treatment plants (if adequate pollution control measures are in place).
Water-compatible development	• Flood control infrastructure • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves. • Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

5.8 Figure 2 - NPPF Flood Risk Vulnerability Classification Extract

Table 3 Flood Risk Compatibility					
Flood Zone	**Essential Infrastructure**	**Water Compatible**	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**
Zone 1	Appropriate	Appropriate	Compatible	Appropriate	Appropriate
Zone 2	Appropriate	Appropriate	Exception Test required	Appropriate	Appropriate
Zone 3a	Exception Test required	Appropriate	Not Permitted	Exception Test required	Appropriate
Zone 3b	Exception Test required	Appropriate	Not Permitted	Not Permitted	Not Permitted

5.9 Figure 3 - NPPF Flood Risk Vulnerability and Flood Zone Classification Extract

6. Management of Surface Water

Existing Drainage Regime

6.1 The site has previously been occupied by dwellings, which have since been demolished. The site is currently occupied by roads, footpaths, hardstanding areas of 1.532 ha. The remainder of the site is shown as open space/ vegetation.

6.2 The topographical survey shows that the remaining hard standing areas are postively drained into the existing sewers running through the site. Prior to demolition of the previous dwellings, the existing surface water discharge rate would have been signiifcantly higher than the current site.

6.3 Using the modified rational method an estimation of the discharge rate from existing areas is shown below:

Area x Q X mm

2.78 X 50 X 1.532ha = Q

Q= 212.9 l/sec, (Brownfield Rate).

6.4 Existing microdrinage model was produced to estimate the existing 1 in 1-year flow from the brownfield section of the pre-development site from topographical survey work provided. This model shows an estimated flow of 172.2 l/sec. See appendix 4 full calculations.

6.5 Therefore, the proposed discharge rate from the brownfield section of the development will be restricted to 172.2 l/sec less 30% as previously agreed/ discussed with Yorkshire Water and the LLFA (see appendix 2.) Giving a proposed discharge rate of **120.5 l/sec.**

Possible Drainage Solutions

6.6 In accordance with Building Regulations and NPPF the disposal of surface water has been considered in the following order of priority;

An adequate soakaway or some other infiltration system; or, where not reasonably practicable,

A watercourse, or where not reasonably practicable,

A sewer

Infiltration

6.7 Ground Investigation works carried out two soakaway tests around the site. The results found infiltration rates to be low and not suitable due to the underlying strata.

6.8 At this stage, it is assumed that infiltration is not a viable option for the disposal of surface water from the site.

Discharge to a Watercourse

6.9 Due to constraints imposed by the surrounding areas, connection to the nearest watercourse is not feasible.

6.10 Therefore, discharge to watercourse will not be suitable for surface water disposal from the development.

Discharge to Public Sewers

6.11 The development will direct flow to the 750mm dia culverted sewer to the North-West boundary of the site at a restricted discharge rate of 120.5l/s, as agreed with Yorkshire Water and the LLFA, see appendix 3 for correspondence.

7. Preferred Drainage Solution

7.1 The preferred drainage strategy will involve the disposal of surface water flows into the existing culverted watercourse, north west of the site.

7.2 The proposed drainage strategy can be found in Appendix 4.

Storm Drainage

7.3 It is proposed to discharge site flows at a restricted surface water discharge rate of 120.5 l/sec across all storm events (equivalent to existing brownfield rate at a 30% reduction) to a 750 dia culverted watercourse to the North West, as agreed with YWL and the LLFA.

7.4 Exceedance flows above this restricted rate are to be attenuated on the site by a private SuDS storage tank (360m3.) Sewerage infrastructure will be managed and maintained by YWL under a Section 104 Agreement while the SuDS Storage tank will likely be managed and maintained by a private management company.

7.5 All new adoptable standard surface water drainage is to be designed in accordance with 'Sewers for Adoption'. A 30% increase in rainfall due to climate change has been considered to determine exceedance flow routes and attenuation capacity based on LLFA & YWL discussions.

Foul Drainage

7.6 YWL have confirmed an unrestricted foul discharge rate into the 225dia running along the western and southern boundaries. It is proposed to split the site between the 225mm dia Foul sewer to the east and to the south. Please refer to appendix 5 drawing QD814-03-01, for outfall information.

7.7 All new adoptable foul sewerage is to be designed in accordance with 'Sewers for Adoption'.

8. Conclusion

Flood Risk

8.1 There is low risk of flooding from fluvial sources with a probability of 1 in 1000 in any one year (<0.1%). The proposed development is classified as 'more vulnerable' and is located within FLOOD ZONE 1, therefore the development is suitable within this flood zone in accordance with NPPF. Employment of the mitigation measures stated in this report will ensure that the development will be safe, and is suitable in this location.

8.2 Flood risk from all sources has been considered and with mitigation where necessary it has been established that these sources do not pose a risk to the development.

Surface Water Management

8.3 Management of the surface water flows have been considered in accordance with Building Regulations H3 Section 3.

8.4 It is proposed to discharge site flows at a restricted surface water discharge rate of 125.5 l/sec (equivalent to an existing brownfield rate with a 30% reduction across all storm events) to the existing culverted watercourse as agreed with YWL.

8.5 Exceedance flows above this restricted rate are to be attenuated on the site by a SuDS Storage tank (volume 360m.) All new adoptable standard surface water drainage is to be designed in accordance with 'Sewers for Adoption'. A 30% increase in rainfall due to climate change has been considered to determine exceedance flow routes and attenuation capacity.

Foul Drainage

8.6 It is proposed to discharge foul flows to the existing public sewerage network South and West of the site as agreed with YWL.

8.7 Adoptable foul sewerage will be designed in accordance with 'Sewers for Adoption'.

Appendix 1 – Site Location

Site Location Plan

Contract Number	**C5393**
Contract	**Site 2 Thurnscoe**
Client	**Keepmoat Homes**



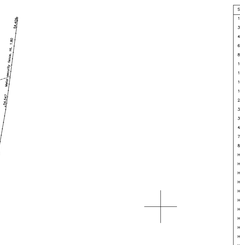
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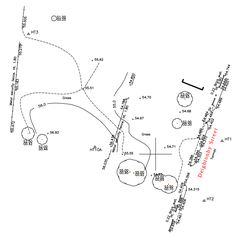
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Licence No. 100042005

Scale	1:50,000		
Drawn by	GH	**Approved**	JD
Drawing Number	C5393/01		

Appendix 2 – Topographical Survey

Station	Easting	Northing	Level
1	445748.465	406088.866	51.321
3	445640.442	406142.865	46.884
4	445597.910	406084.131	47.853
6	445581.340	405970.433	48.227
8	445697.641	405934.532	51.955
10	445692.801	406088.004	49.408
11	445762.217	406056.557	51.299
10A	445690.443	406064.943	49.820
10B	445672.290	406047.871	50.020
2A	445682.137	406121.387	47.804
3A	445612.184	406088.358	47.809
3C	445603.132	406110.323	48.154
4A	445638.491	406066.305	49.089
7A	445666.363	405938.971	51.426
8A	445674.079	405847.894	48.544
HT1	446125.819	406105.061	54.475
HT2	446118.678	406082.038	54.379
HT3	446051.067	406146.234	55.595
HT4	446000.001	406151.692	55.820
HT5	445956.877	406106.327	56.319
HT6	445923.484	406083.531	54.233
HT7	445827.485	406116.685	52.052
HT8	445840.932	406205.672	55.408
HT9	445910.784	405981.851	52.781
HT10	445725.784	405884.723	51.885
HT11	445626.873	405943.116	50.418
HT12	445582.980	406029.423	47.521
HT13	445625.618	406010.365	50.042
HT14	445563.705	406121.564	45.591
HT15	445737.580	406121.056	48.870
HT15A	446078.676	406102.755	56.773
8A	445541.065	405841.891	46.171





HAYCOCK & TODD

LAND SURVEY CONSULTANTS ARCHITECTURAL SURVEYORS
The Hollies, 43 Church Street, Rhuddlan, Rhyl, Denbighshire, LL18 2LT
T : 01745 591002 F : 01745 591004 E : info@haycock-todd.co.uk W : www.haycock-todd.co.uk

SITE SURVEY

SCHOOL STREET THURNSCOE

Survey Job No. S7847	Scale 1/500
Surveyed by SH & NT	Date of Survey
Drawn by SH & NT	April 2013
Sheet 1 of 1	
Datum Related to previous survey	S7847

LEGEND

Manhole shown thus	MH	Spot Level	+123.962
Lamp Column	LC	Fence Line	Post and wire
Telephone	TP		Chainlink
Pole			Hedge
Telegraph Pole	TP	Hedge Line	
Electricity Pole	EP	Contours for Internal Survey Shown at	0.125
Traffic Signal	TS	Trees Spread	0.125
Traffic Signs			0.25
Gas Governor	GG		0.5
Gas Valve	GV		1.0
Water Valve	WV	Kerb Level	0.125
Sluice Valve	SV	Edge Level	0.125
Boundary Post	BP	Road Centre	0.125
Boundary Stone	BS	Surface Spot Heights	0.125
Inspection Chamber	IC	Turning Circles	0.125

Appendix 3 – Yorkshire Water Limited Correspondence

Keepmoat Homes Yorkshire
Callflex Business Park
Golden Smithies Lane
Wath-upon-Dearne
Rotherham
S63 7ER

Chris.Cammidge@keepmoat.com

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

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

Email:
Technical.Sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
John Wellham on 0345 120 8482

Your Ref: KHY003
Our Ref: T002874

6th March 2017

Dear Sir,

School Street, Thurnscoe, Barnsley - Pre-planning sewerage enquiry on R477739 - Residential

Thank you for your recent enquiry. Our charge of £152.00 (plus VAT) will be added to your account with us, reference KHY003. You will receive an invoice for your account in due course.

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:

There are a number of mapped sewers crossing the site:

1no. 750mm diameter public surface water sewer - No buildings, or other obstructions, are to be erected within 5 (five) metres, nor trees planted within 5 (five) metres of any of these public sewers.

6no. public combined sewers of unrecorded diameter - These sewers are required to be site surveyed by the developer to assess the diameter and depth of the pipes. Once the dimensions are known, we will be able to advise on the required stand off distances (if any).

4no. 225mm diameter public surface water sewers - In this instance, building-over may take place under the control of Part H4 Building Regulations 2000.
3no. 225mm diameter public combined sewers - In this instance, building-over may take place under the control of Part H4 Building Regulations 2000.
1no. 150mm diameter public surface water sewer - In this instance, building-over may take place under the control of Part H4 Building Regulations 2000.
1no. 150mm diameter public combined sewer - In this instance, building-over may take place under the control of Part H4 Building Regulations 2000.

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.

YorkshireWater

Foul water domestic waste should discharge to the 225mm diameter public combined sewer recorded crossing the site.

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. The local Waste Water Treatment Works (WWTW) is Bolton-on-Dearne. It is understood that this WWTW may only have limited spare capacity, if any, available. We have contacted the respective treatment team for more information regarding the impact of proposed development and will contact you when an assessment has been made.

Please note that as a result of the Water Industry (Scheme for Adoption of Private Sewers) Regulations 2011, there are public sewers not shown on our mapping records. It may be the case that there are unmapped sewers capable of accommodating the proposed foul water discharge in the vicinity of the site. It is recommended that the developer investigates this by visiting the site to establish the location of any transferred public sewers.

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.

It is understood that a watercourse is located to the North of the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable).

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 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.

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

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

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

All the above comments are based upon the information and records available at the present time. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith.

Yours faithfully

Developer Services Team

Appendix 4 – Brownfield Microdrinage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.MHS

Location - England & Wales

Return Period (years)	1
M5-60 (mm)	19.000
Ratio R	0.363
Maximum Rainfall (mm/hr)	50
Foul Sewage (l/s/ha)	0.00
O'flow Setting (*Foul only)	0
Volumetric Runoff Coeff.	0.75
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Cover Depth for Optimisation (m)	1.200
Min Vel for Auto Design Only (m/s)	1.00
Min Slope for Optimisation (1:X)	500
Minimum Outfall Invert (m)	1.900
Ground Level at Outfall (m)	46.623
Outfall Manhole Name	S9
Outfall Manhole Dia/Length (mm)	0
Outfall Manhole Width (mm)	0

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	25.40	0.882	28.8	0.082	4.00	0.0	0.600	o	150
1.001	109.44	2.460	44.5	0.225	0.00	0.0	0.600	o	225
1.002	34.04	0.901	37.8	0.243	0.00	0.0	0.600	o	225
1.003	38.04	0.174	218.0	0.000	0.00	0.0	0.600	o	300
1.004	32.77	0.150	218.0	0.000	0.00	0.0	0.600	o	300
2.000	77.59	2.339	33.2	0.232	4.00	0.0	0.600	o	225
1.005	30.78	0.500	61.6	0.128	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.2	50.860	0.082	0.0	0.0	0.0	1.88	33.3	11.1
1.001	48.9	5.2	49.903	0.307	0.0	0.0	0.0	1.97	78.2	40.7
1.002	47.9	5.4	47.444	0.550	0.0	0.0	0.0	2.14	84.9	71.3
1.003	45.7	6.0	46.467	0.550	0.0	0.0	0.0	1.06	75.0	71.3
1.004	44.0	6.5	46.293	0.550	0.0	0.0	0.0	1.06	75.0	71.3
2.000	50.0	4.6	48.639	0.232	0.0	0.0	0.0	2.28	90.6	31.4
1.005	43.2	6.8	46.142	0.910	0.0	0.0	0.0	2.01	141.9	106.5

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Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
3.000	40.09	1.159	34.6	0.105	4.00	0.0	0.600	o	150
1.006	77.46	1.800	43.0	0.211	0.00	0.0	0.600	o	300
4.000	172.28	4.660	37.0	0.306	4.00	0.0	0.600	o	225
1.007	10.43	0.500	20.9	0.000	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
3.000	50.0	4.4	47.576	0.105	0.0	0.0	0.0	1.72	30.3	14.2
1.006	41.6	7.3	45.642	1.226	0.0	0.0	0.0	2.40	169.9	138.3
4.000	48.2	5.3	50.059	0.306	0.0	0.0	0.0	2.16	85.8	40.0
1.007	41.5	7.4	43.842	1.532	0.0	0.0	0.0	3.46	244.4	172.2

This model has been produced to estimate the existing 1in1year flow from the brownfield section of the pre development site.

Topographical survey work has enabled a measurement of existing impermeable area, and the location of existing storm sewers.

Typically the existing flow would be estimated as follows:
Q=2.78x50x1.532ha.
Q=212.9 l/sec

However, this model shows an estimated flow of 172.2 l/sec.
Therefore, the proposed discharge rate from the brownfield section of the development will be restricted to 172.2 l/sec less 30% = **120.5 l/sec**

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Appendix 5 – Drainage Strategy



N
W E
S

General Notes:-
1. DO NOT USE THIS DRAWING IN ISOLATION. This drawing has been prepared as part of a set, and must therefore be read in conjunction with all other drawings. Any discrepancies must be reported to the engineer prior to commencing works.
2. Third party information is used to prepare the engineering design (including, architectural layout, ground investigation, existing utilities records, and specialist design items). The engineering design must therefore be read in conjunction with all third party information prior to commencing work. Queensberry Design Ltd are not responsible for any third party information or details.
3. House type working drawings are to be used in conjunction with the plot setting out drawing.
4. Drawing status will remain preliminary until full technical approval is received from local authority and sewerage undertaker. Works commenced prior to technical approval are done so at risk and may be subject to change.
5. The contractor is expected to prepare appropriate construction method statements for all aspects of appointed work. This should include any temporary protection / works.
6. Land drainage is not permitted to discharge into the public sewer network. Any need for land drainage should be assessed by the ground worker and landscaper during construction and placement of gardens on an individual plot basis. If land drainage designs are required, they should be appointed prior to plot completion.
7. The contractor is expected to cross check all drainage inverts prior to commencing work, this may involve completion of trial holes if invert levels have been interpolated.
8. The position, line and diameter of all existing drainage apparatus should be confirmed on site prior to the commencement of the works. Any discrepancies must be reported to the engineer immediately.
9.The connection of foul and surface water drainage to the existing public sewer system shall be subject to the approval of the local sewerage undertaker. The contractor is expected to apply for relevant permits prior to commencing the work.

Highways
1. All highway works to be carried out in accordance with the current South Yorkshire design guide and specification
2. All excavations below proposed and existing highways to be back filled with granular Type 1 sub base and well compacted in layers not exceeding 150mm, unless otherwise agreed.
3. Highway authority to be notified by the contractor prior to the commencement of works.

Yorkshire Water Notes
1. All adoptable sewer works and material to be in accordance with "Sewers for Adoption" 6th Edition, The Relevant British/European and Yorkshire Water's Standards/Requirements/Addendum and Kitemarked".
2. Manhole covers shall/must have a clear opening of 600mm and shall be Class D400 to BS EN 124 with 150mm deep frames in highways.
3. Fill ground must be filled and consolidated under the supervision and to the satisfaction of Yorkshire Water before any sewer works are carried out.
4. Yorkshire Water is not obliged to accept filter drain/land drainage runoff into the public sewer network or adoptable drainage system (directly or in-directly). An alternative method of disposal of the land drainage runoff will therefore be required and you will have to liaise with the Local Authority, Land Drainage Section with regard to the disposal of the filter drain/land drainage runoff.
5. Cover slabs must carry the BSI Kitemark or will be rejected by Yorkshire Water Inspector. Where the clear opening of the Kitemarked product is different to that of the cover and frame, a loading bearing slab should be fitted above the cover slab to bring the size down to 600mm x 600mm for the Yorkshire Water specified cover size. Please refer to Concrete Pipe Systems Association (CPSA), 'Technical Bulletin' issued autumn 2004 for Kitemarked cover slab opening sizes.
6. Sulphate resistant cement (C20-DC2) and precast concrete products must be used or a laboratory report provided proving that such precautions are not necessary.
7. The adoptable sewers should be a minimum of 1m and manholes 0.5m from kerb faces and service margins.
8. "Sewers must have 5 metres clearance from trees and hedges (please also refer to Figure 2.3 on page 33 in "Sewers for Adoption" 6th Edition for restrictions on tree planting adjacent to sewers)".
9. Sewers to be laid in Class "S" Bedding (150mm granular bed and surround), Where depth of cover to top of the sewer is less than 1.2m in highways and verges (or less than 900mm in none vehicular access areas) then a concrete slab should be provide above granular bed and surround.
10. Bedding and backfill material to conform to the requirement of Water Industry Specification 4-08-02 (Table A2).
11. The chamber size of manholes with more than one connection in them may need to be increased an increment to accommodate the connections and bends.
12. Yorkshire Water policy is not to accept Type "C" brick manholes and 1050mm Ø manhole rings. Instead it is preferred that you use a Type "B" manhole with 1200mm Ø or 1500mm Ø rings, with the opening sited over the channel where depth of cover to pipe is 1 - 1.5m
13. All adoptable sewers to be BSI Kitemark (Certified to WIS 4-3501).
14. Adoptable sewer pipes to be laid in maximum 3m lengths unless there is a specific operational need to lay longer lengths. 12. Bedding and backfill material to conform to the requirement of Water Industry Specification 4-08-02 (Table A2).
15. Plastic channel sections in manholes are not acceptable and Yorkshire Water would prefer clayware channel in manholes. we have found that plastic channels are difficult to set in concrete because they float and a satisfactory finish cannot be obtained on the benching.
16. Yorkshire Water policy is not to accept Type "C" brick manholes and 1050mm Ø manhole rings. Instead it is preferred that you use a Type "B" manhole with 1200mm Ø or 1500mm Ø rings, with the opening sited over the channel where depth of cover to pipe is 1 - 1.5m
17. Concrete pipes should be Class 120 to EN 1916 / BS 5911-1 : 2002
18. The position, line and diameter of all existing drainage apparatus should be confirmed on site poriior to the commencement of the works. Any discrepancies must be reported to the engineer immediately.
19. The connection of foul and surface water drainage to the existing public sewer system shall be subject to the approval of the local sewerage undertaker. The contractor is expected to apply for relevant permits prior to commencing the work.
20. 13500 chamber rings are allowed on the adoptable network and are to be Kitemarked.
21. The position, line and diameter of all existing drainage apparatus should be confirmed on site prior to the commencement of the works. Any discrepancies must be reported to the engineer immediately.
22. The connection of foul and surface water drainage to the existing public sewer system shall be subject to the approval of the local sewerage undertaker. The contractor is expected to apply for relevant permits prior to commencing the work.

Existing Services
Prior to the commencement of any works under ground mapping surveys and constraints plan is to be refered to any discrepancies are to be reported to engineer.

Any existing services which may be affected by the proposed works should be located by means of a hand dig in close liaison with the statutory service authorities. The contractor shall inform the developer of any services that may affect the proposed design. Contractor to notify statutory service authorities prior to commencement of work. As Constructed Information lit is the contractors responsibility to provide the following as constructed drawings to the developer upon the completion of the works covered by the contract :-
1. Positions/co-ordinates of all adoptable manholes.
2. Invert and cover levels of all adoptable manholes.
3. New gully positions and connections.
4. Position and depth of service ducts for water, gas, electric, BT, cable and street lighting, stating size and number of ducts.

LEGEND

- Proposed adoptable Combined manhole — C1
- Proposed adoptable Surface Water manhole — S1
- Proposed adoptable Foul Water manhole — F1
- Existing adopted Foul manhole — ex.mh
- Existing adopted Storm manhole — ex.mh
- Existing adopted Combined manhole — ex.mh

Adoptable Highways
- Proposed highway to be cambered
- Proposed highway to have crossfall
- Proposed highway gully — G
- Proposed tactile pedestrian crossing — T.C.
- Primary Access - ref CfSH — ACCESS
- Retaining walls and steps
- Retaining wall (retained height shown), (edge protection required over 600mm ht) — Rwall
- Paving flag Steps - 300mm Going 150mm Rise
- Batter - these should not exceed 1:3 adjacent to adoptable highways

Please refer to Architects layout for details of proposed fencing and walls.
DPC levels must NOT be altered without informing the designer.
RWP locations are subject to Architectural working drawings.

Keepmoat®

REV	REVISION	BY	DATE
-	First Issue	NL	29.07.17

Drawing Status: PRELIMINARY

Title:
Keepmoat Homes Thurnscoe Phase 2
Phase 2 Engineering Layout

scale	Date
1:500 @ A1	July 2017
Drawn by: NL	e-mail: niall.lennon@queensberrydesign.co.uk

Drawing no.	Revision	Checked by:
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