Report: 9507/FRA1
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DRAINAGE IMPACT/FLOOD RISK ASSESSMENT

FOR PROPOSED DEVELOPMENT

at

LESLIE ROAD, KENDRAY, BARNSLEY

Prepared for

Keepmoat Homes

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Drainage Impact/Flood Risk Assessment

For proposed development

at

Leslie Road, Kendray - Barnsley

1 INTRODUCTION

1.1 Encia Environmental (EE) have been appointed by Keepmoat Homes to prepare a Drainage Impact/Flood Risk Assessment (FRA) for the proposed residential development at Leslie Road, Barnsley

1.2 The FRA will be undertaken in accordance with Environment Agency (EA) guidance, and will focus on :

1.3 Site Use and Current Drainage regime, Flooding History, Ground Conditions and use of SUDS, Impact of development and proposed drainage strategy, overland flooding routes and the overall impact of development on the site and surrounds.

1.4 This report is for the sole use of Keepmoat Homes, and presents information and conclusions, based on available data at the time of preparing the report. Encia reserve the right to alter the conclusions in the event of further information becoming available at a later date.

2 BACKGROUND

2.1 Keepmoat Homes are applying for detailed consent for the erection of 98No residential dwellings at land located on Leslie Road, Kendray, Barnsley. The site was formerly occupied by local authority housing, which was recently demolished. The development will feature a mix of dwellings, with associated adopted highways and parking courts. A copy of the application layout enclosed with the outline application is included within appendix F.

2.2 In the process of preparing this report, EE have undertaken a site walkover and liaised with Yorkshire Water(sewerage undertakers), and Barnsley MBC (land drainage authority). A detailed GeoEnvironmental Investigation has been undertaken to provide an overview of the Geological conditions below the site (Encia report ref 9507/1, dated May 2008).

2.3 A detailed topographical survey for the site has been completed and is enclosed within appendix D. In addition a photographic survey record of the site has been completed and selected photographs are enclosed within appendix C.

3 REGULATORY GUIDANCE

3.1 Planning Policy Statement 25 (PPS25) provides the regulatory framework and guidance for planning authorities in relation to Flood Issues for new developments. Any application lodged with a local planning authority will be considered in conjunction with this guidance and dependant on the nature and location of the application the planning authority may request a Flood Risk Assessment as part of the planning application documents.

3.2 The Environment Agency are a statutory consultee to the Planning Authority in relation to flood risk issues. In addition, Barnsley Borough Council Drainage Department will be consulted with respect to the proposals.

3.3 The agency has produced a matrix for local planning authorities, which provides advice in terms of the requirements for risk assessment. 'Environment Agency Standing Advice - Development and Flood Risk' dated October 2005 tabulates the requirements relative to the scale of the development and the applicable Flood Zone.

3.4 The Environment Agency have undertaken a national study of flood risk across England and published flood maps covering the country. The maps can be viewed on the agency web site at **www.environment-agency.gov.uk**. Specific locations can be studied by searching either using postcode or address.

3.5 The EA flood maps identify 3 zones. Zone 1 being the area where risk of flooding from fluvial or tidal sources is lowest and Zone 3 being the area of greatest potential risk. PPS 25 provides guidance to local authorities with respect to the assessment of proposed development within the 3 flood zones, and the allocation of different development, dependant on their associated risk, in areas of potential flooding.

3.6 The level of detail and complexity of a Flood Risk Assessment can vary considerably, dependant on the scale, nature and location of the planned development. EA guidance sets out the criteria for the level of information which should be included within the FRA. The Leslie Road site falls within 'Development within Flood Zone 1', thereby FRA guidance Note 1 is relative to this application. A copy of the EA standard guidance notes is included within appendix A.

4 SITE DESCRIPTION AND HISTORY

4.1 A site location plan is included within Appendix B of this report. Site details are summarised in the Table below.

Detail	Remarks
Location	3.5 Km SW or Barnsley Town Centre
NGR	SE 368 054
Area	2.08 Ha
Current Use	Open land - former housing site

4.2 A walkover survey of the site was undertaken in February 2009.

4.3 The site was originally developed for housing in the early 1950's. Prior to the housing development the site had been undeveloped. The housing was demolished in 2007, however the road infrastructure was retained. At the time of writing this report the site has been left covered by a layer of demolition rubble.

4.4 The site features a sloping topography, typical slopes range between 1:12 to 1:20. The highest point of elevation is 76.1m in the south western part of the site, with a low point of 68.5m in the south east. Site slopes generally fall west to east, and are broken by the existing Leslie Road alignment. To the east of the site there is an existing railway line, which is elevated approximately 4m above the boundary fence.

4.5 To the north and west of the site there is existing residential development. To the south there is an equipped play area and open space.

5 EXISTING SITE DRAINAGE

5.1 Encia obtained a copy of the existing adopted Yorkshire Water sewer records. A copy is enclosed within appendix E. In addition during the detailed walkover a surface inspection was made for manhole covers and drainage features.

5.2 Inspection of the sewer plan confirms that the site is crossed by a number of foul and surface water sewers, many of which serve adjacent development. The foul network features 2 separate outfall points. In the northern part of the site, foul water drains to an existing 225mm diameter sewer which passes below the railway line heading north. This sewer also receives flows from dwellings 45-55 Leslie Road, which are outside the site. Foul drainage from the southern part of the site outfalls to the existing Yorkshire Water foul sewer in the south eastern corner of the site, adjacent to the play area. This network also receives flows from properties to the west of the site.

5.3 Surface water drainage is split into 2 catchments. A surface water outfall is indicated to the northern part of the site, which would have drained a limited number of properties into Raymond Road. The majority of the site drains to the existing 300mm diameter sewer adjacent to the play area to the south of the site. It is assumed that *the sewer network remains below the site, and was not affected by the demolition.*

5.4 The site catchment area prior to demolition, has been assessed using the sewer record plans together with ordnance survey data. A detailed cctv survey of domestic drainage was not undertaken prior to demolition, therefore some assumptions have been made with respect to the specific outfall points for properties. In general we have assumed that dwelling outfalled to the nearest surface water sewer.

5.5 The overall site catchment has been measured as 5988m^2, with 220m^2 outfalling to the north into Raymond Road and 5768m^2 outfalling to the south adjacent to the play area. Using the Wallingford Rational Method (Qp=2.78ACi) where:

Qp	=	Maximum Discharge
A	=	Contributing Area (Ha)
C	=	Runoff Coefficient
I	=	Rainfall Intensity (60mm/hr)

Existing run off rates are -	Catchment 1	3.6 litres/sec
	Catchment 2	96.2 litres/sec
	Total Discharge	**99.8 litres/sec**

5.6 Groundwater flows from site would flow in an easterly direction towards the railway line. Greenfield flows from unpaved areas are estimated as around 7 litres/sec (based on typical 5 litres/sec/Ha Greenfield rate).

6 PROPOSED DEVELOPMENT

6.1 The proposed development will consist of 98 new dwellings. Encia have undertaken an initial assessment of impermeable areas, and can confirm that the impermeable area of the proposed scheme is in the order of 1.18 Ha(57% of gross area).

6.2 Whilst no detailed drainage design has been undertaken for the site to date, based on the site areas above, it is estimated that, if all hard surfaces were drained positively, the proposed development would provide a total surface water run-off rate of approximately 196 litres/second (typical 1 in 2 year event).

7 FLOOD SOURCES

7.1 Flooding can occur from a variety of sources, including tidal, rivers, watercourses, overland run-off, sewers and culverts.

7.2 Inspection of the EA flood map indicates that the site falls within Flood Zone 1, and is not considered at significant risk of flooding from rivers/watercourses.

7.3 Pluvial flooding is flooding from drains or flooding caused by drains being unable to receive water due to being at capacity. This can cause overland flooding from outside the site to enter the site in specific low lying areas. This mechanism has been considered below.

7.3 The existing residential development to the west and south lies at a higher elevation than the site, and as a consequence overland flows from these areas would enter the site if the drainage system became innundated. Three primary routes for overland flows to enter the site have been identified, and are shown on the plan contained within appendix H.

7.4 Flood route 1 (see plan), would enter the site from the south, flowing in a northerly direction within the carriageway of Laurel Avenue. Flows would follow the line of Leslie Road and are likely to breach the footway at the low spot and flow towards the eastern boundary with the railway embankment. Any changes in the vertical alignment of Leslie Road may affect the flood route.

7.5 Flood Route 2 would enter the site from Birch Road to the west, and would flow within the carriageway of Reginald Road in a northerly direction towards the junction of Birk House Lane and Raymond Road. Flows from this point would head north towards the railway embankment underpass without posing significant risk to the site.

7.6 Flood Route 3 would be generated from Reginald Road to the west. Flows would trend down Raymond Road and pose no significant threat to the site.

7.7 Leslie Road has been retained, however it is in poor condition and will require substantial re-construction to bring it up to a suitable standard. The current vertical alignment is almost flat in areas. Given the higher elevation of the area of the site to the west of Leslie Road, there is the potential for overland flows to breach the carriageway and inundate the system. Detailed design should consider the location of any designed low spots within the alignment and provide a flood route through the development towards the eastern boundary with the railway embankment.

7.8 If carriageway construction is being undertaken as part of the proposals, the vertical alignment at the junction can be designed to protect against overland flows in Raymond Road.

7.8 Flash flooding is likely to be an increasingly common event given the trend towards global warming and extreme weather conditions. In flash floods water generated from rainfall landing within the site can cause flooding to low lying areas.

7.9 In July 2007 areas of the UK in Yorkshire and Gloucestershire were subject to extreme unprecedented flooding, estimated to be the equivalent to a 1 in 200 year event. This flooding was caused by a prolonged period of relatively low intensity rainfall, which produced total saturation of the ground. In these conditions moderate intensity rainfall can cause severe problems with regards to overland flows and inundation of large volumes of flood water in low lying areas. During the events of 2007, many storage systems designed to attenuate high flow rates were noted as being part full. This is likely to be due to the low intensity of the storm. The prolonged storm duration however generated significant overall volume, and hence the flooding in low lying areas.

7.10 The issues associated with the weather conditions described in 7.9 are considered a rare occurrence. There is however a risk that similar conditions could apply in the future. The operating characteristics of drainage systems designed to current guidance does not preclude flooding downstream from prolonged rainfall, and overland flows from saturated ground.

8 FLOOD RECORDS AND IMPACT ON EXISTING SITE

8.1 Based on the site walkover and the EA maps, the site is not considered to be at significant risk of flooding. Detailed external works design should consider the potential for overland flows entering the site from higher areas to the west and south as described in section 7.

8.2 Following our consultation exercise, Encia are not aware of any previous flooding history on the site.

9 SUDS

9.1 Building Regulations and Environment Agency advice notes require the consideration of sustainable drainage techniques for new developments. Guidance on SUDS techniques can be found in various publications and web sites.

9.2 The use of SUDS techniques is designed to regulate the impact of development on receiving watercourses, to reduce the possibility of flooding downstream. This effectively mirrors the drainage flow characteristics of the catchment prior to development.

9.3 The use of soakaways and other suitable measures should be considered for new developments. Building regulations provides a hierarchy of drainage methods for consideration, with the emphasis on provision of sustainable methods of drainage wherever possible.

9.4 The most common forms of sustainable drainage on developments of this size are soakaways or flow attenuation, via storage tanks/ponds/swales. The effectiveness of soakaways is dependant on the percolation rate of natural strata below the site, and the continuation of the permeable strata with suitable outfalls.

9.5 The site investigation has characterised the ground conditions below the site. Natural ground consists of a sequence of sandy clays over gravelly clays. Five soakaway tests were undertaken on site, and the report confirms that percolation rates were not measurable, and the site is not suitable for soakaways.

10 PROPOSED DRAINAGE STRATEGY

10.1 The development of the site will require a new drainage system designed to suit the final approved layout, and in compliance with current Building Regulations, British Standards and the 6th edition of Sewers for Adoption.

10.2 Encia have not been instructed to undertake a detailed drainage design at this stage, however, based on our consultation with Yorkshire Water and Barnsley MBC, the following strategy is envisaged:

10.3 Foul water from the new dwellings will be drained to the existing adopted system adjacent to and within the site. Given the extent of adopted sewers within the site, and its layout which related to previous development, a significant number of sewers will need to be abandoned in agreement with Yorkshire Water. Sewers within the site which receive flows from outlying areas will need to be diverted under agreement with Yorkshire Water. Drainage flows should be maintained at all times during the construction process. Yorkshire Water have confirmed that the sewage treatment works has sufficient capacity to accept flows from the development.

10.4 The surface water drainage strategy should consider the potential net increase in flows generated from the new development, and should, in accordance with PPS25, seek to reduce flows to downstream watercourses in areas where there are known flooding issues.

10.5 Discussion with Barnsley MBC indicate that the existing surface water sewer to the south of the site discharges into a watercourse offsite. The council report capacity and potential flooding issues within the watercourse, and confirm that a net 20% reduction in base flows from site will be required. This policy is in line with PPS25, and many local authorities within the West/South Yorkshire area.

10.6 Based on the existing flows identified in section 5.5, design flows from the site should be regulated to the following rates:

Catchment 1 - 5 l/s (no net reduction on existing flow- see below)

Catchment 2 - 80 l/s (20% net reduction on existing flows)

Given the likely small existing outflow rate for catchment 1, it is considered that reduction in flows by a further 20% would lead to potential maintenance risks associated with the small diameter of the control device. In this situation a controllable discharge of 5 l/s is recommended. This rate will provide protection to the downstream sewer in severe rainfall events, without creating additional risk due to blockage within the control device.

10.7 Flows from the majority of the site (catchment 2) should be directed to the existing surface water system within Leslie Road which falls to the 300mm diameter pipe east of the play area. Flows should be restricted to no greater than 80 litres/second in all storm events.

10.8 Flow attenuation can be achieved by the installation of a surface water storage tank. The detailed design should meet the following criteria:

No surcharging for the 1 in 2 year storm (all duration)

No flooding from the system for the 1 in 30 year storm (all durations)

Flood water from the 1 in 100 year event should be modelled and be capable of being stored above ground within the site in a location which does not pose risk to dwellings.

10.9 The affect of climate change should be considered, and all drainage modelling should allow for a 20% increase in rainfall rates in line with the recommendations of PPS25.

11 IMPACT OF DEVELOPMENT AND RESIDUAL RISK

11.1 A detailed Drainage Impact/Flood Risk Assessment has been undertaken with respect to the planned redevelopment at Leslie Road, Barnsley. The assessment has included a site walkover, topographical survey, desk top site investigation report, liaison with Yorkshire Water and Barnsley MBC.

11.2 The assessment has identified the current site drainage characteristics and also established the current level of risk from flooding.

11.3 The existing run off from the site has been estimated at 99.8 litres/second.

11.4 The proposed redevelopment will result in an increase in impermeable area discharging to the public surface water sewer. In order to ensure that flood risk is not increased within the downstream watercourse, a final discharge rate from the site of 85 litres/second (over 2 catchments) is recommended.

11.5 The detailed arrangements for storage design, and the final stored volumes will need to be determined once the layout is approved. Final design drawings would be submitted to Yorkshire Water for approval and incorporation into adoption agreements. Design details may need to be submitted to the local authority in response to Planning Conditions.

11.6 Soakaway drainage is not possible on this site due to underlying natural clays.

11.7 The potential risk of pluvial flooding has been assessed, and the detailed design should consider the possible overland flood routes and ensure that properties are not at risk.

11.7 The conclusions of this report, and measures recommended should be agreed with the planning authority, water authority and EA prior to commencement of construction.

11.8 On the basis of the provision of the required surface water attenuation, the development is not considered to pose a flood risk to downstream areas during periods of high intensity rainfall (up to the 1 in 100 year event).