BECKWITH
& HANLON

September 2025

Flood Risk Assessment

24-002-002 Residential Development, Land Off Low Road,
Cockermouth
Prepared for Fitz Park Properties Ltd

beckwithandhanlon.com

Revision	Description	By	Checked	Date
P4	Updates to Sequential and Exception Tests	JM	MH	19.05.25
P5	Flood Modelling updated	JM	MH	20.08.25
P6	Appendix I updated	JM	MH	01.09.25

CONTENTS

Executive Summary

Description

Beckwith and Hanlon Consulting Engineers Limited (B&H) were commissioned by Fitz Park Properties Ltd in August 2024 to undertake a Flood Risk Assessment (FRA) for a proposed 47-unit residential development on greenfield land adjacent to Fitz Park, Cockermouth. This report will be provided as supporting documentation as part of a planning application.

Site Parameters

Total Area: 4.37 Ha

Greenfield: ✓

Brownfield: **X**

Mixed Green and Brownfield: **X**

Existing Runoff Location: Existing ground

Ground Conditions: Alluvium

Ground Contamination: Low

Ground Infiltration Potential: Low

Flood Risk Assessment

Site is located within Flood Zone 2

Pluvial: Low

Groundwater: Medium-Low

Other sources: N/A

Sequential Test: Required

Drainage Strategy

The proposed surface water drainage for the site will be designed to discharge into the existing unnamed watercourse to the west of the site a maximum restricted discharge of 5.9 l/s/ha as approved through previous planning permissions relating to this site. The design will accommodate up to a 1 in 100-year critical storm event plus 50% climate change and 10% urban creep with on-site attenuation provided. Attenuation is provided by oversize pipes and attenuation tanks.

Conclusions

The proposed development will have a low to very low risk of flooding from rivers and sea, surface water, reservoirs and sewers and will discharge at a controlled, restricted rate as agreed through the planning process.

This Flood Risk Assessment has confirmed that the proposed development is appropriate and sustainable in the terms as set out in NPPF.

Contents

Appendices

1.0 Introduction

Beckwith and Hanlon Consulting Engineers Limited (B&H) were commissioned by Fitz Park Properties Ltd in August 2024 to undertake a Flood Risk Assessment (FRA) for a proposed 47-unit residential development on greenfield land adjacent to Fitz Park, Cockermouth. This report will be provided as supporting documentation as part of a planning application.

The objective of this FRA is to identify flooding or surface water management issues relating to the development site and identify suitable flood mitigation measures, if required. The assessment will be based upon existing available information and will aim to identify if the site is affected by current or future flooding and whether the development will increase flood risk elsewhere.

The objectives of this report are as follows:

- Identify existing site drainage characteristics
- Describe and assess the proposed development
- Assess the flood risk in accordance with the Department for Levelling Up, Housing and Communities (DLUHC) Technical Guidance and the National Planning Policy Framework (NPPF February 2025).
- Consider any existing information provided through discussions with the Environment Agency (EA), the Lead Local Flood Authority (LLFA) and Water Authority to identify any mitigation measures required.

2.0 Existing Site Information

Site Location

The proposed development site is located on land adjacent to Fitz Park, Cockermouth. The subject site has an approximate developable area 4.37 ha and is centred on National Grid Reference NY 10812 30778.

Please refer to the Site Location Plan in **Appendix A**.

Site Description

The site is an irregular shaped parcel of greenfield land and will be accessed off Low Road to the north.

The boundaries of the site are formed as follows:

Northern boundary – The north of the site is bounded by Low Road.

Eastern boundary – The eastern boundary of the site is bounded by a small, landscaped buffer field with Fitz Park beyond.

Western boundary – The western boundary is formed by an unnamed watercourse with residential development beyond.

Southern boundary – The south of the site is formed by the same unnamed watercourse with woodland beyond.

General Background

The site was previously located in Flood Zone 2 and has been subject to a previous planning application, (refer Planning Ref. nos. 2/2017/0312, CON/2017/0312) which approved works to raise the land into Flood Zone 1 to provide a suitable development platform level of 40.7m AOD. These works also involved providing compensatory storage in land to the east referred to as Fitz Park to offset the raising of the development site.

The proposals are to raise the development site in two stages, Stage 1 would raise the site to 40.5m and lower the compensatory storage area to the east of the site to 40.0m AOD to provide a suitable development platform for the proposed residential development and provide additional flood protection to the site by moving the Flood Zone 2 further east. Hydraulic modelling of this system carried out by others in 2018 (refer Planning Ref. nos. 2/2018/5037 and CON/2023/0018) based on

River Derwent model information provided by the Environment Agency confirmed raising the site would raise the land into Flood Zone 1.

Stage 2 was proposed to further raise the land to 40.7m AOD by importing material to further elevate the development site above the predicted Flood Zone 2 level to improve future flood resilience.

A review of the existing site levels has been carried out and this indicates that the western side of the development site has been raised to 40.7m AOD with a 1 in 3 batter down to existing levels on all boundaries. Approx. 0.25 acres of the eastern field has also been raised to 40.70m AOD to secure the planning permission in perpetuity.

The proposed platform levels and adjacent topographical survey can be used to determine proposed site levels whilst taking into consideration the flood risk associated with the scheme and the proposals.

Refer to **Appendix A** which includes a drawing indicating the land raising and compensatory storage areas.

Existing Ground Conditions

The geology of the site has been ascertained by making reference to the 1:50,000 British Geological Survey (BGS) website;

The BGS website states that the bedrock comprises of "Hope Beck Formation – Mudstone and siltstone. Sedimentary bedrock formed between 477.7 and 465.5 million years ago during the "Ordovician period."

The superficial deposits recorded at the site compromise of "Alluvium-Clay, silt, sand and gravel" which is described as: *"Sedimentary Superficial Deposits formed between 11.8 thousand years ago and the present during the Quaternary Period.*

The Governments online flood risk maps show that Surface Water Low Risk flooding is predicted along the western and southern boundaries of the site associated with the unnamed watercourse which flows beneath Fitz Bridge to confluence with the River Derwent. There is also a zone of predicted High Risk flooding towards the northwest of the proposed residential site which appears to be associated with a small area of marginally lower ground elevation. Similarly, an area of Low-Risk flooding is identified in the eastern section of the site which is associated with an area of lower elevation. The risk to the residential site will be removed following the construction of the compensatory flood storage area and the creation of the development platform.

The Governments on-line flood risk maps confirm that flooding from groundwater and or reservoirs is unlikely.

Online EA groundwater vulnerability mapping indicates that the site is located within an area of medium-low groundwater vulnerability and where solution features that enable rapid movement of a pollutant may be present. These areas are defined as 'Areas that offer some groundwater protection'.

EA aquifer designation mapping indicates that the underlying solid strata to be classified as a Secondary bedrock aquifer.

Online BGS 'Soilscape' data records the development area as being within an area of '*slowly permeable seasonably wet slightly acid but base-rich loamy and clayey soils*' and indicates the drainage to ground to be 'impeded'.

Existing Sewer Infrastructure

United Utilities (UU) sewer record plans have been obtained for the site and can be found in **Appendix C**. The plan indicates that there is a combined sewer in private land to the north of Low Road. A review of The Allerdale Strategic Flood Risk Assessment Level 1 and Level 2 confirms no reported sewer flooding incidents in the vicinity of the site.

Hydrology

The nearest watercourse is an unnamed watercourse/tributary to the River Derwent that flows along the southern and western site boundaries. The River Derwent is located approx. 50m to the north of the site beyond Low Road and a disused railway embankment.

3.0 Proposed Development

The proposed scheme is for the development of 47 new residential units accessed off Low Road to the north of the site.

A proposed site plan is included within **Appendix D**.

The proposed site will be suitably raised through compensatory flood storage above the 1 in 1000 year (0.1% annual probability of occurrence) flood level. The proposed compensatory flood storage is to the east of the site in Fitz Park. It is proposed to excavate land which is currently in Flood Zone 1 to create an area which can flood at the 1 in 1000 year flood level (39.32m AOD). Spoil from this area will be moved to the proposed residential site to raise it above the 1 in 1000 year flood level. Sufficient compensatory flood storage will also be provided to raise the central site to provide additional flood protection to the proposed residential development.

Flood Modelling

Modelling carried out by others in 2018 pursuant to the approved planning permission for the compensatory works involved amending the existing Environment Agency River Derwent hydraulic model to include the proposed compensatory flood storage area and the proposed ground raising confirmed that the development site will not flood and there is no additional flooding elsewhere in the model. The compensatory flood storage area was also hydraulically modelled to attenuate and store flood waters during the 0.1% (1 in 1000 year) annual probability of occurrence event to prove that more frequent events will not fill the compensatory storage area, refer to Planning Ref. no. 2/2017/0312.

Following consultation with Cumberland Council further flood modelling has been carried out by GHD. This modelling included consultation with the EA and used the most up to date model provided by the Environment Agency. The results showed that the proposed development site is not inundated during the 1 in 20 year and 1 in 100 year events. During the larger 1 in 1000 year event with 40% climate change the flood compensatory area is fully utilised and the flood levels do not reach the proposed development platform. Peak level is at 40.35m AOD some 350mm below the platform level. Therefore, in summary this modelling demonstrates that the compensatory storage is sufficient to accommodate the proposed scheme. Refer to the Technical Note included in **Appendix H** for full details.

Further consultations with Cumberland Council have resulted in comments from the EA which has led to additional modelling being carried out as a result of the latest EA updates to their flood mapping system This modelling addressed the Council's concerns regarding the understanding of the current risk of flooding to the development site and included incorporating changes to the topography to better represent the current situation and the proposed arrangement. The model includes changes to ground levels to the land north of Low Road referred to as Broomlands which reduces the floodplain levels and a proposed flood wall located on land north east of the garden centre owned by the applicant. Simulations showed that the site does not flood during the 1 in 20 year and 1 in 100 year events and the 1 in 1000 year event with 40% climate change and that there is no flooding on Low Road. Refer to the Technical Note included in **Appendix I** for full details.

4.0 Flood Risk Assessment

National Planning Policy Framework

The National Planning Policy Framework (NPPF) aims to avoid inappropriate development in areas at risk of flooding, directing development away from high-risk areas and avoiding increasing or reducing the risk of flooding elsewhere. This FRA has been undertaken with regards to the NPPF and with reference to the Planning Practice Guidance (PPG) in relation to ensuring that flood risk is taken into consideration to avoid inappropriate development in areas at risk of flooding.

The Environment Agency (EA) provide appropriate information on the extent of flood risk via their 'Flood Map for Planning (Rivers and Sea)' available online via the UK Government website. The flood maps for planning indicate the extent of the extreme flooding from surface water, rivers or sea and reservoirs that would occur without the presence of flood defences. The flood zones are defined and outlined as below:

Table 1: Flood Zone Definition

Flood Zone	Definition
Flood Zone 1 (Low Probability)	Less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) (Area shown clear on Flood Maps – all land outside of Zones 2 and 3)
Flood Zone 2 (Medium Probability)	Between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) **or** between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year (Area shown light blue on Flood Maps)
Flood Zone 3a (High Probability)	1 in 100 or greater annual probability of river flooding (>1%) **or** a 1 in 200 or greater annual probability of flooding from the seas (>0.5%) in any year (Area shown dark blue on Flood Maps)

Flood Zone 3b (Functional Flood Plain)	Land where water must flow or be stored during times of flooding. Strategic Flood Risk Assessments prepared by local planning authorities should identify these areas. (Area also shown dark blue on Flood Maps)

*Flood Map areas do not take flood defences into consideration. Flood Risk increase due to climate change is not considered.

Prior to the land raising and compensatory storage works being carried out the UK Government data indicated that the site is located within a **Flood Zone 2** (Medium Probability) area and is at risk of flooding from rivers or sea or from reservoirs. A Sequential Test has been prepared by Pegasus, refer o Flood Risk Sequential and Exception Test, document ref: P24-2881, dated 01/05/2025.

However, modelling has been carried out which has confirmed that following raising of site levels, compensatory storage works on and off site and the inclusion of a flood wall off site the development site will be in a Flood Zone 1 (Low Probability) area and will be at no risk of flooding from rivers or sea or from reservoirs.

The UK Government 'Extent of Flooding' maps are included in **Appendix E,** although it should be noted that these have not been updated to show that the site will be in Flood Zone 1.

The plans attached within the Appendices are the most updated versions from the *New versions of the flood zones'*. which was created on 12/03/25 and updated on 25/03/25 and represent the best available current information on the extent of flood risk. It should be noted however that these maps are indicative only and are to be used as a basis of consultation and not as the sole basis for decisions on where planning policies apply. Therefore, due to such local variability and uncertainties, it is difficult to be prescriptive about the levels of risk.

Flood Risk Vulnerability Classification

The flood risk vulnerability of land uses is set out in Table 2 of the National Planning Policy Framework (NPPF), below:

Table 2: Flood Risk Vulnerability Classification

Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which must cross the area at risk. • Essential utility infrastructure which must be 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 stations, ambulance stations, fire stations, command centers; 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 • 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 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.

The Flood Risk Vulnerability Classification for this development site is "More Vulnerable - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels". It can be seen from Table 3 below that developments of this nature should be located within Flood Zones 1 and 2 with an Exception Test required for development in a Flood Zone 3a area. An Exception Test has been prepared, refer to the Flood Risk Sequential Test and Exception Test by Pegasus, document ref: P24-2881, dated 01/05/25.

Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (See Table 2)	Essential Infrastructure	Water Compatibility	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test Required	✓	✓
Zone 3a	Exception Test Required	✓	x	Exception Test Required	✓
Zone 3b functional flood plain	Exception Test Required	✓	x	x	x

Key: ✓ - Development is appropriate

x – Development should not be permitted

Sources of Potential Flooding

In accordance with National Guidance other sources of flood risk should be considered therefore information available from the Environment Agency has been reviewed and Table 4 below identifies the potential sources of flood risk to the development.

Table 4: Potential Sources of Flood Risk to the Development

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Fluvial		✓			River Derwent 50m north of the site
Tidal				✓	No tidal influence nearby
Canals				✓	No canals nearby
Groundwater			✓		No ground water issues identified
Reservoirs				✓	No reservoirs nearby
Sewers			✓		The Allerdale SFRA indicates no historic flooding from sewers in the vicinity of the site.
Pluvial			✓		Design process will minimize risk
Development Drainage			✓		Design process will minimize risk

Information from the Environment Agency and the Water Authority to support the risks classification in the above table are included in **Appendix E.**

Existing Structures Affecting Flooding

There are no known existing structures on site that may affect flooding of the site.

Cockermouth Flood Investigation

Following the flood event of 5-6th December 2015 an investigation was carried out by the Environment Agency and a report produced as a key Risk Management Authority under Section 19 of the Flood and Water Management Act 2010 in partnership with Cumbria County council as Lead Local Flood Authority. Refer *Cockermouth S.19 Flood Investigation Report*. This report identified a number of actions to be carried out to manage future flood risk and these were all scheduled for completion in 2017.

Historical Flooding

Recorded flooding has taken place in Cockermouth since 1761 with recent flooding occurring in 2005, 2008, 2009 and 2015. With the latter event detailed in the above-mentioned report. Details of the earlier flooding are referred to in the 2018 FRA provided by Fairhurst as part submission for the previous planning applications Ref. nos. 2/2017/0312, CON/2017/0312.

Sequential Test

As the proposed development is classified as being in a Flood Zone 2 prior to the land raising and compensatory storage works a sequential test has been prepared by Pegasus, refer to the Flood Risk and Exception Test, document ref P4-2881, dated 01/05/25.

Flood Risk Mitigation Measures

As the site will be situated within Flood Zone 1 – Low Probability following the compensatory storage works, there is no requirement for any mitigating measures relating to flooding from Rivers and the Sea, Surface Water, Reservoirs or Groundwater.

Flood Plan

The modelling by GHD (**Appendix I**) indicates that the access into the proposed development will not flood in an extreme event. Please refer to separate evacuation plan which will be implemented prior to first occupation. This will include appropriate signage to inform the public about potential flood risk and evacuation routes for emergency vehicle access should an extremely severe event occur.

5.0 Surface Water Drainage

Discharge Location

Infrastructure protocol states that a designer should consider the following in order of preference before finalising a surface water design statement for the development.

• Discharge via infiltration, or where this is not reasonably practicable,

• Discharge to a watercourse, or where this is not reasonably practicable,

• Discharge to a public sewer network.

Method 1 – Discharge via infiltration

BGS online mapping indicates that the underlying strata beneath the subject site consists of Alluvium. The strata from a nearby BGS borehole confirms this as being slightly clayey, silty, sandy gravel with ground water recorded at depth of 2.2m.

A ground investigation has not been carried out for the site. However, the overall catchment is defined as slowly permeable seasonally wet acid loamy and clayey soils. Following site raising to create a development platform the underlying ground is unlikely to be suitable for infiltration.

Therefore, based on the above it is considered that infiltration systems will not be feasible.

Method 2 – Discharge to a watercourse

The nearest watercourse is an unnamed watercourse that runs along the southern and western boundaries. As the existing land generally falls to this watercourse it is proposed to discharge the surface water to this watercourse.

Method 3 – Discharge to a public sewer network

United Utilities (UU) sewer record plan in **Appendix C** indicates that there are no surface water and foul water sewers within the site boundary.

Proposed Drainage

It is proposed to provide a surface water drainage network serving the proposed development roof and driveway areas.

Surface water runoff from the development will be attenuated on site and discharged to the unnamed watercourse to the west of the site at the greenfield runoff Qbar rate of 5.9 l/s/ha as approved in a previous planning application, refer Planning Ref. nos. 2/2018/2037 and CON/2023/0018.

Exceedance flows generated by the development due to the applied discharge restriction are required to be attenuated and managed on site. The drainage network is required to be designed to meet the following requirements:

• No surcharge for a 1 in 2-year return period event

• No flooding for a 1 in 30-year return period event

• No flooding of buildings or third-party land for a 1 in 100-year return period event with a 50% allowance for climate change and 10% urban creep.

A drainage strategy has been produced associated with surface and foul water drainage to serve the proposed development and is included **Appendix F**.

The surface water drainage network has been designed to discharge to the existing watercourse to the west of the development at a rate of 9 l/s (equivalent to 5.9 l/s/ha). This discharge rate has been achieved using a Hydrobrake with an orifice of 113mm. The design can accommodate surface water flow for storm events up to a 1 in 100-year critical storm event plus 50% climate change and 10% urban creep with on-site attenuation provided. Attenuation for all storm events will be provided via oversize pipes and attenuation tanks.

Detailed Drainage FLOW simulation calculations are included within **Appendix G**.

The proposed surface water drainage system will be private and maintained by a nominated private management company in accordance with the CIRIA C753 SuDS manual.

To ensure the water quality entering the surface water network does not have a detrimental impact to the environment, permeable paving will be included in all shared and private drives and trapped road gullies with sumps will be provided to drain runoff from the hardstanding areas.

Surface water pipework will be designed in accordance with Building Regulations Part H and DCG “the Code” to ensure suitable access for maintenance and operation as required.

6.0 Foul Water Drainage

Development Enquiries for discharge of foul water relating to previous proposals for this site have been submitted to UU and approved. However, as the proposals have changed an updated enquiry will be submitted to UU and their response made available on receipt.

It is proposed to discharge the foul sewer into the existing sewer network in the residential development to the west via a rising main connection. The pumping station will be located within the development site and this, along with the foul sewer network will be maintained by a nominated private management company.

Foul water pipework will be designed in accordance with Building Regulations Part H ensuring suitable access for maintenance and operation as required.

7.0 Conclusions

Beckwith and Hanlon Consulting Engineers Limited were commissioned by Fitz Park Properties Ltd in August 2024 to undertake a Flood Risk Assessment (FRA) for a proposed 47-unit residential development off Low Road, Cockermouth. This report will be provided as supporting documentation as part of a planning application.

As the development is within Flood Zone 2 a Sequential Test has been prepared.

An Exception test has been prepared.

Following raising of site levels, compensatory storage works on and off site and inclusion of a raised flood wall offsite, the development site will be in a Flood Zone 1 (Low Probability) area and will be at no risk of flooding from rivers or sea or from reservoirs and there will be no increase in flood extent or depth elsewhere.

The assessment associated with appropriate surface water management has followed the order of hierarchy based on the following:

Method 1 – Discharge via infiltration

Method 2 – Discharge to a watercourse

Method 3 – Discharge to a public sewer network.

Furthermore, the assessment concluded that the most appropriate method for proposed surface water management associated with the residential development was **Method 2**, discharge to a watercourse.

The surface water drainage for the new build element of the scheme will be designed to discharge into the unnamed watercourse, a tributary of the River Derwent, that runs along the southern and west boundaries at a restricted discharge rate of no more than 5.9 l/s/ha as approved through a previous planning application for the site.

The design can accommodate up to a 1 in 100-year critical storm event plus 50% climate change and 10% urban creep with an on-site attenuation provided. Attenuation for all storm events is provided by oversize pipes and attenuation tanks.

To ensure the water quality entering the surface water network does not have a detrimental impact to the environment, permeable paving is to be included to all uncovered car parking bays. These will be maintained privately in accordance with the CIRIA C753 SuDS manual.

The foul water drainage serving the development is proposed to discharge via a rising main connection into the existing sewer network in the adjacent residential development to the west.

The proposed development will have a low to very low risk of flooding from rivers and sea, surface water, reservoirs and sewers and will discharge at a controlled, restricted rate as advised by the local authority.

This Flood Risk Assessment has confirmed that the proposed development is appropriate and sustainable in the terms as set out in NPPF.

An Evacuation Plan will be provided.

8.0 Report Conditions

The report is based on the information that has been acquired and/or made available to Beckwith and Hanlon Consulting Engineers Limited via the various searches and consultations undertaken as part of the Flood Risk Assessment. In some cases, anecdotal information has been relied upon, where documented evidence has been lacking.

The conclusions drawn in the above report are considered correct although any subsequent additional information may allow refinement of the conclusions.

All work carried out in preparing this report has utilised and is based upon Beckwith and Hanlon Consulting Engineers Limited current professional knowledge and understanding of current UK standards and codes, technology and legislation. Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect.

This report has been prepared using information contained in maps and documents prepared by others. Beckwith and Hanlon Consulting Engineers Limited can accept no responsibility for the accuracy of such information.

APPENDIX A

SITE LOCATION PLAN

N

SITE LOCATION
Centre of Site:
E 310812
N 530778

Contains OS data © Crown copyright and database right 2024

NOTE

THIS PRINT AND ANY DESIGN THEREON IS THE PROPERTY OF BECKWITH & HANLON CONSULTING ENGINEERS LIMITED AND IS TO BE RETURNED ON REQUEST. IT IS TO BE USED ONLY FOR THE PURPOSE FOR WHICH IT WAS EXPRESSLY LOANED AND IS NOT TO BE COPIED IN ANY MANNER, NOR IS INFORMATION TAKEN THEREFROM TO BE TRANSMITTED OR PASSED TO OTHERS.

DO NOT SCALE OFF THIS DRAWING.

DO NOT TAKE DIGITAL DIMENSIONS OFF THIS DRAWING.

REV	AMENDMENT	BY	CKD	DATE
P1	FIRST ISSUE	JH	JM	21/08/24

CLIENT

FITZ PARK PROPERTIES LTD

PROJECT

RESIDENTIAL DEVELOPMENT
LAND OFF LOW ROAD
COCKERMOUTH

DRAWING TITLE

SITE LOCATION PLAN

Beckwith & Hanlon
Consulting Engineers Limited
F22 Willow Court, Marquis Court,
Team Valley Trading Estate,
Gateshead, NE11 0RU
tel: 0191 273 7582

SCALE	BY	CHECKED	DATE
NTS	JH	JM	AUGUST '24

DRAWING NO.
23-002-902

STATUS
PRELIMINARY

REV P1
SIZE A2

APPENDIX B

LAND RAISING AND COMPENSATORY STORAGE WORKS

REV	AMENDMENT	BY	CKD	DATE
P1	FIRST ISSUE	JM	MH	22/08/24

CLIENT

FITZ PARK PROPERTIES LTD

PROJECT

RESIDENTIAL DEVELOPMENT
LAND OFF LOW ROAD
COCKERMOUTH

DRAWING TITLE

LAND RAISING AND COMPENSATORY STORAGE

Beckwith & Hanlon Consulting Engineers Limited
F22 Willow Court, Marquis Court,
Team Valley Trading Estate,
Gateshead, NE11 0RU
tel: 0191 273 7582

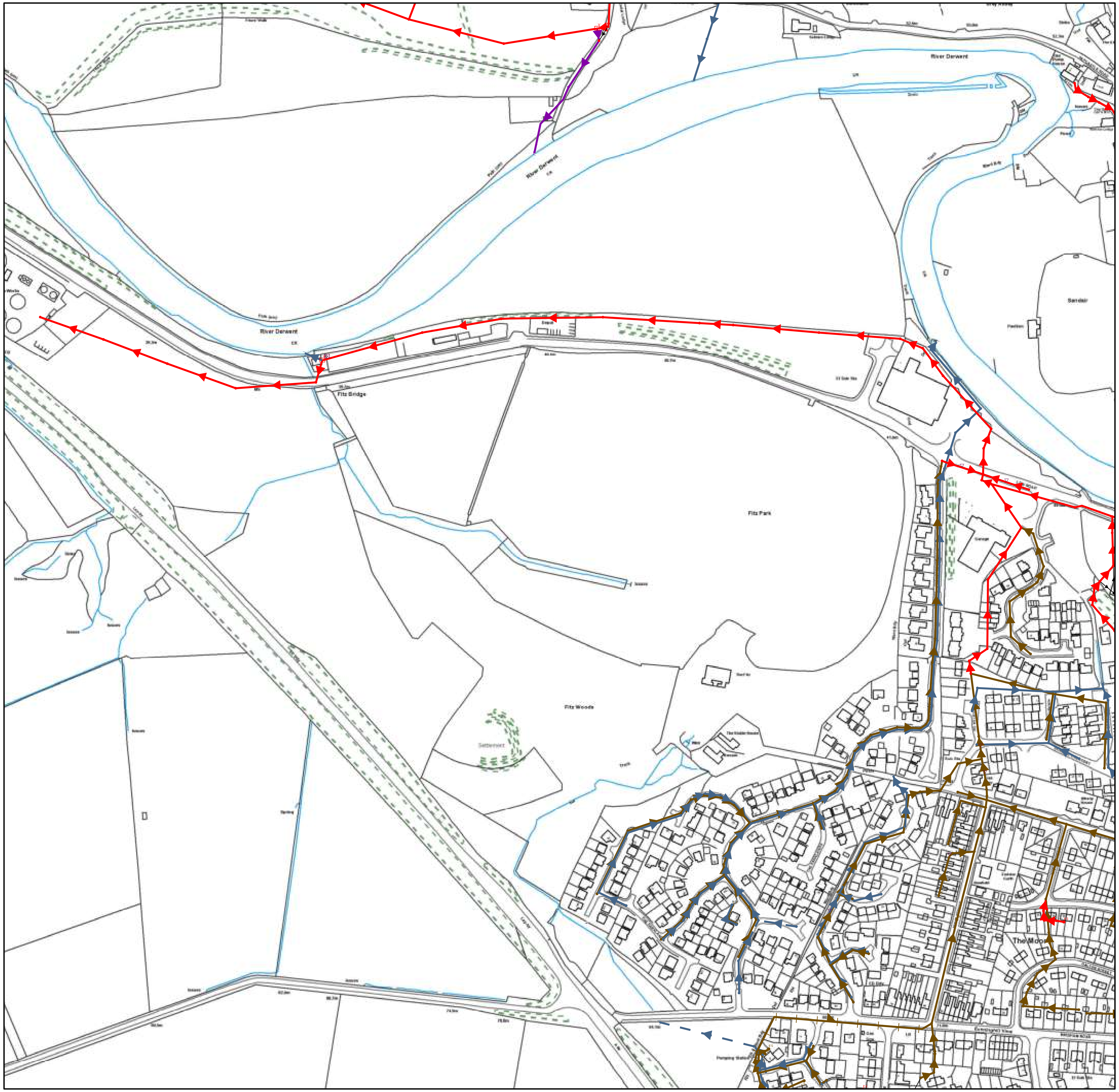
SCALE	BY	CHECKED	DATE
1:2500	JM	MH	AUGUST '24

DRAWING NO.
23-002-903

STATUS	REV	P1
PRELIMINARY	SIZE	A2

APPENDIX C

UU SEWER RECORD PLAN



Extract from Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

LEGEND

Water Course
Overflow Pipe
Sludge Main
Highway Drain

Combined	Surface Water	Foul	Abandoned	
				Public Sewer
				Private Sewer
				Section 104
				Rising Main

X310599 Y531159

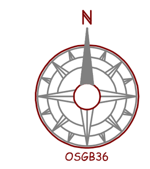
DO NOT SCALE

Approximate Scale: 1:5000

United Utilities
helping life flow smoothly

APPENDIX D

PROPOSED SITE LAYOUT



Note:

1. The grid is the National Grid OSGB36 which was obtained from ETRS89 GPS co-ordinates to which the National Grid Transformation OSTN02 has been applied.

2. The levels shown are to Ordnance Datum Newlyn using the ETRS89 GPS values transformed by the National Geoid Model OSGM02 and are in metres.

No.	Date	Revision	Initial
B	12/03/25	Further site plan amendments.	GB
A	11/01/25	Site plan amendments address LPA comments.	GB

ALPHA DESIGN

Architectural Services
Member of the Chartered Institute of Architectural Technologists

Tel: 01900 829199
email: gb@adcumbria.co.uk

Project

RESIDENTIAL DEVELOPMENT, LAND OFF LOW ROAD, COCKERMOUTH

Client

MR & MRS R.J. SLACK

Drawing

SITE PLAN

Scale 1:500 @ A1 Drawn GB

Checked Date AUGUST 2024

Drawing No.

14/11/848 - 201 b)

APPENDIX E

ENVIRONMENT AGENCY FLOOD INFORMATION

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
The Fitz	**310908/530758**	**16 April 2025 08:44**

Your selected location is in flood zone 3, an area with a high probability of flooding.

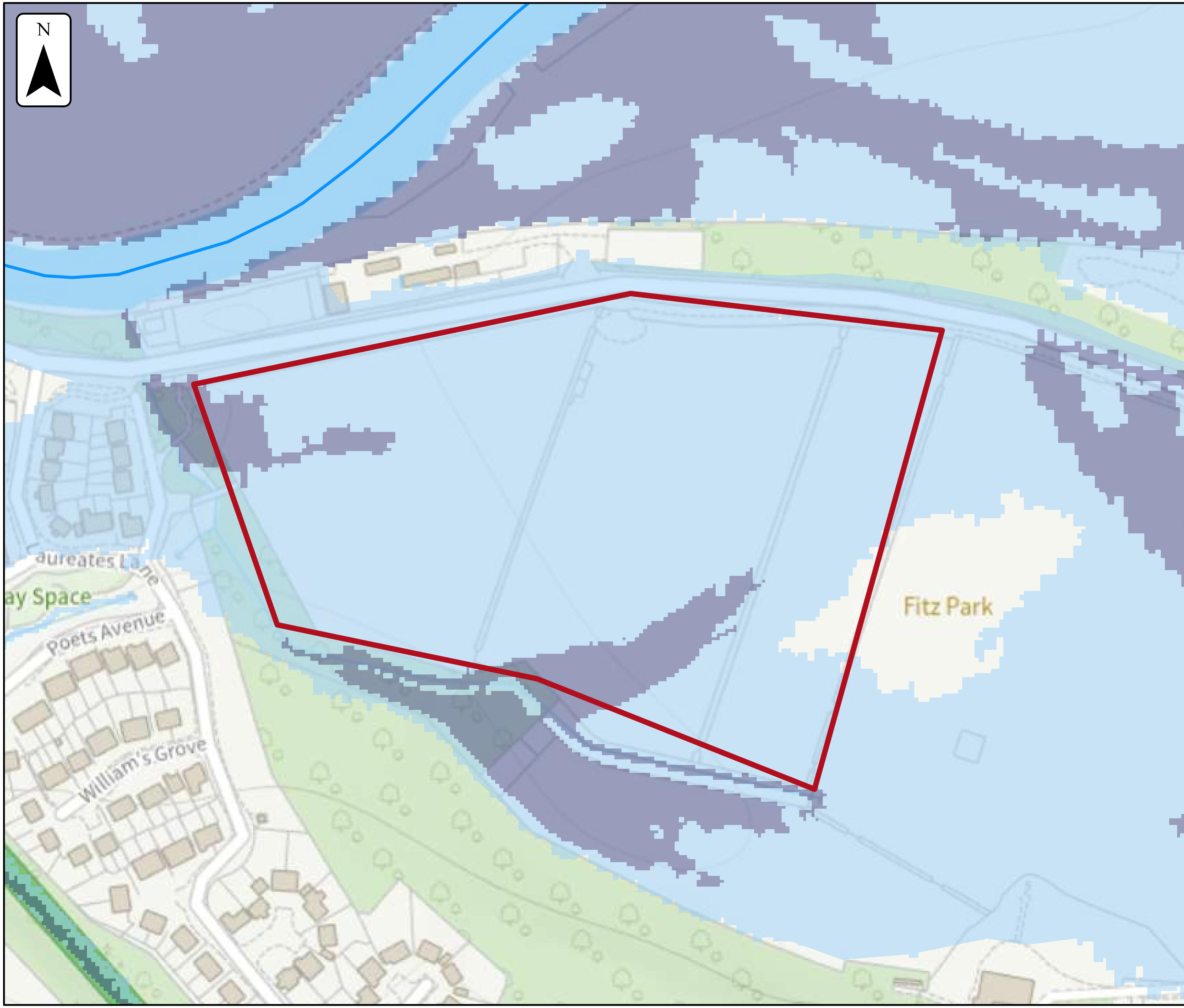
This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see https://www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
The Fitz

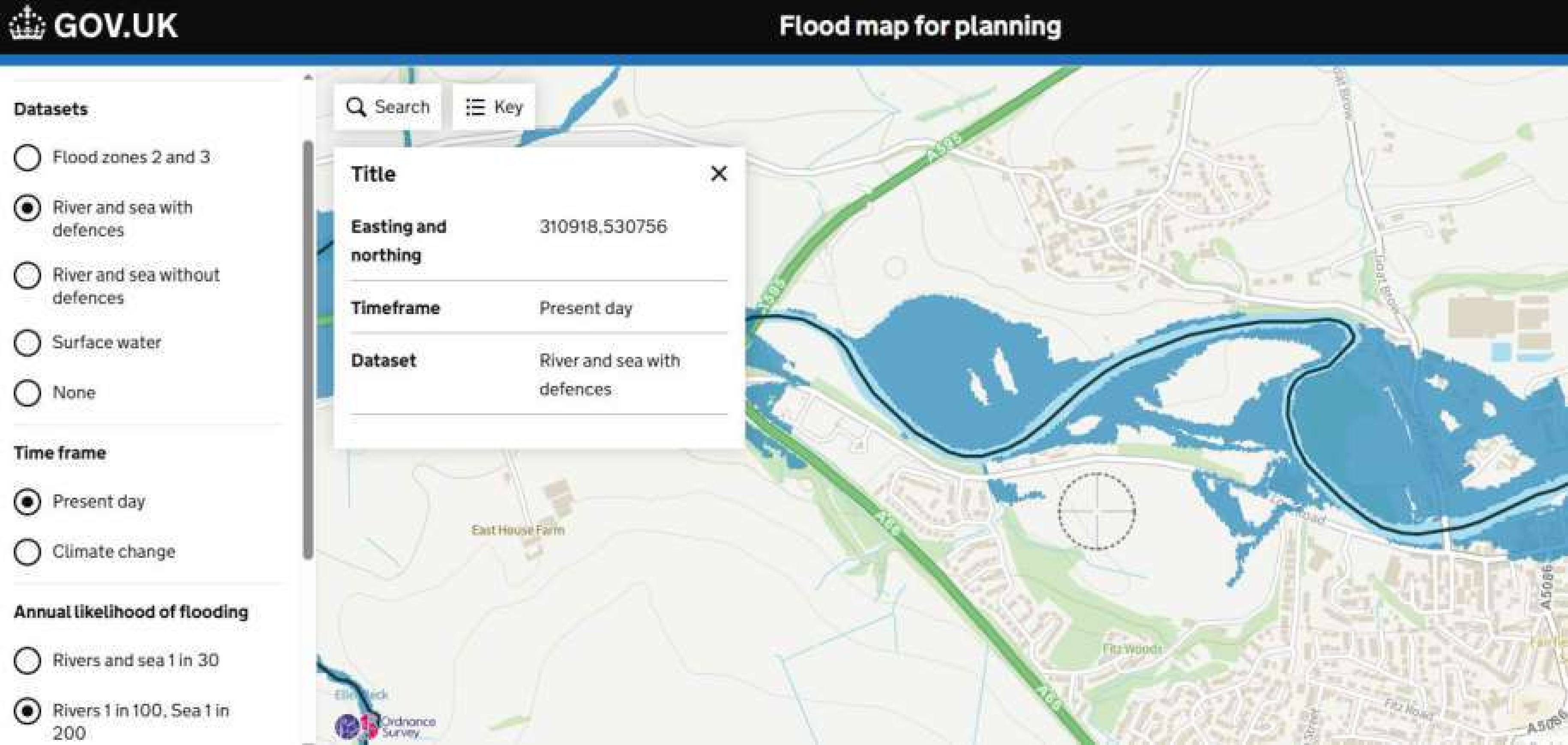
Location (easting/northing)
310908/530758

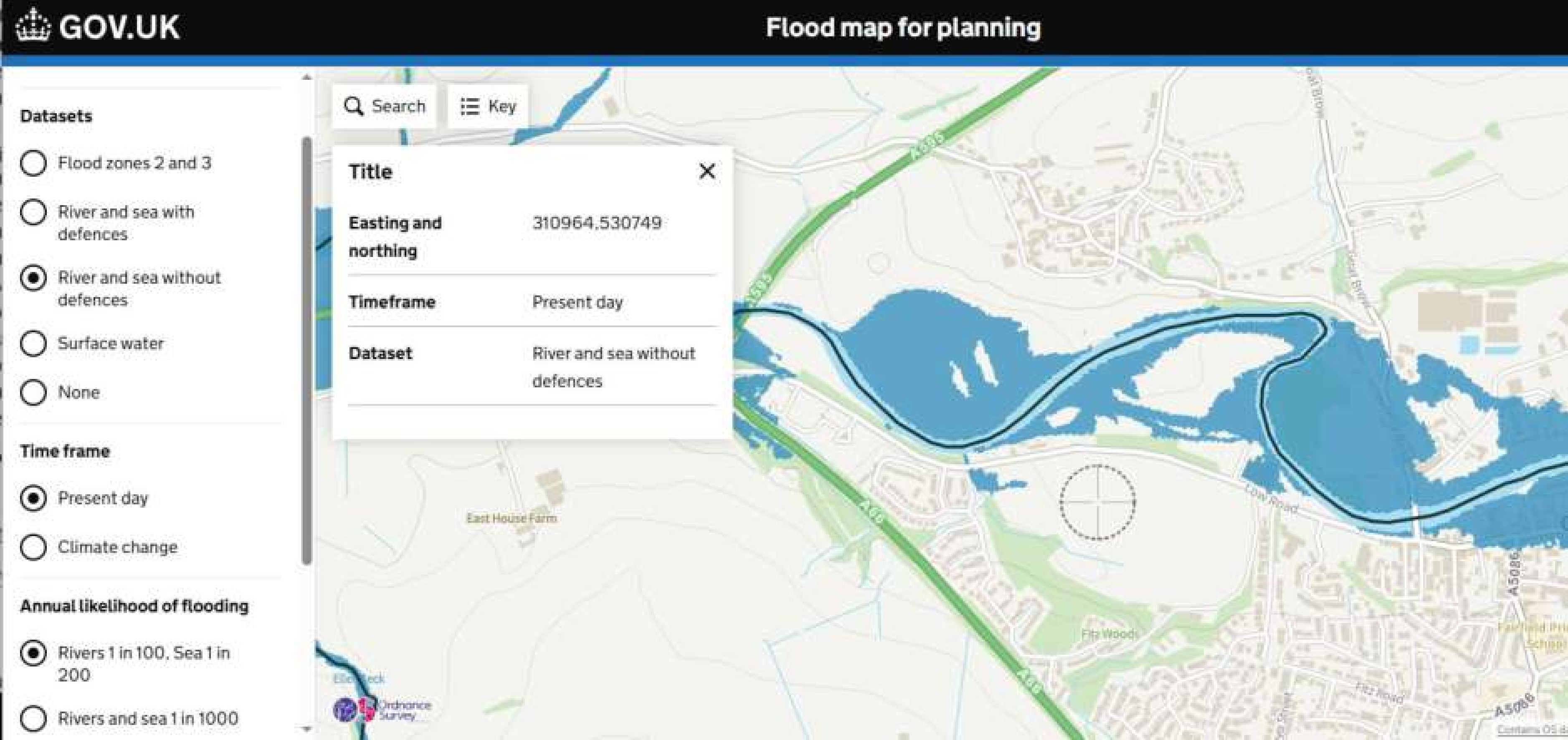
Scale
1:2,500

Created
16 Apr 2025 08:44

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m


GOV.UK
Flood map for planning
Datasets
Flood zones 2 and 3
River and sea with defences
River and sea without defences
Surface water
None
Time frame
Present day
Climate change
Annual likelihood of flooding
Rivers and sea 1 in 30
Rivers 1 in 100, Sea 1 in 200
Search
Key
Title
Easting and northing
310918,530756
Timeframe
Present day
Dataset
River and sea with defences
A595
A66
East House Farm
Fitz Woods
A5086
Ordnance Survey


GOV.UK
Flood map for planning
Search
Key
Datasets
Flood zones 2 and 3
River and sea with defences
River and sea without defences
Surface water
None
Time frame
Present day
Climate change
Annual likelihood of flooding
Rivers 1 in 100, Sea 1 in 200
Rivers and sea 1 in 1000
Title
Easting and northing
310964,530749
Timeframe
Present day
Dataset
River and sea without defences
A595
A66
East House Farm
Low Road
Fitz Woods
Fitz Road
A5086
Ordnance Survey

GOV.UK

Flood map for planning

Search

Key

Datasets

- ( ) Flood zones 2 and 3
- ( ) River and sea with defences
- ( ) River and sea without defences
- (•) Surface water
- ( ) None

Annual likelihood of flooding

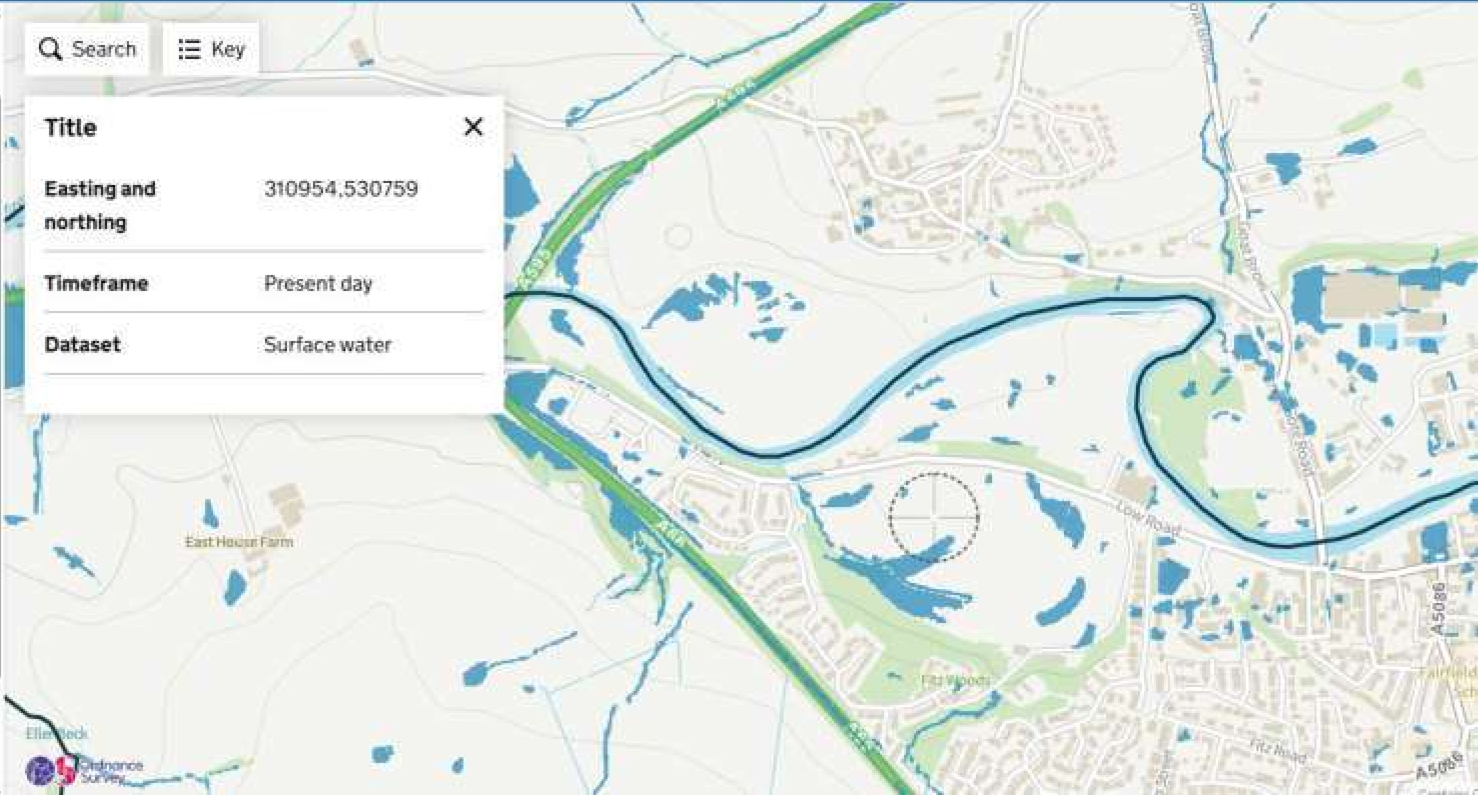
- ( ) 1 in 30
- (•) 1 in 100
- ( ) 1 in 1000

Map features

- [ ] Water storage

Title

Easting and northing	310954,530759
Timeframe	Present day
Dataset	Surface water



APPENDIX F

DRAINAGE STRATEGY

NOTE

THIS PRINT AND ANY DESIGN THEREON IS THE PROPERTY OF BECKWITH & HANLON CONSULTING ENGINEERS LIMITED AND IS TO BE RETURNED ON REQUEST. IT IS TO BE USED ONLY FOR THE PURPOSE FOR WHICH IT WAS EXPRESSLY LOANED AND IS NOT TO BE COPIED IN ANY MANNER, NOR IS INFORMATION TAKEN THEREFROM TO BE TRANSMITTED OR PASSED TO OTHERS.

DO NOT SCALE OFF THIS DRAWING.

DO NOT TAKE DIGITAL DIMENSIONS OFF THIS DRAWING.

NOTES

GENERAL
THIS DRAWING IS BASED ON THE FOLLOWING INFORMATION PROVIDED BY ALPHA DESIGN:
- TOPOGRAPHICAL SURVEY SUPPLIED BY ALPHA DESIGN,
- ALPHA DESIGN SITE LAYOUT PLAN, 14/11/848-201 Rev B (08/04/2025).

LAND OFF LOW ROAD, COCKERMOUTH
THIS IS A PRELIMINARY DRAINAGE STRATEGY ONLY. THE PROPOSALS INCLUDED ARE SUBJECT TO CONFIRMATION OF INVERT LEVELS AT DISCHARGE LOCATIONS, CUMBRIA COUNTY COUNCIL LLFA APPROVAL, SECTION 106 TECHNICAL APPROVAL FROM UNITED UTILITIES AND DETAILED DESIGN.

FOUL WATER
IT IS PROPOSED TO DISCHARGE FOUL WATER WITHOUT RESTRICTION TO THE ADOPTED DRAINAGE IN THE ADJACANT HOUSING ESTATE TO THE WEST VIA A RISING MAIN.

SURFACE WATER
IT IS PROPOSED TO DISCHARGE SURFACE WATER AT A RATE NO GREATER THAN QBAR 9.0 l/s (EQUIVALENT TO 5 l/s/ha) TO THE UNNAMED WATERCOURSE TO THE WEST OF THE SITE SUBJECT TO CUMBRIA COUNTY COUNCIL LLFA APPROVAL.

SURFACE WATER DRAINAGE STRATEGY
CAUSEWAY FLOW MODELLING HAS DEMONSTRATED THAT THE FLOW RATES FROM THE DEVELOPMENT AREA FOR A 1440 MINUTE STORM DURATION ARE AS FOLLOWS;

1 IN 2 YEAR:	6.9 l/s
1 IN 30 YEAR#:	7.3 l/s
1 IN 100 YEAR*:	8.7 l/s

\# INCLUDING 45% CLIMATE CHANGE
* INCLUDING 50% CLIMATE CHANGE

THESE RATES ARE DERIVED FROM THE CAUSEWAY FLOW SOFTWARE MODEL AND INCLUDE A 10% ALLOWANCE FOR URBAN CREEP. SUMMER & WINTER VOLUMETRIC RUN-OFF COEFFICIENTS HAVE BEEN SET AT 1.0.

SURFACE WATER ATTENUATION
SURFACE WATER ATTENUATION OF UP TO AND INCLUDING THE 1 IN 100 YEAR STORM EVENT (+50% CLIMATE CHANGE AND 10% URBAN CREEP) IS PROVIDED VIA A NUMBER OF OFFLINE ATTENUATION TANKS AND OVERSIZED PIPES AS INDICATED WITHIN THE PROPOSED STRATEGY DRAWING.

PERMEABLE PAVING
PERMEABLE PAVING IS TO BE INSTALLED IN ALL SHARED AND PRIVATE DRIVES.

DRAINAGE MAINTENANCE
ALL BELOW GROUND SURFACE AND FOUL WATER DRAINAGE INDICATED WILL BE MAINTAINED PRIVATELY BY A NOMINATED PRIVATE MANAGEMENT COMPANY.

KEY

EXISTING FOUL SEWER
PROPOSED SURFACE WATER SEWER
PROPOSED TRAPPED ROAD GULLY
PROPOSED FOUL SEWER
PROPOSED FOUL SEWER RISING MAIN
PROPOSED ROAD CONTOURS
FFL 40.950 PROPOSED FINISHED FLOOR LEVEL
PERMEABLE PAVING
SITE BOUNDARY

REV	AMENDMENT	BY	CKD	DATE
P1	FIRST ISSUE	JH	JM	14/04/25

CLIENT
MR & MRS R.J. SLACK

PROJECT
LAND OFF LOW ROAD, COCKERMOUTH

DRAWING TITLE
PRELIMINARY DRAINAGE AND LEVELS STRATEGY

Beckwith & Hanlon Consulting Engineers Limited
F22 Willow Court, Marquis Court,
Team Valley Trading Estate,
Gateshead, NE11 0RU
tel: 0191 273 7582

SCALE	BY	CHECKED	DATE
1:500	JM	MH	APRIL '25

DRAWING NO.
23-002-904

STATUS: PRELIMINARY | REV: P1 | SIZE: A1

APPENIDX G

DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.260	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Circular Link Type

Shape	Circular	Barrels	1	Auto Increment (mm)	75	Follow Ground	x

Available Diameters (mm)

100	150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.066	5.00	41.151	1500	310891.716	530716.940	1.425
S2	0.127	5.00	41.235	1500	310910.278	530702.765	1.879
S3	0.146	5.00	41.241	1500	310933.130	530695.906	2.035
S4	0.077	5.00	41.396	1500	310946.484	530743.125	2.400
S6	0.117	5.00	41.073	1500	310956.583	530780.812	2.157
S7	0.117	5.00	41.202	1800	310954.669	530796.880	2.419
S8	0.167	5.00	41.287	1800	310945.694	530805.504	2.801
S11	0.032	5.00	41.000	1800	310888.642	530835.656	2.600
S12		5.00	40.996	2100	310881.743	530819.418	2.596
S13	0.043	5.00	40.996	2400	310876.723	530823.990	2.626
S14			41.062	2100	310851.366	530809.594	2.742
S15		5.00	41.000	1800	310841.592	530802.342	2.400
S16	0.108	5.00	41.067	2100	310847.476	530802.487	2.751
S17			41.068	2400	310844.881	530777.309	2.790
S18	0.101	5.00	41.225	2100	310836.587	530766.626	2.966
S19	0.059	5.00	41.234	2100	310816.096	530711.050	2.575
S20	0.009	5.00	41.340	2400	310821.033	530723.430	2.760
S21	0.109	5.00	41.231	2100	310821.806	530736.584	2.728
S22	0.029	5.00	41.164	2400	310817.529	530760.257	2.932
S23	0.055	5.00	41.060	2100	310800.249	530758.726	2.850
S24	0.043	5.00	41.183	2100	310783.775	530765.841	2.997
S25	0.105	5.00	41.028	1350	310771.803	530799.011	1.586
S26	0.017	5.00	41.302	1800	310774.459	530782.302	3.141
S27			41.000	2100	310741.004	530776.697	2.930
S28			39.000	1500	310723.338	530769.214	1.000
S10			41.002	1800	310905.504	530828.753	2.582
S9		5.00	41.000	1200	310908.270	530834.341	2.550
S5		5.00	41.213	1500	310949.171	530780.109	2.293

Links (Results)

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.508	106.6	11.9	1.125	1.429	0.066	0.0	67	1.004
1.001	1.924	544.0	34.9	1.279	1.435	0.193	0.0	102	1.102
1.002	1.271	359.5	61.2	1.435	1.725	0.339	0.0	166	0.959
1.003	1.412	898.1	75.0	1.500	1.257	0.415	0.0	174	0.875
1.004	2.830	1800.3	96.2	1.257	1.519	0.532	0.0	138	1.543
1.005	4.883	3106.3	117.3	1.519	1.901	0.649	0.0	117	2.420

Links (Results)

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.006	1.172	745.8	147.4	1.901	1.682	0.816	0.0	269	0.923
1.008	1.394	886.9	153.2	1.700	1.726	0.848	0.0	251	1.058
4.000	1.859	1182.5	0.0	1.696	1.726	0.000	0.0	0	0.000
1.009	1.290	820.4	161.0	1.726	1.842	0.891	0.0	268	1.012
1.010	0.689	438.1	161.0	1.842	1.851	0.891	0.0	377	0.638
5.000	2.601	930.9	0.0	1.725	1.850	0.000	0.0	0	0.000
1.011	1.205	766.4	180.6	1.851	1.890	0.999	0.0	295	0.993
1.012	1.411	1595.4	180.6	1.590	1.766	0.999	0.0	269	0.953
1.013	1.363	1541.8	198.8	1.766	1.732	1.100	0.0	287	0.956
6.000	2.409	1532.7	10.7	1.675	1.860	0.059	0.0	52	0.721
6.001	2.392	1521.7	12.4	1.860	1.828	0.069	0.0	56	0.746
6.002	3.971	4491.5	32.2	1.528	1.732	0.178	0.0	70	1.209
1.014	1.328	1502.4	236.2	1.732	1.650	1.307	0.0	318	0.984
1.015	1.356	1533.7	246.1	1.650	1.797	1.362	0.0	321	1.009
1.016	1.352	1529.0	253.8	1.797	1.941	1.405	0.0	327	1.016
7.000	3.859	613.7	18.9	1.136	2.016	0.105	0.0	53	1.776
1.017	1.291	1460.0	275.8	1.941	1.680	1.527	0.0	350	1.005
1.018	0.946	66.9	275.8	2.630	0.700	1.527	0.0	300	0.958
1.007	1.030	655.0	147.4	1.682	1.700	0.816	0.0	288	0.838
3.000	1.087	76.8	0.0	2.250	2.282	0.000	0.0	0	0.000
2.000	0.598	214.0	0.0	1.618	1.482	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	23.885	108.6	300	Circular	41.151	39.726	1.125	41.235	39.506	1.429
1.001	23.953	159.7	600	Circular	41.235	39.356	1.279	41.241	39.206	1.435
1.002	49.045	363.3	600	Circular	41.241	39.206	1.435	41.396	39.071	1.725
1.003	39.017	487.7	900	Circular	41.396	38.996	1.500	41.073	38.916	1.257
1.004	16.287	122.5	900	Circular	41.073	38.916	1.257	41.202	38.783	1.519
1.005	12.264	41.3	900	Circular	41.202	38.783	1.519	41.287	38.486	1.901
1.006	46.505	704.6	900	Circular	41.287	38.486	1.901	41.002	38.420	1.682
1.008	15.000	500.0	900	Circular	41.000	38.400	1.700	40.996	38.370	1.726
4.000	8.475	282.5	900	Circular	40.996	38.400	1.696	40.996	38.370	1.726
1.009	29.174	583.5	900	Circular	40.996	38.370	1.726	41.062	38.320	1.842
1.010	8.053	2013.3	900	Circular	41.062	38.320	1.842	41.067	38.316	1.851
5.000	5.886	101.5	675	Circular	41.000	38.600	1.725	41.067	38.542	1.850
1.011	25.370	667.6	900	Circular	41.067	38.316	1.851	41.068	38.278	1.890

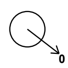
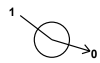
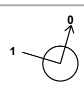
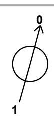
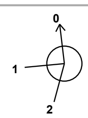
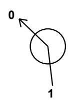
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1500	Manhole	Adoptable	S2	1500	Manhole	Adoptable
1.001	S2	1500	Manhole	Adoptable	S3	1500	Manhole	Adoptable
1.002	S3	1500	Manhole	Adoptable	S4	1500	Manhole	Adoptable
1.003	S4	1500	Manhole	Adoptable	S6	1500	Manhole	Adoptable
1.004	S6	1500	Manhole	Adoptable	S7	1800	Manhole	Adoptable
1.005	S7	1800	Manhole	Adoptable	S8	1800	Manhole	Adoptable
1.006	S8	1800	Manhole	Adoptable	S10	1800	Manhole	Adoptable
1.008	S11	1800	Manhole	Adoptable	S13	2400	Manhole	Adoptable
4.000	S12	2100	Manhole	Adoptable	S13	2400	Manhole	Adoptable
1.009	S13	2400	Manhole	Adoptable	S14	2100	Manhole	Adoptable
1.010	S14	2100	Manhole	Adoptable	S16	2100	Manhole	Adoptable
5.000	S15	1800	Manhole	Adoptable	S16	2100	Manhole	Adoptable
1.011	S16	2100	Manhole	Adoptable	S17	2400	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.012	13.213	695.4	1200	Circular	41.068	38.278	1.590	41.225	38.259	1.766
1.013	20.093	744.2	1200	Circular	41.225	38.259	1.766	41.164	38.232	1.732
6.000	13.327	168.7	900	Circular	41.234	38.659	1.675	41.340	38.580	1.860
6.001	13.177	171.1	900	Circular	41.340	38.580	1.860	41.231	38.503	1.828
6.002	24.056	88.8	1200	Circular	41.231	38.503	1.528	41.164	38.232	1.732
1.014	17.234	783.4	1200	Circular	41.164	38.232	1.732	41.060	38.210	1.650
1.015	18.049	752.0	1200	Circular	41.060	38.210	1.650	41.183	38.186	1.797
1.016	18.915	756.6	1200	Circular	41.183	38.186	1.797	41.302	38.161	1.941
7.000	16.918	27.9	450	Circular	41.028	39.442	1.136	41.302	38.836	2.016
1.017	33.992	829.1	1200	Circular	41.302	38.161	1.941	41.000	38.120	1.680
1.018	19.119	273.1	300	Circular	41.000	38.070	2.630	39.000	38.000	0.700
1.007	18.220	911.0	900	Circular	41.002	38.420	1.682	41.000	38.400	1.700
3.000	6.235	207.8	300	Circular	41.000	38.450	2.250	41.002	38.420	2.282
2.000	7.445	1861.3	675	Circular	41.213	38.920	1.618	41.073	38.916	1.482

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.012	S17	2400	Manhole	Adoptable	S18	2100	Manhole	Adoptable
1.013	S18	2100	Manhole	Adoptable	S22	2400	Manhole	Adoptable
6.000	S19	2100	Manhole	Adoptable	S20	2400	Manhole	Adoptable
6.001	S20	2400	Manhole	Adoptable	S21	2100	Manhole	Adoptable
6.002	S21	2100	Manhole	Adoptable	S22	2400	Manhole	Adoptable
1.014	S22	2400	Manhole	Adoptable	S23	2100	Manhole	Adoptable
1.015	S23	2100	Manhole	Adoptable	S24	2100	Manhole	Adoptable
1.016	S24	2100	Manhole	Adoptable	S26	1800	Manhole	Adoptable
7.000	S25	1350	Manhole	Adoptable	S26	1800	Manhole	Adoptable
1.017	S26	1800	Manhole	Adoptable	S27	2100	Manhole	Adoptable
1.018	S27	2100	Manhole	Adoptable	S28	1500	Manhole	Adoptable
1.007	S10	1800	Manhole	Adoptable	S11	1800	Manhole	Adoptable
3.000	S9	1200	Manhole	Adoptable	S10	1800	Manhole	Adoptable
2.000	S5	1500	Manhole	Adoptable	S6	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1	310891.716	530716.940	41.151	1.425	1500		0	1.000	39.726	300
S2	310910.278	530702.765	41.235	1.879	1500		1	1.000	39.506	300
							0	1.001	39.356	600
S3	310933.130	530695.906	41.241	2.035	1500		1	1.001	39.206	600
							0	1.002	39.206	600
S4	310946.484	530743.125	41.396	2.400	1500		1	1.002	39.071	600
							0	1.003	38.996	900
S6	310956.583	530780.812	41.073	2.157	1500		1	2.000	38.916	675
							2	1.003	38.916	900
							0	1.004	38.916	900
S7	310954.669	530796.880	41.202	2.419	1800		1	1.004	38.783	900
							0	1.005	38.783	900

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S8	310945.694	530805.504	41.287	2.801	1800	1	1.005	38.486	900
						0	1.006	38.486	900
S11	310888.642	530835.656	41.000	2.600	1800	1	1.007	38.400	900
						0	1.008	38.400	900
S12	310881.743	530819.418	40.996	2.596	2100				
						0	4.000	38.400	900
S13	310876.723	530823.990	40.996	2.626	2400	1	4.000	38.370	900
						2	1.008	38.370	900
						0	1.009	38.370	900
S14	310851.366	530809.594	41.062	2.742	2100	1	1.009	38.320	900
						0	1.010	38.320	900
S15	310841.592	530802.342	41.000	2.400	1800				
						0	5.000	38.600	675
S16	310847.476	530802.487	41.067	2.751	2100	1	5.000	38.542	675
						2	1.010	38.316	900
						0	1.011	38.316	900
S17	310844.881	530777.309	41.068	2.790	2400	1	1.011	38.278	900
						0	1.012	38.278	1200
S18	310836.587	530766.626	41.225	2.966	2100	1	1.012	38.259	1200
						0	1.013	38.259	1200
S19	310816.096	530711.050	41.234	2.575	2100				
						0	6.000	38.659	900
S20	310821.033	530723.430	41.340	2.760	2400	1	6.000	38.580	900
						0	6.001	38.580	900
S21	310821.806	530736.584	41.231	2.728	2100	1	6.001	38.503	900
						0	6.002	38.503	1200
S22	310817.529	530760.257	41.164	2.932	2400	1	6.002	38.232	1200
						2	1.013	38.232	1200
						0	1.014	38.232	1200
S23	310800.249	530758.726	41.060	2.850	2100	1	1.014	38.210	1200
						0	1.015	38.210	1200
S24	310783.775	530765.841	41.183	2.997	2100	1	1.015	38.186	1200
						0	1.016	38.186	1200

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S25	310771.803	530799.011	41.028	1.586	1350	0	7.000	39.442	450
S26	310774.459	530782.302	41.302	3.141	1800	1	7.000	38.836	450
						2	1.016	38.161	1200
						0	1.017	38.161	1200
S27	310741.004	530776.697	41.000	2.930	2100	1	1.017	38.120	1200
						0	1.018	38.070	300
S28	310723.338	530769.214	39.000	1.000	1500	1	1.018	38.000	300
S10	310905.504	530828.753	41.002	2.582	1800	1	3.000	38.420	300
						2	1.006	38.420	900
						0	1.007	38.420	900
S9	310908.270	530834.341	41.000	2.550	1200	0	3.000	38.450	300
S5	310949.171	530780.109	41.213	2.293	1500	0	2.000	38.920	675

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	1440
M5-60 (mm)	18.300	Additional Storage (m³/ha)	0.0
Ratio-R	0.260	Starting Level (m)	
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	50	10	0
30	45	10	0				

Node S27 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	38.070	Product Number	CTL-SHE-0113-9000-2900-9000
Design Depth (m)	2.900	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	9.0	Min Node Diameter (mm)	1500

Node S12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	206.0	0.0	1.800	206.0	0.0	1.801	0.0	0.0

Node S15 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	300.0	0.0	1.200	300.0	0.0	1.201	0.0	0.0

Node S5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.920
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	930

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	300.0	0.0	1.800	300.0	0.0	1.801	0.0	0.0

Node S9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	1.000	50.0	0.0	1.001	0.0	0.0

Node S6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.300	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	255	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.000	Inf Depth (m)	
Porosity	0.33	Length (m)	45.000		

Node S2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.600	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.800	Inf Depth (m)	
Porosity	0.33	Length (m)	92.000		

Node S7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.600	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.000	Inf Depth (m)	
Porosity	0.33	Length (m)	45.000		

Node S14 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.600	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	90	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.000	Inf Depth (m)	
Porosity	0.33	Length (m)	40.000		

Node S21 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.500	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.000	Inf Depth (m)	
Porosity	0.33	Length (m)	45.000		

Results for 2 year Critical Storm Duration. Lowest mass balance: 93.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	39.795	0.069	12.0	0.1222	0.0000	OK
15 minute summer	S2	10	39.457	0.101	35.1	0.1781	0.0000	OK
15 minute summer	S3	11	39.375	0.169	61.5	0.2992	0.0000	OK
15 minute summer	S4	11	39.170	0.174	73.7	0.3069	0.0000	OK
15 minute summer	S6	11	39.060	0.144	94.4	0.2544	0.0000	OK
15 minute summer	S7	11	38.902	0.119	108.0	0.3035	0.0000	OK
1440 minute summer	S8	960	38.842	0.356	17.4	0.9053	0.0000	OK
1440 minute summer	S11	990	38.840	0.440	16.1	1.1210	0.0000	OK
1440 minute summer	S12	990	38.840	0.440	8.0	87.5841	0.0000	OK
1440 minute summer	S13	1020	38.840	0.470	16.6	2.1247	0.0000	OK
1440 minute summer	S14	1020	38.840	0.520	12.0	1.8017	0.0000	OK
1440 minute summer	S15	990	38.840	0.240	13.7	68.9508	0.0000	OK
1440 minute summer	S16	1020	38.840	0.524	14.0	1.8151	0.0000	OK
1440 minute summer	S17	990	38.840	0.562	7.6	2.5445	0.0000	OK
1440 minute summer	S18	990	38.841	0.582	7.7	2.0149	0.0000	OK
1440 minute summer	S19	990	38.841	0.182	1.7	0.6312	0.0000	OK
1440 minute summer	S20	1020	38.840	0.260	1.9	1.1751	0.0000	OK
1440 minute summer	S21	1020	38.840	0.337	3.6	1.1669	0.0000	OK
1440 minute summer	S22	990	38.840	0.608	9.0	2.7502	0.0000	OK
1440 minute summer	S23	1020	38.840	0.630	8.8	2.1812	0.0000	OK
1440 minute summer	S24	1020	38.840	0.654	9.2	2.2645	0.0000	OK
15 minute summer	S25	10	39.498	0.056	19.2	0.0800	0.0000	OK
1440 minute summer	S26	1020	38.840	0.679	9.1	1.7273	0.0000	OK
1440 minute summer	S27	990	38.840	0.770	8.2	2.6676	0.0000	SURCHARGED
15 minute summer	S28	1	38.000	0.000	6.9	0.0000	0.0000	OK
1440 minute summer	S10	990	38.841	0.421	16.9	1.0705	0.0000	OK
1440 minute summer	S9	1020	38.840	0.390	1.9	18.9530	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	11.8	0.988	0.111	0.2855	
15 minute summer	S2	1.001	S3	34.8	0.763	0.064	1.1488	
15 minute summer	S3	1.002	S4	60.3	0.980	0.168	3.0166	
15 minute summer	S4	1.003	S6	73.9	0.997	0.082	2.9417	
15 minute summer	S6	1.004	S7	87.6	1.530	0.049	0.9345	
15 minute summer	S7	1.005	S8	107.7	1.098	0.035	1.2476	
1440 minute summer	S8	1.006	S10	16.9	0.392	0.023	12.1317	
1440 minute summer	S11	1.008	S13	15.7	0.430	0.018	4.8215	
1440 minute summer	S12	4.000	S13	-8.0	-0.244	-0.007	2.7214	
1440 minute summer	S13	1.009	S14	12.0	0.323	0.015	10.4177	
1440 minute summer	S14	1.010	S16	11.6	0.300	0.026	3.0707	
1440 minute summer	S15	5.000	S16	-13.7	-0.446	-0.015	0.7805	
1440 minute summer	S16	1.011	S17	7.6	0.353	0.010	10.1347	
1440 minute summer	S17	1.012	S18	7.7	0.309	0.005	7.0025	
1440 minute summer	S18	1.013	S22	8.8	0.292	0.006	11.1954	
1440 minute summer	S19	6.000	S20	1.8	0.343	0.001	1.6169	
1440 minute summer	S20	6.001	S21	1.3	0.292	0.001	2.4232	
1440 minute summer	S21	6.002	S22	3.1	0.104	0.001	9.9999	
1440 minute summer	S22	1.014	S23	8.8	0.319	0.006	10.0974	
1440 minute summer	S23	1.015	S24	9.2	0.317	0.006	11.0691	
1440 minute summer	S24	1.016	S26	9.1	0.302	0.006	12.1522	
15 minute summer	S25	7.000	S26	19.1	1.735	0.031	0.1858	
1440 minute summer	S26	1.017	S27	8.2	0.426	0.006	23.1697	
1440 minute summer	S27	Hydro-Brake®	S28	6.9				755.9
1440 minute summer	S10	1.007	S11	15.4	0.374	0.023	5.4565	
1440 minute summer	S9	3.000	S10	-1.9	0.140	-0.025	0.4391	

Results for 2 year Critical Storm Duration. Lowest mass balance: 93.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	S5	208	38.980	0.060	5.8	17.1715	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	S5	2.000	S6	-5.8	-0.415	-0.027	0.1202	

Results for 30 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 93.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S1	1380	39.949	0.223	2.5	0.3943	0.0000	OK
1440 minute winter	S2	1380	39.949	0.593	7.3	1.0481	0.0000	OK
1440 minute winter	S3	1380	39.949	0.743	12.8	1.3131	0.0000	SURCHARGED
1440 minute winter	S4	1380	39.949	0.953	15.7	1.6842	0.0000	SURCHARGED
1440 minute winter	S6	1380	39.949	1.033	20.9	1.8256	0.0000	SURCHARGED
1440 minute winter	S7	1380	39.949	1.166	36.5	2.9680	0.0000	SURCHARGED
1440 minute winter	S8	1380	39.949	1.463	90.6	3.7239	0.0000	SURCHARGED
1440 minute winter	S11	1380	39.949	1.549	20.0	3.9428	0.0000	SURCHARGED
1440 minute winter	S12	1380	39.949	1.549	27.6	308.5400	0.0000	SURCHARGED
1440 minute winter	S13	1380	39.949	1.579	30.4	7.1443	0.0000	SURCHARGED
1440 minute winter	S14	1380	39.949	1.629	19.5	5.6436	0.0000	SURCHARGED
1440 minute winter	S15	1380	39.949	1.349	22.2	345.5762	0.0000	SURCHARGED
1440 minute winter	S16	1380	39.949	1.633	19.7	5.6574	0.0000	SURCHARGED
1440 minute winter	S17	1380	39.949	1.671	9.0	7.5606	0.0000	SURCHARGED
1440 minute winter	S18	1380	39.949	1.690	10.2	5.8549	0.0000	SURCHARGED
1440 minute winter	S19	1380	39.949	1.290	11.7	4.4694	0.0000	SURCHARGED
1440 minute winter	S20	1380	39.949	1.369	7.0	6.1944	0.0000	SURCHARGED
1440 minute winter	S21	1380	39.949	1.446	10.6	5.0097	0.0000	SURCHARGED
1440 minute winter	S22	1380	39.949	1.717	33.2	7.7687	0.0000	SURCHARGED
1440 minute winter	S23	1380	39.949	1.739	22.6	6.0247	0.0000	SURCHARGED
1440 minute winter	S24	1380	39.949	1.763	14.3	6.1079	0.0000	SURCHARGED
1440 minute winter	S25	1380	39.949	0.507	4.0	0.7259	0.0000	SURCHARGED
1440 minute winter	S26	1380	39.949	1.788	12.4	4.5511	0.0000	SURCHARGED
1440 minute winter	S27	1380	39.949	1.879	23.8	6.5098	0.0000	SURCHARGED
15 minute summer	S28	1	38.000	0.000	6.9	0.0000	0.0000	OK
1440 minute winter	S10	1380	39.949	1.529	28.2	3.8919	0.0000	SURCHARGED
1440 minute winter	S9	1380	39.949	1.499	5.2	49.2195	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S1	1.000	S2	2.5	0.630	0.023	1.5122	
1440 minute winter	S2	1.001	S3	7.3	0.478	0.013	6.7407	
1440 minute winter	S3	1.002	S4	12.8	0.644	0.036	13.8149	
1440 minute winter	S4	1.003	S6	15.2	0.594	0.017	24.7280	
1440 minute winter	S6	1.004	S7	16.6	0.934	0.009	10.3223	
1440 minute winter	S7	1.005	S8	85.3	0.519	0.027	7.7726	
1440 minute winter	S8	1.006	S10	28.2	0.337	0.038	29.4737	
1440 minute winter	S11	1.008	S13	29.0	0.385	0.033	9.5066	
1440 minute winter	S12	4.000	S13	-27.6	-0.125	-0.023	5.3712	
1440 minute winter	S13	1.009	S14	19.5	0.315	0.024	18.4897	
1440 minute winter	S14	1.010	S16	16.0	0.287	0.036	5.1038	
1440 minute winter	S15	5.000	S16	-22.2	-0.391	-0.024	2.1012	
1440 minute winter	S16	1.011	S17	-12.3	0.350	-0.016	16.0788	
1440 minute winter	S17	1.012	S18	-9.0	0.311	-0.006	14.8872	
1440 minute winter	S18	1.013	S22	11.6	0.294	0.008	22.6390	
1440 minute winter	S19	6.000	S20	-9.5	0.315	-0.006	8.4463	
1440 minute winter	S20	6.001	S21	-6.7	0.265	-0.004	8.3512	
1440 minute winter	S21	6.002	S22	20.5	0.115	0.005	27.1041	
1440 minute winter	S22	1.014	S23	7.2	0.314	0.005	19.4177	
1440 minute winter	S23	1.015	S24	-13.4	0.326	-0.009	20.3360	
1440 minute winter	S24	1.016	S26	-12.7	0.288	-0.008	21.3117	
1440 minute winter	S25	7.000	S26	4.0	1.005	0.007	2.6805	
1440 minute winter	S26	1.017	S27	23.8	0.354	0.016	38.2991	
1440 minute winter	S27	Hydro-Brake®	S28	7.3				1128.7
1440 minute winter	S10	1.007	S11	18.9	0.335	0.029	11.5474	
1440 minute winter	S9	3.000	S10	-5.2	-0.102	-0.067	0.4391	

Results for 30 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 93.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S5	1380	39.949	1.029	14.0	295.1229	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S5	2.000	S6	-14.0	-0.233	-0.066	2.6577	

Results for 100 year +50% CC +10% A Critical Storm Duration. Lowest mass balance: 93.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S1	1020	40.763	1.037	3.2	1.8329	0.0000	SURCHARGED
960 minute winter	S2	780	40.753	1.397	12.7	3.0828	0.0000	SURCHARGED
960 minute winter	S3	780	40.756	1.550	22.3	2.7394	0.0000	SURCHARGED
960 minute winter	S4	780	40.757	1.761	26.7	3.1122	0.0000	SURCHARGED
960 minute winter	S6	780	40.737	1.821	110.1	11.6374	0.0000	SURCHARGED
1440 minute winter	S7	1080	40.740	1.957	84.3	5.8499	0.0000	SURCHARGED
1440 minute winter	S8	1080	40.740	2.254	39.2	5.7361	0.0000	SURCHARGED
1440 minute winter	S11	1050	40.758	2.358	45.3	6.0018	0.0000	FLOOD RISK
1440 minute winter	S12	1050	40.760	2.360	26.4	360.5321	0.0000	FLOOD RISK
1440 minute winter	S13	1050	40.757	2.387	41.4	10.8005	0.0000	FLOOD RISK
1440 minute summer	S14	1080	40.741	2.421	40.3	9.3803	0.0000	SURCHARGED
1440 minute summer	S15	1080	40.740	2.140	32.9	347.5892	0.0000	FLOOD RISK
1440 minute summer	S16	1080	40.739	2.423	39.3	8.3949	0.0000	SURCHARGED
1440 minute winter	S17	1050	40.736	2.458	28.0	11.1201	0.0000	SURCHARGED
1440 minute winter	S18	1050	40.737	2.478	29.7	8.5839	0.0000	SURCHARGED
1440 minute winter	S19	1050	40.738	2.079	10.8	7.2010	0.0000	SURCHARGED
1440 minute winter	S20	1050	40.739	2.159	8.6	9.7667	0.0000	SURCHARGED
1440 minute winter	S21	1050	40.740	2.237	28.4	10.3127	0.0000	SURCHARGED
1440 minute winter	S22	1050	40.739	2.507	31.8	11.3423	0.0000	SURCHARGED
1440 minute winter	S23	1050	40.740	2.530	21.5	8.7631	0.0000	SURCHARGED
1440 minute winter	S24	1050	40.740	2.554	14.6	8.8470	0.0000	SURCHARGED
960 minute winter	S25	780	40.741	1.299	6.9	1.8591	0.0000	FLOOD RISK
1440 minute winter	S26	1050	40.740	2.579	22.2	6.5627	0.0000	SURCHARGED
960 minute winter	S27	780	40.740	2.670	14.0	9.2488	0.0000	FLOOD RISK
15 minute summer	S28	1	38.000	0.000	6.9	0.0000	0.0000	OK
1440 minute winter	S10	1050	40.753	2.333	46.9	5.9370	0.0000	FLOOD RISK
960 minute winter	S9	840	40.749	2.299	8.9	50.1239	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S1	1.000	S2	9.7	0.678	0.091	1.6820	
960 minute winter	S2	1.001	S3	20.0	0.560	0.037	6.7470	
960 minute winter	S3	1.002	S4	21.8	0.726	0.061	13.8149	
960 minute winter	S4	1.003	S6	23.5	0.678	0.026	24.7280	
960 minute winter	S6	1.004	S7	-48.1	1.006	-0.027	10.3223	
1440 minute winter	S7	1.005	S8	-51.8	0.480	-0.017	7.7726	
1440 minute winter	S8	1.006	S10	46.9	0.352	0.063	29.4737	
1440 minute winter	S11	1.008	S13	40.7	0.416	0.046	9.5066	
1440 minute winter	S12	4.000	S13	-26.4	-0.159	-0.022	5.3712	
1440 minute winter	S13	1.009	S14	-19.2	0.320	-0.023	18.4897	
1440 minute summer	S14	1.010	S16	-20.7	0.290	-0.047	5.1038	
1440 minute summer	S15	5.000	S16	-32.9	-0.299	-0.035	2.1012	
1440 minute summer	S16	1.011	S17	-25.8	0.354	-0.034	16.0788	
1440 minute winter	S17	1.012	S18	28.8	0.307	0.018	14.8872	
1440 minute winter	S18	1.013	S22	29.6	0.301	0.019	22.6390	
1440 minute winter	S19	6.000	S20	-8.4	0.300	-0.005	8.4463	
1440 minute winter	S20	6.001	S21	-8.5	0.256	-0.006	8.3512	
1440 minute winter	S21	6.002	S22	-26.7	0.127	-0.006	27.1041	
1440 minute winter	S22	1.014	S23	15.3	0.317	0.010	19.4177	
1440 minute winter	S23	1.015	S24	14.2	0.308	0.009	20.3360	
1440 minute winter	S24	1.016	S26	13.0	0.292	0.009	21.3117	
960 minute winter	S25	7.000	S26	6.9	1.102	0.011	2.6805	
1440 minute winter	S26	1.017	S27	22.8	0.303	0.016	38.2991	
960 minute winter	S27	Hydro-Brake®	S28	8.7				1048.4
1440 minute winter	S10	1.007	S11	44.8	0.361	0.068	11.5474	
960 minute winter	S9	3.000	S10	-8.9	-0.186	-0.116	0.4391	

Results for 100 year +50% CC +10% A Critical Storm Duration. Lowest mass balance: 93.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	S5	780	40.754	1.834	59.1	516.3831	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	S5	2.000	S6	-59.1	-0.369	-0.276	2.6577	

APPENDIX H

RIVER DERWENT HYDRAULIC MODELLING APRIL 2025

Technical Memorandum

April 7, 2025

To	Robert Slack (client)	**Contact No.**	+44 (0)191 917 1588
Copy to	Julie Middleton (Beckwith & Hanlon) Steve Dickie (GHD) Duncan Nicholls (GHD)	**Email**	daniel.roberson@GHD.com
From	Daniel Roberson (GHD)	**Project No.**	12574842
Project Name	The Fitz, Low Road, Cockermouth, planning application FUL/2024/0192		
Subject	River Derwent hydraulic modelling updates and third party consultation		

1. Introduction

1.1 Purpose of this Memorandum

GHD were appointed by Robert Slack to carry out hydraulic modelling of the River Derwent, to inform flood risk at a proposed development site, situated at The Fitz, Low Road, Cockermouth. The client, Robert Slack, has submitted a planning application for the development of residential properties on a site in Cockermouth. Cumberland Council responses to the planning application (FUL/2024/0192) have identified that due to the age of the hydraulic modelling currently used to inform the Flood Risk Assessment (FRA), that updates may be required to address changes in flood risk understanding and climate change allowances. GHD has carried out simulations using a model previously supplied by the Environment Agency, incorporating changes to the topography to both better represent the current situation and the proposed development arrangement. This Technical Note details the consultation process that was undertaken and the hydraulic modelling carried out, but does not constitute a Flood Risk Assessment.

1.2 Scope and limitations

This technical memorandum has been prepared by GHD for Robert Slack. It is not prepared as, and is not represented to be, a deliverable suitable for reliance by any person for any purpose. It is not intended for circulation or incorporation into other documents. The matters discussed in this memorandum are limited to those specifically detailed in the memorandum and are subject to any limitations or assumptions specially set out.

Accessibility of documents

If this Technical Memorandum is required to be accessible in any other format this can be provided by GHD upon request and at an additional cost if necessary.

2. Consultation

2.1 Environment Agency

GHD has issued email enquiries to the Environment Agency (EA) regarding flood risk in Cockermouth. Based on email exchanges in September 2024, there were updated hydraulic models for Cockermouth to be used for flood risk assessment. The files supplied by the EA at that time were contained within a zipped folder named "*Cockermouth Town Model*", a term of reference used in the supporting email correspondence.

GHD contacted the EA via their information requests mailbox to confirm, together with a range of more specific technical queries, whether this was the latest model for Cockermouth. A full copy of the email issued to the EA is included in Appendix A.

At the time of writing, 7th April 2025, no response from the EA had been received.

2.2 Cumberland Council

The purpose of the hydraulic modelling, as outlined above, is to provide an improved understanding of current flood risk to the development site. The Council had expressed concern at the age, and therefore validity, of the modelling used in support of the FRA report.

To ensure the scope and methodology of the hydraulic modelling was appropriate for the understanding of flood risk from Cumberland Council's perspective, the proposed approach was outlined to the Council contact who first raised the query.

The response from the Council, included in Appendix B, identified that *"the acceptability of what you are proposing will depend on comments from the EA"* but that *"the measures you have outlined appear reasonable".*

In the absence of a response from the EA, and due to time constraints relating to the planning application, the hydraulic modelling was progressed without first agreeing the parameters with the EA at the client's instruction.

3. Model data used

GHD are aware that a number of hydraulic models for Cockermouth have been developed over the years. The latest model, based on consultation in September 2024 by GHD with the EA, identified the files relating to the "*Cockermouth Town Model*" were to be used for the assessment of flood risk.

This model data was supplied without any supporting documentation and so the full history and purpose of the model is unclear. The files used in this hydraulic model were supplied by the EA to GHD in April 2024, following an earlier data request. The accompanying email explained that there was a 2018 'appraisal model' for Cockermouth, with associated reporting. It was also stated that:

> *"We also commissioned some additional model runs in 2022. This included some additional runs for the Baseline (defended) scenario, and some additional runs to represent the 'undefended' scenario as required for Flood Map for Planning, as well as undefended climate change. (Confusingly, the ASCII 2D results for this scenario are called 'Do Nothing').*
>
> *This data was delivered as a Geodatabase. There was no report accompanying this work."*

In the absence of direct confirmation from the EA of the latest model to be used, the model files provided were interrogated. This identified scenarios referring to 'Do Nothing', which are specifically mentioned by the EA, as being the most recent by save date. As a result, the files associated with these scenarios have been assumed to be the latest, and so most appropriate, model data for Cockermouth.

3.1 Changes to the baseline model

The model files were all included with the zipped folder named "*Cockermouth Town Model*", with the exception of the 1D (geometry) file. The model files linked to an earlier version (v28) but only v29 and v30 were provided in this pack of data. The names of the files identified that v29 was a "Do Minimum" scenario and v30 was a "Do Nothing" scenario. As such, and based on past naming conventions, it was identified that v29 was the most appropriate to represent the current defences in Cockermouth, and that v30 was more appropriate for an undefended model.

The model is a Flood Modeller (1D) and TUFLOW (2D) model. The available logs show that it was historically run on older version of both software, which are now superseded. A more recent version of the software has been used for this assessment. This also enabled the use of the Heavily Parallelised Compute (HPC) which is a 2D Shallow Water Equation (SWE) solver that leverages parallel processing, including GPU acceleration, for significantly faster simulation times compared to the single-core TUFLOW Classic solver, with the added benefit of improving stability in some cases. As both the baseline and proposed models were run on the same solvers, this ensures a direct comparison between the two flood extents can be made.

Finally, a review of the model setup identified that older elevation data from 2016 was being used to represent the floodplain topography. To ensure the most appropriate ground levels were being used for the floodplain, a comparison was made between the 2016 digital terrain model and the more recent 2022 LiDAR data, which was freely available from the EA. This identified that immediately west of the proposed site, significant changes in land elevation had occurred, in some places ground levels had been raised more than 2m. As this was considered to have potentially significant impacts on flood risk at the development site, a section of new LiDAR was extracted and added to the model for the baseline and proposed scenarios. This ensured that the residential development to the west of the proposed development site is more appropriately represented.

3.2 Modifications to represent the proposed site levels

The development proposal involves the creation of a development platform at 40.70m AOD, together with floodplain reprofiling to the east, to create some flood storage to compensate flood volumes displaced by the ground raising.

The proposed platform and compensation area levels were provided by Beckwith & Hanlon on 1st April 2025. The elevations were added to the model via the use of ‘2d_zsh points’ and region layers. This provides local changes in ground topography only within the specified ground raising/lowering areas.

No other changes to the model were made, roughness was left as in the base model on, and around, the site.

3.3 Changes to flow data

The EA model included a range of flow data, ranging from the 1 in 2 year (50% Annual Exceedance Probability, or AEP) to 1 in 200 year (0.5% AEP). Whilst a folder was provided in the model for the 1 in 1000 year (0.1% AEP) flows, this was empty, and the EA did not identify an alternative means to run the 0.1% AEP events.

The return periods included in the GHD hydraulic modelling were:

- 1 in 20 year (2020)
- 1 in 100 year (2020)
- 1 in 100 year (2020), plus a 40% uplift for climate change
- A sensitivity test for peak flows of the River Derwent and River Cocker scaled to older model 0.1% AEP peak flows. This is considered a sensitivity test, not an assessment of the 0.1% AEP flood extents. The method for this scaling is discussed in more detail later in this Technial Memorandum.

The EA flow data provided includes a range of uplifts for climate change. These were identified by the year in the file name and values included 2015, 2020, 2040 and 2070.

The flow data has been inferred from the information provided in the “*Kendal Appraisal Package FRM Appraisal Summary Report Cockermouth FRM Scheme*”. This was supplied in a separate pack of data by the EA at the same time as the model. This report states that peak river flow increases are relative to a 1961-1990 hydrological baseline. The 2015 period is not defined, but the remainder are explained to be:

- 2020: **2015** to 2039 time period, representative of a 15% uplift in flows from the baseline
- 2050: **2040** to 2069 time periods, representative of a 25% uplift in flows from the baseline

- 2080: **2070** to 2115 time periods, representative of a 30% uplift in flows from the baseline

The GHD modelling undertaken for these works, has used the “2020” flow information as the “current” (present day) flow data. A 40% uplift in flows was applied to the 1 in 100 year hydrograph included in the dataset to account for climate change in accordance with the latest guidance. For the Derwent North West Management Catchment, the 2080s Central Allowance is 40%.

The 2080s time period represents the full development lifetime for the proposed scheme, assuming it is a residential site with a 100 year design life. The EA guidance[1] states that residential development (classified as more vulnerable in accordance with the National Planning Policy Framework) should use the Central Allowance, when in Flood Zones 2 and 3.

To test a scenario with higher flows, the 1 in 1000 year flow data from older model builds was reviewed. This data shared only two common inflows with the current model; the River Derwent and the River Cocker. The older model had many extra inflows for smaller contributing catchments/watercourses, which in the more recent model, have been consolidated or re-named. As such, the only direct comparison that could be drawn was for the Rivers Derwent and Cocker.

To provide a sense of flood risk during a flow in excess of the 1 in 100 year plus 40% CC, a sensitivity test was carried out. This used all the same lateral inflows as the 1 in 100 year plus 40% CC flow data but with the River Derwent and River Cocker’s peak flow scaled to match the older model’s 1 in 1000 year peak flow. The shape of the hydrographs were not altered, nor the timing of the peak flows. This is considered representative of the scale of a 1 in 1000 year flow, in the absence of a full set of flow data from the EA. As the lateral inflows have not changed from the 1 in 100 year plus 40% CC event, it is reasonable to assume that this sensitivity test slightly under represents the true risk posed by the 1 in 1000 year flood event at the site.

[1] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#peak-river-flow-allowances

4. Results

4.1 Baseline (present day)

The baseline model, with flood defences in place and updated topography to the west of the development site, shows that during the 1 in 20 year (Figure 1), and 1 in 100 year (Figure 2) events, the site does not flood.

For the 1 in 100 year with climate change scenario (Figure 3), the site is partially inundated with depths ranging from 0m to 1.5m.

During the sensitivity test, representative of the scale of a 1 in 1000 year peak flow, (refer to Section 3.3), the site is more extensively inundated, although not entirely (Figure 4). Depths range between 0 and 1.8m. Upon receipt of the EA 1 in 1000 year flow data, the assessment should be re-run to confirm peak flood levels during this event.

Figure 1 *Pre development 1:20 year depths*

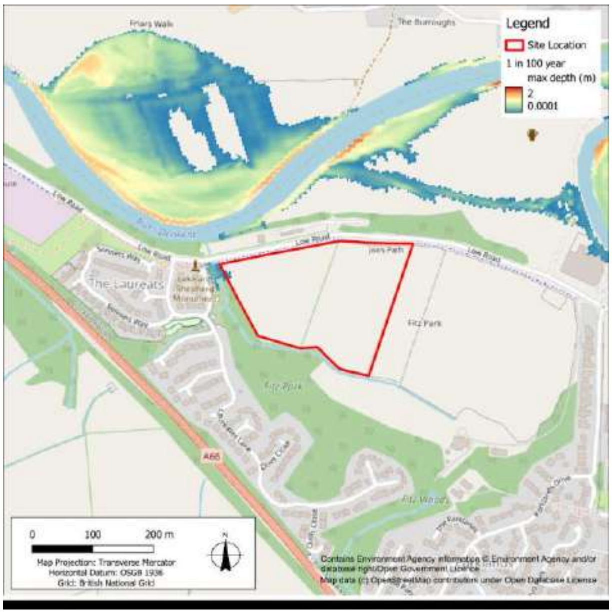


Figure 2 *Pre development 1:100 year depths*

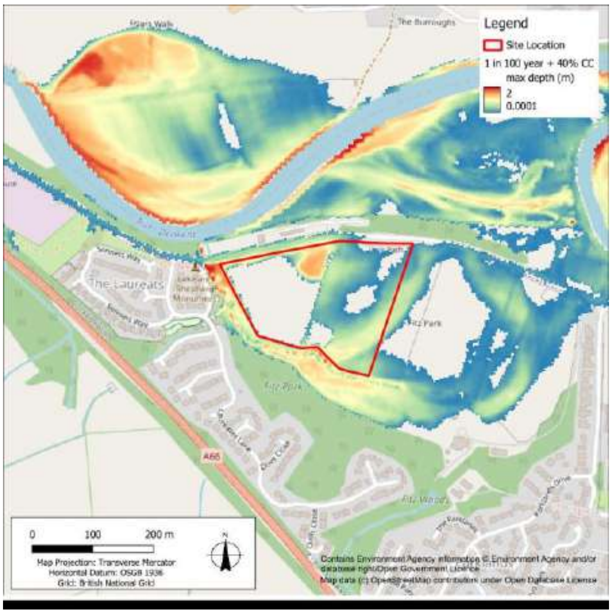


Figure 3 *Pre development 1:100+40%CC year depths*

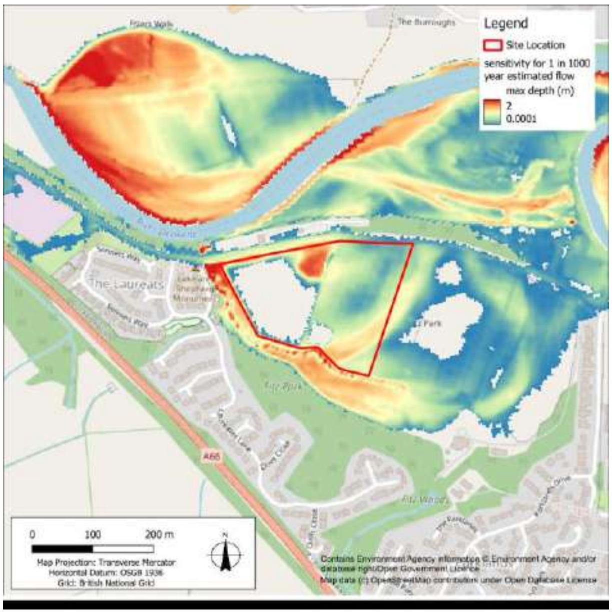


Figure 4 *Pre development estimated 1 in 1000 year depths*

4.2 Proposed Site

The proposed development site model, with flood defences in place, shows that during the 1 in 20 year (Figure 5) and 1 in 100 year (Figure 6) events, the site does not flood. These results are consistent with the baseline condition.

This scenario includes updated topography to the west of the development site, the raised site levels/platform and flood compensation to the east.

Figure 5 Post development 1:20 year depths

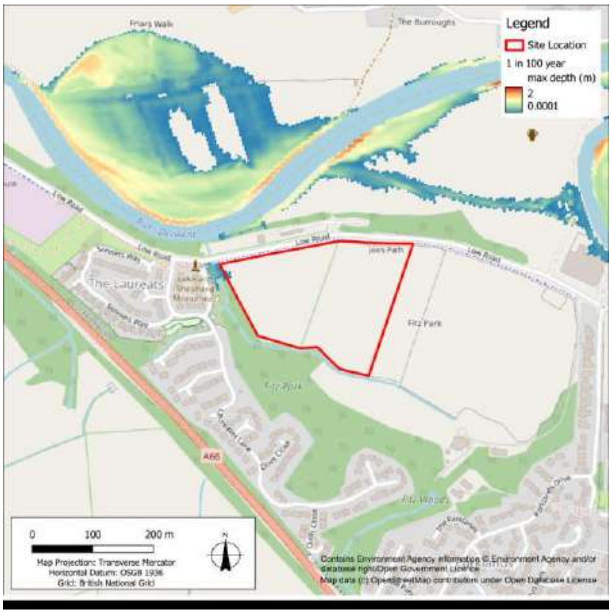


Figure 6 Post development 1:100 year depths

For the 1 in 100 year with climate change scenario, the floodplain compensation area is utilised, with depths of around 400mm, equivalent to a peak water level of 40.41m AOD (Figure 7). The development platform is not inundated, with peak flood levels adjacent to the northern and western boundary of 40.28m AOD. A peak flood level of 40.35m AOD is recorded at the eastern corner of the site.

During the sensitivity test, representative of the scale of a 1 in 1000 year peak flow, (refer to Section 3.3), the site was entirely inundated (Figure 8). However, depths on the development platform are shallow, recorded as less than 10mm. Upon receipt of the EA 1 in 1000 year flow data, the assessment should be re-run to confirm peak flood levels during this event.

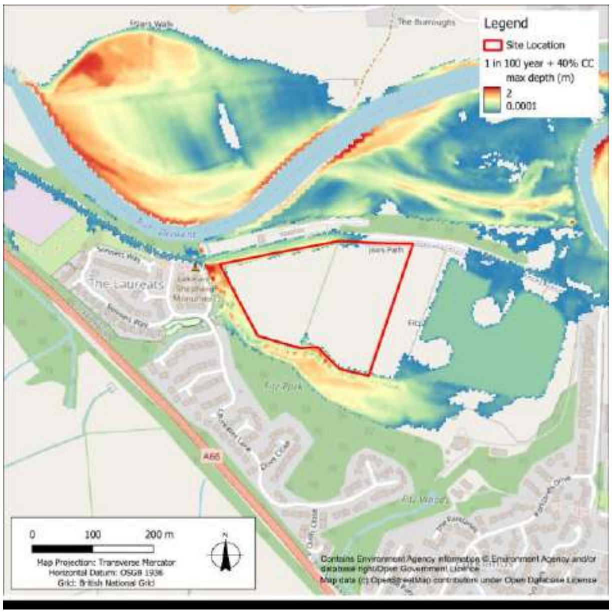


Figure 7 *Post development 1:100+40%CC year depths*

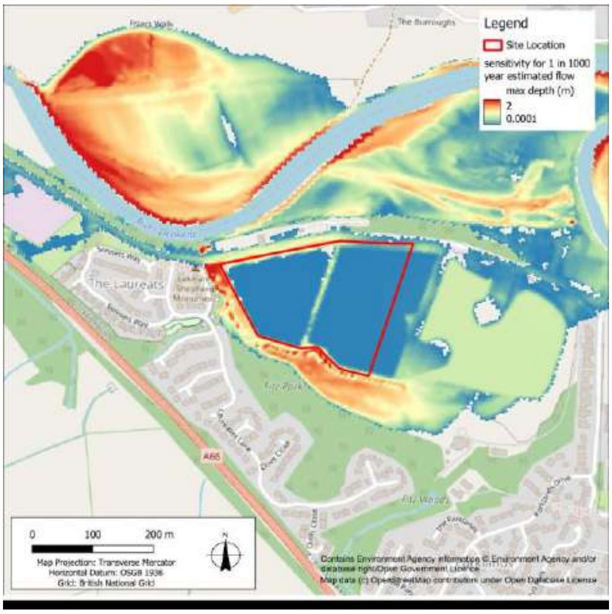


Figure 8 *Post development estimated 1 in 1000 year depths*

5. Change in flood extents

The hydraulic model flood extents were reviewed for pre and post development scenarios. This shows that during the 1 in 100 year plus 40% CC event, there are small, localised increases in flood extent on the adjacent highway (Low Road). These are isolated, and any changes in depths in and around these areas are very small when compared to the existing scenario. Adjacent to the site's northern boundary the maximum water depth increases on Low Road by approximately 20mm, elsewhere to the west, towards the waste water treatment works there are two isolated areas where depth increases exceed this. These are approximately 150m and 380m west of the site boundary. Here, depths locally increase by up to 35mm.

There is a single location where the increase in flood extent is more extensive. This is at the Wastewater Treatment Works to the west. Here, there is an increase in flood extent of 0.2 hectares. The maximum depth of water in this new area of flooding, which is centred on the depressions in the digital terrain model representative of the trickling filters, is approximately 200mm.

The difference in flood extents pre and post development is included below in Figure 9.

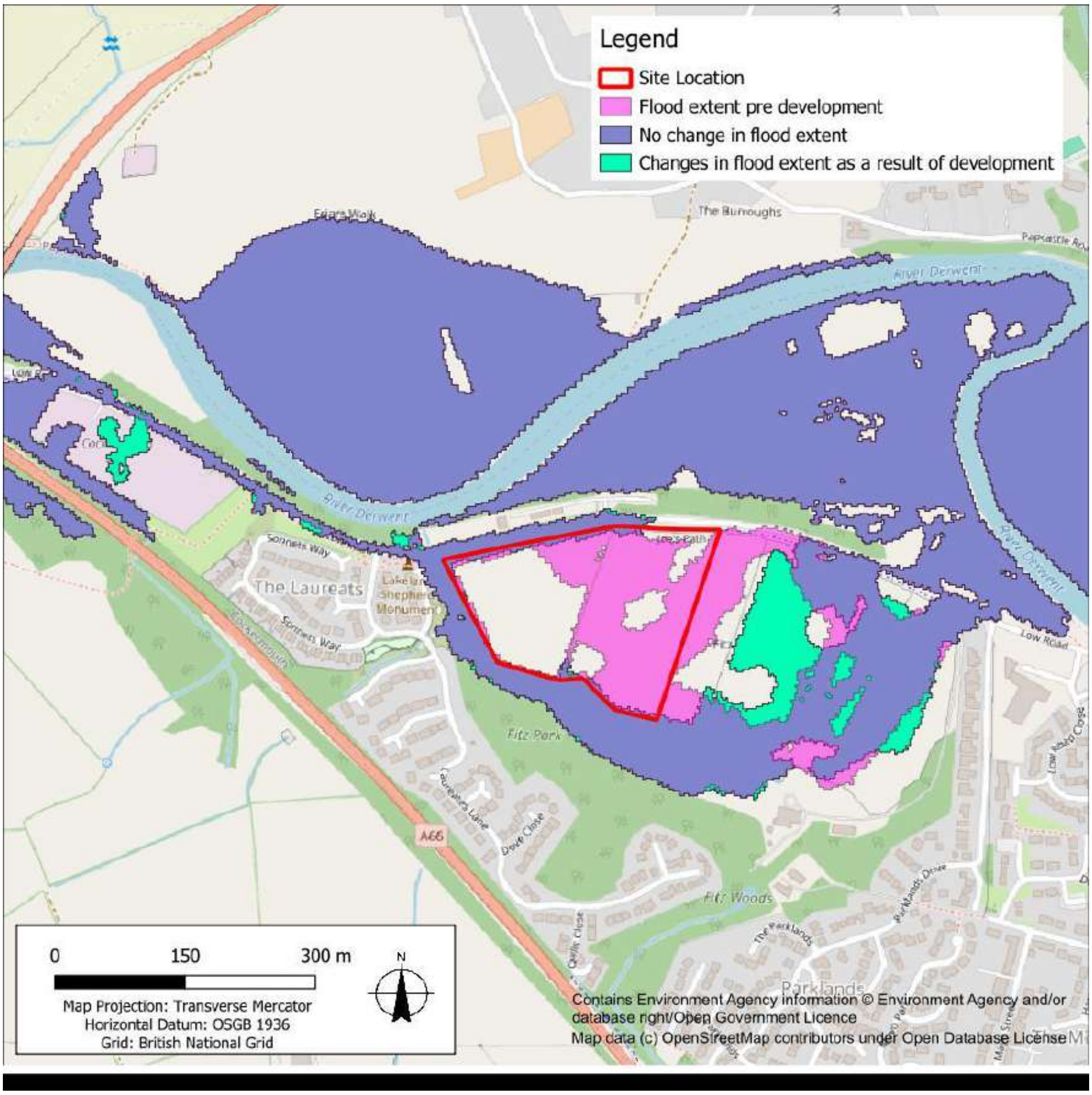


Figure 9 Change in flood extent pre vs post development

6. Conclusion

Hydraulic modelling has been undertaken using a model provided by the EA. A review of the model identified that, despite being released by the EA in 2018, and used again as late as 2022, the baseline topography was not representative of ground levels on or west of the development site. Updates to the model to include these wider floodplain modifications were made using freely available EA 2022 LiDAR data.

The baseline model, with updated topography for the development west of the proposed site, was run for a range of return periods to define the current flood risk to the site and surrounding area. The proposed site levels, including a floodplain compensation area, was then included and simulations re-run.

During the 1 in 20 year and 1 in 100 year flood events, the development site is not inundated, with the floodplain compensation area not being used for storage of displaced water. During the larger 1 in100 year with 40% climate change event, the floodplain compensation area is fully utilised and flood levels around the proposed development platform reach a peak level of 40.35m AOD, 350mm below the development platform of 40.7m AOD.

In the absence of 1 in 1000 year flow data from the EA, an estimate has been made to allow sensitivity testing of flood risk to take place. This found that, based on the approximation of flows, the likely flood risk during an event reflective of the 1 in 1000 year return period, could result in flooding to the development platform. Upon receipt of the EA 1 in 1000 year flow data the assessment should be re-run to confirm peak flood levels during this event.

Appendix A

Duncan Nicholls

From:	Duncan Nicholls
Sent:	04 April 2025 14:48
To:	CMBLNC Info Requests
Cc:	Daniel Roberson
Subject:	RE: CL376949KR: The Fitz, Cockermouth
CompleteRepository:	12574842
Description:	The Fitz, Broomlands
JobNo:	12574842
OperatingCentre:	401
RepoEmail:	12574842@ghd.com
RepoType:	Project

Hi Karen,

I just wanted to follow up on the below and ask if you or the team have had an opportunity to review the various points?

I also wanted to ask about the availability of up to date 1:1000 year flow data. The model "Cockermouth Town Model" currently assumed to be the most recent and relevant to the work being undertaken has been identified to include a range of flow data, however there is no Q1000 (1:1000) year flow data, despite their being a folder in the 1D model folders for it to be located.

Can we please request this data to enable us to test the model and proposed arrangements for the 1:1000 flows?

Regards,

Duncan

Duncan Nicholls
BSc MSc
Senior Flood Risk Consultant
Storm & Surface Water Service Line | Europe and Middle East

GHD
Proudly employed owned | ghd.com
41-51 Grey Street, Newcastle upon Tyne, NE1 6EE
DD +44 (0)191 917 1609 **E** duncan.nicholls@ghd.com

From: Duncan Nicholls
Sent: 31 March 2025 12:36
To: 'CMBLNC Info Requests' <Inforequests.cmblnc@environment-agency.gov.uk>
Cc: Daniel Roberson <Daniel.Roberson@ghd.com>
Subject: RE: CL376949KR: The Fitz, Cockermouth

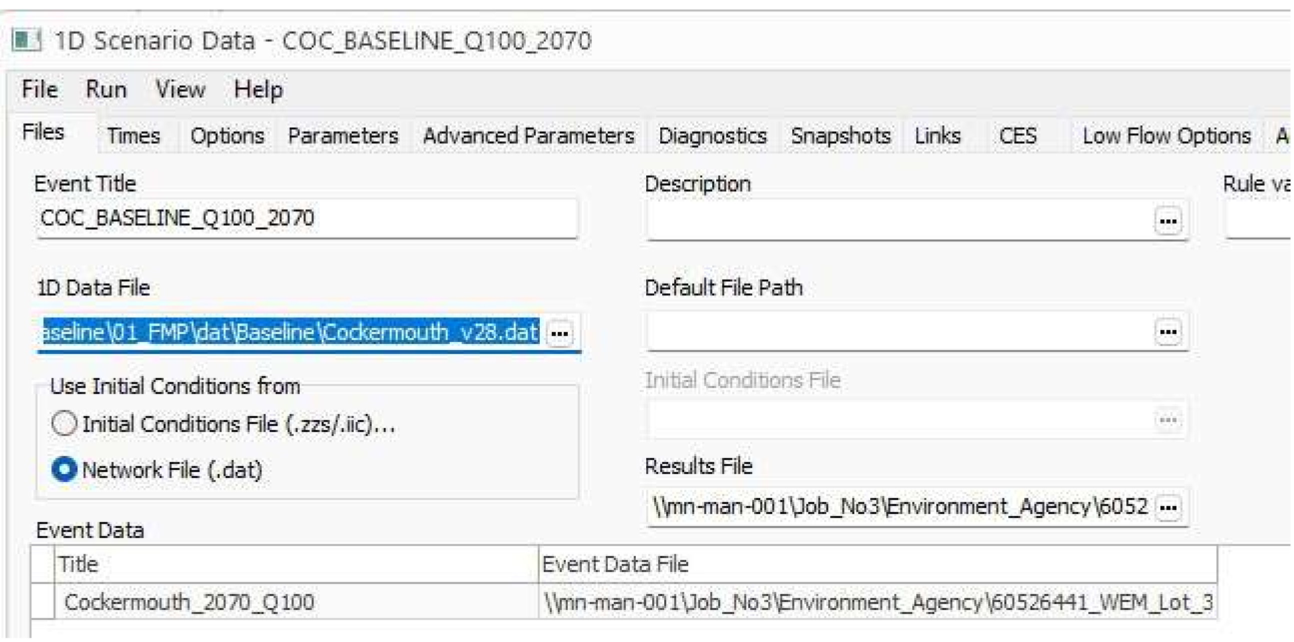
Hi Karen,

I hope you are well. I appreciate it has been a few months since we last spoke about the development in Cockermouth but we have been working with the client in the background on this. We have now been provided with some input by the council to the FRA for the scheme, which asks that the hydraulic modelling used in the FRA is updated given the time that has passed since it was last done. To ensure that the modelling that is done is as relevant as possible I wanted to check a few points with yourselves before we commence with this. I understand you might need to consult internally with other teams to provide a response to the three questions below but would appreciate any input or updates you can provide as that takes place.

The questions that we have in relation to the model are:

1. Is the model referred to as “Cockermouth Town Model” shown in the email of 19th September 2024 (below) the latest and most relevant to Cockermouth? These were provided to GHD via the attached email.
    a. If so can you confirm why the “Cockermouth_v28.dat” is not included for re-runs as based on the below screenshot this is required. Only V29 (Cockermouth_v29_DM.dat) and V30 (Cockermouth_v30_DN.dat) have been provided, and no model log was provided to confirm what changes have been applied. Can you please confirm which version of the 1D network to use to re-run the defended model?
2. The attached email refers to defended and undefended scenarios. As there are flood defences in Cockermouth that are maintained by the EA we assume that modelling using the defended scenario is acceptable for the purposes of the FRA?
    a. The defences, if agreed as acceptable, will be modelled as provided in the above mentioned model without any adjustments.
3. The latest model includes a range of climate change scenarios, described by the year (e.g. for the 100 year there are 2015, 2020, 2040, 2070). Our proposal is to use the 2020 flow data (.ied file) and scale the hydrographs using the flow multiplier function to achieve a 40% uplift in peak flows. This is the 2080s central allowance in Cockermouth. Is this CC uplift agreeable for the purposes of assessing risk to a new residential development, including the impact of floodplain compensation?

We also assume that given this is a re-run that a more recent version of TUFLOW (2023-03-AE) can be used, and possibly with the GPU HPC module? As the model will be run for baseline and proposed scenarios this will ensure a ‘like for like’ comparison is available and the two scenarios will use the same solvers. It is noted that the results will not be directly comparable to the EA results due to that using the older 2016-03-AE solver.



Regards,

Duncan

Duncan Nicholls
BSc MSc
Senior Flood Risk Consultant

Storm & Surface Water Service Line | Europe and Middle East

GHD
Proudly employee owned | ghd.com
41-51 Grey Street, Newcastle upon Tyne, NE1 6EE
DD +44 (0)191 917 1609 **E** duncan.nicholls@ghd.com

The Power of Commitment

Connect

From: CMBLNC Info Requests <Inforequests.cmblnc@environment-agency.gov.uk>
Sent: 09 October 2024 09:13
To: Duncan Nicholls <Duncan.Nicholls@ghd.com>
Subject: CL376949KR: The Fitz, Cockermouth

Dear Duncan

Enquiry regarding The Fitz, Cockermouth

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Thank you for your recent request for support and information concerning the modelling products that you are using to inform a planned development by your client.

Since Neil has left the Environment Agency there has been a budget review which is currently ongoing. As part of the review there has been a local recruitment freeze in place, which unfortunately means that we have not been able to look for a replacement for Neil and, currently, will be unable to provide support to your project. Neil has identified your project in his handover notes and if we are able to recruit to Neil's post these will be passed on to the new post holder for progression.

With regards to your model query, I can confirm that the original Options Appraisal modelling was completed in 2018 and we had some additional work carried out in 2022 to produce additional scenarios (including climate change allowances). The files that you have sent us are the most up to date versions.

I hope that the above information is helpful and hope that you can continue with the successful development of your project.

Please refer to Open Government Licence which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Thanks

Karen

Karen Rooke
Customers and Engagement Officer, Cumbria and Lancashire
Environment Agency | Ghyll Mount, Gillan Way, Penrith 40 Business Park, Penrith, Cumbria, CA11 9BP

inforequests.cmblnc@environment-agency.gov.uk

From: CMBLNC Info Requests
Sent: 19 September 2024 16:12
To: Duncan Nicholls <Duncan.Nicholls@ghd.com>
Subject: CL376949KR: The Fitz, Cockermouth

Dear Duncan

Thank you for contacting the Environment Agency regarding The Fitz, Cockermouth. Unfortunately we don't have a replacement for Neil so I have forwarded your request to the Team Leader.

As your request for information falls under either the Freedom of Information Act or Environmental Information Regulations we must respond to you within 20 working days.

I have sent your request to the relevant team to answer and will be in touch with you in due course.

In the meantime you may wish to look at www.data.gov.uk to see if the data you have requested is available for you online.

You may find it helpful to look online at The Flood Hub, which has been developed to hold up to date information about flooding in the North West, including what the Environment Agency is doing and what steps you can do yourself, to help increase your flood resilience.

For further information on what you can expect from us and our full service commitment to you, please click this link; https://www.gov.uk/government/publications/environment-agency-customer-service-commitment

If you need to contact me in the meantime, please do not hesitate to do so using the details below and quoting reference number CL376949KR.

Thanks

Karen

Karen Rooke
Customers and Engagement Officer, Cumbria and Lancashire
Environment Agency | Ghyll Mount, Gillan Way, Penrith 40 Business Park, Penrith, Cumbria, CA11 9BP

inforequests.cmblnc@environment-agency.gov.uk

EA2025
A HEALTHIER, GREENER, MORE SUSTAINABLE FUTURE
SHARE OUR AMBITION

From: Duncan Nicholls <Duncan.Nicholls@ghd.com>
Sent: 19 September 2024 15:26
To: CMBLNC Info Requests <Inforequests.cmblnc@environment-agency.gov.uk>
Cc: Daniel Roberson <Daniel.Roberson@ghd.com>
Subject: The Fitz, Cockermouth

Dear Sir/Ma'am,

We are hoping you can assist us. We (GHD) have been working on a project site west of Gote Bridge in Cockermouth. The general aim of the development, amongst other things, was to create a flood bypass channel on the inside of a meander on land our client owns. Neil Ash has previously been supporting us and providing some input, but I understand he has now left the EA. We were wondering if there was a replacement for his position that we could pick up the discussions with? We are keen to keep the scheme progressing and much of the design work and optioneering has already been undertaken.

Are you aware who we might be best for us to reach out too?

We also wanted to confirm the latest and greatest river model for this area. Via a data request in early 2024 I was informed that there is a 2018 Appraisal model for Cockermouth but that the EA also commissioned some additional model runs in 2022. We have been sent the below files. Are you able to confirm if these are the correct files to use if we are to update the model geometry for the most recent proposed arrangement of the flood bypass channel?

Name

- 2022 Additional model run results - Cockermouth.zip
- Cockermouth Report and Appendices.zip
- Cockermouth Town model.zip

Regards,

Duncan

Duncan Nicholls
BSc MSc
Senior Flood Risk Consultant
Storm & Surface Water Service Line | Europe and Middle East

GHD
Proudly employee owned | ghd.com
41-51 Grey Street, Newcastle upon Tyne, NE1 6EE
M +44 (0)7704 408843 **DD** +44 (0)191 917 1609 **E** duncan.nicholls@ghd.com

The Power of Commitment

Connect

Appendix B

Duncan Nicholls

From: Fearon, Caroline <Caroline.Fearon@Cumberland.gov.uk>
Sent: 03 April 2025 16:38
To: Duncan Nicholls
Cc: Daniel Roberson
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

Hi Duncan

Overall, I think the acceptability of what you are proposing will depend on comments from the EA. However, the measures you have outlined appear reasonable. The 40%CC would be acceptable if this meets with the gov. websites as some areas now require 50% CC.

Kind regards

Caroline

Caroline Fearon MRTPI
Specialist Planner | Inclusive Growth and Placemaking
Places, Sustainable Growth & Transport | Cumberland Council
Allerdale House, Workington, Cumbria, CA14 3YJ
T. 01900 516922
Cumberland.gov.uk

From: Duncan Nicholls <Duncan.Nicholls@ghd.com>
Sent: 27 March 2025 13:46
To: Fearon, Caroline <caroline.fearon@allerdale.gov.uk>
Cc: Daniel Roberson <Daniel.Roberson@ghd.com>
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

Hi Caroline,

I called your number listed below and note you were on leave when I called yesterday, so I just wanted to send a follow up email as well. We have been appointed by the client for the development at Low Road, Cockermouth, to support them with Hydraulic Modelling of the River Derwent. I note from your email below there is one bullet point in relation to this, but that the rest of the points are more focused on the FRA and drainage design. For clarity, we (GHD) have not been asked to produce an FRA, only to carry an update to the river modelling.

I wanted to discuss with you the proposed modelling methodology we were looking to use, so that we could ensure our proposed scope of works are aligned with your expectations for the sites flood risk appraisal. We currently have on our system a number of models for the River Derwent, all supplied by the EA over the years, in relation to work done on this site and others in Cockermouth.

We are proposing to consult with the EA to confirm that the models we hold are the latest and most relevant, given the recent updates to the Flood Map for Planning and the changes in flood extents these have shown. We would thereafter use the model agreed upon and re-run it to get a baseline flood risk including, if appropriate, site-specific topographical survey data. The baseline flood risk would be established for the 1:20, 1:100, 1:100+40%CC (2080s central allowance) and 1:1000 year return period events. Once this was complete, we would then modify the floodplain topography to reflect the proposed development levels, including the compensation flood storage areas, and re-run the model for the same range of return periods.

The final stage of the work would be to identify differences in flood risk, if any, because of the change in floodplain topography. We would liaise with the client and their appointed civil engineers to optimise the design of the site levels and compensation area, if required. The consultation and modelling process that has been undertaken would be documented in a technical note for inclusion within an FRA.

Can you please confirm whether the model is to include all existing flood defences? Whilst the Flood Map for Planning has historically shown the undefended scenario, we are aware there are a significant number of defences upstream of this site that do affect flood extents around the development. As these defences should be maintained or upgraded by the EA for the lifetime of the development, it would be unrealistic to model a scenario with all these defences removed.

I would appreciate speaking with you on the phone about this on your return, but in the meantime hope that this summary provides you with an overview of the intended work. Can you please, by reply to this email, acknowledge if this would help to satisfy your concerns raised in the below highlighted point?

Regards,

Duncan

Duncan Nicholls
BSc MSc
Senior Flood Risk Consultant
Storm & Surface Water Service Line | Europe and Middle East

GHD
Proudly employee owned | ghd.com
41-51 Grey Street, Newcastle upon Tyne, NE1 6EE
DD +44 (0)191 917 1609 **E** duncan.nicholls@ghd.com

From: Fearon, Caroline <Caroline.Fearon@Cumberland.gov.uk>
Sent: 27 February 2025 15:05
To: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>

Cc: Robert Slack <rjslack@hotmail.com>; Glen Beattie <GB@adcumbria.co.uk>; Jonathan Hobbs <Jonathan.Hobbs@pegasusgroup.co.uk>
Subject: FW: FUL/2024/0192 Low Road, Cockermouth

Dear Dominic

I have be reviewing in detail the Flood Risk Assessment submitted with he application and the contents raise some concerns. These include:

- The FRA refers to 2019 NPPF which was out of date at the time the submitted report was written which ate that time would have been Dec 2023. This has since been updated to the latest version published Dec 2024.
- It list the site has less vulnerable. The site is for houses and therefore would fall within the more vulnerable category.
- 45% Climate Change has been added on this should be 50% with the 10% urban creep.
- The report references that Hydraulic modelling has been carried out by other. This is a separate application and therefore this would need to be carried out again as part of the current proposal to establish the scheme is acceptable in terms of flood risk. The previous FRA modelling and data was from 2027/2018 given that 7/8 years has passed this modelling and data from the RA is likely to be out of date. We would therefore expect consultation with the EA to be carried again as part of this application and for an significant increase in numbers.
- It needs to consider all aspects of a FRA as it is a new scheme such as historical flooding. What is the outcome of the Cockermouth Flood Investigation by EA and how does this impact the proposal.
- Details infiltration not feasible but no ground investigation has been carried out and the results submitted to discount these as would be needed to follow the drainage hierarchy.

The site is within Flood Zone 2 and therefore normally planning permission would not be supported in area of higher flood risk without the sequential test been undertaken. Paragraph 175 of the current NPPF reads" The sequential test should not be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escapes routes, land raising or other potentially vulnerable elements, would be located on an areas that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk)".

In this case a sequential test is not required a site specific flood risk is to be undertaken. The current NPPF seek that all area including access is within FZ2 and 3 should be considered. While in principle it can be demonstrated that the site levels are to rise to take the development into FZ1 this would not be the case for the access and this needs to be considered.

Whilst the Council are aware that an extant permission remains on the site for 27 dwellings this was considered an determined based the detail information submitted with the application at the time and the legislation and policy at this time. While the extant permission would allow the principle of residential development on the site, this is anew permission for a significant greater number of dwellings and needs to be and requires full updated reports based on the most up to date data available such as a FRA as the proposal will be determined against current national and local policies. As submitted the FRA has not taken account of the elements that should be considered in a FRA, most up to date data and current modelling should be undertaken and does not demonstrate the proposal is acceptable in terms of flood risk. The revised FRA should also be in accordance with the newly published flood maps and guidance New national flood and coastal erosion risk information - GOV.UK.

The 2018 application was approved subject to S106 that required the flood compensatory to be carried out on the adjacent Fitz land as secured under application 2/2017/0312. It has been proposed that this work would again be secured under S106. However, given the time that has passed and that modelling as part of this application was based on 16 dwellings it is considered that this may be out of date and a larger compensatory area may be required to serve 47 dwellings as such. This would need revisiting to demonstrate it is sufficient to accommodate the proposed scheme and if it is not a revised application may be required. Can you please also clarify what part of the works approved under the 2017 application have been implemented in accordance with the approved details. If the works vary for these works then this may also necessitate a new application .

Given the information contained in this email and that previously provided can you please confirm whether you seek to amend the application or should I move forward with a determination of refusal on the current submitted plans and reports.

Kind regards

Caroline

From: Fearon, Caroline
Sent: 31 January 2025 08:42
To: 'Dominic Waugh' <Dominic.Waugh@pegasusgroup.co.uk>
Cc: Robert Slack <rjslack@hotmail.com>; Glen Beattie <gb@adcumbria.co.uk>; Jonathan Hobbs <Jonathan.Hobbs@pegasusgroup.co.uk>
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

Hi Dominic

I do not consider your approach to be acceptable. The other matters I have addressed would have an impact on the final layout. I will mention a few:

- If the 10% net gain has not been provided on the site I reduction in the number of dwelling would be required to provide this;
- Drainage should be designed into the layout rather than an afterthought;
- The police comments may change the layout;
- The design/scale of the dwelling themselves would impact on the size of the plots they site in;

The minor changes you have made do not address may comments on density and it is still changing the development to a high density urban development. They examples for the terraced or conjured dwellings was not a suggestion for the whole site but was trying to provide you with alternatives that may be incorporated to achieve some of the smaller units. A stated in the letter we do consider the design and scale of the dwellings already approved in the 2018 are the approach that should be taken.

Kind regards

Caroline

From: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>
Sent: 30 January 2025 17:09
To: Fearon, Caroline <caroline.fearon@allerdale.gov.uk>
Cc: Robert Slack <rjslack@hotmail.com>; Glen Beattie <gb@adcumbria.co.uk>; Jonathan Hobbs <Jonathan.Hobbs@pegasusgroup.co.uk>
Subject: FW: FUL/2024/0192 Low Road, Cockermouth

Good afternoon Caroline,

Thanks for the attached letter received yesterday afternoon. Based on our earlier correspondence, we were keen to revisit the layout based upon the consultee comments and our email dialogue to date. Following receipt of the attached letter, I do still think that the correct approach is to seek a mutually agreeable layout before responding to the other responses from yourself and consultees. However, I do find the content of the attached letter somewhat contradictory in terms of design. When I say 'design', I am keen to firstly focus on the layout itself. This certainly isn't me dismissing any other design comments, it is just that I believe that if we reach agreement on a density suitable for the locality then we can then consider the comments on the design of the properties themselves. I interpret the attached letter as, on the one hand, suggesting that the scheme should be significantly less dense, in order to replicate the density of the already approved scheme. However, on the other hand, if we were to follow other suggestions in the letter, for example incorporating short terraces and cojoined buildings, then I believe that an inevitable outcome would be a higher density scheme.

In this regard, focussing firstly on the layout itself, I attach the following:

1. Site Plan 201a);
2. Site Sections 209a); and
3. Dwelling Tyle Schedule.

Plot 13 has been re-orientated to align seamlessly alongside units 14-16, ensuring a cohesive design where you raised concerns about the property appearing incongruous. Similarly, plots 44-47 have been re-orientated, with their rear private gardens now facing Low Road. Parking arrangements in this area have also been reorganised to provide more fluid access, creating a more user-friendly and efficient layout. These adjustments result in a more attractive vista from Low Road and contribute to a more inclusive and thoughtful scheme design.

Additionally, a roundabout has been incorporated into the proposal, which as well as precisely replicating the access approved for the extant scheme, softens the layout of the scheme and contributes to a more fluid and visually appealing design. This roundabout had previously been approved as part of planning application 2/2018/053 and is therefore considered an appropriate element to integrate into the scheme.

Further addressing the Authority's request, the amount of Open Space has been clearly highlighted and quantified within the plan, with each area providing its corresponding value. In total, the site offers 3,080m^2 of amenity space, significantly exceeding the Council's requirement provided in your previous correspondence of 705m^2.

In making these amendments to the previously submitted plans, it is considered that the Applicant has addressed all comments previously made on the site layout. I would be grateful if you could initially provide your agreement to the revised layout so that the Applicant can seek to address the other matters raised on the proposed scheme.

I look forward to your response in due course.

Kind regards,

Dominic Waugh
Senior Director - Planning

E Dominic.Waugh@pegasusgroup.co.uk
M 07741 249776 | **DD** 0191 594 7180 | | **EXT** 6221
3rd Floor, Gainsborough House | 34-40 Grey Street | Newcastle upon Tyne | NE1 6AE
PEGASUS GROUP

From: Fearon, Caroline <Caroline.Fearon@Cumberland.gov.uk>
Sent: 29 January 2025 15:53
To: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

Dear Dominic

Please find attached my replying to you letter and email received the 16 December 2024.

Kind regards

Caroline

Caroline Fearon MRTPI
Specialist Planner | Inclusive Growth and Placemaking
Places, Sustainable Growth & Transport | Cumberland Council
Allerdale House, Workington, Cumbria, CA14 3YJ
T. 01900 516922
Cumberland.gov.uk

From: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>
Sent: 20 January 2025 12:32
To: Fearon, Caroline <caroline.fearon@allerdale.gov.uk>
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

WARNING: This email originated outside of Allerdale Borough Council.
DO NOT CLICK links or attachments unless you recognise the sender and know the content is safe.

Thanks Caroline,

The extension of time is agreed. By way of an update, the site design is currently being revised to align with the comments made to date. I hope to be back in contact with you soon to discuss the revised design.

Kind regards,

Dominic Waugh
Senior Director – Planning

E Dominic.Waugh@pegasusgroup.co.uk
M 07741 249776 | **DD** 0191 594 7180 | | **EXT** 6221
3rd Floor, Gainsborough House | 34-40 Grey Street | Newcastle upon Tyne | NE1 6AE
PEGASUS GROUP

From: Fearon, Caroline <Caroline.Fearon@Cumberland.gov.uk>
Sent: 16 January 2025 10:54
To: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>
Subject: FUL/2024/0192 Low Road, Cockermouth

Dear Dominic

Please find attached comments from Natura England regarding the BNG information submitted.

I have only returned to work yesterday so have not been able to look into your letter in detail and will be doing this over the next few weeks. Can I please therefore request an extension of time until the 5 April 2025.

Kind regards

Caroline

Caroline Fearon MRTPI
Specialist Planner | Inclusive Growth and Placemaking
Places, Sustainable Growth & Transport | Cumberland Council
Allerdale House, Workington, Cumbria, CA14 3YJ
T. 01900 516922
Cumberland.gov.uk

Cumberland Council
Workington Office, Allerdale House, Workington, Cumbria, CA14 3YJ

Follow us on:
Web: https://www.cumberland.gov.uk
Twitter: https://twitter.com/CumberlandCoun
Facebook: https://www.facebook.com/CumberlandCouncil1/

Cumberland Council
Workington Office, Allerdale House, Workington, Cumbria, CA14 3YJ

Follow us on:
Web: https://www.cumberland.gov.uk
Twitter: https://twitter.com/CumberlandCoun
Facebook: https://www.facebook.com/CumberlandCouncil1/

EMAIL DISCLAIMER

The views expressed in this document are those of the individual and are not necessarily the same as the Council's.

This electronic transmission is only intended for the individual or entity to which it is addressed and may contain information that is privileged,

APPENDIX I

RIVER DERWENT HYDRAULIC MODELLING UPDATES AUGUST 2025

Technical Memorandum

August 26, 2025

To	Robert Slack (client)	**Contact No.**	+44 (0)191 917 1588
Copy to	Steve Best (GHD)	**Email**	daniel.roberson@GHD.com
From	Daniel Roberson (GHD)	**Project No.**	12574842
Project Name	The Fitz, Low Road, Cockermouth, planning application FUL/2024/0192		
Subject	River Derwent hydraulic modelling updates and third party consultation		

1. Introduction

1.1 Purpose of this Memorandum

GHD were appointed by Robert Slack to carry out hydraulic modelling of the River Derwent, to inform flood risk at a proposed development site, situated at The Fitz, Low Road, Cockermouth. The client, Robert Slack, has submitted a planning application for the development of residential properties on a site in Cockermouth. Cumberland Council responses to the planning application (FUL/2024/0192) have identified that due to the age of the hydraulic modelling currently used to inform the Flood Risk Assessment (FRA), that updates may be required to address changes in flood risk understanding and climate change allowances. GHD has carried out simulations using a model previously supplied by the Environment Agency, incorporating changes to the topography to both better represent the current situation and the proposed development arrangement. This Technical Note details the consultation process that was undertaken and the hydraulic modelling carried out, but does not constitute a Flood Risk Assessment.

2. Consultation

2.1 Environment Agency

GHD has issued email enquiries to the Environment Agency (EA) regarding flood risk in Cockermouth. Based on email exchanges in September 2024, there were updated hydraulic models for Cockermouth to be used for flood risk assessment. The files supplied by the EA at that time were contained within a zipped folder named "*Cockermouth Town Model*", a term of reference used in the supporting email correspondence.

GHD contacted the EA via their information requests mailbox to confirm, together with a range of more specific technical queries, whether this was the latest model for Cockermouth. A full copy of the email issued to the EA is included in Appendix A.

The EA responded on the 22nd April 2025 and confirmed that the model referred to as "Cockermouth Town Model" shown in the email of 19th September 2024 was the latest and most relevant. The EA also provided a complete set of the flow data, including the 1 in 1000 year data that was previously omitted.

2.2 Cumberland Council

The purpose of the hydraulic modelling, as outlined above, is to provide an improved understanding of current flood risk to the development site. The Council had expressed concern at the age, and therefore validity, of the modelling used in support of the FRA report.

To ensure the scope and methodology of the hydraulic modelling was appropriate for the understanding of flood risk from Cumberland Council's perspective, the proposed approach was outlined to the Council contact who first raised the query.

The response from the Council, included in Appendix B, identified that *"the acceptability of what you are proposing will depend on comments from the EA"* but that *"the measures you have outlined appear reasonable".*

In the absence of a response from the EA at the time of instruction by the client, and due to time constraints relating to the planning application, the hydraulic modelling was progressed without first agreeing the parameters with the EA at the client's instruction. However, confirmation was received from the EA at a later date regarding the validity of the model being used, which helps to ensure confidence in the work being undertaken.

3. Model data used

GHD are aware that a number of hydraulic models for Cockermouth have been developed over the years. The latest model, based on consultation in September 2024 by GHD with the EA, identified the files relating to the "*Cockermouth Town Model*" were to be used for the assessment of flood risk.

This model data was supplied without any supporting documentation and so the full history and purpose of the model is unclear. The files used in this hydraulic model were supplied by the EA to GHD in April 2024, following an earlier data request. The accompanying email explained that there was a 2018 'appraisal model' for Cockermouth, with associated reporting. It was also stated that:

> *"We also commissioned some additional model runs in 2022. This included some additional runs for the Baseline (defended) scenario, and some additional runs to represent the 'undefended' scenario as required for Flood Map for Planning, as well as undefended climate change. (Confusingly, the ASCII 2D results for this scenario are called 'Do Nothing').*
>
> *This data was delivered as a Geodatabase. There was no report accompanying this work."*

In the absence of any model log or further clarity on the model setup, the model files provided were interrogated. This identified scenarios referring to 'Do Nothing', which are specifically mentioned by the EA, as being the most recent by save date. As a result, the files associated with these scenarios have been assumed to be the latest, and so most appropriate, model data for Cockermouth.

3.1 Changes to the baseline model

The model files were all included with the zipped folder named "*Cockermouth Town Model*", with the exception of the 1D (geometry) file. The model files linked to an earlier version (v28) but only v29 and v30 were provided in this pack of data. The names of the files identified that v29 was a "Do Minimum" scenario and v30 was a "Do Nothing" scenario. As such, and based on past naming conventions, it was identified that v29 was the most appropriate to represent the current defences in Cockermouth, and that v30 was more appropriate for an undefended model.

The model is a Flood Modeller (1D) and TUFLOW (2D) model. The available logs show that it was historically run on older version of both software, which are now superseded. A more recent version of the software has been used for this assessment. This also enabled the use of the Heavily Parallelised Compute (HPC) which is a 2D Shallow Water Equation (SWE) solver that leverages parallel processing, including GPU acceleration, for significantly faster simulation times compared to the single-core TUFLOW Classic solver, with the added benefit of improving stability in some cases. As both the baseline and proposed models were run on the same solvers, this ensures a direct comparison between the two flood extents can be made.

Finally, a review of the model setup identified that older elevation data from 2016 was being used to represent the floodplain topography. To ensure the most appropriate ground levels were being used for the floodplain, a comparison was made between the 2016 digital terrain model and the more recent 2022 LiDAR data, which was freely available from the EA. This identified that immediately west of the proposed site, significant changes in land elevation had occurred, in some places ground levels had been raised more than 2m. As this was considered to have potentially significant impacts on flood risk at the development site, a section of new LiDAR was extracted and added to the model for the baseline and proposed scenarios. This ensured that the residential development to the west of the proposed development site is more appropriately represented.

3.2 Modifications to represent the proposed site levels and wider model arrangements

The development proposal involves the creation of a development platform at 40.70m AOD on land south of Low Road, and flood storage to compensate flood volumes displaced by the ground raising, on land north of Low Road.

The proposed platform levels were provided by Beckwith & Hanlon on 1st April 2025. The elevations were added to the model via the use of ‘2d_zsh points’ and region layers. This provides local changes in ground topography only within the specified ground raising/lowering areas.

The changes in ground levels to the land north of Low Road, referred to as Broomlands, was based on a GHD design which reduces the floodplain levels to 39.400mAOD (refer to Appendix C for further detail).

Finally, a proposed floodwall was added to the model. The aim of this wall is to remove the flow pathway for water crossing the nearby garden centre land and reaching the site and surrounding area. The wall is located on land owned by the Client and was raised to be a minimum of 600mm above the 1:1000 year peak water level in the channel. The alignment of this wall is shown below in Figure 1.

Figure 1 Site location and proposed flood wall location

No other changes to the model were made, roughness was left as in the base model on, and around, the site.

3.3 Flow data

The EA model included a range of flow data, ranging from the 1 in 2 year (50% Annual Exceedance Probability, or AEP) to 1 in 200 year (0.5% AEP). Whilst a folder was provided in the original model for the 1 in 1000 year (0.1% AEP) flows, this was empty, and the EA did not identify an alternative means to run the 0.1% AEP events. During the later consultation response in April 2025, the 1 in 1000 year data was provided by the EA.

The return periods included in the GHD hydraulic modelling were:

- 1 in 20 year (2020)
- 1 in 100 year (2020)
- 1 in 100 year (2020), plus a 40% uplift for climate change
- 1 in 1000 year (2020)

The EA flow data provided includes a range of uplifts for climate change. These were identified by the year in the file name and values included 2015, 2020, 2040 and 2070.

The flow data has been inferred from the information provided in the "*Kendal Appraisal Package FRM Appraisal Summary Report Cockermouth FRM Scheme*". This was supplied in a separate pack of data by the EA at the same time as the model. This report states that peak river flow increases are relative to a 1961-1990 hydrological baseline. The 2015 period is not defined, but the remainder are explained to be:

- 2020: **2015** to 2039 time period, representative of a 15% uplift in flows from the baseline
- 2050: **2040** to 2069 time periods, representative of a 25% uplift in flows from the baseline
- 2080: **2070** to 2115 time periods, representative of a 30% uplift in flows from the baseline

The GHD modelling undertaken for these works, has used the "2020" flow information as the "current" (present day) flow data. A 40% uplift in flows was applied to the 1 in 100 year hydrograph included in the dataset to account for climate change in accordance with the latest guidance. For the Derwent North West Management Catchment, the 2080s Central Allowance is 40%.

The 2080s time period represents the full development lifetime for the proposed scheme, assuming it is a residential site with a 100 year design life. The EA guidance[1] states that residential development (classified as more vulnerable in accordance with the National Planning Policy Framework) should use the Central Allowance, when in Flood Zones 2 and 3.

[1] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#peak-river-flow-allowances

4. Results

4.1 Baseline (present day)

The baseline model, with flood defences in place and updated topography to the west of the development site, shows that during the 1 in 20 year (Figure 2), and 1 in 100 year (Figure 3) events, the site does not flood.

For the 1 in 100 year with climate change scenario (Figure 4), the site is partially inundated with depths ranging from 0m to 1.5m.

During the 1 in 1000 year peak flow, the site is more extensively inundated, although not entirely (Figure 5). Depths range between 0 and 1.8m.

Figure 2 ***Pre-development 1:20 year depths***

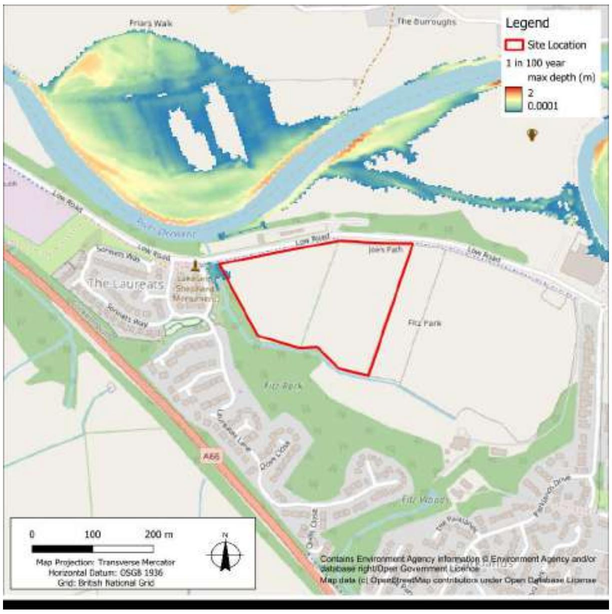


Figure 3 ***Pre-development 1:100 year depths***

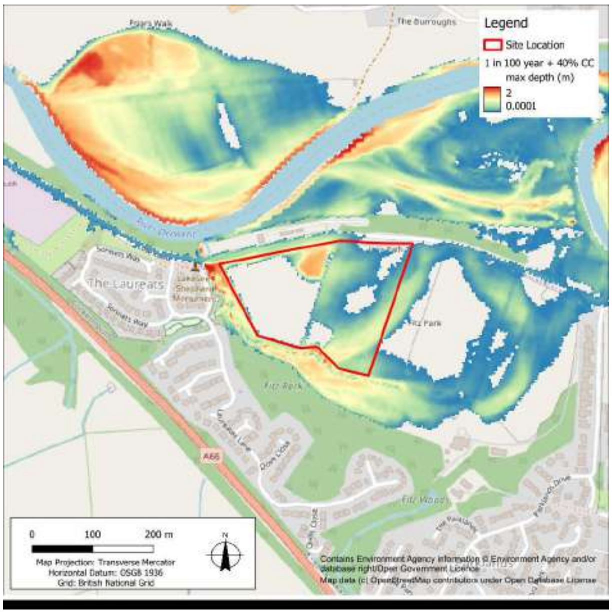


Figure 4 ***Pre-development 1:100+40%CC year depths***

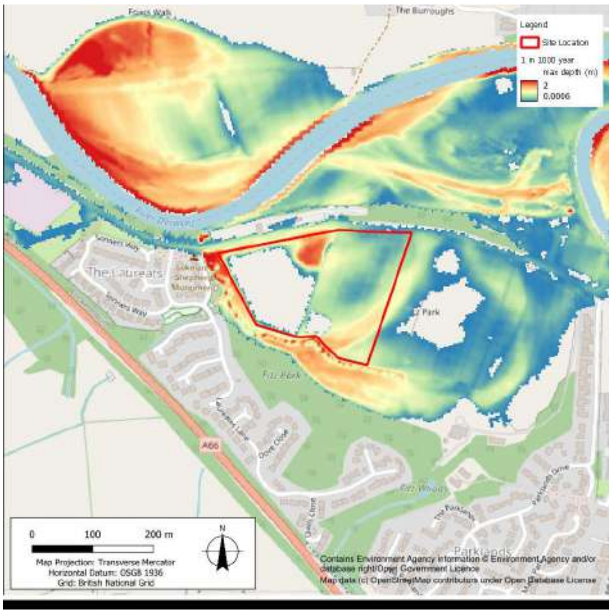


Figure 5 ***Pre-development estimated 1 in 1000 year depths***

4.2 Proposed Site

The proposed development site model, with floodplain lowering on the Broomlands land and the raised floodwall north east of the garden centre, shows that for all events, the 1 in 20 year (Figure 6), 1 in 100 year (Figure 7), 1 in 100 year + 40%CC (Figure 8) and 1 in 1000 year (Figure 9) events, the site does not flood.

This scenario also includes updated topography to the west of the development site.

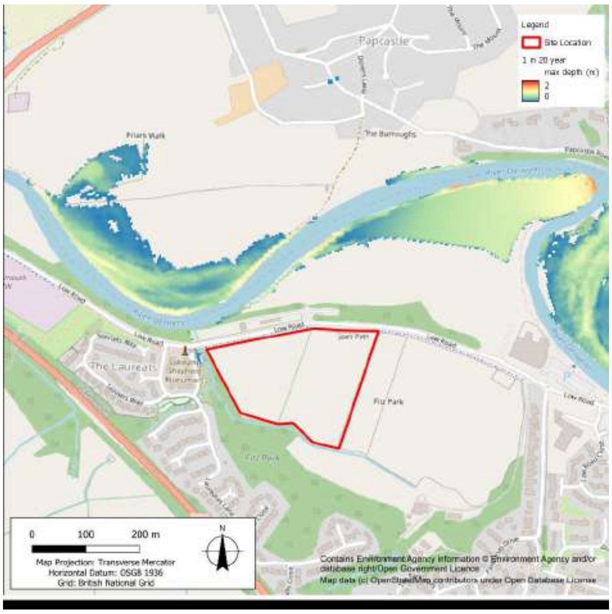


Figure 6 Post development 1:20 year depths

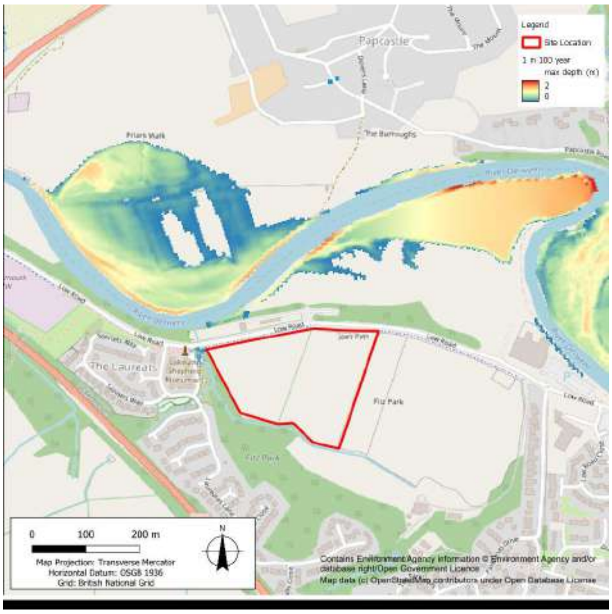


Figure 7 Post development 1:100 year depths

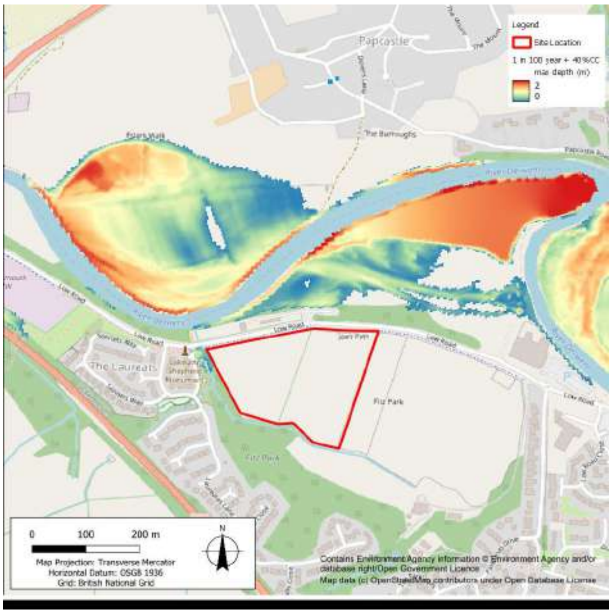


Figure 8 Post development 1:100+40%CC year depths

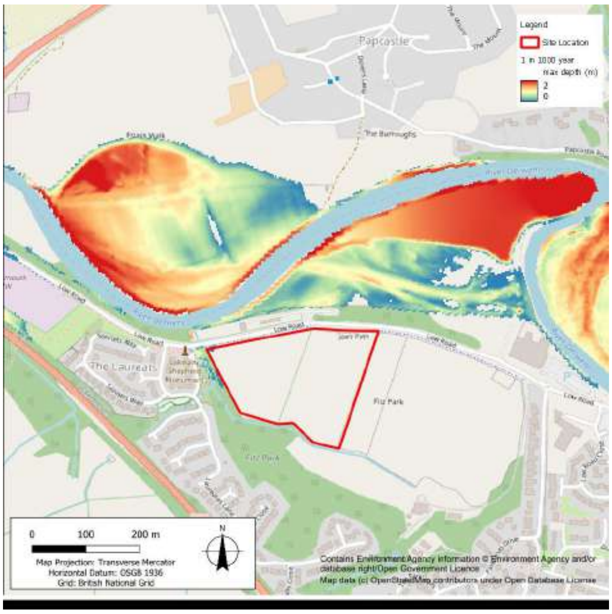


Figure 9 Post development 1 in 1000 year depths

5. Change in flood extents

The hydraulic model flood extents were reviewed for pre and post development scenarios. This shows that during the 1 in 100 year plus 40% CC event, the inclusion of the flood wall and the lowering of Broomlands floodplain has resulted in the removal of flooding from Low Road in its entirety, as well as at the site boundary.

The only areas where flood extents increase compared to the baseline is in the Broomlands land where ground lowering will take place.

The difference in flood extents pre and post development is included below in Figure 10. The areas in pink indicate where flooding has been removed as a result of the inclusion of the floodwall and land lowering.

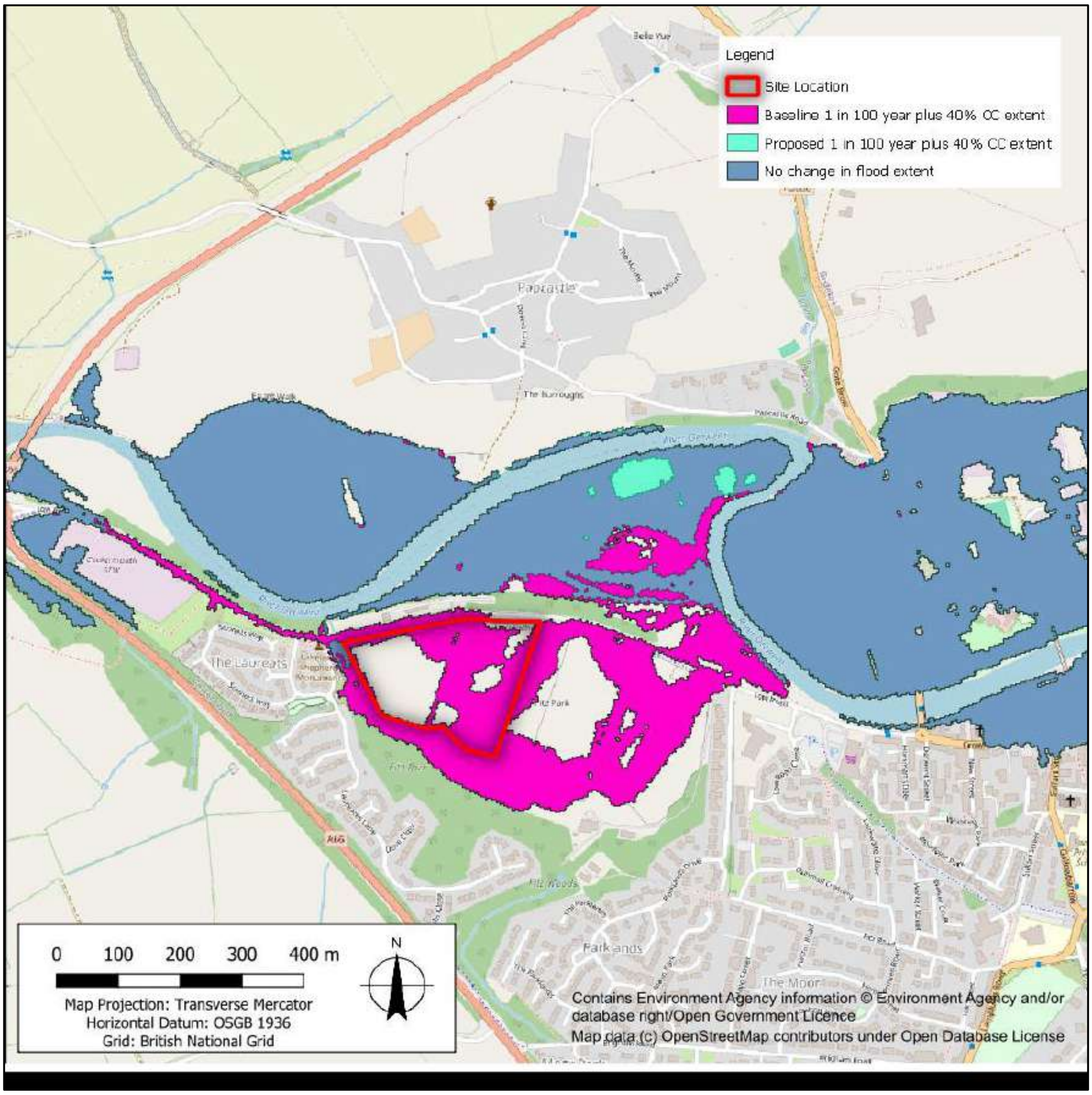


Figure 10 Change in flood extent pre vs post development

6. Conclusion

Hydraulic modelling has been undertaken using a model provided by the EA. A review of the model identified that, despite being released by the EA in 2018, and used again as late as 2022, the baseline topography was not representative of ground levels on or west of the development site. Updates to the model to include these wider floodplain modifications were made using freely available EA 2022 LiDAR data.

The baseline model, with updated topography for the development west of the proposed site, was run for a range of return periods to define the current flood risk to the site and surrounding area. The proposed site levels, including a floodplain compensation area on land north of Low Road, was then included, as well as a raised flood wall north east of the garden centre, and simulations re-run.

During all simulated events the inclusion of the raised flood wall and land lowering ensures that flood water does not reach the site, and there is no increase in flood extent or depth elsewhere as a result.

Appendix A

Duncan Nicholls

From:	Cumbria and Lancashire Enquiries <no.reply@ea.ecase.co.uk>
Sent:	22 April 2025 13:22
To:	Duncan Nicholls
Subject:	Request for information - Ref: EIR2025/03598RI

Dear Duncan Nicholls,

I am writing in response to your request for information, received 4 April 2025, regarding The Fitz, Cockermouth.

We respond to requests for information under the Freedom of Information Act 2000 (FOI) and Environmental Information Regulations 2004 (EIR).

Please note we are unable to advise on any modelling technical queries.

Is the model referred to as "Cockermouth Town Model" shown in the email of 19 th September 2024 (below) the latest and most relevant to Cockermouth? These were provided to GHD via the attached email.

Yes

1. *If so can you confirm why the "Cockermouth_v28.dat" is not included for re-runs as based on the below screenshot this is required. Only V29 (Cockermouth_v29_DM.dat) and V30 (Cockermouth_v30_DN.dat) have been provided, and no model log was provided to confirm what changes have been applied. Can you please confirm which version of the 1D network to use to re-run the defended model* ***?***

We have checked the deliverables and there is no v28.dat. We have provided you with all the Cockermouth Town model files we received at the close of the study. We are unable to advise on the 1D network technical query.

I also wanted to ask about the availability of up to date 1:1000 year flow data. The model "Cockermouth Town Model" currently assumed to be the most recent and relevant to the work being undertaken has been identified to include a range of flow data, however there is no Q1000 (1:1000) year flow data, despite their being a folder in the 1D model folders for it to be located.

We have provided you with everything we received at the close of the study for Cockermouth Town model - We have resupplied this as a zip file below just to be sure you're in receipt of everything.

If you require up to date flow data, please make a separate request and this will be answered by our Hydrometry Team.

Please download within 21 days of receipt: https://ea.sharefile.com/public/share/web-sbf1ef01ec5d04e3da789f8c2c004d5cf

Should you wish us to review any technical documents or want further advice to address the environmental issues raised, we may do this as part of our charged for planning advice service.

Further engagement will provide you with the certainty of our position as to what our response to your planning application will be. It should also result in a better quality and more environmentally sensitive development.

As part of our charged for service we will provide a dedicated project manager to act as a single point of contact to help resolve any problems. We currently charge £100 per hour, plus VAT. We will provide you with an estimated cost for any further discussions or review of documents. The standard terms of our charged for service are available here.

If you would like more information on our planning advice service, including a cost estimate, please contact us at clplanning@environment-agency.gov.uk.

Please refer to the Open Government Licence which explains the permitted use of this information.

Rights of appeal

If you are not satisfied with our decision, you can contact us within two calendar months to ask for the decision to be reviewed. We will then conduct an internal review of our response to your request and give you our decision in writing within 40 working days.

If you are not satisfied with the outcome of the internal review, you can then make an appeal to the Information Commissioner Office, the statutory regulator for EIR and FOI. The address is: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire. SK9 5AF.

Tel: 0303 123 1113 (local rate) or 01625 545 745 (national rate) | Fax: 01625 524 510 Email: casework@ico.org.uk | Website: www.ico.org.uk

Yours sincerely,

Rosie Irlam

CLA Area Customers and Engagement Team

Appendix B

Duncan Nicholls

From: Fearon, Caroline <Caroline.Fearon@Cumberland.gov.uk>
Sent: 03 April 2025 16:38
To: Duncan Nicholls
Cc: Daniel Roberson
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

Hi Duncan

Overall, I think the acceptability of what you are proposing will depend on comments from the EA. However, the measures you have outlined appear reasonable. The 40%CC would be acceptable if this meets with the gov. websites as some areas now require 50% CC.

Kind regards

Caroline

Caroline Fearon MRTPI
Specialist Planner | Inclusive Growth and Placemaking
Places, Sustainable Growth & Transport | Cumberland Council
Allerdale House, Workington, Cumbria, CA14 3YJ
T. 01900 516922
Cumberland.gov.uk

From: Duncan Nicholls <Duncan.Nicholls@ghd.com>
Sent: 27 March 2025 13:46
To: Fearon, Caroline <caroline.fearon@allerdale.gov.uk>
Cc: Daniel Roberson <Daniel.Roberson@ghd.com>
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

Hi Caroline,

I called your number listed below and note you were on leave when I called yesterday, so I just wanted to send a follow up email as well. We have been appointed by the client for the development at Low Road, Cockermouth, to support them with Hydraulic Modelling of the River Derwent. I note from your email below there is one bullet point in relation to this, but that the rest of the points are more focused on the FRA and drainage design. For clarity, we (GHD) have not been asked to produce an FRA, only to carry an update to the river modelling.

I wanted to discuss with you the proposed modelling methodology we were looking to use, so that we could ensure our proposed scope of works are aligned with your expectations for the sites flood risk appraisal. We currently have on our system a number of models for the River Derwent, all supplied by the EA over the years, in relation to work done on this site and others in Cockermouth.

We are proposing to consult with the EA to confirm that the models we hold are the latest and most relevant, given the recent updates to the Flood Map for Planning and the changes in flood extents these have shown. We would thereafter use the model agreed upon and re-run it to get a baseline flood risk including, if appropriate, site-specific topographical survey data. The baseline flood risk would be established for the 1:20, 1:100, 1:100+40%CC (2080s central allowance) and 1:1000 year return period events. Once this was complete, we would then modify the floodplain topography to reflect the proposed development levels, including the compensation flood storage areas, and re-run the model for the same range of return periods.

The final stage of the work would be to identify differences in flood risk, if any, because of the change in floodplain topography. We would liaise with the client and their appointed civil engineers to optimise the design of the site levels and compensation area, if required. The consultation and modelling process that has been undertaken would be documented in a technical note for inclusion within an FRA.

Can you please confirm whether the model is to include all existing flood defences? Whilst the Flood Map for Planning has historically shown the undefended scenario, we are aware there are a significant number of defences upstream of this site that do affect flood extents around the development. As these defences should be maintained or upgraded by the EA for the lifetime of the development, it would be unrealistic to model a scenario with all these defences removed.

I would appreciate speaking with you on the phone about this on your return, but in the meantime hope that this summary provides you with an overview of the intended work. Can you please, by reply to this email, acknowledge if this would help to satisfy your concerns raised in the below highlighted point?

Regards,

Duncan

Duncan Nicholls
BSc MSc
Senior Flood Risk Consultant
Storm & Surface Water Service Line | Europe and Middle East

GHD
Proudly employee owned | ghd.com
41-51 Grey Street, Newcastle upon Tyne, NE1 6EE
DD +44 (0)191 917 1609 **E** duncan.nicholls@ghd.com

From: Fearon, Caroline <Caroline.Fearon@Cumberland.gov.uk>
Sent: 27 February 2025 15:05
To: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>

Cc: Robert Slack <rjslack@hotmail.com>; Glen Beattie <GB@adcumbria.co.uk>; Jonathan Hobbs <Jonathan.Hobbs@pegasusgroup.co.uk>
Subject: FW: FUL/2024/0192 Low Road, Cockermouth

Dear Dominic

I have be reviewing in detail the Flood Risk Assessment submitted with he application and the contents raise some concerns. These include:

- The FRA refers to 2019 NPPF which was out of date at the time the submitted report was written which ate that time would have been Dec 2023. This has since been updated to the latest version published Dec 2024.
- It list the site has less vulnerable. The site is for houses and therefore would fall within the more vulnerable category.
- 45% Climate Change has been added on this should be 50% with the 10% urban creep.
- The report references that Hydraulic modelling has been carried out by other. This is a separate application and therefore this would need to be carried out again as part of the current proposal to establish the scheme is acceptable in terms of flood risk. The previous FRA modelling and data was from 2027/2018 given that 7/8 years has passed this modelling and data from the RA is likely to be out of date. We would therefore expect consultation with the EA to be carried again as part of this application and for an significant increase in numbers.
- It needs to consider all aspects of a FRA as it is a new scheme such as historical flooding. What is the outcome of the Cockermouth Flood Investigation by EA and how does this impact the proposal.
- Details infiltration not feasible but no ground investigation has been carried out and the results submitted to discount these as would be needed to follow the drainage hierarchy.

The site is within Flood Zone 2 and therefore normally planning permission would not be supported in area of higher flood risk without the sequential test been undertaken. Paragraph 175 of the current NPPF reads" The sequential test should not be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escapes routes, land raising or other potentially vulnerable elements, would be located on an areas that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk)".

In this case a sequential test is not required a site specific flood risk is to be undertaken. The current NPPF seek that all area including access is within FZ2 and 3 should be considered. While in principle it can be demonstrated that the site levels are to rise to take the development into FZ1 this would not be the case for the access and this needs to be considered.

Whilst the Council are aware that an extant permission remains on the site for 27 dwellings this was considered an determined based the detail information submitted with the application at the time and the legislation and policy at this time. While the extant permission would allow the principle of residential development on the site, this is anew permission for a significant greater number of dwellings and needs to be and requires full updated reports based on the most up to date data available such as a FRA as the proposal will be determined against current national and local policies. As submitted the FRA has not taken account of the elements that should be considered in a FRA, most up to date data and current modelling should be undertaken and does not demonstrate the proposal is acceptable in terms of flood risk. The revised FRA should also be in accordance with the newly published flood maps and guidance New national flood and coastal erosion risk information - GOV.UK.

The 2018 application was approved subject to S106 that required the flood compensatory to be carried out on the adjacent Fitz land as secured under application 2/2017/0312. It has been proposed that this work would again be secured under S106. However, given the time that has passed and that modelling as part of this application was based on 16 dwellings it is considered that this may be out of date and a larger compensatory area may be required to serve 47 dwellings as such. This would need revisiting to demonstrate it is sufficient to accommodate the proposed scheme and if it is not a revised application may be required. Can you please also clarify what part of the works approved under the 2017 application have been implemented in accordance with the approved details. If the works vary for these works then this may also necessitate a new application .

Given the information contained in this email and that previously provided can you please confirm whether you seek to amend the application or should I move forward with a determination of refusal on the current submitted plans and reports.

Kind regards

Caroline

From: Fearon, Caroline
Sent: 31 January 2025 08:42
To: 'Dominic Waugh' <Dominic.Waugh@pegasusgroup.co.uk>
Cc: Robert Slack <rjslack@hotmail.com>; Glen Beattie <gb@adcumbria.co.uk>; Jonathan Hobbs <Jonathan.Hobbs@pegasusgroup.co.uk>
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

Hi Dominic

I do not consider your approach to be acceptable. The other matters I have addressed would have an impact on the final layout. I will mention a few:

- If the 10% net gain has not been provided on the site I reduction in the number of dwelling would be required to provide this;
- Drainage should be designed into the layout rather than an afterthought;
- The police comments may change the layout;
- The design/scale of the dwelling themselves would impact on the size of the plots they site in;

The minor changes you have made do not address may comments on density and it is still changing the development to a high density urban development. They examples for the terraced or conjured dwellings was not a suggestion for the whole site but was trying to provide you with alternatives that may be incorporated to achieve some of the smaller units. A stated in the letter we do consider the design and scale of the dwellings already approved in the 2018 are the approach that should be taken.

Kind regards

Caroline

From: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>
Sent: 30 January 2025 17:09
To: Fearon, Caroline <caroline.fearon@allerdale.gov.uk>
Cc: Robert Slack <rjslack@hotmail.com>; Glen Beattie <gb@adcumbria.co.uk>; Jonathan Hobbs <Jonathan.Hobbs@pegasusgroup.co.uk>
Subject: FW: FUL/2024/0192 Low Road, Cockermouth

Good afternoon Caroline,

Thanks for the attached letter received yesterday afternoon. Based on our earlier correspondence, we were keen to revisit the layout based upon the consultee comments and our email dialogue to date. Following receipt of the attached letter, I do still think that the correct approach is to seek a mutually agreeable layout before responding to the other responses from yourself and consultees. However, I do find the content of the attached letter somewhat contradictory in terms of design. When I say 'design', I am keen to firstly focus on the layout itself. This certainly isn't me dismissing any other design comments, it is just that I believe that if we reach agreement on a density suitable for the locality then we can then consider the comments on the design of the properties themselves. I interpret the attached letter as, on the one hand, suggesting that the scheme should be significantly less dense, in order to replicate the density of the already approved scheme. However, on the other hand, if we were to follow other suggestions in the letter, for example incorporating short terraces and cojoined buildings, then I believe that an inevitable outcome would be a higher density scheme.

In this regard, focussing firstly on the layout itself, I attach the following:

1. Site Plan 201a);
2. Site Sections 209a); and
3. Dwelling Tyle Schedule.

Plot 13 has been re-orientated to align seamlessly alongside units 14-16, ensuring a cohesive design where you raised concerns about the property appearing incongruous. Similarly, plots 44-47 have been re-orientated, with their rear private gardens now facing Low Road. Parking arrangements in this area have also been reorganised to provide more fluid access, creating a more user-friendly and efficient layout. These adjustments result in a more attractive vista from Low Road and contribute to a more inclusive and thoughtful scheme design.

Additionally, a roundabout has been incorporated into the proposal, which as well as precisely replicating the access approved for the extant scheme, softens the layout of the scheme and contributes to a more fluid and visually appealing design. This roundabout had previously been approved as part of planning application 2/2018/053 and is therefore considered an appropriate element to integrate into the scheme.

Further addressing the Authority's request, the amount of Open Space has been clearly highlighted and quantified within the plan, with each area providing its corresponding value. In total, the site offers 3,080m^2 of amenity space, significantly exceeding the Council's requirement provided in your previous correspondence of 705m^2.

In making these amendments to the previously submitted plans, it is considered that the Applicant has addressed all comments previously made on the site layout. I would be grateful if you could initially provide your agreement to the revised layout so that the Applicant can seek to address the other matters raised on the proposed scheme.

I look forward to your response in due course.

Kind regards,

Dominic Waugh
Senior Director - Planning

E Dominic.Waugh@pegasusgroup.co.uk
M 07741 249776 | **DD** 0191 594 7180 | | **EXT** 6221
3rd Floor, Gainsborough House | 34-40 Grey Street | Newcastle upon Tyne | NE1 6AE
PEGASUS GROUP

From: Fearon, Caroline <Caroline.Fearon@Cumberland.gov.uk>
Sent: 29 January 2025 15:53
To: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

Dear Dominic

Please find attached my replying to you letter and email received the 16 December 2024.

Kind regards

Caroline

Caroline Fearon MRTPI
Specialist Planner | Inclusive Growth and Placemaking
Places, Sustainable Growth & Transport | Cumberland Council
Allerdale House, Workington, Cumbria, CA14 3YJ
T. 01900 516922
Cumberland.gov.uk

From: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>
Sent: 20 January 2025 12:32
To: Fearon, Caroline <caroline.fearon@allerdale.gov.uk>
Subject: RE: FUL/2024/0192 Low Road, Cockermouth

WARNING: This email originated outside of Allerdale Borough Council.
DO NOT CLICK links or attachments unless you recognise the sender and know the content is safe.

Thanks Caroline,

The extension of time is agreed. By way of an update, the site design is currently being revised to align with the comments made to date. I hope to be back in contact with you soon to discuss the revised design.

Kind regards,

Dominic Waugh
Senior Director – Planning

E Dominic.Waugh@pegasusgroup.co.uk
M 07741 249776 | **DD** 0191 594 7180 | | **EXT** 6221
3rd Floor, Gainsborough House | 34-40 Grey Street | Newcastle upon Tyne | NE1 6AE

PEGASUS GROUP

From: Fearon, Caroline <Caroline.Fearon@Cumberland.gov.uk>
Sent: 16 January 2025 10:54
To: Dominic Waugh <Dominic.Waugh@pegasusgroup.co.uk>
Subject: FUL/2024/0192 Low Road, Cockermouth

Dear Dominic

Please find attached comments from Natura England regarding the BNG information submitted.

I have only returned to work yesterday so have not been able to look into your letter in detail and will be doing this over the next few weeks. Can I please therefore request an extension of time until the 5 April 2025.

Kind regards

Caroline

Caroline Fearon MRTPI
Specialist Planner | Inclusive Growth and Placemaking
Places, Sustainable Growth & Transport | Cumberland Council
Allerdale House, Workington, Cumbria, CA14 3YJ
T. 01900 516922
Cumberland.gov.uk

Cumberland Council
Workington Office, Allerdale House, Workington, Cumbria, CA14 3YJ

Follow us on:
Web: https://www.cumberland.gov.uk
Twitter: https://twitter.com/CumberlandCoun
Facebook: https://www.facebook.com/CumberlandCouncil1/

EMAIL DISCLAIMER

The views expressed in this document are those of the individual and are not necessarily the same as the Council's.

This electronic transmission is only intended for the individual or entity to which it is addressed and may contain information that is privileged,

Appendix C

GENERAL ARRANGEMENT PLAN

SCALE: 1:1000

NOTES:

1. THIS DRAWING IS FOR INFORMATION ONLY.

Rev	Description	Checked	Approved	Date
P01	PRELIMINARY FOR INFORMATION	DR	SD	28.07.25

Author K. DABASOL **Drafting Check** D. ROBERSON

Designer **Design Check** D. ROBERSON

GHD
First Floor, 41-51 Grey Street,
Newcastle Upon-Tyne, NE1 6EE,
United Kingdom T 44 (0)191 731 6100
E UKmail@ghd.com W www.ghd.com
www.ghd.com

Project No. 12574842

Client -

Project THE FITZ, BROOMLANDS

Status FOR INFORMATION Status Code S2

Drawing Title GENERAL ARRANGEMENT

Size A1

Drawing No. 12574842-GHD-DR-C-1000 Rev P01

BECKWITH & HANLON

CONTACT

F22 Willow Court, Marquis Court,
Team Valley Trading Estate, Gateshead NE11 0RU

Email: info@beckwithandhanlon.com
Tel: +44 (0) 191 273 7582

beckwithandhanlon.com