BURO HAPPOLD

Dewsbury Riverside Gateway Development

Flood Risk Assessment

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27 September 2021

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Abbreviations

Term	Definition
AEP	Annual Exceedance Probability
EA	Environment Agency
FRA	Flood Risk Assessment
mAOD	Metres Above Ordnance Datum
NPPF	National Planning Policy Framework
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
YW	Yorkshire Water

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1 Executive Summary

This Flood Risk Assessment (FRA) has been carried out as part of the hybrid planning application for the Dewsbury Riverside Gateway Development, located in the Kirklees district of West Yorkshire.

This FRA has been prepared in accordance with the National Planning Policy Framework (NPPF) (July 2021) and the Calder Catchment Strategic Flood Risk Assessment (SFRA) (July 2016). The FRA contains an assessment of the risk associated with each of the following flood sources:

- The sea (tidal);
- Rivers (fluvial);
- Surface water;
- Failure of drainage infrastructure;
- Groundwater; and
- Lakes, reservoirs and artificial sources (excluding water mains failure).

According to the national flood map produced by the Environment Agency (EA), the entirety of the site is located within Flood Zone 1, which is defined as having a low risk of flooding, with a probability of flooding of less than 1 in 1,000 years (0.1%) in any given year, from rivers and the sea. The nearest river to the proposed development, River Calder, is approximately 300m to the north of the site from the site boundary at its nearest location. The site is sloped, with elevations of 10-20m higher than that of the river. Therefore, tidal and fluvial flood risk is considered to be low and additional measures to reduce this risk will not be considered.

In accordance with the NPPF, all of the land uses for the proposed development are appropriate for Flood Zone 1. The proposed development consists of primary and secondary roads and landscaped open space, all of which are classified as *Less Vulnerable* or *water compatible* within the NPPF and residential units classified as *More Vulnerable*.

Surface water is proposed to be discharged to the existing Yorkshire Water (YW) sewers at a rate which does not exceed greenfield surface runoff rates. The runoff in the north will be conveyed by gravity via swales towards the northern end where detention basins will provide attenuation. These detention basins will discharge to the public sewer located under Ravensthorpe Road. The strategy for the south of the site will also utilise swales and detention basins, but the stormwater will discharge into the existing culverted watercourse to the east. On-site foul water will be discharged directly to the combined sewer located along Ravensthorpe Road by gravity. With the proposed Foul and Surface Water Drainage Strategy in place, the risk of flooding from surface water and the surcharge of combined sewers is considered to be low.

The site is not located within an area of high potential for elevated groundwater as it is underlain by the Pennine Lower Coal Measures Formation, with strata consisting of mudstone, siltstone and sandstone; layers which are unlikely to facilitate groundwater flow. Therefore, the risk of groundwater flooding is considered to be low.

The map showing the risk of flooding from reservoirs produced by the EA indicates that the site is not located within the maximum extent of flooding that would occur if an upstream reservoir were to fail. The risk of flooding caused by the failure of a reservoir is therefore considered to be low and mitigatory measures are not required.

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2 Introduction

2.1 Background

This site-specific Flood Risk Assessment (FRA) has been prepared by Buro Happold as part of the outline planning application for the Dewsbury Riverside Gateway Development, hereafter referred to as the 'proposed development'. This assessment has been developed in accordance with the National Planning Policy Framework (NPPF).

2.2 Site Description

The proposed development is located within the town of Dewsbury, in the Metropolitan Borough of Kirklees, West Yorkshire (Ordnance Survey grid reference SE 231196). The site, which is located off Ravensthorpe Road, is approximately 28.26 hectares in area and is predominantly occupied by cropped farmland. Areas of woodland are found in the west and Ravenshall School and allotments are found in the east. Figure 2-1 shows the location of the proposed development.

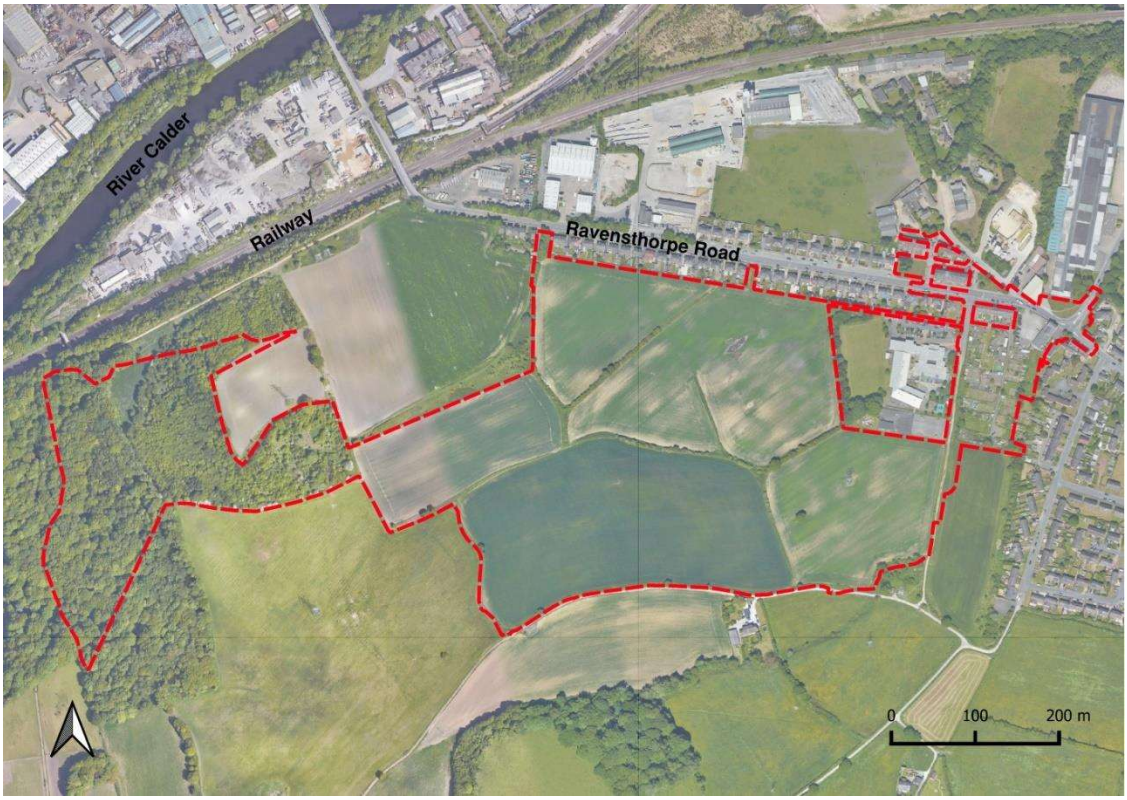

Figure 2-1 Red Line Boundary showing the site extent (Map data ©2021 Google)

The site is sloped; this slope is generally downwards towards the north and northeast. The highest elevation on site is approximately 87 mAOD whilst the lowest elevation is 44.3 mAOD.

The nearest watercourse is the River Calder, approximately 300m to the north of the nearest site boundary.

The online GeoIndex tool produced by the British Geological Survey indicates that the bedrock geology underlying the site is the Pennine Lower Coal Measures formation.

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2.3 Proposed Development

The proposed development is shown in the Illustrative Masterplan (Figure 2-2). Approximately 350 residential dwellings are planned for the illustrated residential plots, as well as mixed use developments including community facilties. A connecting corridor off Ravensthorpe Road is proposed to allow active travel access into the north of the site, with another corridor further along the road to allow pedestrian and allotment access. A proposed main road to the north-east will allow for primary vehicle access to the development, with a junction to the south to connect the site to the wider Dewsbury Riverside development. Allotments are planned in the north-east, with landscape features, public open space and green infrastructure distributed in various locations across the site.



Figure 2-2: Dewsbury Riverside Gateway Development Illustrative Masterplan (Source: Barton Willmore, 32147-MR-M-Ai22A-illustrative masterplan-). Refer to the full illustrative masterplan provided in Appendix A for the symbology information.

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3 Planning Context

3.1 Overview

This Flood Risk Assessment (FRA) has been prepared in accordance with the policies and guidance applicable to the proposed development, outlined within the following publications:

- National Planning Policy Framework (July 2021);
- National Planning Policy Framework Planning Practice Guidance website (Updated: 24 June 2021);
- Calder Catchment Strategic Flood Risk Assessment (July 2016)
- Kirklees Local Plan Strategy and Policies (February 2019)

3.2 National Planning Policy Framework

3.2.1 Flood Zone Assessment

The National Planning Policy Framework (NPPF) aims to avoid inappropriate development in areas at highest risk of flooding. The Planning Practice Guidance to the NPPF contains a series of tables that help identify the risk of flooding to a development. These tables are duplicated in Appendix B to Appendix D.

- Table 1 (Appendix B) defines four Flood Zones by flood risk, gives the land use classification appropriate to the flood risk and specifies the requirements of a FRA within each zone;
- Table 2 (Appendix C) identifies specific land use types for each flood risk vulnerability classification given in Table 1. For example, hospitals and residential buildings are classified as more vulnerable; and
- Table 3 (Appendix D) identifies where development is appropriate for each flood risk vulnerability classification and whether the Exception Test is required.

The Flood Zones defined in the NPPF are as follows:

Flood Zone 1 Low Probability:

< 1 in 1,000 annual probability of river or sea flooding in any given year (<0.1% Annual Exceedance Probability (AEP)).

Flood Zone 2 Medium probability:

Between 1 in 100 and 1 in 1,000 annual probability of river flooding in any year (1% - 0.1% AEP), or
Between 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year (0.5% - 0.1% AEP).

Flood Zone 3a High probability:

> 1 in 100 annual probability of river flooding in any year (>1% AEP), or
> 1 in 200 annual probability of sea flooding in any year (>0.5% AEP).

Flood Zone 3b Functional floodplain:

> 1 in 20 annual probability of flooding in any year (5% AEP).

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3.2.2 Climate Change

Allowances for the predicted effects of climate change should be taken into account when preparing site-specific flood risk assessments. The guidance published by the Environment Agency (EA) in February 2016, updated in July 2021, to support the NPPF contains sensitivity ranges that are recommended to be applied to peak rainfall intensities, peak river flows, sea level rise, offshore wind speeds and extreme wave heights. The general trend is for each parameter to increase in the future, which in turn increases the risk of flooding to any site. The recommended allowances for peak rainfall intensity are given in Table 3-1.

Table 3-1: Climate change allowances for peak rainfall intensity

Allowance Category	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
Upper End	+10%	+20%	+40%
Central	+5%	+10%	+20%

The Surface Water Drainage Strategy, also prepared by Buro Happold, has therefore made an allowance for a 40% increase in peak rainfall intensity as this 'upper end' allowance represents the more conservative scenario.

3.3 Strategic Flood Risk Assessment

Strategic Flood Risk Assessments (SFRA) are required to be carried out by Local Authorities to guide developers on the authority's strategies to avoid, reduce and manage flood risk. The Calder Catchment SFRA considers the risk of flooding from the following potential sources:

- Rivers (fluvial);
- The sea (tidal);
- Surface water, sewers and SuDS;
- Groundwater; and
- Artificial Sources, such as reservoirs.

The risk of flooding to the proposed development from each flood source listed above will be assessed in Section 4.

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4 Appraisal of Flood Risk

4.1 National Planning Policy Framework

4.1.1 Flood Zone

The Flood Map for Planning (Figure 4-1) produced by the EA shows that the entire site is located entirely within Flood Zone 1. Flood Zone 1 is defined as an area with an annual probability of flooding from rivers or the sea of less than 0.1%, or 1 in 1,000 years.

By definition, the risk of flooding from rivers or the sea in Flood Zone 1 is classified as low. In line with EA guidance, the focus of this FRA will therefore be on the management of surface water run-off and the risk of flooding from other sources.

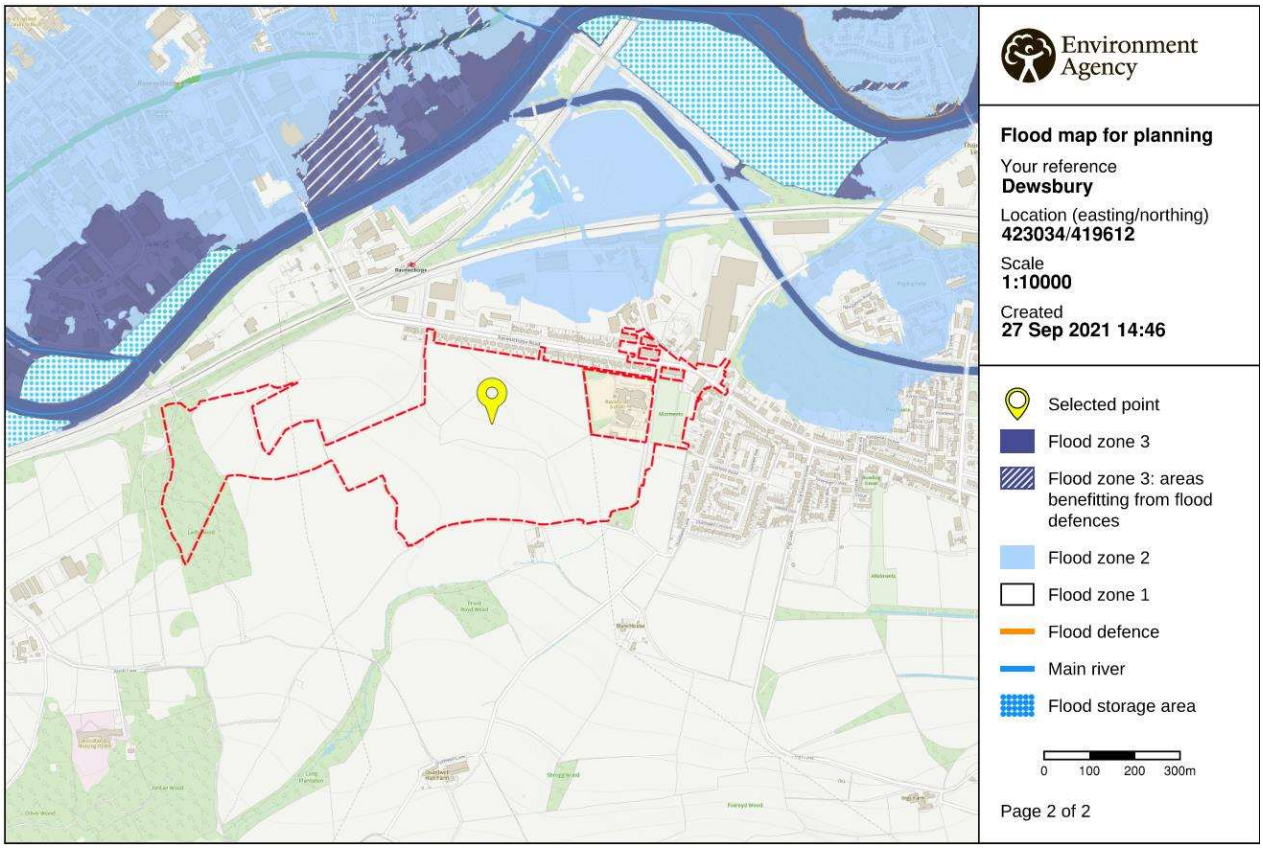

Figure 4-1: Environment Agency Flood Map for Planning, with site location marked in yellow

4.1.2 Flood Risk Vulnerability Classification

The NPPF Planning Practice Guidance contains a series of tables which identify where development should be permitted, based on the Flood Zone in which the development is located and the proposed uses of that development. These tables are included in Appendix C and Appendix D.

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The proposed development consists of residential units, primary and secondary roads and landscaped open space. All of the above land uses are considered appropriate for development within Flood Zone 1, in accordance with the NPPF.

4.2 Fluvial and Tidal Flooding

Fluvial flooding occurs when sustained or intense rainfall events increase the flow in rivers causing the water level to rise above the level of the banks and into the surrounding areas.

Tidal flooding occurs when particularly high tides coincide with storm surges. Storm surges are caused by low atmospheric pressure events resulting in temporary localised raising of sea levels.

The nearest watercourse is the River Calder, approximately 300m to the north of the site. The Historic Flood Map (Figure 4-2) produced by the EA indicates there are no records of fluvial flood events which meet a set criteria that have occurred on site.

Land levels at the site are approximately 10m – 20m higher than the river and therefore the site is also at a low risk of flooding from the river in the future.

As the proposed development is located within Flood Zone 1, which is defined as having a low risk of flooding from rivers and the sea, no additional measures to reduce this risk will be required.



Figure 4-2: Environment Agency Historic Flood Map, showing the maximum extent of past fluvial flood events in relation to Red Line Boundary (Map data ©2021 Google).

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4.3 Surface Water Flooding

4.3.1 Baseline

Surface water flooding occurs when intense rainfall is unable to naturally soak into the ground due to impermeable ground covering such as concrete or tarmac, or low permeability ground conditions preventing infiltration. This excess surface water can flow through built-up areas and open space and pond in lower-lying areas causing localised flooding.

The surface water flood map produced by the EA (Figure 4-3) indicates that the site is predominantly classified as having a very low probability of surface water flooding (less than 0.1%). However, to the east and south-east, there is a stretch of land which has a high risk (greater than 3%). This corresponds with an existing watercourse on site, which becomes culverted on the approach to Ravenshall School. In the westerly part of the site, an overland flow path flowing northwesterly towards the river crosses through Lady Wood, exhibiting a low/medium risk of surface water flooding. The north of the site has areas of land behind existing residences which exhibit a low probability of surface water flooding; these areas are points of low elevation on site where surface water ponds due to gravity.

The existing site consists almost entirely of cropped farmland, which allows for precipitation to infiltrate into the soil. Existing drainage features comprise of:

- The River Calder beyond the railway tracks to the north.
- A 200 mm diameter vitrified clay SW sewer in Ravensthorpe Road that connects to a 1080mm diameter concrete pipe before the junction with Lees Hall Road.
- An open watercourse which runs through Priest Royd Wood to the south of the site and the rear of Ravenshall School where it becomes enclosed.
- Private system at the rear of the dwellings located off Ravensthorpe Road.

The construction of impermeable paving and roofing on this land would reduce infiltration rates and hence increase surface runoff, which, in turn, can result in increased risk of surface water flooding. Therefore, the surface water drainage strategy will take measures to reduce this risk.

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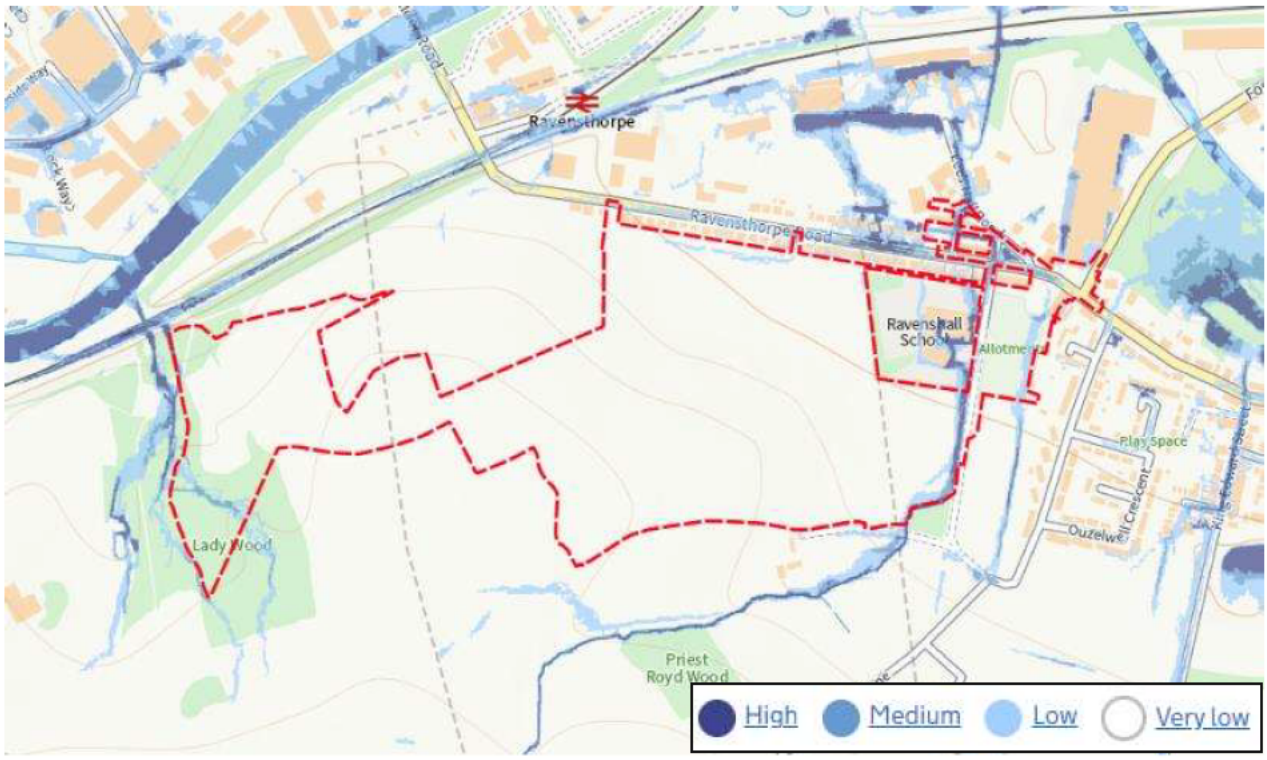

Figure 4-3: Environment Agency surface water flood map, with indicative site boundary marked in red

4.3.2 Proposed

Under the proposed Surface Water Drainage Strategy, on-site surface water will be managed separately from foul water. Sustainable drainage systems (SuDS) will be used to restrict runoff to greenfield runoff rates in accordance with the Kirklees Local Plan Strategy and Policies (February 2019) for the critical 1 in 100 year rainfall event, with an additional 40% allowance for climate change in accordance with the latest EA guidance. The runoff in the north will be conveyed by gravity via swales towards the northern end where detention basins will provide attenuation. These detention basins will discharge to the sewer located under Ravensthorpe Road. The southern site runoff will be conveyed by gravity via swales and other drainage routes towards the east of the site where detention basins will be used to provide attenuation and water quality treatment before discharging to the existing culverted watercourse.

The proposed surface water drainage strategy will provide a substantial reduction in the peak rate of surface water runoff entering the SW and combined sewer relative to simply discharging stormwater directly to the sewer. Therefore, with the proposed surface water drainage strategy in place, the risk of surface water flooding is considered low.

Further details of the proposed surface water drainage strategy are provided in the Surface Water Drainage Strategy Report, September 2021 prepared by Buro Happold.

4.4 Flooding from Combined Sewers

Flooding from combined sewers may occur during periods of intense rainfall when high volumes of surface water run-off exceed the capacity of the sewer and cause the pipes to back up and overflow.

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4.4.1 Baseline

No buildings, aside from Ravensthorpe School, currently exist on site. The offsite residential dwellings located along Ravensthorpe Road drain into a 200 mm diameter public surface water sewer and a 300 mm diameter public combined sewer in Ravensthorpe Road.

4.4.2 Proposed

Under the proposed Foul Water Drainage Strategy, on-site foul water will be discharged directly to the combined sewer located along Ravensthorpe Road by gravity, where possible. Where gravitational discharge is not possible, it is likely that a sewage pumping station will be required to facilitate the connection to the public sewer network.. Yorkshire Water were contacted to agree discharge rates and connection points, and in their response on 15th July 2021 confirmed that foul water from the proposed development can be accommodated by the combined sewer network, subject to a robust build rate profile and start date. It is therefore considered that the risk of flooding from the surcharge of the public sewer network caused by an increase in foul water flow from the proposed development is low.

Further details of the proposed foul water drainage strategy and correspondence with Yorkshire Water are provided in the Utility Report, September 2021 prepared by Buro Happold.

4.5 Groundwater Flooding

Groundwater flooding generally occurs in low-lying areas above permeable rock aquifers where the water table meets, and rises above, the ground surface.

The Calder Catchment SFRA states that the risk of groundwater emergence is very high in parts of Dewsbury and Ravensthorpe. However, this is based on a coarse 1km grid square map and considers the risk of groundwater emergence as opposed to groundwater flood risk. The Geoenvironmental Appraisal (February 2021) conducted by Lithos notes that excavations in the north are likely to encounter some groundwater ingress if left open for extended periods of time.

One groundwater strike was observed during a site investigation conducted by Rogers Geotechnical Services (November 2020). This was observed in the north of the site, where the elevation is generally lowest. As highlighted by the report, groundwater is subject to seasonal variation. The strike may have occurred in a localised area of perched groundwater.

There are no groundwater Source Protection Zones on or adjacent to the site.

The site is underlain by the Pennine Lower Coal Measures Formation, with strata consisting of mudstone, siltstone and sandstone; these layers are unlikely to facilitate groundwater flow. Therefore, the risk of groundwater flooding is considered to be low.

4.6 Flooding from Reservoirs

The map showing the risk of flooding from reservoirs produced by the EA (Figure 4-4) indicates that the site is not located within the maximum extent of flooding that would occur if an upstream reservoir were to fail. The risk of flooding caused by the failure of a reservoir is therefore considered to be low and mitigation is not required.

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Figure 4-4: Environment Agency map showing the risk of flooding from reservoirs, with indicative site boundary marked in red

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5 Summary and Conclusion

This FRA has been carried out as part of the hybrid planning application for a proposed residential and mixed-use development located south of Ravensthorpe Road in Dewsbury, West Yorkshire. The proposed development consists of residential dwellings, mixed-use development (including community facilities), associated roads and parking, landscaping works including green infrastructure and public open space.

According to the national flood map produced by the EA, the site is located entirely within Flood Zone 1, which is classified as having a low risk of flooding from rivers and the sea. The nearest river to the proposed development is the River Calder, approximately 300m north of the proposed development; however the site is sloped, with site elevation levels 10-20m higher than the river. Tidal and fluvial flood risk is therefore considered to be low and additional measures to reduce this risk will not be required.

In accordance with the NPPF, all of the land uses for the proposed development are appropriate for Flood Zone 1. Primary and secondary roads, allotments, green infrastructure and public open space are all classified as *Less Vulnerable* or *water compatible* within the NPPF and residential units classified as *More Vulnerable*.

The surface water flood map produced by the EA indicates that the site is predominantly classified as having a very low probability of surface water flooding. Near to the eastern site boundary, the risk of surface water flooding is high, corresponding to the presence of a watercourse which becomes culverted on the approach to Ravenshall School.

The proposed surface water drainage strategy is to use sustainable drainage measures to attenuate and restrict site runoff to greenfield runoff rates. Swales are proposed to convey runoff to detention basins, which will provide attenuation and discharge to the existing sewer in the north and the culverted water course in the east. Foul water from the proposed development is proposed be discharged directly to the combined sewer located along Ravensthorpe Road by gravity, where possible. The availability of the public combined sewer for on-site foul discharge has been confirmed via communications with Yorkshire Water. The risk of surface water flooding or flooding from combined sewers is therefore considered to be low.

The site is not located within an area of increased potential for elevated groundwater as it is underlain by the Pennine Lower Coal Measures Formation, with strata consisting of mudstone, siltstone and sandstone; these layers are unlikely to facilitate groundwater flow. Therefore, the risk of groundwater flooding is considered to be low.

The map showing the risk of flooding from reservoirs produced by the EA indicates that the site is not located within the maximum extent of flooding that would occur if an upstream reservoir were to fail. The risk of flooding from the failure of a reservoir is therefore low.

It is concluded that the risk of flooding from all sources, for the entire design life is considered to be low and that the proposed development will not increase the risk of flooding elsewhere. Moreover, it is considered that the inclusion of the attenuation to restrict surface water discharge to greenfield runoff rates will reduce the risk associated with surface water flooding.

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Appendix A Illustrative Masterplan

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The scaling of this drawing cannot be assured

Revision	Date	Drn	Ckd
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- Site Boundary (c.28.26ha)
- Proposed 3m shared pedestrian/ cycle path (alongside Spine Road)
- Indicative active travel connections
- Indicative residential development
- Indicative residential or community use
- (1) Indicative SuDS
- (2) Allotments (planing ref: 2021/62/90552/E) granted on 3rd June 2021.
- (3) Proposed spine road
- (4) Lady Wood
- Proposed primary vehicle access
- Existing school access/ Proposed alternative/ secondary access
- Proposed vehicle access to third party land
- Approved allotment access/ pedestrian access (Planning Ref: 2021/62/90552/E)
- Proposed active travel access
- HV Pylon
- Indicative public open space (to include retained landscape features, SuDS, new planting and ecological enhancements)
- Indicative planting
- Potential play area

Notes:

Development Capacity: Up to 350 Homes

Project
Dewsbury Riverside

Drawing Title
Illustrative Masterplan

Date	Scale	Drawn by	Check by
23.09.21	1:5000	SW	SW

Project No	Drawing No	Revision
32147	18	C

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Appendix B Planning Practice Guidance Table 1: Flood Zones

Table 1: Flood Zones

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.(Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the Strategic Flood Risk Assessment when considering location and potential future flood risks to developments and land uses.

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Appendix C Planning Practice Guidance Table 2: Flood Risk Vulnerability Classification

Table 2: Flood risk vulnerability classification

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police and ambulance stations; fire stations and command centres; 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. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

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

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; 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 works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-compatible development

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- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence 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.

" * " Landfill is as defined in Schedule 10 of the Environmental Permitting (England and Wales) Regulations 2010.

Paragraph: 066 Reference ID: 7-066-20140306

Revision date: 06 03 2014

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Appendix D Planning Practice Guidance Table 3: Flood risk vulnerability and flood zone 'compatibility'

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Table 3: flood risk vulnerability and flood zone 'compatibility' (PDF, 58.1KB, 1 page)

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

" * " In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

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Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

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