

 T J Booth Associates. Consulting Engineers 20A Eastgate St, Rochdale OL16 1DH	Project Rollins / Salley Street, Calderbrook				Job Ref. calc-tjba-rollins-salley st-DSR-260721	
	Section DRAINAGE STRATEGY REPORT				Sheet no./rev. 1 / 0	
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History.

Revision	Date	Reason
0	Jul 2021	Original.
1	August 2024	Updated for recent planning application.
2	January 2025	Update as per LLFA consultation & FW proposals.

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Introduction.

Reference:

The Site is within a rural area on the north side of the Roch Valley, with natural topography on the Site and immediate local area sloping down to the southeast.

The Site is currently undeveloped.

It is proposed to construct a single detached residential dwelling, built into the hillside.

The proposal is currently in the initial design stage and this report will form part of the planning application package.

Purpose of Report:

The primary purpose of this report is to identify specific drainage proposals in accordance with the national drainage hierarchy for surface water disposal & exceedance characteristics, also considering the proposed end adopters and their requirements.

Regarding site assessment, this report will appraise the existing site and local drainage infrastructure, assess the suitability of the proposed development, giving recommendations for drainage design & management, specifically for approval of the LLFA/EA/sewerage undertakers, as applicable.

General principles:

Drainage from new developments is to be designed to follow the national drainage hierarchy for surface water discharge to the following networks in order of preference:

- *infiltration*
- *watercourse*
- *public sewer*

Flow rates (existing & proposed) are to be estimated for approval using the following methodology:

- *Development should aim to deliver greenfield runoff on greenfield sites up to a 100yr rainfall event, considering climate change.*
- *Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites on a 1yr rainfall event.*
- *Development should be designed so that there is no flooding to the development in a 30yr event and so that there is no property flooding in a 100yr event considering climate change.*

Plans.

Location Plan.

Refer to the appended Location Plan.

The Site is bound by Salley Street/Calderbrook Road to the southeast and the Higher Calderbrook Road bridle path to the northwest boundary.

The Site is bound by agricultural fields to the southwest and agricultural fields/sheds to the northeast side.

There are no major or minor watercourses shown on maps within close proximity to the Site.

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Site Plan.

The pre-development Site area comprises a vacant plot of land currently an open field used for animal husbandry. There is a semi-dry drainage ditch through the Site centre, which connects to a flowing drainage ditch within the grass verge at the Site entrance/Salley Street.

The Salley Street drainage ditch flows to the northeast and gullies were noted in the bottom as well as a MH at the ditch end, which anecdotally (local knowledge) discharges beneath the road to the southeast. The gullies in the bottom of the drainage ditch suggest there is a lower carrier pipe.

The predevelopment site areas are:

- *Total area* 1280 sqm
- *Hardstanding area (impermeable & positively drained)* 0 sqm
- *Landscaped/greenfield area (assumed permeable)* 1280 sqm.

The proposed development is for a residential dwelling built into the hillside and predominantly buried allowing much of the Site to retain its greenfield state. The percolation of rainwater into covering soils will have to be managed by engineered & French drains or similar to the rear of retaining walls and discharged into the drainage ditch at the front of the Site.

The main courtyard will be of permanent hardstanding and will require drainage management in the form of SUDS permeable paving or similar systems.

Proposed Site areas are as follows (refer to Proposed Impermeable Area Plan in Appendix):

- *Total area* 1280 sqm
- *Proposed courtyard, parking & minor landscaping (impermeable)* 380 sqm
- *Soft landscaping (permeable)* 900 sqm

Desk Surveys & Investigations.

Existing and proposed topography.

A pre-development topographic survey was undertaken which indicates the Site to be on a slope from the northwest to southeast boundaries of between 226.00maOD to 219.00maOD (7m) respectively. The road level at the Site entrance is approximately 219.35maOD.

There is a drainage ditch that has been identified central to the Site, flowing southeast into a main drainage ditch in the verge between the Site and Calderbrook Road/Salley Street.

The level of the Salley Street drainage ditch is nominally 118.80maOD.

The courtyard is proposed to be at road level nominally 219.35maOD. The proposed ground floor level will be set at 219.46maOD.

Geology & Site Investigations.

Extracts from the regional BGS geological maps indicate the site is not underlain by superficial (glacial) cover.

The solid geology beneath the Site is mudstone & siltstone of the Namurian Marsden Formation.

Borehole records in the local area suggest there is clay at shallow depth beneath the upper topsoil.

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Assessments.

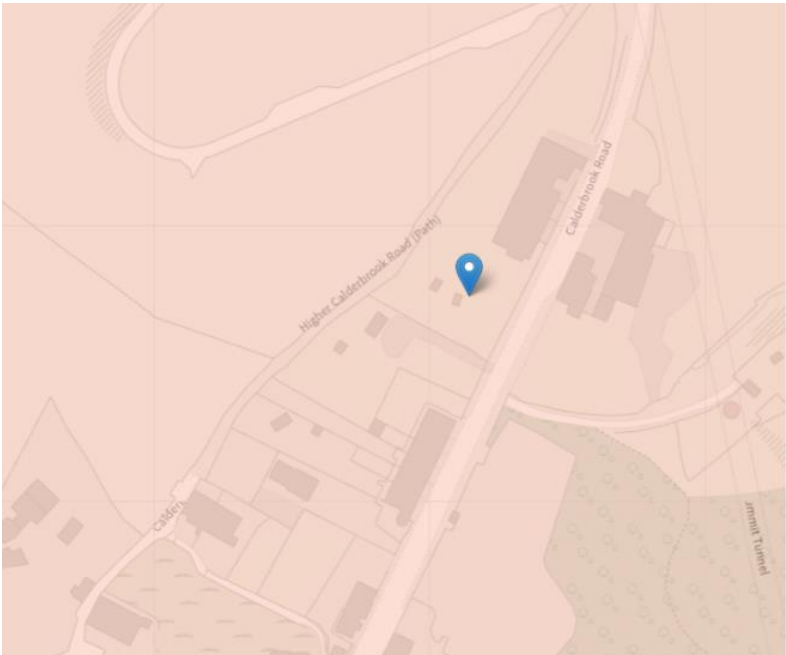
Flood zone category.

Refer to the .gov flood maps appended. The site is within Food Zone 1, ie a LOW probability of flooding. Surface water flooding is not a risk to the site.

The site area is less than 1.0 Ha so a specific flood risk assessment isn't required.

Climate change impacts.

Climate change allowances to peak rainfall intensity are given nationally across the whole of England, based upon river management catchment areas. Refer to graphic inset:



3.3% annual exceedance rainfall event

Epoch	3.3% annual exceedance rainfall event	
	Central allowance	Upper end allowance
2050s	25%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch	1% annual exceedance rainfall event	
	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

Given the proposed residential Site end use, the 2070s epoch is considered suitable for climate change allowance estimation which suggests the following allowance to be used:

30yr rainfalls +40% climate change allowance.

100yr rainfalls +45% climate change allowance.

Existing surface water system.

The Site is a vacant plot of agricultural land and has not been developed historically. As such it shall be assessed for the purposes of drainage design as a greenfield site.

Hydrological characteristics for the site were obtained from the HR Wallingford mapping database:

SAAR (mm) ⓘ	1354
M5-60 rainfall depth (mm) ⓘ	20
'r' ratio M5-60 / M5-2day ⓘ	0.2
FEH/FSR conversion factor ⓘ	1.25
Hydrological region ⓘ	3
Specify SOIL type ⓘ	5

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Rainfall Runoff Assessment.

EXISTING GREENFIELD RUNNOFF ESTIMATION

Attenuation design in accordance with CIRIA publication C753 - The SUDS Manual

Tedds calculation version 1.0.04

Pre post runoff method

Site characteristics

Location	Other
Hydrological region	3
Soil type (Wallingford Procedure W.R.A.P map)	5
Standard percentage runoff	SPR = 0.53
Average annual rainfall	SAAR = 1354 mm
5 year return period rainfall of 60 minute duration	M5_60min = 20.0 mm
Ratio 60-minute to 2 day rainfalls of 5 year return	r = 0.20
Rainfall intensity increase due to global warming	p _{climate} = 0%
Routing coefficient	C _r = 1.30
Volumetric runoff coefficient	C _v = 0.75

Catchment details

Subcatchment	Name	Area (ha)	PIMP (%)	Impermeable. area (ha)
1	Salley Street	0.13	0.0	0.00
Total		0.13	0.0	0.00

Greenfield runoff rates

Catchment area	AREA = 50.00 hectare
Greenfield runoff rate (50 hectare site)	$\dot{Q}_{\text{rural}} = 0.00108 \text{ m}^3/\text{s} * (\text{AREA}/1\text{km}^2)^{0.89} * (\text{SAAR}/1\text{mm})^{1.17} * \text{SPR}^{2.17} = \mathbf{677.9 \text{ l/s}}$
Greenfield runoff rate	$\dot{Q} = \dot{Q}_{\text{rural}} / \text{AREA} * A = \mathbf{1.7 \text{ l/s}}$
Greenfield runoff rate per unit area	$\dot{Q}_A = \dot{Q} / A = \mathbf{13.6 \text{ l/s/hectare}}$

Estimated site discharges

FSR growth rate (1 year)	FSR _{1yr} = 0.86
Discharge (1 year)	Q _{1yr} = $\dot{Q} * \text{FSR}_{1\text{yr}} = \mathbf{1.5 \text{ l/s}}$
FSR growth rate (30 year)	FSR _{30yr} = 1.75
Discharge (30 year)	Q _{30yr} = $\dot{Q} * \text{FSR}_{30\text{yr}} = \mathbf{3.0 \text{ l/s}}$
FSR growth rate (100 year)	FSR _{100yr} = 2.08
Discharge (100 year)	Q _{100yr} = $\dot{Q} * \text{FSR}_{100\text{yr}} = \mathbf{3.6 \text{ l/s}}$

DESIGN RAINFALL 1YR (THE WALLINGFORD PROCEDURE)

Design rainfall in accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Other
Storm duration	D = 30 min
Return period	Period = 1 yr

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Ratio 60 min to 2 day rainfall of 5 yr return period	$r = 0.200$
5-year return period rainfall of 60 minutes duration	$M5_{60min} = 20.0 \text{ mm}$
Increase of rainfall intensity due to global warming	$p_{climate} = 0 \%$
Factor Z1 (Wallingford procedure)	$Z1 = 0.72$
Rainfall for 30min storm with 5 year return period	$M5_{30min_i} = Z1 \cdot M5_{60min} = 14.5 \text{ mm}$
Factor Z2 (Wallingford procedure)	$Z2 = 0.62$
Rainfall for 30min storm with 1 year return period	$M1_{30min} = Z2 \cdot M5_{30min_i} = 9.0 \text{ mm}$
Design rainfall intensity	$I_{max} = M1_{30min} / D = 17.9 \text{ mm/hr}$

DESIGN RAINFALL 30YR (THE WALLINGFORD PROCEDURE)

Design rainfall in accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Other
Storm duration	$D = 30 \text{ min}$
Return period	Period = 30 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	$r = 0.200$
5-year return period rainfall of 60 minutes duration	$M5_{60min} = 20.0 \text{ mm}$
Increase of rainfall intensity due to global warming	$p_{climate} = 0 \%$
Factor Z1 (Wallingford procedure)	$Z1 = 0.72$
Rainfall for 30min storm with 5 year return period	$M5_{30min_i} = Z1 \cdot M5_{60min} = 14.5 \text{ mm}$
Factor Z2 (Wallingford procedure)	$Z2 = 1.52$
Rainfall for 30min storm with 30 year return period	$M30_{30min} = Z2 \cdot M5_{30min_i} = 22.0 \text{ mm}$
Design rainfall intensity	$I_{max} = M30_{30min} / D = 44.1 \text{ mm/hr}$

DESIGN RAINFALL 100YR (THE WALLINGFORD PROCEDURE)

Design rainfall in accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Other
Storm duration	$D = 30 \text{ min}$
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	$r = 0.200$
5-year return period rainfall of 60 minutes duration	$M5_{60min} = 20.0 \text{ mm}$
Increase of rainfall intensity due to global warming	$p_{climate} = 0 \%$
Factor Z1 (Wallingford procedure)	$Z1 = 0.72$
Rainfall for 30min storm with 5 year return period	$M5_{30min_i} = Z1 \cdot M5_{60min} = 14.5 \text{ mm}$
Factor Z2 (Wallingford procedure)	$Z2 = 1.98$
Rainfall for 30min storm with 100 year return period	$M100_{30min} = Z2 \cdot M5_{30min_i} = 28.7 \text{ mm}$
Design rainfall intensity	$I_{max} = M100_{30min} / D = 57.3 \text{ mm/hr}$

Proposed Surface Water System.

Following the guidance of hierarchy for disposal of surface water (SUDS):

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- **INFILTRATION:** Local BGS maps and borehole records suggest the Site subsoils comprise clay over highly weathered mudstone/siltstone. While there will be soakage capacity of the existing soils, this will be limited, and saturation of the ground and runoff is expected to happen relatively quickly.

Due to the nature of the development, and the predominant burial of the structure beneath soft landscaping; the development building will require significant excavation into the bedrock and associated retaining walls to hold the surrounding landscape.

It will be necessary to provide drainage to the rear of the walls with engineered as well as French drains, allowing some natural infiltration & slow percolation.

Drainage of the courtyard may be undertaken with permeable finishes and open graded subbase, with preferential pathways again falling to the drainage ditch at the front of the Site.

The inclusion of permeable surfaces & open graded subbase will be an improvement on the existing clay geology, and should inhibit the speed at which the ground is saturated and overland flow occurs.

Once rainwater hits bedrock it will move to the front of the Site and will discharge to the Salley Street drainage ditch.

- **WATERCOURSE:** The closest 'watercourse' is the drainage ditch in the road verge. The engineered building drains/french drains and permeable paving may ultimately discharge to this feature.
- **SEWER:** Not required.

The Site entrance appears to be in a low point of Salley Street. It would be prudent to keep the courtyard levels as high as possible & above the max road and opposite verge level, so that natural runoff in extreme exceedance events can occur, should the Salley Street drainage ditch become overwhelmed.

Proposed Foul Water System.

The closest foul water sewer is nominally 23m to the southwest of the Site to the front of No.19 Salley Street. It is understood this is a shallow system. Ground levels at No.19 are nominally 219.72m aOD.

Proposed finished ground floor level at the Site is to be 219.46m aOD, with external levels around 219.35m aOD. Invert levels of a proposed foul gravity system from the Site building to No.19 Salley Street are estimated at c218.00m aOD by the time falls are accounted for, nominally 1.70m below the ground level at No.19.

It is assumed a gravity system will not be suitable, but a pumped solution could work, subject to a drainage survey & suitable connection points.

Refer to Indicative Foul Drainage Plan in the Appendix.

Additional Recommendations.

Prior to detailed design, the existing surface water drains to the front of the Site should be surveyed for pipe sizes, gradient, associated invert depths and condition.

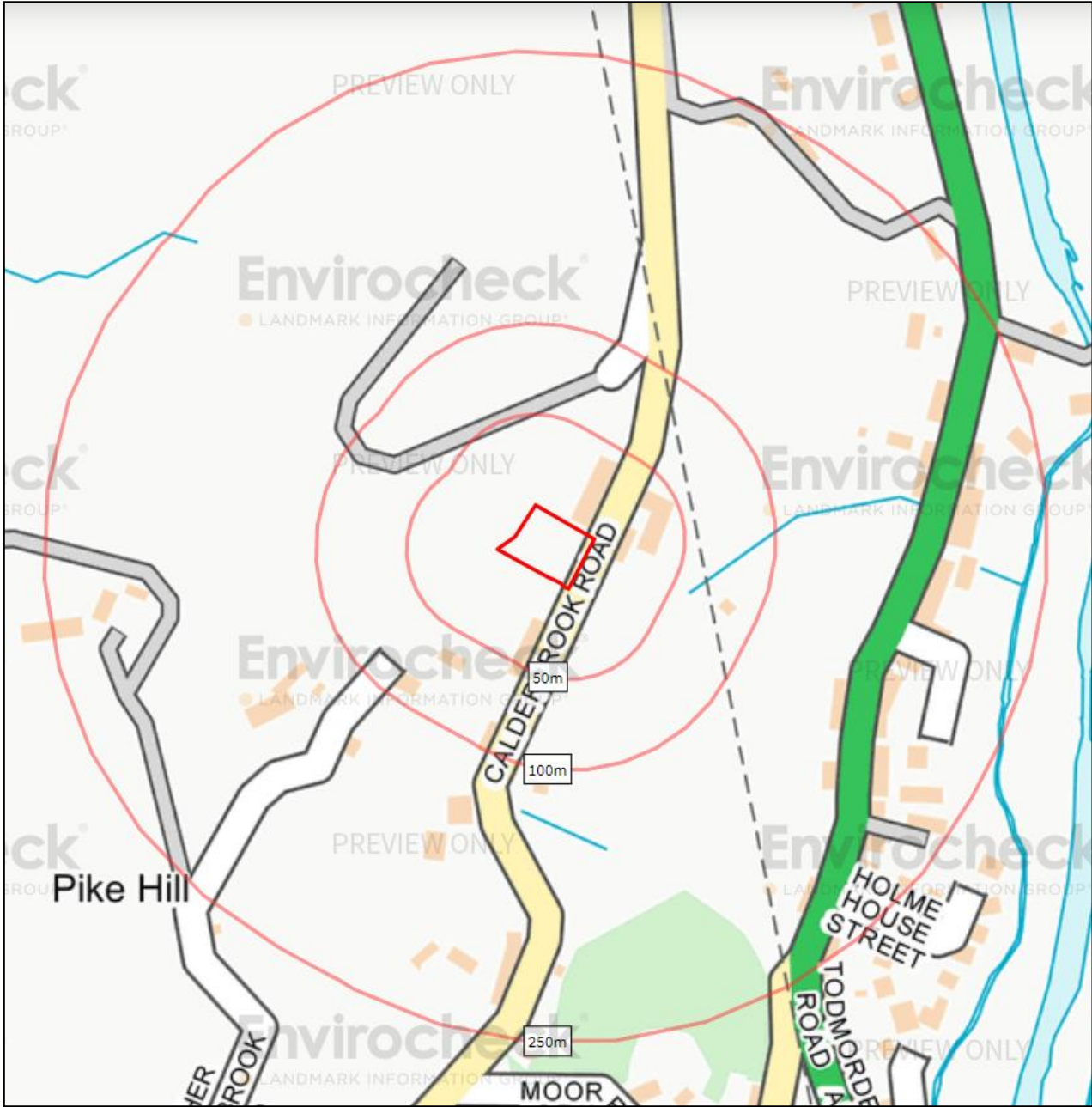
FW sewers to the fronts of No.17-19 Salley Street should be surveyed for suitability of connection for the proposed foul system.

This report should be issued to the LLFA to approve and/or comment on the proposed drainage strategy.

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Appendix.

Location Plan.



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Proposed Site Plan & Aerial View.



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Proposed Impermeable Area Plan



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Topographic Survey Plan

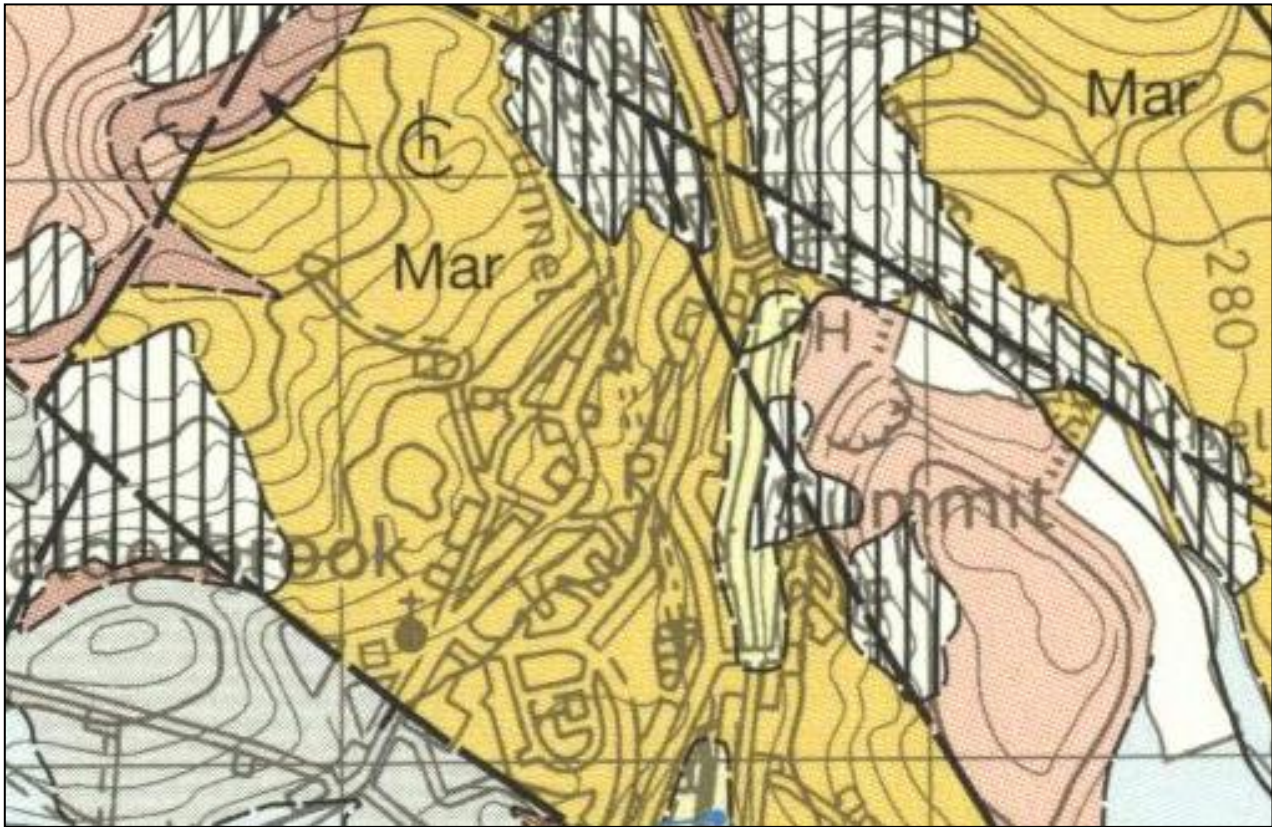
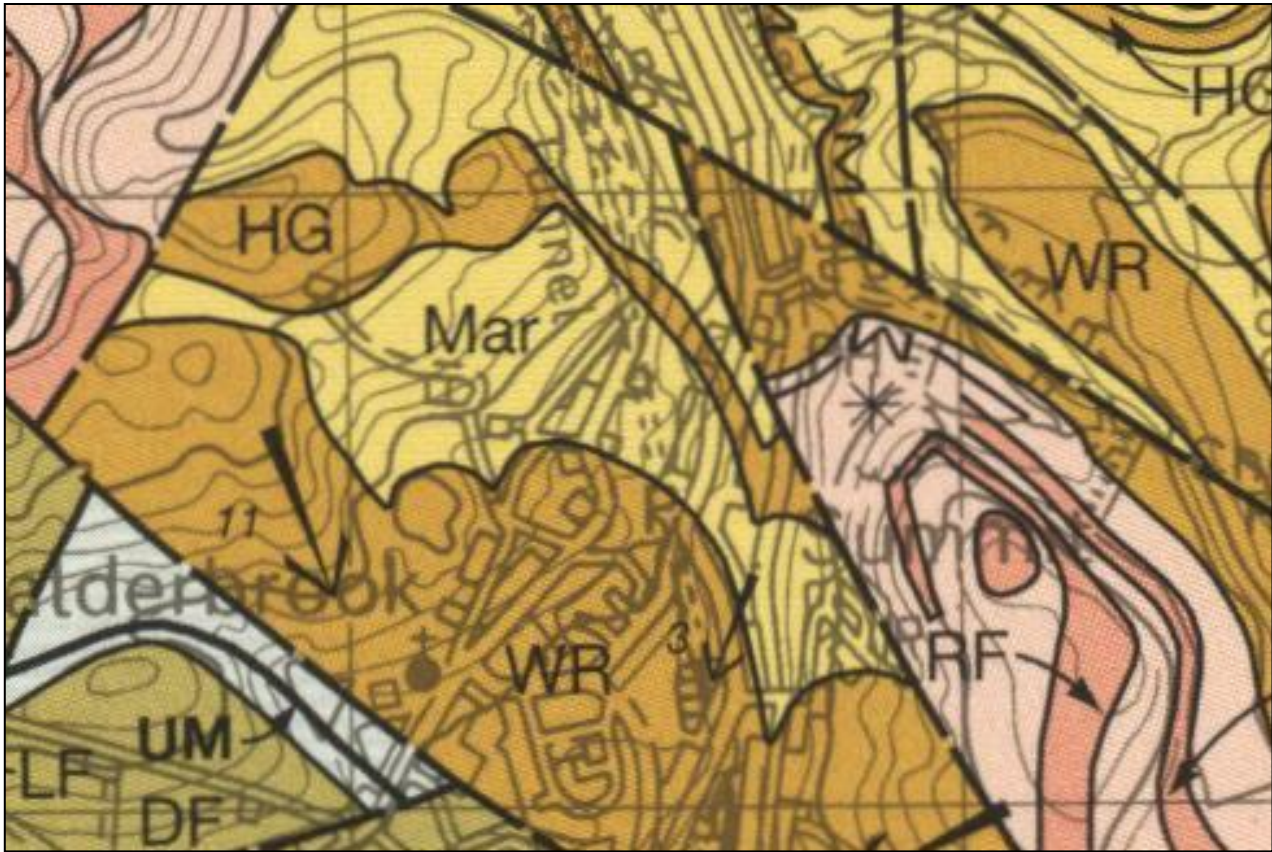


Site Investigation Plan & Logs

N/A

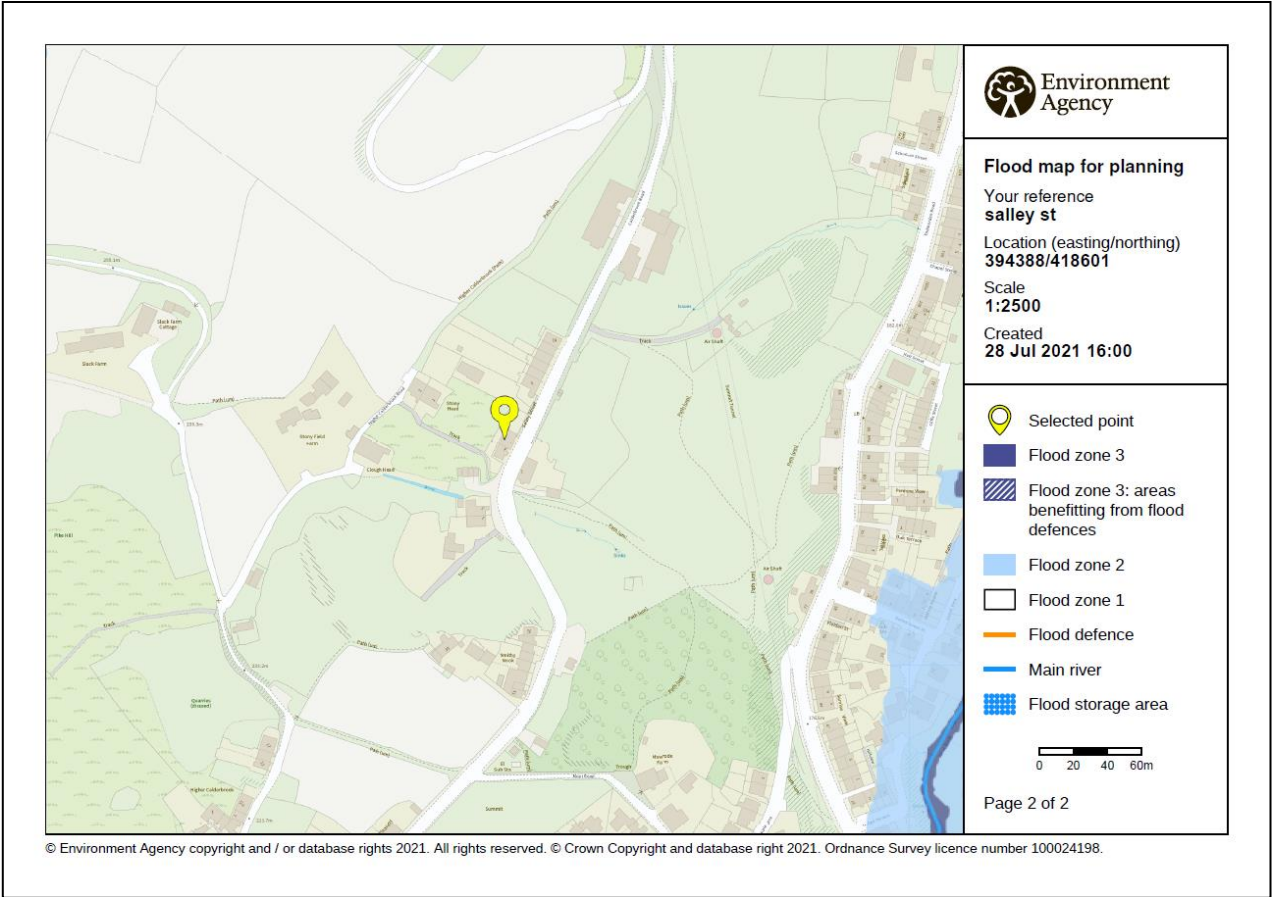
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BGS Solid & Superficial Geology Maps



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Gov River Flood Map (Flood Zones).



Gov Surface Water Flood Map.

