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Flood Risk Assessment & Drainage Strategy

Proposed Residential Development
Barfs Road
Distington

Thomas Armstrong Construction Ltd and Home Group

Ref: K42601.FRA/001

Version	Date	Prepared By	Checked By	Approved By
Original	11 August 2026	T. Melhuish	C. Abram	T. Melhuish

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GLOSSARY OF TERMS

AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
BGL	Below Ground Level
BGS	British Geological Society
CC	Climate Change
CCC	Cumberland Council
DSM	Digital Surface Model
DTM	Digital Terrain Model
EA	Environment Agency
FEH	Flood Estimation Handbook
FFL	Finished Floor Level
FRA	Flood Risk Assessment
GIS	Geographical Information System
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
OS	Ordnance Survey
RGP	RG Parkins & Partners Ltd
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage System
UU	United Utilities

1. INTRODUCTION

1.1 BACKGROUND

This report has been prepared by R. G. Parkins & Partners Ltd (RGP) for Thomas Armstrong Construction Ltd and Home Group in support of their proposals for a residential development comprising 61 no. dwellings with associated access roads, driveways and landscaped areas for a site located in Distington.

RGP has been appointed to undertake a Flood Risk Assessment and Foul and Surface Water Drainage Strategy in accordance with the National Planning Policy Framework[1] (NPPF) to support a planning application that fulfils the requirements of the Local Planning Authority, Environment Agency and the Sewerage Undertaker.

The following study assesses flood risk to the site and proposed development and demonstrates the proposed development will not adversely affect flood risk elsewhere.

1.2 PLANNING POLICY

The NPPF [1] and its Planning Practice Guidance [2] states "a site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in the future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

1.3 THE DEVELOPMENT IN THE CONTEXT OF PLANNING POLICY

Owing to the size of the development (over 1 ha), it is classed as major development in accordance with The Town and Country Planning Order 2015 [3].

The area covered by the application is approximately 2.838 ha (hectares) and by reference to the Environment Agency Flood Map, the site lies in Flood Zones 1.

Table 2 of the NPPF's Planning Practice Guidance [2] classifies each development into a vulnerability class, depending on the type of development, as outlined in

The site is to be developed for dwellings; and is classified as 'more vulnerable'. 'More Vulnerable' development classes are deemed acceptable in terms of flood risk within Flood Zones 1, 2 and 3a but are not acceptable within Flood Zone 3b.

Table 1.1 Vulnerability Classification

Vulnerability Classification	Development
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 operation 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, 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 education 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 distributions; non-residential institutions not included in the 'more vulnerable' class; and assemble and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill & hazardous waste facilities). Minerals working & processing (except for sand & 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	Flood control infrastructure. Water transmission infrastructure & pumping stations. Sewage transmission infrastructure & pumping stations. Sand & gravel working. Docks, marinas, and wharves. Navigation facilities. Ministry of Defence installations. Ship building, repairing & dismantling, dockside fish processing & refrigeration & compatible activities requiring a waterside location. Water based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation & 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 & evacuation plan.

2. SITE CHARACTERISATION

2.1 SITE LOCATION

The site is located east of Barfs Road, Distington to the south of Workington at National Grid Co Ordinates 300663E 523819N as indicated in Figure 2.1 below.

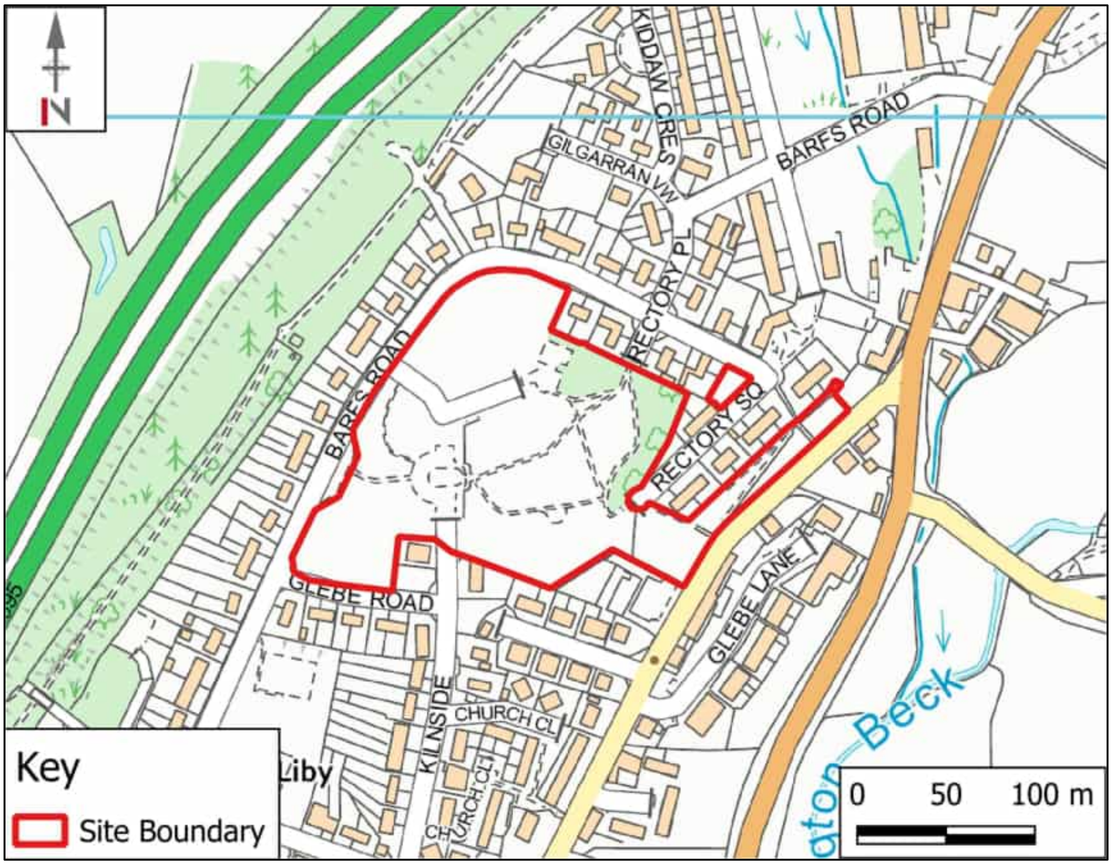

Figure 2.1 Site Location

2.2 SITE DESCRIPTION

The development site covers an area of approximately 2.838 ha (28,383 m²). The site was a previous housing development as noted in the 1961 Ordnance Survey map (see Figure 2.2). It is understood that the majority of the original housing was demolished in c. 2002 with a further 2no. dwellings on Kilnside demolished in c. 2009. Following the demolition works, the site was turned into public open space, primarily grassed over with landscaping and trees, and several surfaced footpaths running through the site. The site is bounded by existing housing and highways to all boundaries.

The site is accessed via Kilnside (public highway) along the western boundary off Barfs Road and terminates at the block-paved public open realm (private land owned by Home Group) in the middle of the site. Kilnside Place (also public highway) is accessed off Kilnside and terminates at a circular turning head. To the south of the block-paved public open realm Kilnside continues as public highway and intersects with Glebe Road, which forms the south-west boundary of the development site. Barfs Road and Rectory Place form the northern boundary with Rectory Square and Main Street located along the eastern boundary.

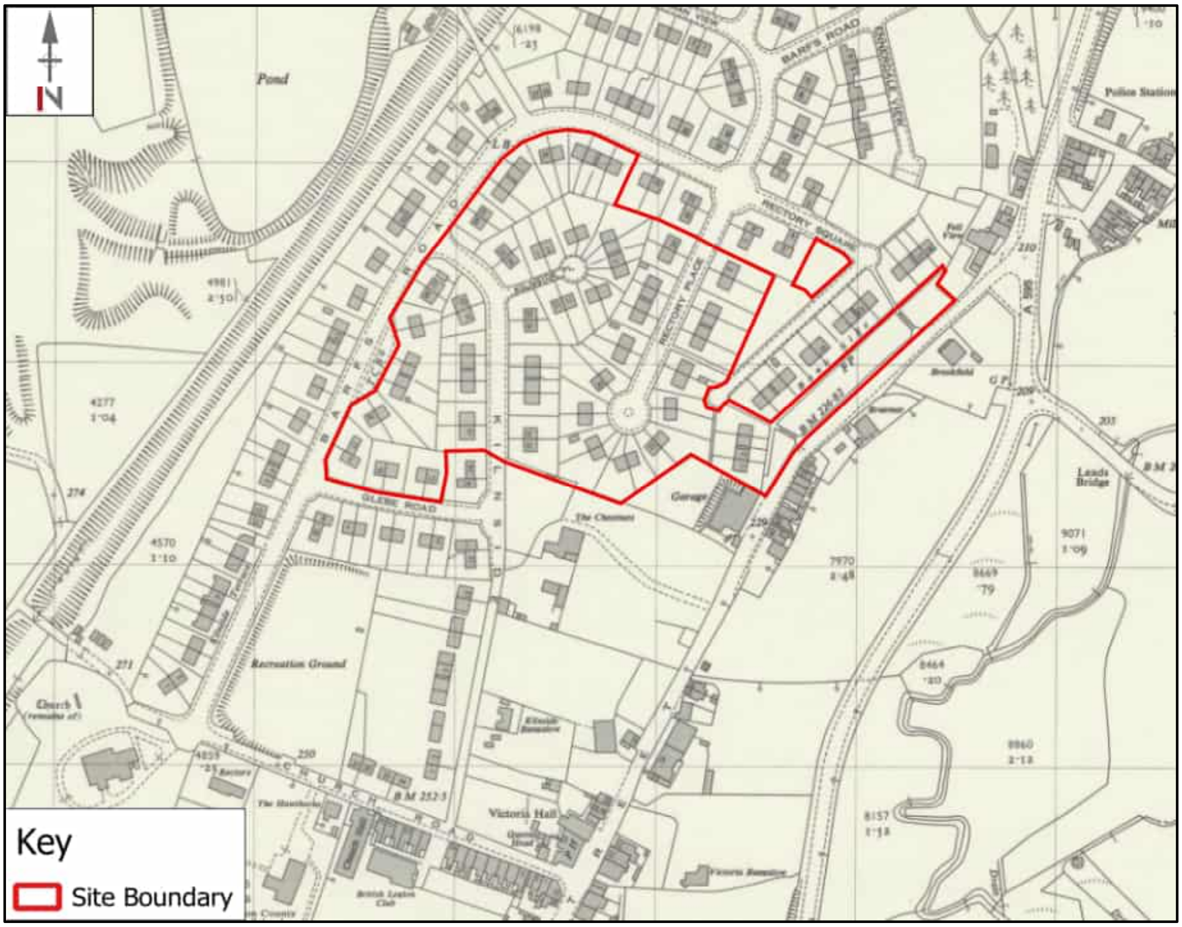

Figure 2.2 1961 Ordnance Survey Plan

Topographically, the site falls generally to the east with levels ranging from c. 79.0 mAOD along the western boundary down to c. 70.0 mAOD in the east as indicated in Figure 2.3.

2.3 GEOLOGY & HYDROGEOLOGY

British Geological Survey (BGS) [4] and Land Information Systems (LandIS) [5] mapping indicates the site is underlain by the geological sequences outlined in Table 2.1. The DEFRA Magic Map Application [6] indicates the nearest Groundwater Source Protection Zone is a Zone 3 'Total Catchment' which is situated approximately 1 km south-east of the site.

A Phase 1 Desk Top Study Report has been completed by Geoenvironmental Engineering Ltd (GEO)[7] and confirms that the site is at very low risk to geohazards and that there are no geological faults inferred on or immediately adjacent to the site.

The Coal Mining report obtained by GEO from the Mining Remediation Authority has indicated that there are no recorded mine workings beneath the site and as such the risk to the site from mine workings is considered to be negligible.

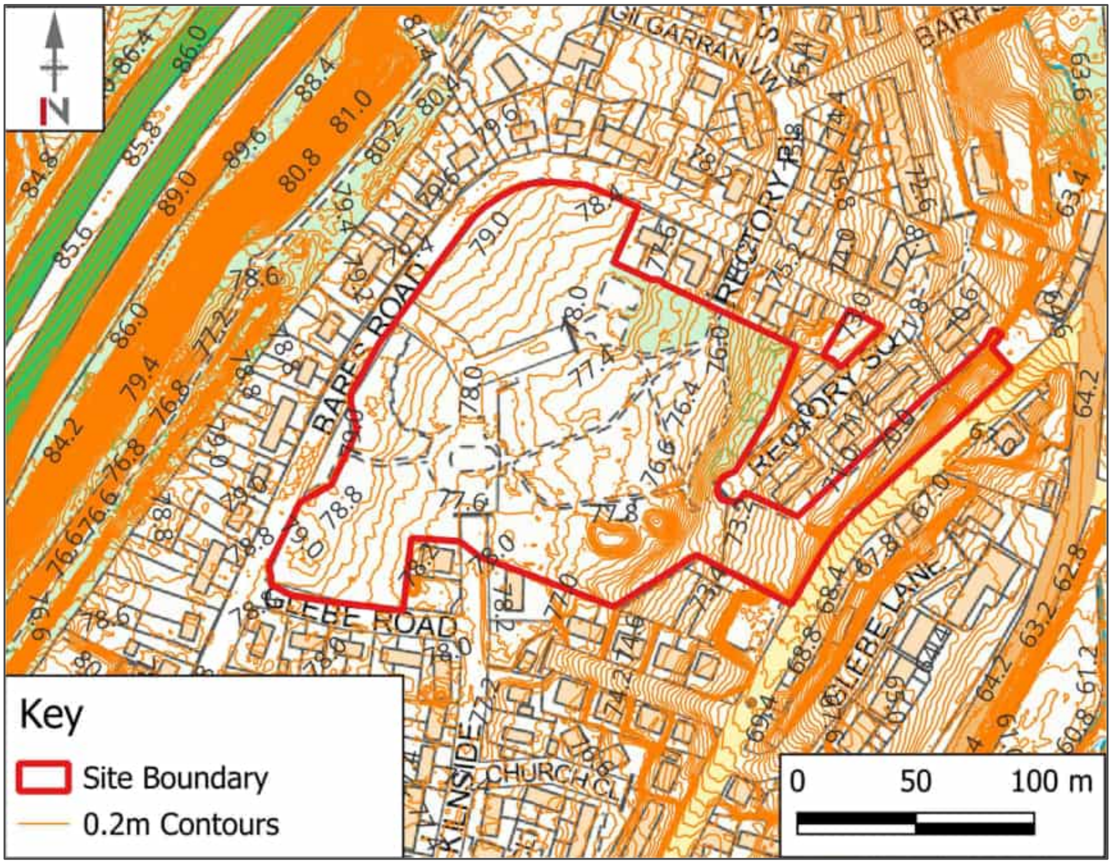

Figure 2.3 Site Topography

Table 2.1 Site Geological Summary

Geological Unit	Classification	Description	Aquifer Classification
Soil	Soilscape 17	Slowly permeable seasonally wet acid loamy and clayey soils	N/A
Drift	Till, Devensian	Diamicton	Summary: Secondary (undifferentiated)
Solid (west)	First Limestone (Cumbria)	Limestone	Summary: Secondary A
Solid (east)	Hensingham Grit	Sandstone	Summary: Secondary A

Ground investigation and published geological mapping indicate the probable presence of significant soluble rocks (limestone) within the underlying bedrock. While the overall likelihood of localised subsidence or dissolution-related degradation is considered low, the potential for such ground movements cannot be discounted under adverse hydrological conditions, particularly where high surface water flows or elevated subsurface water movement occur (e.g. as a result of infiltration-based drainage).

A recorded sinkhole/swallow hole located approximately 140 m southeast of the site, within the same limestone formation, provides direct evidence of karstic susceptibility in the local geological setting. This feature is situated close to a beck, suggesting that focused water flow may have contributed to dissolution and cavity formation. Its presence demonstrates that the wider area is vulnerable to dissolution-related ground instability, even if such features are infrequent.

Given these conditions, the site should be considered to have a low but credible risk of dissolution-related ground movement, requiring appropriate caution in foundation and drainage design, particularly for any proposals that may alter groundwater or surface-water flow regimes.

2.4 HYDROLOGY

The nearest watercourse is an open “ordinary” watercourse/tributary located c. 130m to the east of the development site and flows south next to the B5306. This watercourse discharges into Distington Beck c. 175m further to the south. Distington Beck is located on the opposite side of the B5306 road and across third-party land. Distington Beck is classified as a “main river” and is therefore regulated by the EA.

2.5 EXISTING SEWERS

The United Utilities sewer records for the development site are included in Appendix A for reference. As can be seen, the records are sporadic with significant gaps in the information. Generally, the area is served by 150mm or 225mm combined sewers, heading towards the east where they discharge into larger 375mm or 450mm public combined sewers. There are separate foul and surface water sewers serving The Chestnuts, but these both discharge into the same 225mm combined sewer.

2.6 DRAINAGE SURVEY INVESTIGATIONS

Due to the lack of information contained in the UU sewer records, RGP instructed Drain Doctor to carry out a drainage investigation and CCTV survey of all the existing sewers in the proposed development areas to verify the size, depth and condition of the existing drainage infrastructure both within the boundary and nearby vicinity.

The survey was undertaken in January 2026, and a copy of the findings is included within the Drain Doctor report[8]. The investigations found significant combined sewer and manhole locations that were not shown on the UU sewer records and was successful in identifying missing drainage runs across the site to verify existing asset locations and routing of pipework that will need to be retained/incorporated as part of the new proposals.

The drainage survey also verified that the existing highways gullies serving public highways are connected to separate highways drainage pipe systems for disposal into the existing open watercourse tributary to Distington Beck, located to the east of the development site. It was noted that there were some sections of existing highways drainage, namely serving Kilnside and Kilnside Place that were heavily silted and could not be accessed or surveyed.

The results from this drainage investigation are summarised on RGP drawing K42601-41, included in Appendix B. This survey record obtained for the area will assist with future detailed drainage design and for any formal S104 sewer adoption agreement with UU that will be required.

2.7 GROUND INVESTIGATION

Geoenvironmental Engineering Ltd (GEO) completed a Phase 2 Ground Investigation in May 2026. Full details of the investigative works are included in their report [9]. The works comprised 15no. dynamic (windowless) sampler boreholes, 5no. falling head permeability tests, 5no. dynamic cone penetrometer tests, in-situ standard penetration testing and geotechnical and chemical laboratory testing. The results from the ground investigation are summarised below.

2.7.1 MADE GROUND DEPOSITS

A thin surface cover of topsoil, typically ranging in thickness between 0.10m to 0.40m was overlying Made Ground which is present across the entire site, which varies significantly in thickness and composition.

The Made Ground typically ranges between 0.30m and 1.40m thick, comprising sandy gravelly clay and gravelly sand with brick and concrete fragments, ash and coal, sandstone and dolerite fragments, plastic and timber fragments, and occasional cobbles.

The greatest thickness of made ground was recorded at WS02, approximately 4.90m, where no natural deposits were encountered before termination and a 1.20m high void was recorded at depth. This indicates a highly variable anthropogenic fill profile typical of previously developed land.

No visual or olfactory evidence of fuel/oil contamination (no staining, odour or free product) or asbestos containing materials (ACM's) was encountered within the Made Ground deposits.

2.7.2 NATURAL DRIFT DEPOSITS

The natural ground is predominantly Glacial Till, with most boreholes encountering varying compositions of sandy gravelly clay, very sandy clay and slightly silty clay. Consistency ranged from soft to very soft locally (particularly WS03 and parts of WS08), although the clays are generally firm to stiff in nature becoming very stiff/high strength with depth.

Frequent sand layers/lenses occur within the Till deposits, again with varying compositions of fine to coarse sand, clayey sand and gravelly sand. A number of localised weaker zones of deposits were identified in WS03 and WS08.

2.7.3 SOLID (BEDROCK) GEOLOGY

The natural bedrock deposits were not encountered during the investigation works.

2.7.4 GROUNDWATER

Groundwater observations were limited but indicate localised water ingresses within the Glacial Till deposits. Recorded water strikes were observed in WS06 at 3.00m, standing at approximately 2.13m below ground level, and WS11 at 3.64m below ground level. Several investigation locations noted "wet" sand deposits and saturated clay/sand horizons. Within the monitoring wells, standing water levels have been recorded in 2 no. positions at depths ranging between 0.99m and 2.76m BGL. Groundwater appears discontinuous and likely associated with granular sand lenses within the Till.

2.7.5 FALLING HEAD PERMEABILITY TESTING

Permeability testing was attempted in 4no. borehole monitoring wells and returned very poor drainage characteristics, typical of practically impermeable clay as detailed in GEO's report [9]. One test (WS08) did yield an erroneous result whereby the input volume of water could not maintain an appropriate head and rapidly discharged in 10 seconds. It is likely that this was due to a void or similar below ground feature associated with the original housing development.

3. ASSESSMENT OF FLOOD RISK

3.1 BACKGROUND

The following risk assessment has been carried out in accordance with the National Planning Policy Framework [1] and its Planning Practice Guidance [2] on Flood Risk. The broad aim of the guidance is to reduce the number of people and properties within the natural and built environment at risk of flooding. To achieve this aim, planning authorities are required to ensure that flood risk is properly assessed during the initial planning stages.

Responsibility for this assessment lies with the developers and they must demonstrate:

- Whether the proposed development is likely to be affected by flooding.
- Whether the proposed development will increase flood risk in other parts of the hydrological catchment.
- That the measures proposed to deal with any flood risk are sustainable.

The developer must prove to the Local Planning Authority and the Environment Agency that the existing flood risk or the flood risk associated with the proposed development can be satisfactorily managed.

3.2 FLOOD RISK TERMINOLOGY

Flood risk considers both the probability and consequence of flooding.

Flood events are often described in terms of their probability of recurrence or probability of occurring in any one year. The threshold between a medium flood and a large flood is often regarded as the 1 in 100-year event. This is an event which statistical analysis suggests will occur on average once every hundred years. However, this does not mean that such an event will not occur more than once every hundred years. Table 3.1 shows the event return periods expressed in years and annual exceedance probabilities as a fraction and a percentage.

For example, a 1 in 100-year event has a 1% probability of occurring in any one year, i.e. a 1 in 100 probability. A 1000-year event has a 0.1% probability of occurring in any one year, i.e. a 1 in 1000 probability.

Table 3.1 Flood Return Periods & Exceedance Probabilities

Return Period (years)	Annual Exceedance Probability (AEP)	
	Fraction	Percentage
2	0.5	50%
10	0.1	10%
25	0.04	4%
50	0.02	2%
100	0.01	1%
200	0.005	0.5%
500	0.002	0.2%
1000	0.001	0.1%

3.3 DATA COLLECTION

The following information was referred to for the Flood Risk Assessment:

- Environment Agency Flood Map for Planning covering the site and adjacent area
- Environment Agency Surface Water Flood Risk Map
- Environment Agency Reservoir Flood Risk Map
- Environment Agency Historic Flood Map
- United Utilities sewer records
- Development layout plan
- Topographic survey

3.4 ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

Figure 3.1 is an extract from the EA's Flood Map for Planning [10]. This map identifies the extent of Flood Zones 2 and 3. Flood Zone 3 (darker blue) is the area that could be affected by flooding up to and including a river flow rate with an annual exceedance probability of 1% or an area that could be affected by flooding from the sea with an annual exceedance probability of 0.5%. Flood Zone 2 (lighter blue) is the area that would be affected by more extreme events with an AEP of 0.1%. Areas which are not coloured are Flood Zone 1, i.e. areas where flooding is highly unlikely. The Flood Map for Planning (Figure 3.1) shows that the site is located entirely within Flood Zone 1. It is considered that the site is not risk of tidal or fluvial flooding.

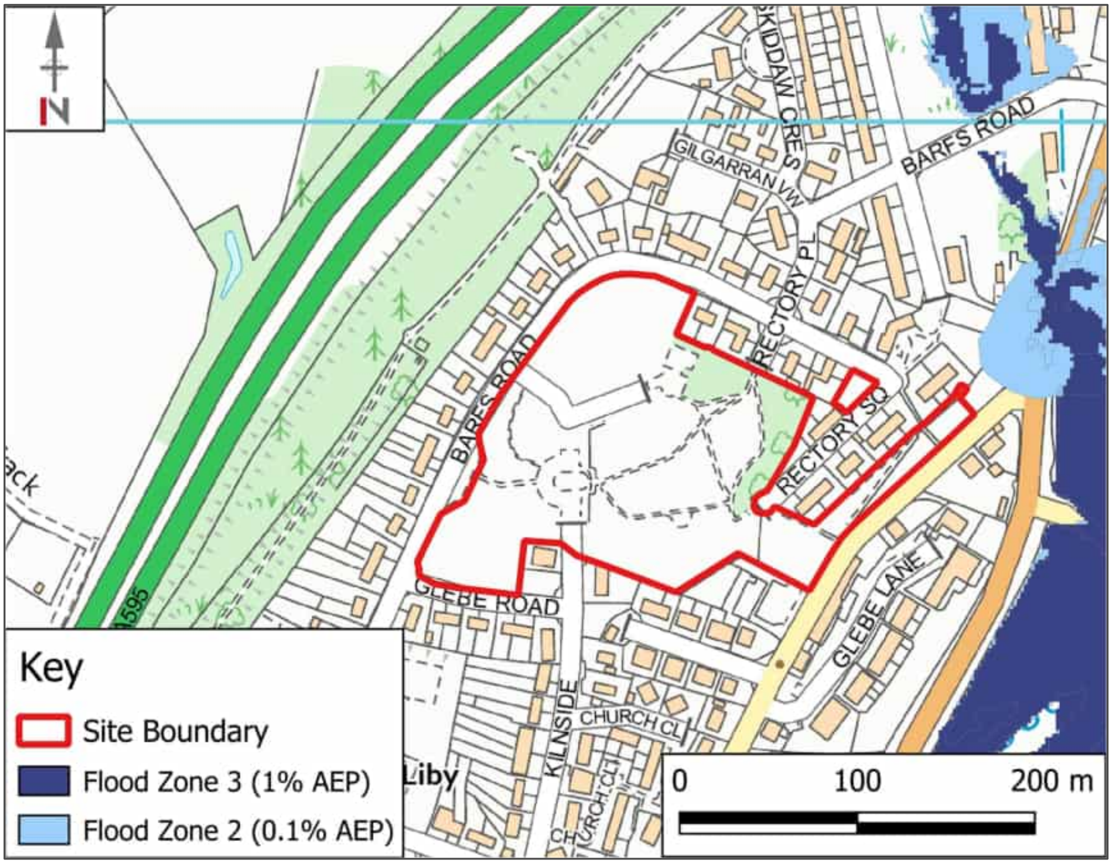

Figure 3.1 Environment Agency Flood Map for Planning

3.5 SURFACE WATER FLOOD RISK

Surface water flooding is that which results from extreme rainfall rather than overflowing rivers. This type of flooding typically occurs when extreme rainfall causes water to run down slopes and collect in depressions in the landscape or where runoff is focussed into an area where drainage is insufficient. It can also cause erosion resulting in the partial or complete blockage of drains or culverts.

Figure 3.2 shows an extract from the EA surface water flood risk map [10]. This has four risk classifications from very low probability (<0.1% AEP) to high probability (>3.3% AEP). The EA's map shows that part of the site has a high probability of surface water flooding in two locations, within the existing section of public highway (Kilnside), and three other locations at low to medium risk of flooding, principally in the landscaped areas and also within Kilnside Place.

As regards the potential for surface water flooding to occur within the existing sections of public highway, this would appear to align with the findings of the CCTV survey, which showed that the existing highways drainage network was heavily silted up and not able to effectively convey runoff from the highways surfaces. Remedial works to address this issue are a discussed in detail in Section 4.7.3, whereby it is proposed to replace and upgrade the existing 150mm pipe with new 225mm and 300mm pipes for enhanced conveyance capacity.

For the landscaped areas at risk of surface water flooding, these would appear to coincide with localised, shallow depressions within the site, where there is insufficient infiltration through the topsoil/subsoil and/or evapotranspiration to effectively drain the runoff. As part of the redevelopment works these depressions would be removed and replaced with new gardens and landscaped areas with improved topsoil/subsoil and appropriate planting.

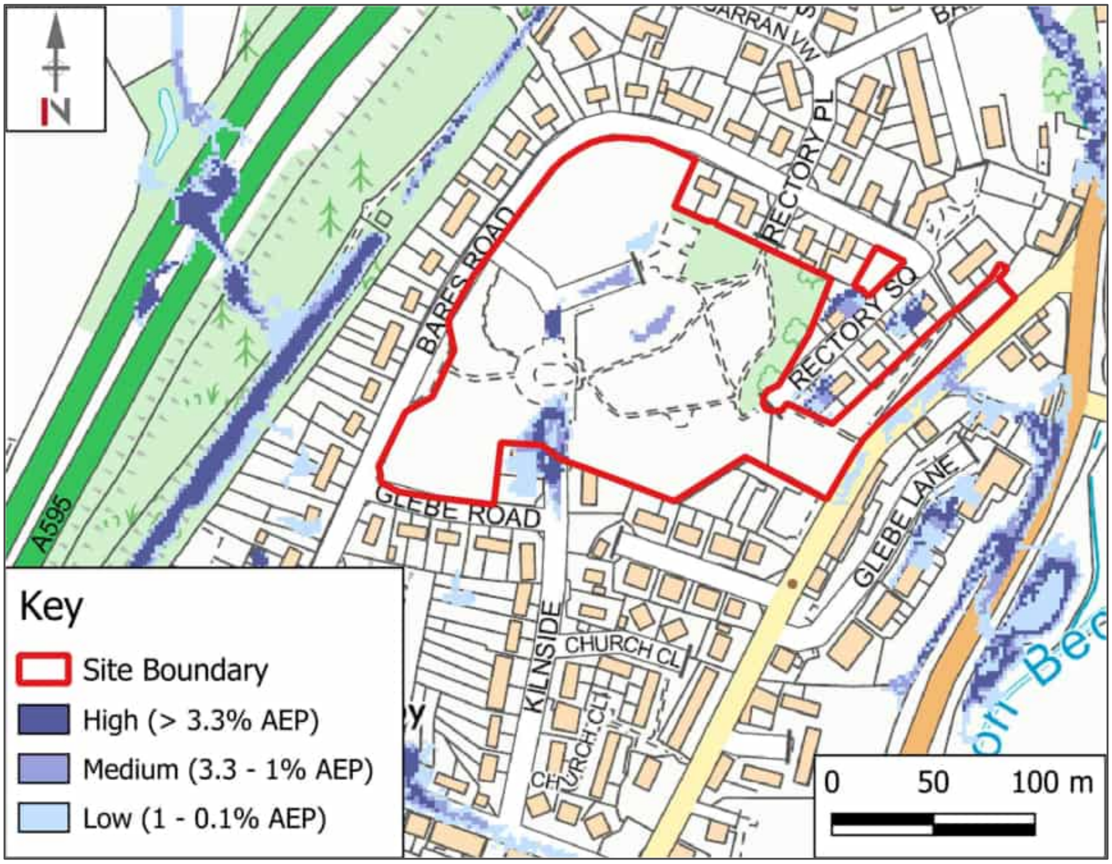

Figure 3.2 Environment Agency Surface Water Flood Map

3.6 GROUNDWATER FLOOD RISK

Groundwater flooding occurs when water levels in the ground rise above the ground. It is most likely to occur in low lying areas underlain by permeable drift and rocks.

There has not been any historical evidence of groundwater flooding at the proposed development site. The proposals do not include below-ground development with no changes to levels proposed throughout the site, it is therefore predicted that groundwater flood risk to the site will be low.

3.7 FLOODING FROM RESERVOIRS, CANALS OR OTHER ARTIFICIAL SOURCES

There are no reservoirs, canals or other artificial sources within the vicinity of the proposed development site.

3.8 FLOODING FROM SEWERS

As discussed in Section 2.5 the United Utilities sewer records are sporadic near the development site. The drainage CCTV survey and investigations have identified an existing 225mm combined sewers running through the development site along the southern boundary that appears to be in good working condition. This information has been passed onto UU and will be added onto their public sewer records in due course. This sewer will not be near any new dwellings (closest will be Plot 14 with rear corner a min. 6.5m from sewer) and as such it is considered that the risk of sewer flooding impacting new properties is low.

3.9 FLOODING FROM HIGHWAYS DRAINAGE

As discussed on Section 2.6, an existing highways drainage system has been identified that takes runoff from existing public highways via existing gullies. The pipe is only 150mm diameter in Kilnside and Kilnside Place and was heavily silted up at the time of the survey. It is considered highly probable that this section of highways drainage has insufficient conveyance capacity and is responsible for the extent of surface water flooding illustrated in the EA flood map (Figure 3.2). It is proposed that this section of highways drainage will be replaced and upgraded to help alleviate the existing flooding in these areas (see Section 4.7.3 for further details).

3.10 HISTORIC FLOODING

There was an area of recorded flooding from Distington Beck to the north-east of the site indicated in Figure 3.3 and Table 3.2 below. The development site is located at a much higher elevation than where this flooding occurred and as such there is a very low risk that the site would be at risk of flooding from Distington Beck.

Table 3.2 Historic Flooding

fid	Name	Start date	End date	Flood src	Flood Cause
Recorded Flood Outlines.11732	Flooding 05_11_1999	Nov 5, 1999, 12:00:00 AM	Nov 5, 1999, 12:00:00 AM	Main River	Channel capacity exceeded (no raised defences)

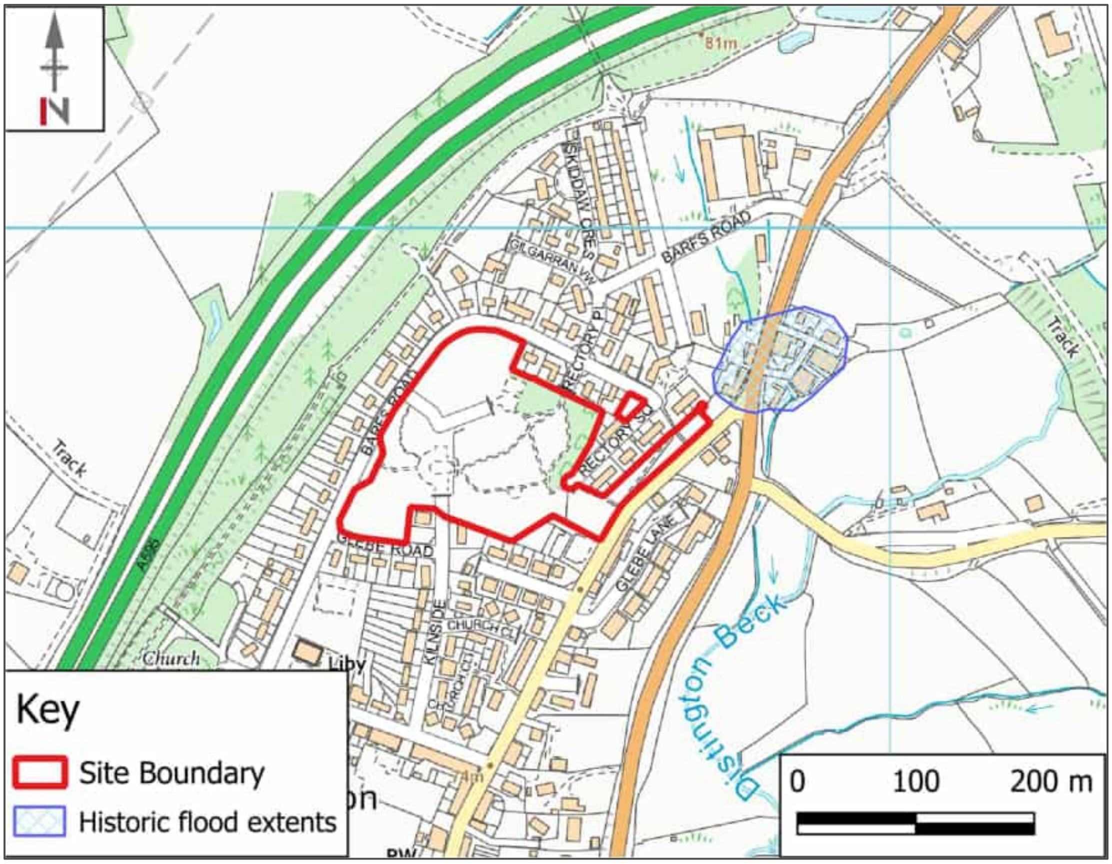

Figure 3.3 Environment Agency Historic Flooding Map

3.11 FLOOD RISK MITIGATION

The risk of flooding from surface water, groundwater, sewers, and other artificial sources are considered to be low and therefore it is recommended that mitigation measures are not necessary in this respect.

In respect to fluvial flood risk, the residential development site has been shown to be located within Flood Zone 1 and is not at risk of fluvial flooding. Therefore, no mitigation is required.

4. SURFACE WATER DRAINAGE STRATEGY & DESIGN

4.1 INTRODUCTION

The principal aim of the following drainage strategy is to design the development to avoid, reduce and delay the discharge of rainfall to public sewers and watercourses in order to protect watercourses and reduce the risk of localised flooding, pollution and other environmental damage.

In order to satisfy these criteria this surface water runoff assessment and drainage design has been undertaken in accordance with the following reports and guidance documents:

- SuDS Manual, CIRIA Report C753, 2015 [11]
- Code of Practice for Surface Water Management, BS8582:2013, November 2013[12]
- Rainfall Runoff Management for Developments, Defra/EA, SC030219, October 2013[13]
- Designing for Exceedance in Urban Drainage – Good Practice, CIRIA Report C635, 2006[14]
- Flood Estimation Handbook (FEH)[15]
- Flood Studies Report (FSR), Volume 1, Hydrological Studies, 1993[16]
- Flood Studies Supplementary Report No 14 (FSSR14), Review of Regional Growth Curves, 1983[17]
- Flood Estimation for Small Catchments, Marshall & Bayliss, Institute of Hydrology, Report No. 124 (IoH 124), 1994[18]
- Department for Environment, Food and Rural Affairs, National Standards for Sustainable Drainage Systems (SuDS), July 2025[19]

The following drainage strategy is based on the latest site layout plan by Architects Plus. Any alterations to the site plan resulting in changes to impermeable areas will require the drainage strategy to be revisited.

4.2 SURFACE WATER DISPOSAL

Surface water disposal has been considered in line with the hierarchy outlined in the SuDS Manual[11]. The approach considers infiltration drainage in preference to disposal to watercourse, in preference to discharge to sewer.

Cumberland Council as Lead Local Flood Authority prefer design in accordance with the Cumbria Design Guide which identifies the following hierarchy of techniques to be used:

- **Prevention**: Prevention of runoff by good site design and the reduction of impermeable areas.
- **Source Control**: Dealing with water where and when it falls (e.g. permeable paving).

- **Site Control**: Management of water in the local area (e.g. swales, detention basins).
- **Regional Control**: Management of runoff from sites (e.g. balancing ponds, wetlands).

4.2.1 COLLECTED FOR NON-POTABLE USE

The national standards for SuDS were updated in July 2025, placing "collected for non-potable use" (i.e. rainwater harvesting) as the highest priority, above "infiltrated to ground." Rainwater harvesting (RWH) involves collecting and storing rainwater (typically from roof areas) for reuse in non-potable applications such as irrigation, toilet flushing, and laundry. While it can reduce reliance on mains water and lower water bills, RWH systems are generally expensive to install, often requiring large underground tanks and pumped distribution systems.

Most commercially available RWH systems provide minimal additional storage for attenuation, meaning they offer limited benefit in terms of SuDS performance. In Cumbria, tanks are also likely to be full at the onset of a storm, and without an automated drawdown mechanism to create pre-event capacity, they cannot function as effective attenuation features. For RWH to contribute meaningfully to SuDS, it must be paired with a consistent, frequent non-potable demand that keeps the tank sufficiently empty to accommodate new rainfall. Where water use is low or intermittent, the system cannot reliably provide attenuation.

Given the nature of the proposed affordable housing development, the budget constraints, and the limited attenuation benefit offered by RWH, it is concluded that RWH is not a suitable option for this site. Additionally, the Environment Agency does not classify Distington as a "seriously water-stressed" area, so the use of RWH is not considered necessary or appropriate in this context.

4.2.2 DISCHARGE TO GROUND

The underlying ground conditions identified at the site and permeability testing undertaken by GEO has indicated that the ground is not suitable to facilitate soakaway drainage. For further information refer to Section 2.7.

In addition, as the existing hardstanding areas of the site and former residences were known to be positively drained and connected to the existing combined public sewers in the vicinity for conveyance/disposal, this also indicates that soakaways are not a viable drainage solution.

4.2.3 DISCHARGE TO WATERCOURSE, SURFACE WATER OR HIGHWAYS DRAIN

As discussed in Sections 2.5 & 2.6 there are no separate public surface water sewers in proximity to the site that would be suitable for discharge of attenuated surface water from the proposed development.

As discussed in Section 2.6 there is an existing highways drainage system running through the development site, but this is not suitable for connection due to the poor condition, lack of capacity and lack of depth (to facilitate a gravity connection from a below-ground attenuation tank).

Disposal of attenuated surface water to the nearest watercourse is therefore considered the most feasible option. The nearest watercourse is the ordinary watercourse located c. 130m to the east of the development site as identified in Figure 4.1 below. Note the tracing dye in water from drainage survey, undertaken in January 2026, confirming point of discharge for existing highways drainage system serving upstream public highways network.

Figure 4.1 Ordinary watercourse located to east of the development site

4.3 PRE-APPLICATION CONSULTATIONS WITH LLFA & UU

Due to the complexity of the existing drainage infrastructure identified during the January 2026 investigation work, RGP arranged a consultation with both Cumberland Council Lead Local Flood Authority officers and United Utilities Engineers. The first meeting was held on 29th April 2026 and the principal aim was to establish which sections of drainage infrastructure were owned by United Utilities (i.e. under the Transfer of Private Sewers Regulations 2011) and which sections were owned by Cumberland Council (i.e. as part of the public highways drainage network).

During and post- the meeting UU have confirmed the following:

- UU do not consider the surface water network in the vicinity to be their asset as it only conveys highways drainage.
- UU do consider the existing combined sewer drainage to be a transferred asset and will update the sewer records to reflect the investigations – subject to further review of the CCTV. UU would undertake further investigations where required.

- UU would have no objection to receipt of foul flows from the proposed development to the combined sewer, subject to a S106 application.

- UU would not accept new surface water connections from the development into the combined sewer based on the presence of a known surface water system in the vicinity, despite the existing surrounding and former (now demolished) plot surface water connections to this combined sewer without strong justification as to why it would be required.

- UU do not require S116 abandonment applications for any relic sewers that are not currently shown on the records.

- UU would potentially adopt any new separate surface water system subject to design in accordance with S104 adoptable criteria, as long as the system was conveying the domestic run off from the site.

- UU would also potentially adopt any new surface water conveyance pipework receiving flows from any new private surface water drainage system serving the development through to outfall to the watercourse located to the east – subject to design in accordance with S104 adoption criteria.

During the meeting the following items were discussed with Cumberland Council LLFA:

- All existing surface water drainage linked to the existing public highways is considered to be public highways drainage, maintained by Cumberland Council. However, where this highways drainage crosses over into private/Home Group land the LLFA consider this drainage to then be under riparian ownership and would fall under the landowner's responsibility for future maintenance. RGP have challenged this claim and have requested that the LLFA speak to their legal department and Highways team to provide justification for this.

- Any new surface water connections to this highways drainage pipework, regardless of location would trigger capacity calculations of the existing network to ensure there is sufficient capability to receive additional flows.

- Any additional required drainage investigations to determine contributing catchment connections and pipe modelling requirements as part of the above would be Home Group's responsibility and at their own expense.

- Cumberland Council would expect the new development roads to be offered for adoption under a S38 Agreement. Amendments to existing public highways would likely require a S278 Agreement.

- Any new separate surface water drainage system serving the new development would be expected to store a 1 in 100yr + Climate change event with suitable attenuation and controlled discharge to match the equivalent Greenfield QBAR rate.

- Only if the above scenario is proven not to be achievable, a consideration of an assessment whereby a 50% min. betterment on the previously demolished Brownfield development QBAR rate would be considered.

A follow-up meeting was held with UU and the LLFA on 29th June 2026 to discuss and agree in principle the proposed drainage solution and adoption of the proposed off-site surface water sewer. Additionally, the ownership of the existing highways drainage system was further discussed with the LLFA and clarification sought from Cumberland Council's legal representative.

4.4 PRE-DEVELOPMENT RUNOFF ASSESSMENT

The pre-development Greenfield runoff assessment has been undertaken in accordance with the latest Flood Estimation Handbook (FEH) Statistical Method[15], updated in 2025, which introduced significant changes to hydrological analysis in the UK, focusing on better representing current catchment conditions through updated datasets and recalibrated models. This impacts how greenfield runoff rates (the baseline flow from undeveloped land used in SuDS design) are calculated. The updated calculation has been undertaken using the Greenfield runoff rate estimation tool provided by HR Wallingford (www.uksuds.com). The assessment is based on the total development site area (28,383m^2) less the proposed BNG landscaped area located along the eastern boundary and any section of existing public highway located within the development area. This provides a total area of 21,232m^2 to be used for the pre-development Greenfield runoff assessment. A copy of the calculations is presented in Appendix C and summarised below in Table 4.1.

Table 4.1 Pre-Development Greenfield Runoff Rates

Rate of Runoff (l/s)	
Event	**Greenfield**
Q1	24.3
QBAR	**27.9**
Q10	38.6
Q30	47.5
Q100	58.1
Q200	66.2

Despite there being previous houses and roads on the site (i.e. Brownfield development) the site area has been classified as Greenfield for the purposes of deriving the runoff calculations. This approach is highly conservative as the peak runoff rate from the former residential estate would have been significantly higher than the greenfield runoff rate calculated.

The proposed discharge rate matching the equivalent Greenfield QBAR runoff of 27.9 l/s is a considerable improvement on the rate of discharge that would previously have occurred when the site was occupied by housing which was positively drained at an unrestricted brownfield rate into the combined sewer network and highways drainage system.

4.5 SURFACE WATER DRAINAGE DESIGN PARAMETERS

The surface water drainage system has been designed on the following basis using the modified rational method and a generated rainfall profile:

4.5.1 CLIMATE CHANGE

Projections of future climate change indicate that more frequent short-duration, high intensity rainfall and more frequent periods of long-duration rainfall are likely to occur over the next few decades in the UK. These future changes will have implications for river flooding and for local flash flooding. These factors will lead to increased and new risks of flooding within the lifetime of planned developments.

The EA have provided a peak rainfall online map showing the anticipated changes in peak rainfall intensity across the UK. Climate change allowances are now provided on a catchment-by-catchment basis. The site falls within the South West Lakes catchment. Table 4.4 outlines the EA guidance for this catchment, for the anticipated design life of the proposed development.

Table 4.2 South West Lakes Management Catchment Peak Rainfall Allowances (1.0% AEP)

South West Lakes (1.0% AEP)	Central Allowance (%)	Upper End Allowance (%)
2050s	30	45
2070s	35	50

In line with current guidance and for conservative design, a 50% allowance shall be used within this assessment.

4.5.2 URBAN CREEP

BS 8582:2013[12] outlines best practice with regard to Urban Creep. Although not a statutory requirement, future increase in impermeable area due to extensions and introduction of impervious positively drained areas has been considered. An uplift of 10% on impermeable areas associated with plots only has been applied to the contributing area used for surface water drainage design.

4.5.3 PERCENTAGE IMPERMEABILITY (PIMP)

The percentage impermeability (PIMP) for all impermeable areas is modelled as 100%. The entirety of the impermeable areas is to be positively drained.

4.5.4 VOLUMETRIC RUNOFF COEFFICIENT (CV)

The volumetric runoff coefficient describes the volume of surface water which runs off an impermeable surface following losses due to infiltration, depression storage, initial wetting and evaporation. The coefficient is dimensionless. Default industry standard volumetric runoff coefficients are 0.75 for summer and 0.84 for winter.

A winter runoff coefficient of 1.0 has been used in the surface water drainage design. This is higher than the default industry standards and provides a further factor of safety within the hydraulic design.

4.5.5 RAINFALL MODEL

The calculations use the REFH2 unit hydrograph methodology in line with best practice as outlined in the SuDS Manual[11]. The calculations use the most up to date available catchment descriptors (2022) provided by the Centre for Ecology and Hydrology Flood Estimation Handbook web service.

4.5.6 CONTRIBUTION OF RUNOFF FROM PERMEABLE AREAS

Post-development, the runoff contribution from permeable/undrained gardens and landscaped areas that fall towards driveways/roads and potentially contribute to a new drainage system must be assessed to ensure the drainage network is designed appropriately.

Runoff coefficients for permeable surfaces vary significantly with soil type, slope gradient, planting type, antecedent moisture, infiltration capacity, local depressions, and wider site conditions. There is no industry-wide consensus on values, with typical coefficients for gardens and landscaping ranging from 0.1 to 0.5. Applying a coefficient of 1.0 would be inappropriate, as it would disregard the natural interception, attenuation and storage benefits that permeable areas provide during extreme rainfall events. To establish a more representative value, it is proposed that the Base Flow Index (BFI), derived from the UK Hydrology of Soil Types (HOST) classification within the FEH Web Service, is used as an inverse proxy for surface runoff intensity from permeable/undrained areas. A higher BFI indicates greater catchment storage and slower, lower-intensity runoff. Accordingly, the runoff coefficient decreases as BFI increases, and vice versa.

On this basis, 30% of the permeable areas that falls towards potential intercepting drainage components could contribute to the drainage network and as such have been included within the catchment area draining into the new surface water drainage system. This includes all front and rear gardens serving the dwellings and some areas of landscaping/POS located adjacent to proposed areas of positively drained hardstanding.

The catchment assessment is further complicated by the requirement to apply a 10% uplift to all roof areas to account for Urban Creep. Extensions, widened driveways, and enlarged patios typically encroach into garden areas, reducing the effective permeable area within each property's curtilage. This reduction has been incorporated into the revised calculations, and the corresponding overall drained areas contributing to the drainage network have been included in Table 4.5 for reference.

4.6 ASSESSMENT OF SITE AREAS & CATCHMENT PLAN

To support the exploration of options for site drainage, the spatial extent of different types of proposed land cover on the site have been measured. Table 4.3 shows the measured proposed land cover areas. Note that the +10% urban creep contribution is included in these calculations for all impermeable areas associated with the plots (roofs, footpaths, patios and driveways). A drawing summarising these land cover areas is included in Appendix B for reference.

Table 4.3 Land Cover Areas

Land Cover Type	Area		Percentage of total site area
	m²	Ha	
Dwelling roofs	3,686.8	0.369	13%
Footpaths & patios	3,058.4	0.306	11%
Driveways	2,259.7	0.226	8%
Front & rear gardens	4,069.6	0.407	14%
Private access road, footways & visitor parking	2,482.0	0.248	9%
Adopted highway & footway	705.1	0.071	2%
Existing public highways & footways	1,597.1	0.160	6%
Remaining landscaping / POS /BNG	10,524.3	1.052	37%
Total	**28,383.0**	**2.838**	**100%**

To develop the detailed drainage design, only certain surfaces and areas will be positively drained into the surface water network. Positively drained areas include roof areas, patio /paved areas, car parking, access road and footways. Front and rear gardens will have a permeable surface and will have no positive drainage system. However, as discussed in Section 4.5.6 runoff from some of these permeable areas may potentially contribute to the drainage network. As such, a runoff contribution of 30% has been factored into the catchment calculations for gardens and landscaping that may runoff into the drainage network.

Existing public highways and new sections of adoptable highway (i.e. through Kilnside and the extension Kilnside Place) will drain into the existing and upgraded highways drainage system and will therefore not contribute to the proposed new surface water drainage system serving the development site.

On this basis the total drained catchment area contributing to the new private surface water drainage system and geocellular attenuation tanks has been calculated and is summarised in Table 4.4 and the. The total catchment area is represented in the Surface Water Drainage Catchment Plan included in Appendix B.

Table 4.4 Summary of total catchment areas contributing to the surface water drainage system

Land Cover	Area		Percentage of total site area
	m²	Ha	
Total area contributing	12,319.8	1.232	43.4%
Total area not contributing	16,063.2	1.606	56.6%
Total	**28,383.0**	**2.838**	**100%**

4.7 SURFACE WATER DRAINAGE DESIGN

The proposed surface water drainage network serving the development has been modelled using Causeway FLOW and the output files area included in Appendix D for reference.

4.7.1 PRIVATE DRAINAGE SYSTEM & GEOCELLULAR TANKS

The private surface water drainage design has been sized to store a future 1% AEP event of critical duration without any flooding. Future climate change (50%), urban creep (10%) and runoff contribution from permeable areas (30%) are all accounted for within the calculations.

Based on the site constraints 2no. linear geocellular attenuation tanks are proposed to provide the surface water storage requirements for the development. The tanks will be located below the proposed new private highway accessed off Rectory Place.

Silt trap manholes with in-built sumps will be located upstream of each attenuation tank, and will provide surface water treatment and access for maintenance. Silt traps isolate silt and other particles by encouraging settlement into sumps, preventing ingress into the tank.

The attenuation tanks will be founded at the same level providing a minimum depth of cover of 1m below the new private access road. The tanks will be wrapped and sealed with an impermeable membrane to provide a water-tight structure. Each tank discharges directly into the flow control chamber via separate 300mm dia. pipes, which allows the tanks to effectively act as a single attenuation storage system. The total volume of on-site storage provided (not including storage in pipes or manholes) is 752m^3. A summary of the geocellular attenuation tanks is included in Table 4.5.

Table 4.5 Summary of geocellular tanks

Tank No.	Length (m)	Width (m)	Depth (m)	Plan Area (m^2)	Storage Volume provided (m^3)
1	37	4.5	1.6	166.5	253
2	73	4.5	1.6	328.5	499
				Total	**752**

The flow control chamber will restrict discharge from the geocellular attenuation tanks with a maximum offsite discharge rate of 27.9 lit/sec, equalling the pre-development greenfield QBAR rate. The specification for the suggested flow control device is as follows:

- Type = HydroBrake Optimum by Hydro International
- Design Head = 2.40 m
- Design Flow = 27.9 lit/s
- Orifice diameter = 209 mm
- Unit Reference: SHE-0209-2790-2400-2790

Registered Office: RG Parkins & Partners Ltd, Meadowside, Shap Road, Kendal, LA9 6NY
Registered in England & Wales - Company number 04107150

Roof runoff, driveways, footpaths and contributing green area runoff will connect directly via conventional below-ground pipework into the new surface water drainage system upstream of the attenuation systems. Inspection chambers will be utilised to route the new pipework and allow for future inspection and maintenance. Proposed external levels will fall consistently to enable gravity connections to the drainage system.

The new private access road will be constructed using conventional surfacing in the form of asphalt and will be drained via. a series of highway gullies into the proposed surface water drainage network. Driveways and visitor car parking areas will be block paved and will drain via channel drains into the pipe network.

Full details of the drainage proposals are shown on the RGP drawings included in Appendix B.

4.7.2 ADOPTED OFFSITE SURFACE WATER SEWER

It is proposed that the offsite 225mm dia. by 163m long surface water sewer and associated outfall into the downstream ordinary watercourse will be adopted by United Utilities under a S104 Agreement. The principle of this solution was discussed and agreed with UU in the consultation meeting held on 29th June 2026.

4.7.3 ADOPTED HIGHWAYS DRAINAGE

As discussed on Sections 2.6 and 3.9, an existing highways drainage system has been identified that takes runoff from existing public highways via existing gullies in Barfs Road, Kilnside and Kilnside Place. The total area from existing public highways and footways draining into this highways drainage system has been estimated to be approx. 2000m^2 which equates to a run-off rate of approx. 70 lit/sec for Q30 storm event. The pipe is only 150mm diameter and laid at a very flat gradient (approx. 1 in 141). Using the Colebrook White formulation, the hydraulic capacity of the existing pipe is approx. 15.2 lit/sec with a velocity of 0.86 m/s for a pipe flowing full. Self-cleansing velocity should be > 1 m/s for an effective drainage system, which explains why the pipe has become blocked. The existing system is also significantly undersized to take the run-off from the existing highways network.

It is therefore proposed that the existing highways drainage system running through Kilnside and Kilnside Place will be upgraded and replaced with new 225mm and 300mm dia. pipes laid at suitable gradient to provide enhanced conveyance capacity and self-cleansing velocity. The hydraulic capacity of the proposed new pipes has been calculated, and the results summarised in Table 4.6 below. Supporting calculations are included in Appendix E for reference.

Table 4.6 Summary of hydraulic capacity of existing and proposed highways drainage

Pipe Size (mm)	Length (m)	Gradient (1 in x)	Velocity (m/s)	Discharge (l/s)
150	67.5	141	0.86	15.2
225	37	118	1.22	48.4
300	67.5	182	1.17	83.0

It can therefore be seen that the new 300mm dia. pipe will have over five times the capacity of the existing system and will be sufficient to convey the runoff from both the existing public highways and proposed new sections of new highway

4.8 OTHER BENEFITS OF DEVELOPMENT

The development site in its current form is sparse vegetation, underlain by relatively impermeable soil, which provides little in the way of natural flood defence or attenuation to overland flows and stormwater runoff. The land in its current form also lacks any meaningful biodiversity or amenity value and provides limited benefits to the surrounding community.

The proposed development site will tie into the existing topography via careful design. Slopes, gardens and open space areas will be carefully landscaped using a variety of plants, shrubs and trees, providing a net gain in biodiversity and enhanced storage/protection against overland flows.

As such the existing hydraulic regime of the site will be modified whereby overland and subsurface flows will be intercepted, attenuated, and re-directed by below ground structures, positive drainage and service trenches.

As noted in Section 4.4, the new development will significantly reduce the rate of surface water runoff for storms in excess of the predevelopment Greenfield QBAR. Hydraulic gradients and velocities will be reduced, and the risk of downstream flooding would not be increased.

4.9 DESIGNING FOR LOCAL DRAINAGE SYSTEM FAILURE

In accordance with the general principles discussed in CIRIA Report C635 – Designing for Exceedance in Urban Drainage [14] the proposed surface water drainage, where practical, should be designed to ensure there is no increased risk of flooding to the proposed dwellings on the site or elsewhere as a result of extreme rainfall, lack of maintenance, blockages or other causes. These measures are discussed below.

4.9.1 BLOCKAGE & EXCEEDANCE

The sustainable drainage system has been designed to attenuate a 100-year design storm including a 50% allowance for climate change, with no flooding. The drainage system will also provide capacity for lower probability (greater design storm events) which are not critical duration.

Should flooding occur within any of the flow control device, manholes or silt traps, exceedance flows would follow the road gradients, re-entering the network via capture from the proposed new road gullies. In the highly unlikely event that exceedance flows were to bypass any of the proposed development, drainage flows would migrate towards the existing site highway where they would be contained and intercepted by existing road gullies.

A Surface Water Drainage Exceedance Plan is included in Appendix B for reference.

4.9.2 SURFACE STORAGE & EXTERNAL LEVELS

The site levels have been designed to offer additional surface water storage volume and conveyance of flood water should the SuDS and drainage system fail, flood or exceed capacity.

Where appropriate, the kerb lines have been raised to channel surface water runoff back into the drainage system or onto the existing highway.

4.9.3 BUILDING LAYOUT & DETAIL

The finished floor levels to the new dwellings have been designed and situated to ensure that they are not at risk of flooding from overland flow. Finished floor levels will typically be set 150mm above external paved areas (whilst providing level access where needed). External footpaths typically fall away from the thresholds, ensuring that any flood water runs away from, rather than towards the dwellings. Threshold drains could be incorporated at level access points for additional redundancy.

4.9.4 DRAINAGE CONTINGENCY

The proposed surface water system will be designed to provide adequate storage volume against flooding for the Q100 event, including a 50% allowance to account for climate change. The drainage system will also provide capacity for lower probability (greater design storm events) which are not critical duration.

4.10 SURFACE WATER TREATMENT

The treatment of surface water is not a statutory requirement. Water quality remains a material consideration but there are no prescriptive standards to be imposed in terms of treatment train management. In the absence of a design standard, the SuDS manual has been used which outlines best practice.

Pollutants such as suspended solids, heavy metals and organic pollutants may be present in surface water runoff, the quantity and composition of the runoff is highly dependent upon site use. For housing developments, the pollutant load is very low. The SuDS Manual[11] outlines best practice with regards to treatment of surface water by SuDS components prior to discharge to the environment. SuDS components can be effective in reducing the amount of pollutants within the surface water discharged and therefore environmental impact of the development. SuDS components may be installed in series to form a treatment train to treat the runoff.

For the three categories of runoff areas served by the drainage system (e.g. roof areas, residential parking and residential roads), treatment is proposed by directing all surface water runoff via. a hydrodynamic vortex separator before discharge off site to the downstream ordinary watercourse. Tables 4.7-4.9 summarise the pollution hazard and mitigation indices for this type of runoff and show that adequate treatment of surface water runoff is provided by the use of a hydrodynamic vortex separator (or similar device) which removes sediments, oils and floatables from the site stormwater runoff.

Table 4.7 Pollution Hazard & Mitigation Indices - Roof Areas

Indices	Suspended Solids	Metals	Hydrocarbons
Pollution Hazard	0.2	0.2	0.05
Pollution Mitigation	0.5	0.4	0.8
Treatment Suitability	**Adequate**	**Adequate**	**Adequate**

Table 4.8 Pollution Hazard & Mitigation Indices - Parking Areas

Indices	Suspended Solids	Metals	Hydrocarbons
Pollution Hazard	0.5	0.4	0.4
Pollution Mitigation	0.5	0.4	0.8
Treatment Suitability	**Adequate**	**Adequate**	**Adequate**

Table 4.9 Pollution Hazard & Mitigation Indices - Road Areas

Indices	Suspended Solids	Metals	Hydrocarbons
Pollution Hazard	0.5	0.4	0.4
Pollution Mitigation	0.5	0.4	0.8
Treatment Suitability	**Adequate**	**Adequate**	**Adequate**

4.11 OPERATIONS & MAINTENANCE RESPONSIBILITY

The drainage systems will be privately maintained by Home Group. A SuDS '*Operations & Maintenance Plan'* has been prepared by RGP detailing the requirements for future maintenance of the SuDS components.

5. FOUL WATER DRAINAGE STRATEGY

It is proposed that foul water from the new development shall be drained via gravity within the site for disposal via multiple connections to the existing public combined sewer network located within the existing site boundary and/or adjacent public highways.

The new connections will be subject to formal application to UU under S106 agreements. Under Section 106 of The Water Industry Act 1991, '*the owner / occupier of any premises shall be entitled to have his drain or sewer communicate with the public sewer of any sewerage undertaker and thereby to discharge foul water and surface water from those premises or that private sewer*.' Unless '*the making of the communication would be prejudicial to the undertaker's sewerage system'*.

All private drainage will be constructed in accordance with The Building Regulations Approved Document Part H.

Foul water discharge calculations have been undertaken for the 61 no. dwellings in accordance with the Design and Construction Guidance for Foul and Surface Water Sewers [20], as shown in Table 5.1.

Table 5.1 Peak Foul Flow Rates

Sewerage Sector Design & Construction Guidance Clause B3.1	
Total Peak Load based on Number of Dwellings, 61 no. units @ 4000 l/day	244,000
Peak Flow Rate from Site (l/s)	2.82

The estimated cumulative total peak foul flow rate for the development is 2.82 litres/sec.

These flows will be split up across the site via multiple local connections to the existing combined sewer network to locally suit areas of the development.

For further details of the proposed foul water drainage strategy refer to the Outline Foul & Surface Water Drainage Plans included in Appendix B.

6. CONCLUSIONS AND RECOMMENDATIONS

The proposed Flood Risk Assessment and Drainage Strategy can be summarised as follows:

- The EA Flood Map for Planning shows the site lies within Flood Zones 1 and predicts it is at very low risk of tidal/fluvial flooding.

- The EA Surface Water Flood Map shows that three locations within the existing public highways (Kilnside and Kilnside Place) have a medium to high probability of surface water flooding. It is surmised that this is likely due to the inadequate and undersized drainage system serving the highways. Two other locations are shown to be at low to medium risk of flooding in the landscaped areas relating to localised depressions in the POS.

- Ground investigations undertaken for the development have confirmed that the underlying natural strata offers very poor soakaway potential for infiltration drainage systems. The presence of soluble bedrock (limestone) also means that localised subsidence or dissolution-related degradation could occur where there is elevated subsurface water movement (e.g. resulting from infiltration-based drainage).

- Drainage investigations have confirmed the presence of existing combined sewers and highways drainage systems running through the site. Pre-Planning consultation meetings have been held with United Utilities and the Lead Local Flood Authority to discuss and agree in principle the proposed drainage strategy for the development.

- Rainwater harvesting is not considered appropriate for this development.

- The nearest watercourse is an open "ordinary" watercourse/tributary located c. 130m to the east of the development site and flows south next to the B5306. This watercourse discharges into Distington Beck c. 175m further to the south. It is proposed that attenuated surface water runoff from the development will discharge into this ordinary watercourse.

- It is proposed that surface water drainage shall be positively drained and stored in two large, linear geocellular attenuation tanks with offsite discharge restricted to the pre-development Greenfield QBAR rate of 27.9 lit/sec using a proprietary vortex flow control device.

- Foul water flows generated from the development shall discharge via gravity to the existing public combined sewers via several new connections and manholes. The peak wastewater flow from the development site is estimated to be 2.82 lit/sec.

- A SuDS Operations and Maintenance Plan has been prepared detailing future maintenance requirements of all sustainable drainage systems.

7. REFERENCES

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