

SR12 – The Meadows

Flood Risk Assessment

Issue Date:

13 JUNE 2022

Report Number:

1842-FRA1

Client:

LAKELAND ASSOCIATES

Revision:

B

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Executive Summary

Site Location	The site is located off A5086, Cleator, CA23 3EP (nearest) at NGR 301752E 514082N. The site footprint is approximately 1.35 Ha and forms a phase of the overall development that has a footprint measuring approximately 3.30 Ha, entirely greenfield.
Site Proposals	It is proposed to develop the site with residential units.
Ground Conditions	The site is located in an area underlain by drift deposits consisting of soft - stiff clays.
Nearest Watercourse	The River Ehen is located 300m to the south of the site boundary beyond third party land.
Nearest water feature	Within the development site, an historic man-made culverted mill race flows from north to south and outfalls via a culvert below the public highway located to the south. The mill race conveys flows from agricultural land located to the north of the development site.
Nearest Surface Water Sewer.	Adjacent to proposed site entrance, discharging within 40m of the head of the run to a UU combined sewer at A5086. Another surface water sewer is located within Howthorne Fields to the south of Flish Meadows
Nearest Combined Sewer	On site adjacent to southern boundary.
Nearest Foul Water Sewer	Adjacent to proposed site entrance, discharging within 40m to a UU combined sewer at A5086
Flood Zone	FZ1
Surface Water Flooding	High risk of surface water flooding with overland flows ponding at the southern boundary, with maximum depths of up to 300mm. It is assumed that flows emanate to the north of the site and flow in a southerly direction, largely following the route of the mill race. The Lidar data that is used to produce the surface water flood maps does not take account of features present on site, such as the man-made mill race and open ditch located at the south of the site. The ditch funnels flows to the culvert at the south of the site. It is proposed to divert the mill race around the northern and western boundary of the development site, utilising a combination of open swales and a piped network. The open swales will intercept overland flows emanating from the north and convey them to the mill race at southern boundary. In addition, the site will be constructed with a positive surface water drainage system which will collect and convey any ponding water within the development site. Proposed site levels will be designed to direct surface water away from dwelling entrances. Risk of flooding from this source can be deemed as low.
Ground Water	Low risk

The above summary should not be used in isolation and reference should be made the full report which provides a detailed assessment of the risks affecting the development.

1. Introduction

Lakeland Associates (Cleator) have commissioned coast Consulting Engineers Limited to assess the flood risk associated with a proposed development at Floss Meadows, Cleator. This Flood Risk Assessment (FRA) is reviewed in accordance with the National Planning Policy Framework (NPPF) for Development and Flood Risk. In conjunction with assessing the site for flood risk a proposed drainage strategy has been prepared.

This site-specific FRA has been undertaken to determine the risk of flooding to the proposed development from all sources in accordance with the NPPF and to assess the flood risk to others as a result of the development. The assessment will recommend how the risk can be managed in line with planning policy requirements.

One of the key aims of the NPPF is to ensure that flood risk is considered at all stages of the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk. Where new development is necessary in such areas, the policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.

1.1 National Planning Policy Framework (NPPF)

The NPPF requires that:

- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account the vulnerability of its users, without increasing flood risk elsewhere, and where possible, will reduce flood risk overall.
- A site-specific flood risk assessment is required for proposals greater than 1 ha in size in a Flood Zone 1; all proposals for new development in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as identified in the Strategic Flood Risk Assessment).

The following definitions for flood zones are derived from NPPF:

FLOOD ZONE 1:

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

FLOOD ZONE 2:

This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

FLOOD ZONE 3:

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

In addition to the risk of flooding from rivers or sea, consideration must also be given to surface water flooding, flooding due to ground water and flooding from artificial sources such as sewer failure or overtopping of reservoirs.

2.1 Site Location

The development location is indicated in Figure 2.11 and the proposed phasing in Figure 2.12 below.

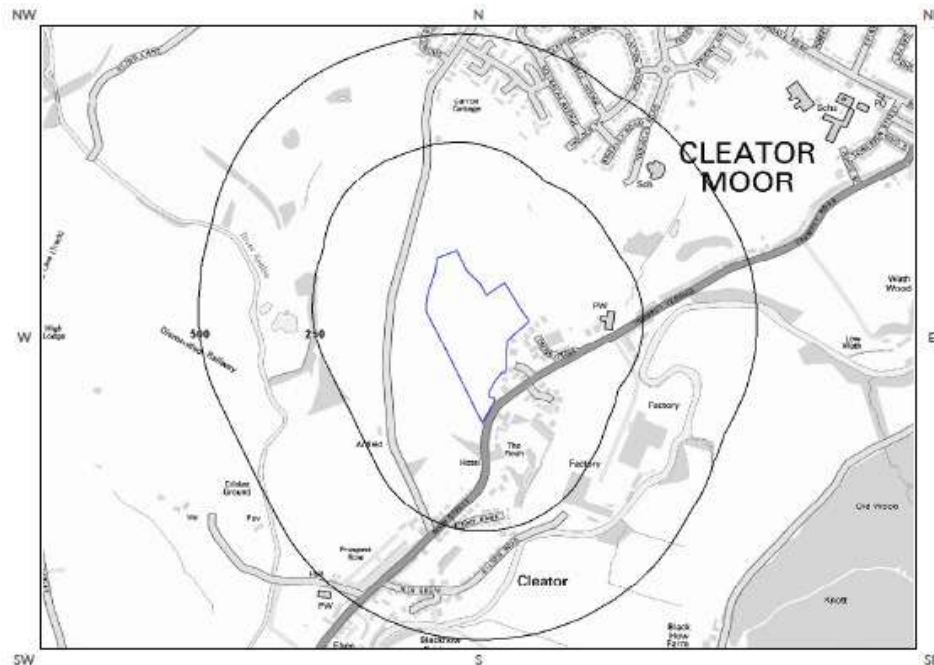


Figure 2.11 – Site Location

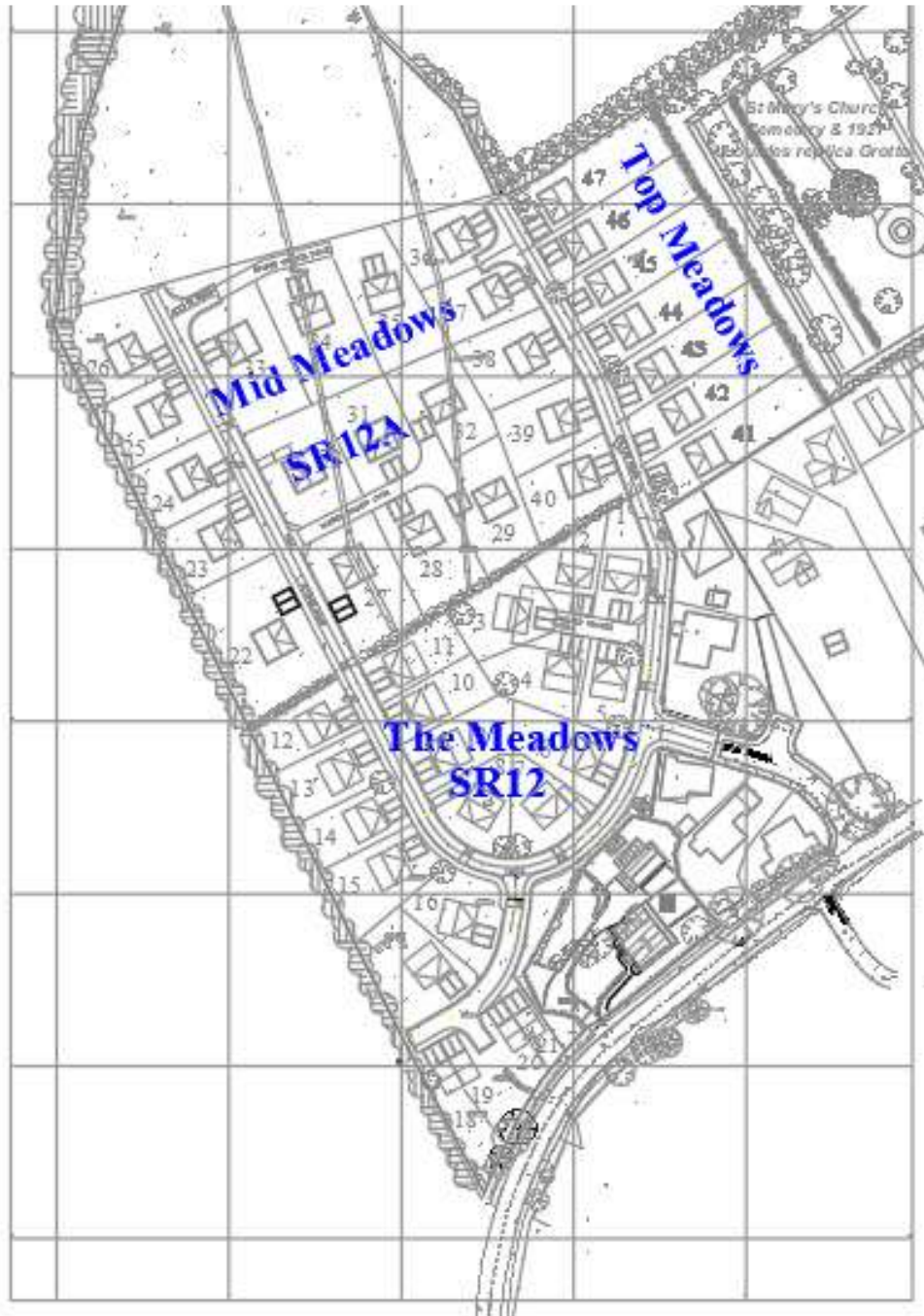


Figure 2.12 – Proposed Phasing

2.2 Existing Topography

A topographical survey of the site has been undertaken and is included in Appendix A. The overall development site generally falls in a southerly direction. Site levels range from approximately 67.50m AOD at the north of SR12A to 63.00m AOD at the southern extents of SR12.

The surrounding area is developed as follows:

North: Agricultural Land
East: Agricultural Land and residential properties
South: Residential properties
West: Agricultural Land

Figure 2.21 below extracted from Google maps shows the existing site.



Figure 2.21 – Satellite image of the existing site.

2.3 Existing sewers and watercourses

A combined sewer is located within the development land, adjacent to the southern boundary line of SR12. Adopted foul and surface water sewers are located within Floss Meadows, adjacent to the proposed site entrance, the head of each run is located at the proposed site entrance. The adopted surface water and foul sewers outfall into a combined sewer approximately 40m downstream of the head of each run. All sewers are owned and maintained by United Utilities Ltd (UU). Figure 2.31 below shows the location of the existing public sewers within the vicinity of the site.

Within the overall development site, an historic man-made culverted mill race flows from north to south and outfalls via a culvert below the public highway located to the south of SR12. The mill race conveys flows from agricultural land located to the north of SR12A. Figure 2.32 overleaf shows the location of the natural watercourses within the vicinity of the site. Please also refer to Appendix C for further information on the existing drainage regime.

The River Ehen is located approximately 300m to the south of the site boundary, beyond third party land.

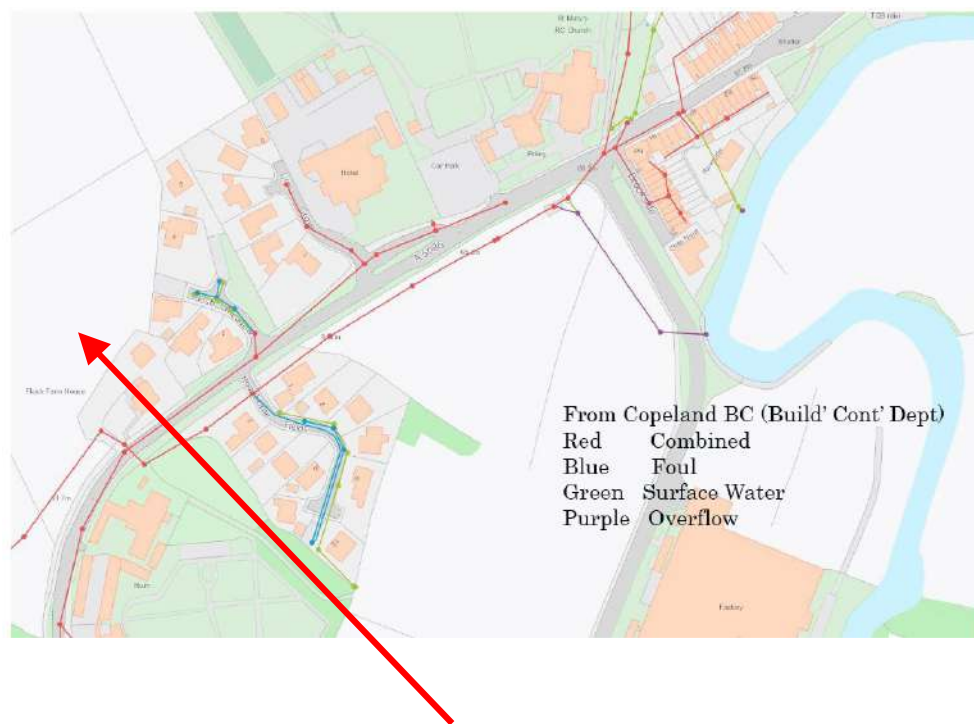


Figure 2.31 – sewers.

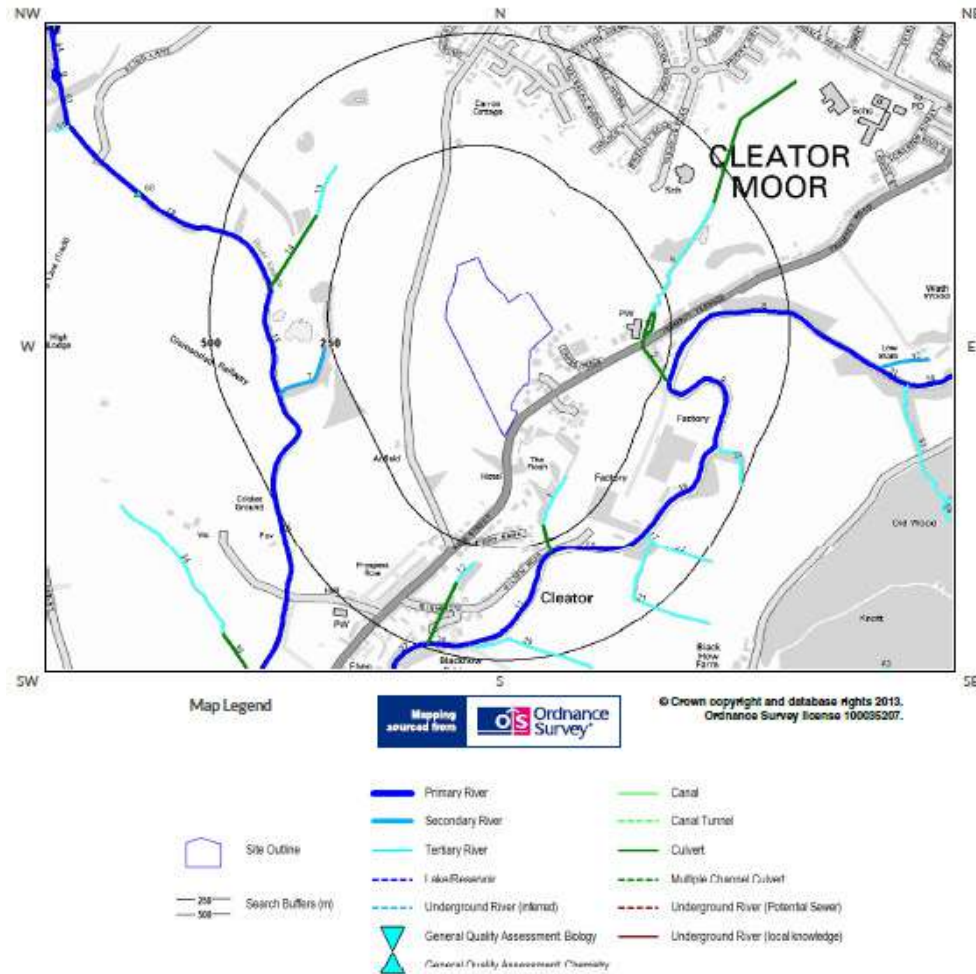


Figure 2.32 – watercourses.

2.4 Geology

A phase 2 intrusive investigation of ground conditions has been completed by Geo Environmental Engineering Ltd, reference 2018-3167 dated 09.08.2018. The report states that the site is underlain by varying ground conditions, comprising soft to stiff clays. Ground water was encountered across the site at depths of between 1.50m to 2.90m.

2.5 Development Proposals

It is proposed to develop the site with residential units. A copy of the proposed architectural site layout can be found in Appendix B.

3. Potential Sources of Flooding and Proposed Mitigation

As required by the National Planning Policy Framework (NPPF) and planning practice guidance (PPG), each potential source of flooding has been considered; rivers and sea, land, groundwater, sewers and artificial sources (such as reservoirs and canals). Consideration also needs to be given to the flood risk vulnerability classification for this type of development.

3.1 Flood Zone Classification

Government flood maps have been acquired to help with this assessment. The flood maps indicate that the proposed development footprint is located entirely within an area classified as a Flood Zone 1.

Land located within a flood zone 1 is defined as having less than a 1 in 1,000 annual probability of flooding from rivers or the sea (low risk). Refer to the extract below which identifies the Flood Zones in proximity to the development site.

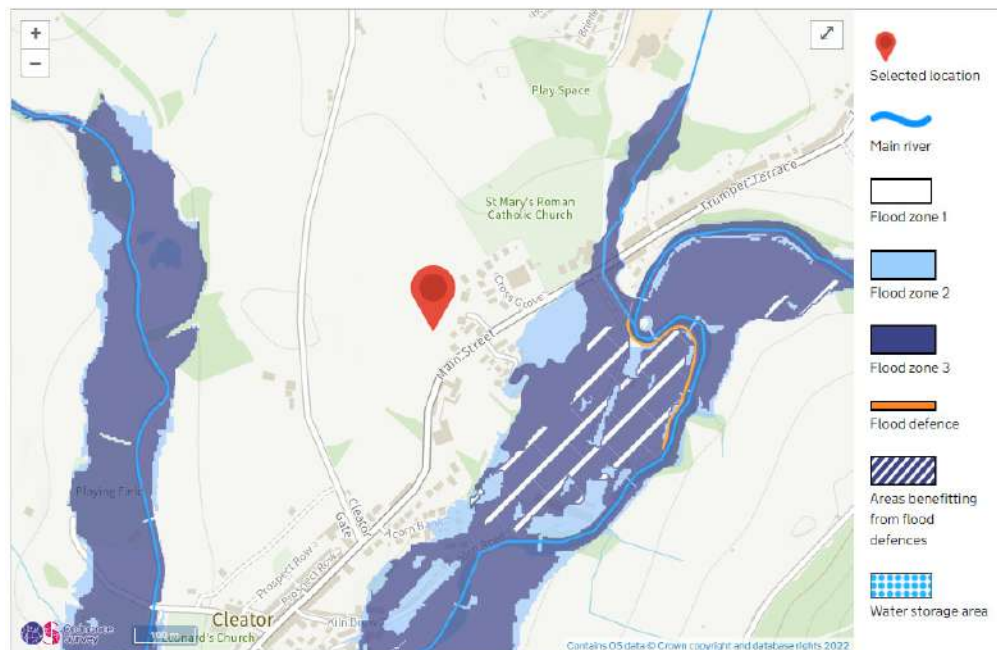


Figure 3.11 – Flood zone map.

3.2 Flood Risk Vulnerability Classification

Table 2 of the PPG 2021 states the following with respect to flood risk vulnerability classification.

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

Table 3 of PPG 2021 states the following with respect to appropriate land uses:

Table 3: flood risk vulnerability and flood zone 'compaibility'

Flood Risk Vulnerability Classification (See Table 2)	Essential Infrastructure	Water Compatible	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 floodplain	Exception Test required	✓	x	x	x

Key: ✓ Development is appropriate.
X Development should not be permitted.

An exception test will not be required in this instance as development is located outside of a flood zone 3. **The development is considered appropriate in a Flood Zone 1.**

3.3 Surface Water Flood Risk

Land within the proposed development generally falls towards the southern boundary of the site. It is noted on the Environment Agency surface water flood maps that the site lies within an area classified as having a high risk of surface water flooding with overland flows ponding at the southern boundary, with maximum depths of up to 300mm. Based upon the topography of the site and the “low risk” flood maps, it is assumed that flows emanate to the north of the site and flow in a southerly direction, largely following the route of the mill race. The Lidar data that is used to produce the surface water flood maps does not take account of features present on site, such as the man-made mill race and open ditch located at the south of the site. The ditch funnels flows to the culvert at the south of the site.

It is proposed to divert the mill race around the northern and western boundary of the development site, utilising a combination of open swales and a piped network. The open swales will intercept overland flows emanating from the north and convey them to the mill race at southern boundary.

In addition, the site will be constructed with a positive surface water drainage system which will collect and convey any ponding water within the development site. Proposed site levels will be designed to direct surface water away from dwelling entrances. Based upon the information outlined above the risk of surface water flooding can be considered as low throughout the site, as is indicated in figures 3.31 – 3.33 below.

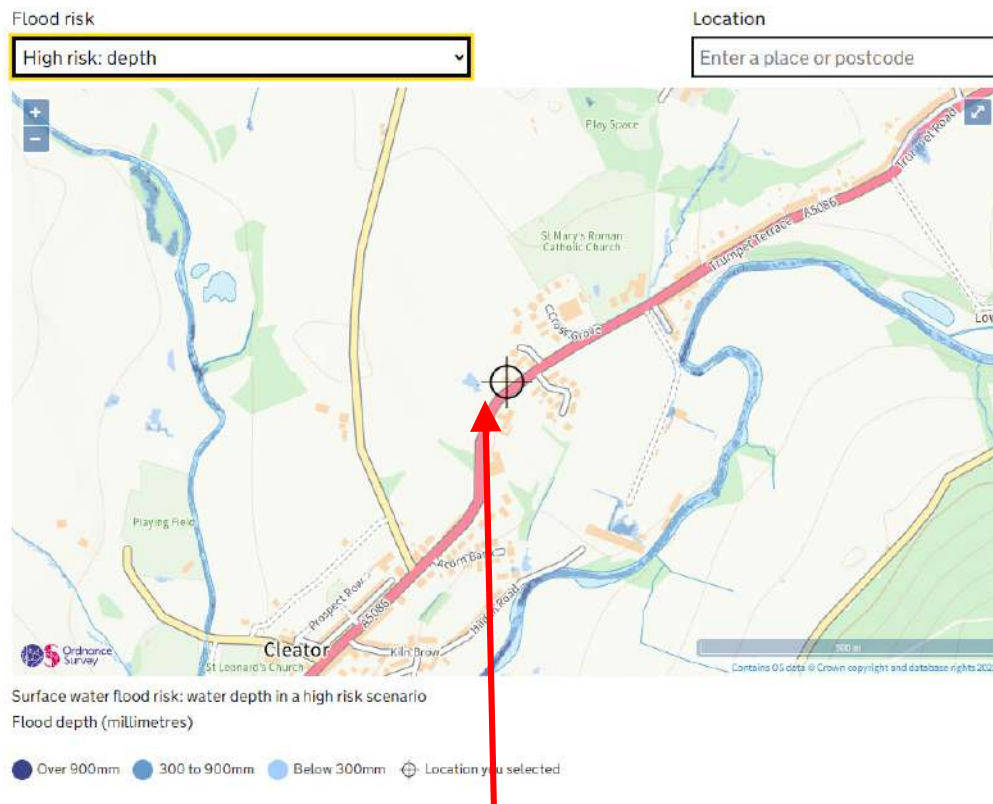


Figure 3.31 – Surface Water Flood Risk – High – Depth below 300mm

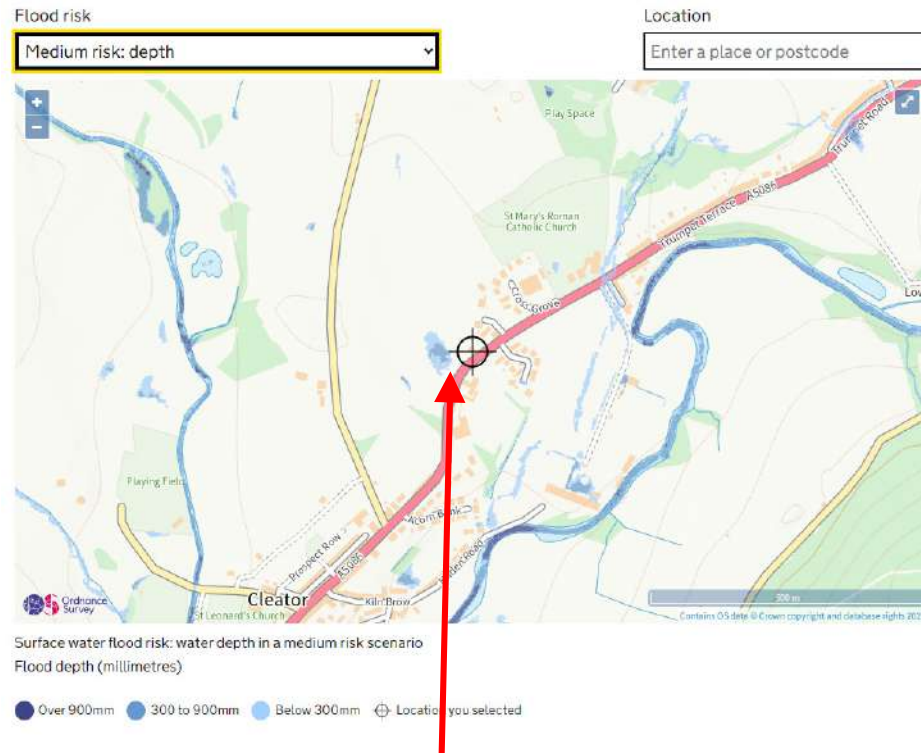


Figure 3.32 – Surface Water Flood Risk – Medium – Depth 300mm – 900mm

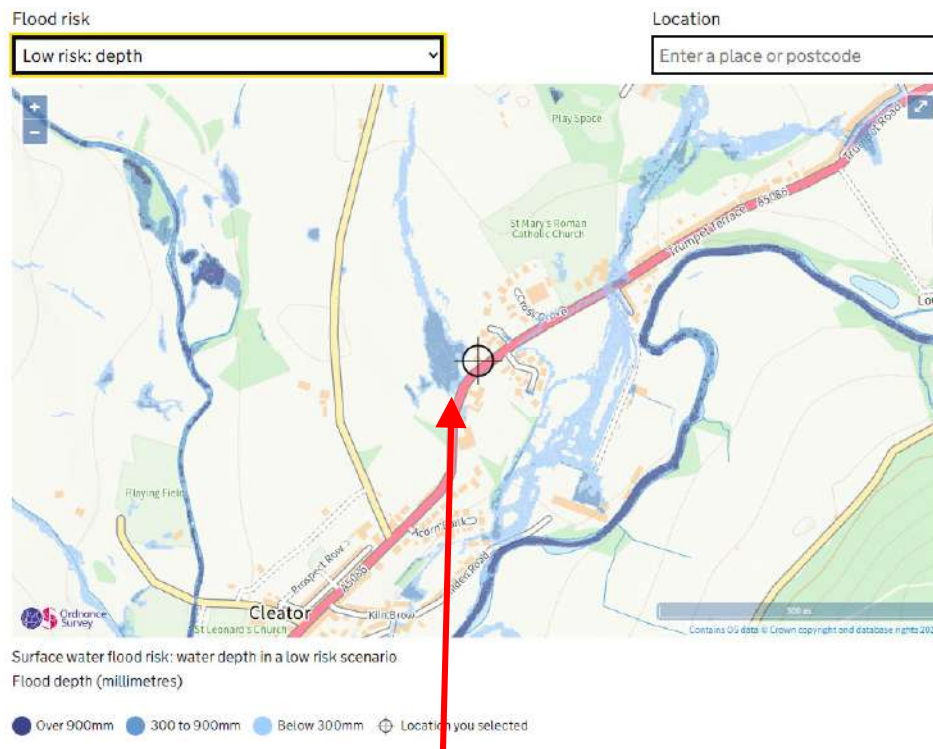


Figure 3.33 – Surface Water Flood Risk – Low - Depth 300mm – 900mm



Figure 3.34 – Existing Man-Made Mill Race at Southern Boundary (taken from public highway, looking north).

3.4 Groundwater Flood Risk

Flooding due to ground water occurs when the levels of water below the ground rise and emanate above finished ground level. This occurs more frequently when the site is underlain by a permeable strata. As noted earlier, the development land is underlain by clays which are a predominantly impermeable deposit. The risk of flooding due to ground water rise is considered as **low** throughout the site.

3.5 Reservoir Flood Risk

Artificial sources of flood risk such as manufactured ponds or reservoirs can cause a potential risk of flooding. Reservoir flood risk mapping shows that there is no potential risk of flooding of the site from this source.

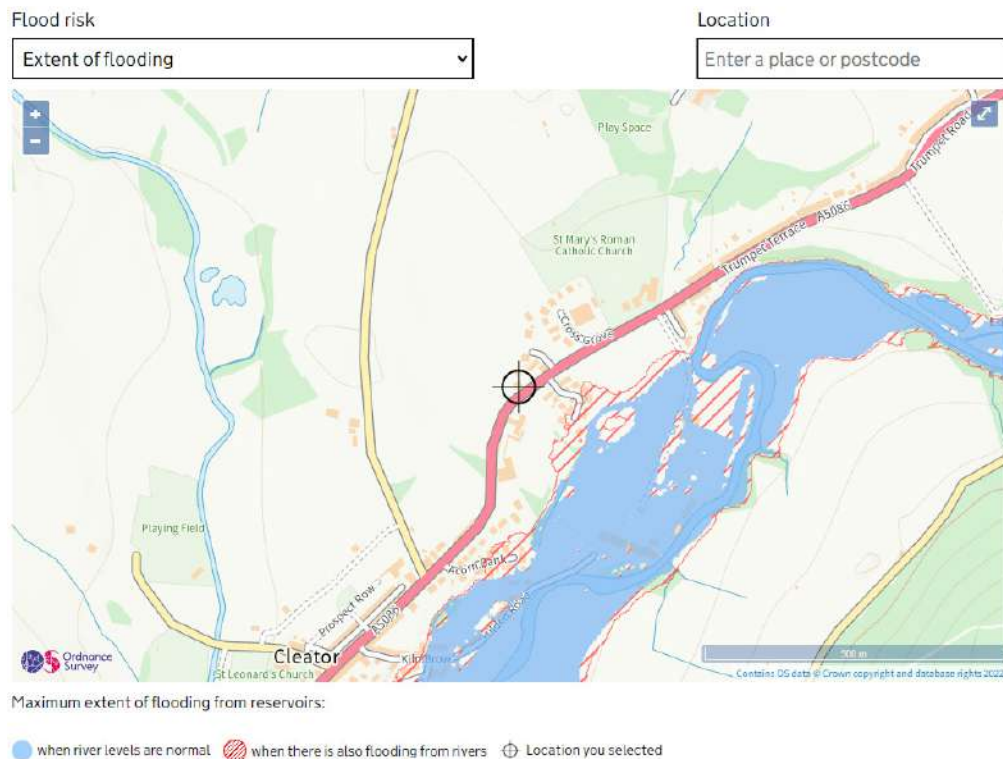


Figure 3.51 – Reservoir Flood Risk

The proposed development is considered appropriate within a Flood Zone 1 in line with the guidance contained within the NPPF.

4. References

The following reference documents have been used in the preparation of this report.

- National Planning Policy Framework 2021.
- PPG 2021.
- Environment Agency online flood maps.
- Susdrain.org

Appendices

Appendix A



UTILITY KEY

LINE TYPES		
BT BELOW GROUND		WATER BELOW GROUND
BT ABOVE GROUND		WATER ABOVE GROUND
BT ASSUMED ROUTE		WATER ASSUMED ROUTE
CATV BELOW GROUND		UNION BELOW GROUND
CATV ABOVE GROUND		UNION ABOVE GROUND
CATV ASSUMED ROUTE		UPR BELOW GROUND
COMB BELOW GROUND		COMBINED WATER SEWER
COMB ABOVE GROUND		ASSUMED COMBINED WATER SEWER ROUTE
COMB ASSUMED ROUTE		SEWAL WATER SINKER
GAS BELOW GROUND		ASSUMED P-PHIL WATER SEWER ROUTE
GAS ABOVE GROUND		STORM WATER SEWER
GAS ASSUMED ROUTE		ASSUMED STORM WATER SINKER ROUTE
ELECTRIC BELOW GROUND		REINSTATEMENT SCARY
ELECTRIC ABOVE GROUND		SURVEY SINKER
ELECTRIC ASSUMED ROUTE		

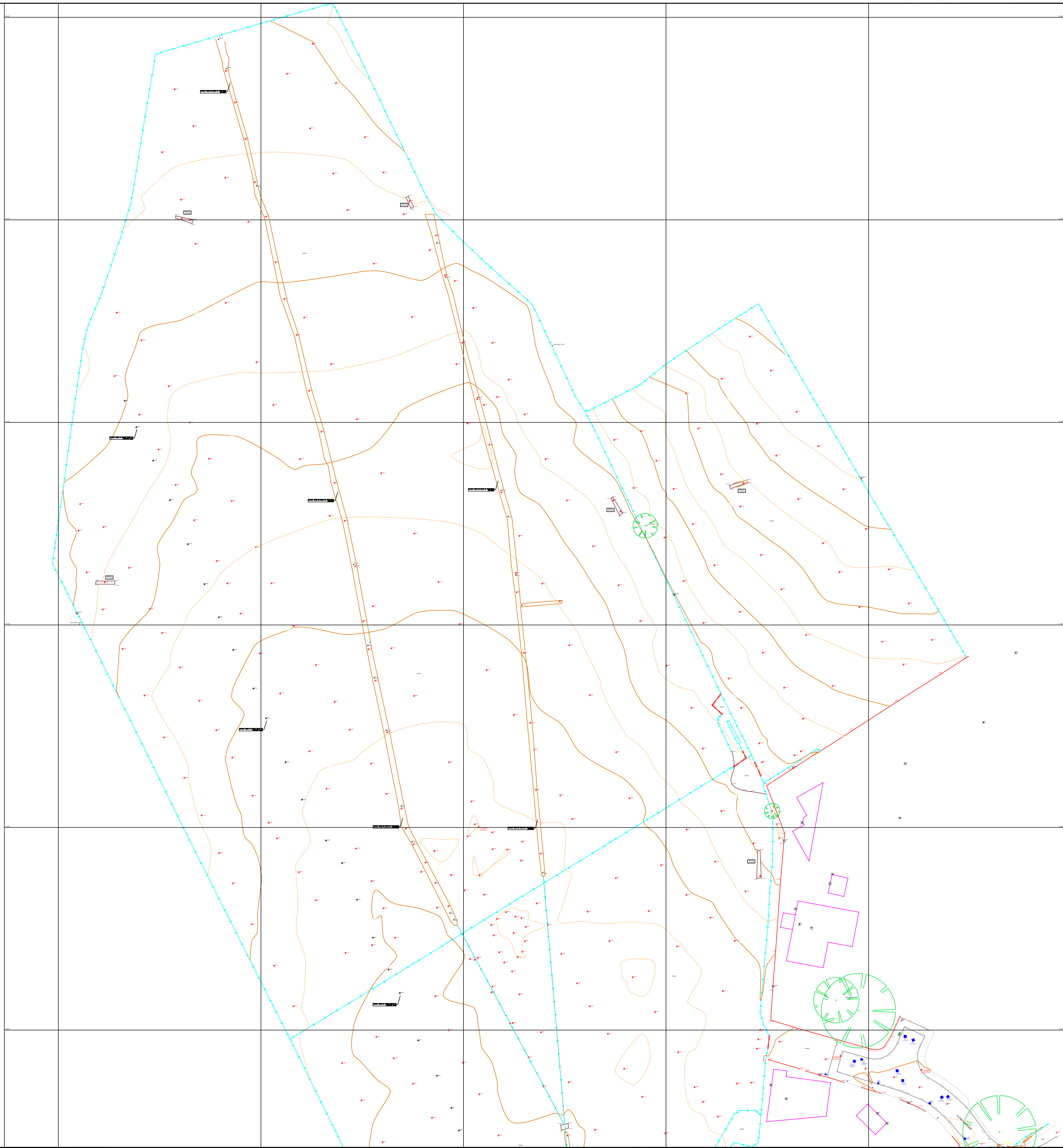
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NOTES

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RICHARD MULHOLLAND				
CLIENT				
LAND AT FLOSH MEADOWS CLEATOR CUMBRIA				
PROJECT TITLE				
TOPOGRAPHICAL SURVEY				
ISSUING TITLE				
1:500 @ A1		DATE	18.03.14	OSTN02
SCALE AT A1		DATE	18.03.14	OSTN02
NP		DATE	NP	NG
UNAPPROVED BY		DATE	UNAPPROVED	NG
P14053		DATE	1/2	C
PROJECT NO.		DATE	1/2	C



UTILITIES KEY	
UTILITIES	KEY
 VERGE  FENCE - CHALK LINE  FENCE - METAL  FENCE - WOODEN  FENCE - METAL & WOOD  HEDGE  HOLE  CHURNER  BURNING LINE	 CONCRETE EDGE  FOOTPATH  FENCE  BUILDING  FINE  GATE  HIGHWAY DRIVE  STAIRS  EARTH
UTILITIES	KEY
 BT BELOW GROUND  BT ABOVE GROUND  GFT BELOW GROUND  GFT ABOVE GROUND  GFT ASSIGNED ROUTE  GFT UNASSIGNED ROUTE  GAS BELOW GROUND  GAS ABOVE GROUND  GAS ASSIGNED ROUTE  GAS UNASSIGNED ROUTE  ELECTRIC BELOW GROUND  ELECTRIC ABOVE GROUND  ELECTRIC ASSIGNED ROUTE  ELECTRIC UNASSIGNED ROUTE	 WATER BELOW GROUND  WATER ABOVE GROUND  WATER ASSIGNED ROUTE  WATER UNASSIGNED ROUTE  UNKNOWN BELOW GROUND  UNKNOWN ABOVE GROUND  OPEN BELOW GROUND  OPEN ABOVE GROUND  ASSIGNED CONDUIT WATER SEWER ROUTE  UNASSIGNED CONDUIT WATER SEWER ROUTE  ASSIGNED PFA WATER SEWER ROUTE  UNASSIGNED PFA WATER SEWER ROUTE  ASSIGNED STAGNANT WATER SEWER ROUTE  UNASSIGNED STAGNANT WATER SEWER ROUTE  SURVEY BOUNDARY
ABBREVIATIONS	KEY
ACB ASSIGNED CONNECTION ACD ASSIGNED CONDUIT ASB ASSIGNED ROUTE ASD ASSIGNED ROUTE AV AIR LINE B1 BELM LINE B2 BACK DROP B3 BELM LINE B4 BELM LINE B5 BOLLARD B6 BELM LINE BT BT BT BT/STRIELEDOM CUT CUT CORN CORNAL BOX C1 C1 C2 C2 C3 C3 C4 C4 C5 C5 C6 C6 C7 C7 C8 C8 C9 C9 C10 C10 C11 C11 C12 C12 C13 C13 C14 C14 C15 C15 C16 C16 C17 C17 C18 C18 C19 C19 C20 C20 C21 C21 C22 C22 C23 C23 C24 C24 C25 C25 C26 C26 C27 C27 C28 C28 C29 C29 C30 C30 C31 C31 C32 C32 C33 C33 C34 C34 C35 C35 C36 C36 C37 C37 C38 C38 C39 C39 C40 C40 C41 C41 C42 C42 C43 C43 C44 C44 C45 C45 C46 C46 C47 C47 C48 C48 C49 C49 C50 C50 C51 C51 C52 C52 C53 C53 C54 C54 C55 C55 C56 C56 C57 C57 C58 C58 C59 C59 C60 C60 C61 C61 C62 C62 C63 C63 C64 C64 C65 C65 C66 C66 C67 C67 C68 C68 C69 C69 C70 C70 C71 C71 C72 C72 C73 C73 C74 C74 C75 C75 C76 C76 C77 C77 C78 C78 C79 C79 C80 C80 C81 C81 C82 C82 C83 C83 C84 C84 C85 C85 C86 C86 C87 C87 C88 C88 C89 C89 C90 C90 C91 C91 C92 C92 C93 C93 C94 C94 C95 C95 C96 C96 C97 C97 C98 C98 C99 C99 C100 C100 C101 C101 C102 C102 C103 C103 C104 C104 C105 C105 C106 C106 C107 C107 C108 C108 C109 C109 C110 C110 C111 C111 C112 C112 C113 C113 C114 C114 C115 C115 C116 C116 C117 C117 C118 C118 C119 C119 C120 C120 C121 C121 C122 C122 C123 C123 C124 C124 C125 C125 C126 C126 C127 C127 C128 C128 C129 C129 C130 C130 C131 C131 C132 C132 C133 C133 C134 C134 C135 C135 C136 C136 C137 C137 C138 C138 C139 C139 C140 C140 C141 C141 C142 C142 C143 C143 C144 C144 C145 C145 C146 C146 C147 C147 C148 C148 C149 C149 C150 C150 C151 C151 C152 C152 C153 C153 C154 C154 C155 C155 C156 C156 C157 C157 C158 C158 C159 C159 C160 C160 C161 C161 C162 C162 C163 C163 C164 C164 C165 C165 C166 C166 C167 C167 C168 C168 C169 C169 C170 C170 C171 C171 C172 C172 C173 C173 C174 C174 C175 C175 C176 C176 C177 C177 C178 C178 C179 C179 C180 C180 C181 C181 C182 C182 C183 C183 C184 C184 C185 C185 C186 C186 C187 C187 C188 C188 C189 C189 C190 C190 C191 C191 C192 C192 C193 C193 C194 C194 C195 C195 C196 C196 C197 C197 C198 C198 C199 C199 C200 C200 C201 C201 C202 C202 C203 C203 C204 C204 C205 C205 C206 C206 C207 C207 C208 C208 C209 C209 C210 C210 C211 C211 C212 C212 C213 C213 C214 C214 C21	

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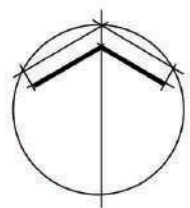
NOTES

C S A	SURVEY EXTENDED DRAINAGE SURVEYED INITIAL RELEASE	NP NP NP	NG NG NG
REV	AMENDMENT		DRAWN CHECKED

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RICHARD MULHOLLAND			
LAND AT FLOSH MEADOWS CLEATOR CUMBRIA			
TOPOGRAPHICAL SURVEY			
DRAWING TITLE			
1:500 @ A1	DATE 18.03.14	OSTN02	
APPROVED BY NP	PREPARED BY NP	CHECKED BY NG	
P14053		2/2	C
DRAWN BY	CHECKED BY	REV	

Appendix B



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Scale ~ 1:1,250 at A3 page size.
Do not scale off this drawing.



Existing mature hedgerows provide substantial screening of consented and proposed development from Jacktrees Road. Additional planting up of small gaps as part of consented scheme provides further screening, creating a continuous band of trees between road and site.

New hedgerow along fenceline created as part of consented housing development to support landscape character objectives and to provide screening from Jacktrees Road. Additional planting to further increase screening of proposed housing.

Trees and hedges within proposed housing scheme to soften its appearance and create a green environment for residents.

Tree planting as part of consented scheme, supplemented by additional tree and hedge planting to create a green corridor.

Field access and turning head.

Shared surface

Tree and hedgerow planting within the site softens and frames new housing

Shared surfaces

Tree planting to frame proposed housing and soften rooflines.

New hedgerow to be planted as part of consented housing development, with further proposed tree planting alongside.

Cemetery Garden

Cross Grove

Flosch Meadows

Flosch Farm

A 5086

R 03	15/09/2017	further refinements to shared surface
R 02	12/09/2017	shared surface corrected
R 01	05.09.2017	minor changes to planting and notes
R 00	05.09.2017	original drawing
revision	date	notes

drawing number

01

drawing name

Illustrative layout

project

Housing at SR12A, Flosch Meadows

client

Mr and Mrs Mulholland
Flosch Farm, Cleator

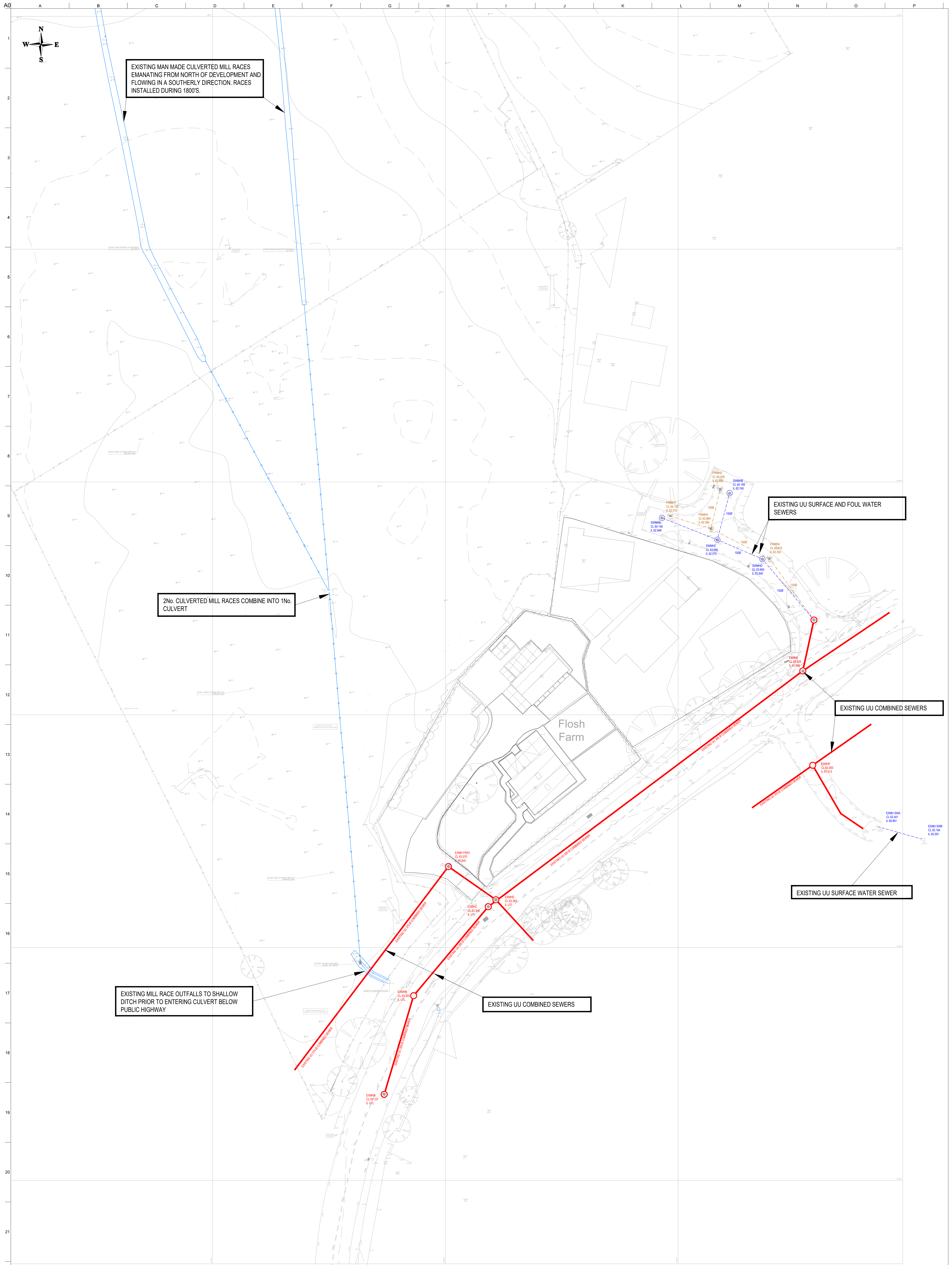
Key

- | | | | |
|--|---|--|---|
| | Existing vegetation | | Proposed houses (ridge lines shown) |
| | Planting included in consented housing development proposals | | Existing, consented and proposed access roads. |
| | Proposed planting | | Consented and proposed shared surfaces. |
| | Existing and consented houses and other buildings. (no ridge lines shown) | | No-build zone in consented housing development. |

produced for:
Lakeland Associates (Cleator) Ltd, The Flosch Farm House, Cleator, Cumbria. CA23 3DT
Directors: RW & E Mulholland. Registered in England and Wales no. 3184247. VAT no. 206997278
This illustration is based on a layout provided by Lakeland Associates (Cleator) Ltd.

Eden Environment Ltd
www.edenenvironment.com

Appendix C



LEGEND	
	LAND DRAINAGE
	UU COMBINED WATER SEWER
	UU FOUL WATER SEWER
	UU SURFACE WATER SEWER

P3	19-05-21	Updated to reflect client comments	RH	RH	PL
P2	25-04-21	Updated to reflect client comments	RH	RH	PL
P1	22-04-21	Preliminary issue	RH	BN	PL
Issue	Date	Description	By	Chkd	Appd



7 Silverton Court, Northumberland Business Park, NE23 7RY
0191 5977879

Client
MR R.W. MULHOLLAND

Job Title
FLOSH MEADOWS
CUMBRIA

Drawing Title
EXISTING DRAINAGE

Scale of A0
1:250

Drawing Status
PRELIMINARY

Job No
1842

Drawing No
201

Issue
P3



Coast Consulting Engineers Ltd

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