

FLOOD CONSEQUENCES ASSESSMENT

for

Bleazard & Galletta LLP

at

**Proposed Barn Conversion
Halghton New Mill Cottage
Mill Lane
Halghton
Whitchurch**



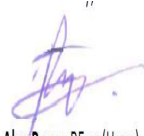
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24/11/2020	Approval/Information	B A Daykin CEng, CWEM, ICE, FIHE, CIWEM Signed: 	A Payne BEng, Signed:  Alex Payne BEng (Hons)	30 November 2020

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Unless otherwise stated the assessments made assume that the site and facilities will continue to be used for their current purpose without significant changes. The report offers remedial solutions, but no detailed design information is provided. Any design suggestions are for guidance only.

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1.0 INTRODUCTION

1.1 Brief/Objective

This Flood Consequences Assessment report has been prepared on behalf of Bleazard & Galletta building consultants and current property owners in support of a planning application for proposed expansion and refurbishment works at the Halghton New mill cottage development. Please refer to Proposed Site Layout and masterplan drawing included in Appendix A of this report. (still to be obtained)

The development generally comprises of refurbishment to an existing barn building converting it to residential dwellings.

The objective of the report is to highlight source of flood risk and determine potential for future flood risk posed by the development proposals. Flood Consequence assessment deemed required as the development area is noted to have Zone B Flooding in close proximity to the site.

1.2 Site Location & Description

The proposed development site is accessed off a lane (Mill Lane) leading to the former mill buildings. Mill Lane is accessed from Bryn Lane. The Ordnance Survey National Grid coordination for the site is SJ430417 / SJ4303241700 and the site is located approximately 12km Southeast of Wrexham and 10Km West of Whitchurch. The site covers approximately **0.015Ha** and is edged in red in **Figure 1 and 1a**. The main area of development is the existing barn building. The site is bound in all directions by open farmland and a few minor highway routes.

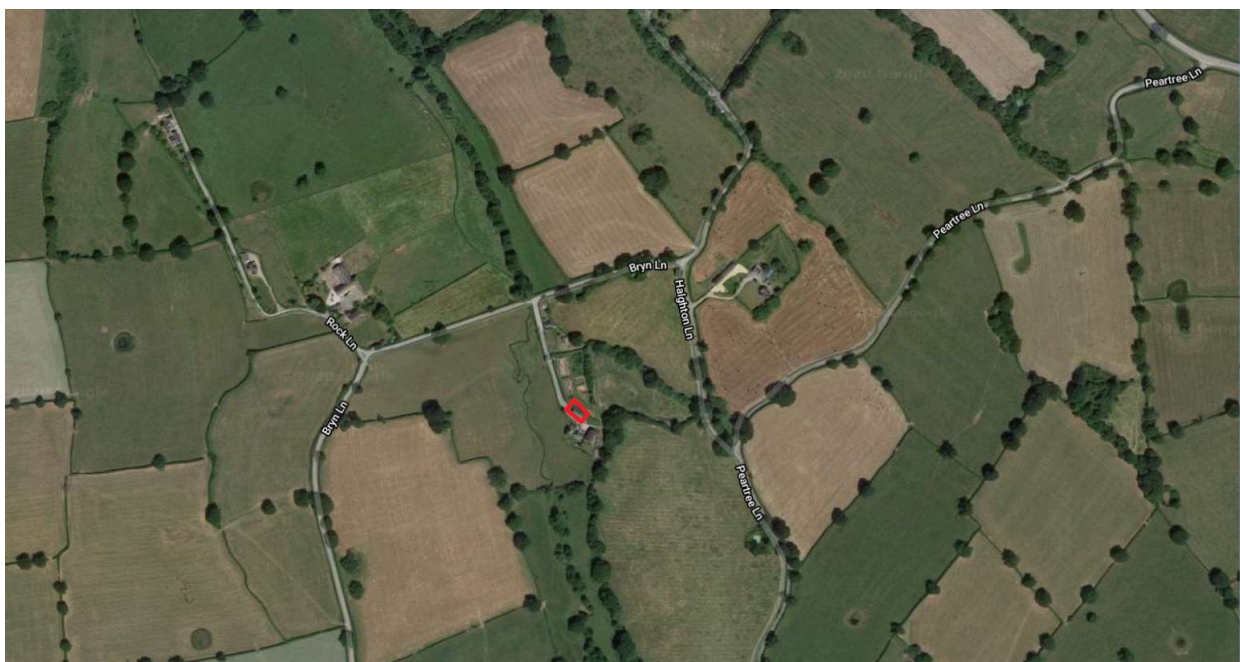


Figure 1 -site location

Map data imagery Copyright Google 2019



Figure 1a -site location

The site access from Bryn Lane gives to a partially paved roadway in a bound surface and gravel material giving vehicular access to the various buildings associated with the former Mill. From the access road a number of accessways lead off to the various parts mill buildings and adjacent residential properties.

The site buildings comprise of a mixture single 1 and 2 storey units constructed from a variety of materials and of mixed ages. Some building may be grade listed.

1.3 Topography

The site has been topographically surveyed for the purpose of the development. The topographical survey drawings B&G\Halghton\01 (undated) prepared by Compass Land surveys is included in **Appendix B** of this report.

The existing site, and surrounding topography, is relatively flat with the general topography falling east to west towards the existing watercourse. No significant level changes are noted across the site.

1.4 Development Proposals

The development proposals are as listed in the planning application document but comprise of renovation of existing barn buildings to changing use from industry to residential.

The development proposals are still in the development stages but the bulk of the works is focused on renovation of the existing barn indicated in the site location section.

2.0 SOURCES OF FLOOD RISK

2.1 Fluvial Flood Risk

Natural Resources Wales Maps for Planning have been accessed via the naturalresources.wales website and shows that the site is located within Flood Zone B, using the development active Map, as seen in **Figure 3** below and therefore identified as an area known to have flooded in the past.

This fluvial flooding source is associated with the a ordinary watercourse (Cumbers Brook) understood to be a tributary to the River Dee which is located which is located some 6.4Km to the Northwest. The Cumbers Brook sits approximately 50m from the development building.

Using the Natural Resources Wales flood risk assessment mapping tools the development building is found to be located outside of any flood risk area with the nearest low risk zone (0.1-1% chance of flooding) being some 10m from the development building. The whole of the development area can be therefore be said to be located in flood zone A – **see Figure 3a**

The flood zone A definition states that:

Zone A Low Probability	Area considered to be a little or no risk of fluvial flooding – (EA) Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones B and C)
Zone B	Area known to have been flooded in the past evidenced by sedimentary deposits. (Area noted as yellow on the map)
Zone C2	Area of floodplain without significant flood defence infrastructure have greater than 1 in 1000 annual probability of river or sea flooding (area noted in blue on the map)

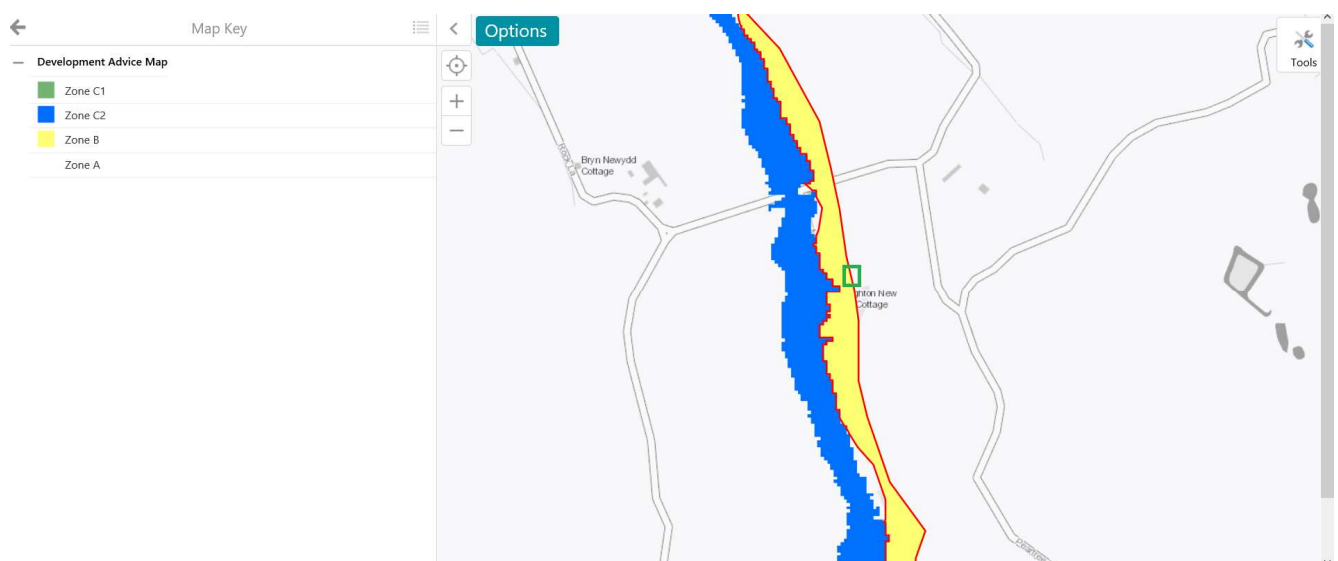


Figure 3 Fluvial flood risk, Development active map– approx building position in green.

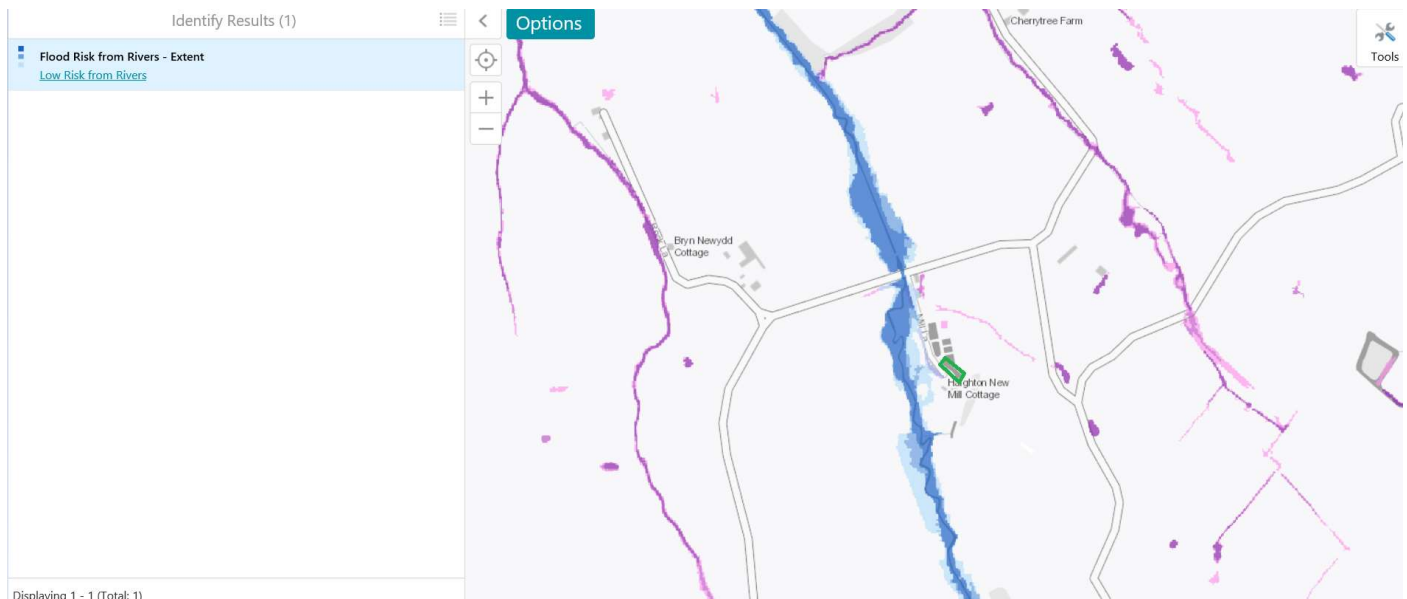


Figure 3a Fluvial flood risk, flood risk assessment map

The vulnerability of all associated development elements is considered to be highly vulnerable (houses) as stated in Technical Advice Note 15 (TAN15) figure 2.

The development does however meet the TAN15 development requirements for vulnerable developments.

Using the site topographical data it would be estimated that the development FFL would be some 300mm above the low risk (0.1-1% flooding probability) and some 600mm above the high risk (>3.3% flooding probability) – this evidence is demonstrated on the drainage strategy drawing located in appendix D of this report – 15480-900.

A ditch drain is known to exist fronting the development building and this feature provides a “cut off” line for the flood waters. This can be seen from the flood mapping as the flood extents coincide with the line of the ditch drain. Again this feature can be seen on the drainage strategy drawing 15480-900.

The potential flood risk relative to the site from Fluvial flood sources is therefore identified to be **low**.

A hydraulic study of the watercourse may provide further reassurance on the maximum flood levels for the purpose of building insurance but such a study isn't currently deemed necessary at planning stage.

2.2 Tidal Flood Risk

The coastline is located more than 60km Northwest of the development site and the associated tidal flood risk to the development site is 'low', given the proximity and catchment characteristics. No tidal rivers are noted within the immediate area.

2.3 Surface Water Flood Risk

Long Term Flood Risk Maps have been accessed via the naturalresourse.wales website and identify areas on the development site that are shown to be at risk of surface water flooding. Areas adjacent the site limits are noted as having high medium and low surface water flood risk.

The extent of areas susceptible to surface water flooding are shown in **Figure 4** and summarised below. No Development proposals lie within areas noted as having high medium or low flooding risk.

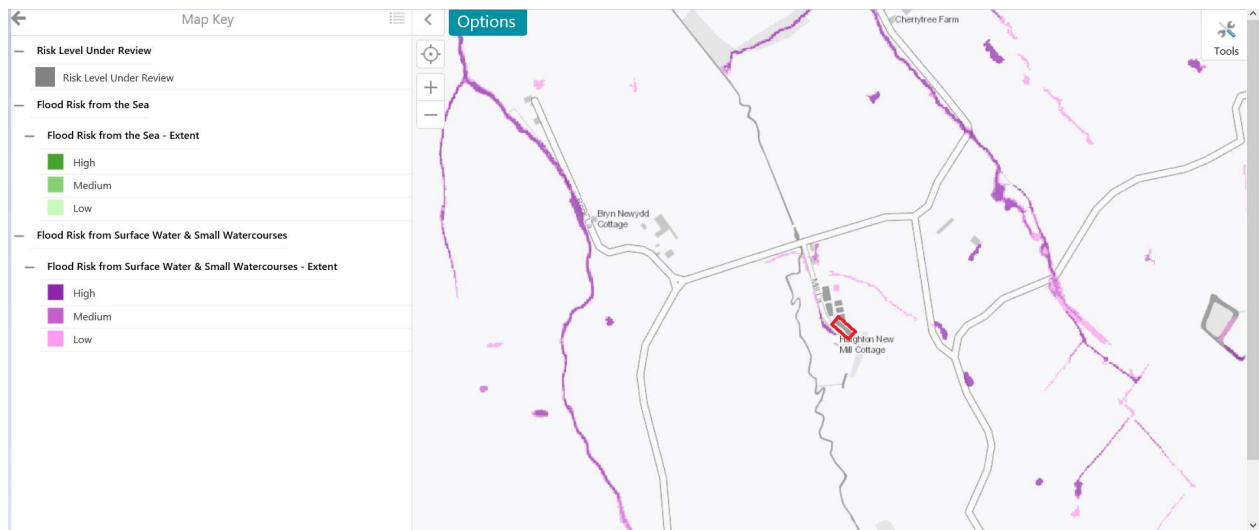


Figure 4 – surface water flooding

Map data Imagery Copyright Natural Resources Wales 2019

High Risk – The areas identified as high risk show flood depths between 300 to 900mm with velocities generally less than 0.25m/s.

Medium Risk – The areas identified as medium risk show isolated locations where flood depths between 300-900mm may occur with velocities less than 0.25m/s. Beyond these locations flood depths are shown to be less than 300mm in depth with velocities over 0.25m/s.

Low Risk – Similar to medium risk areas described above isolated areas of greater flood depth coincide with lower velocities and the greater extent consists of lesser flood depth with higher velocity.

Based on the surface water flood risk identified and the position and type of development proposals no surface water flooding problems can be expected or further increased due to the development.

The surface water flooding is confined to the small open watercourse (ditch drain) that runs adjacent the access road. The depth of this open drain coincides with the depths associated with the risk levels and reinforces that the flood water doesn't breach the drain sides.

When considering the information available and reviewing this against the development proposals suggested it is considered that flooding risk from surface water source is of low.

2.4 Flood Risk From Reservoirs

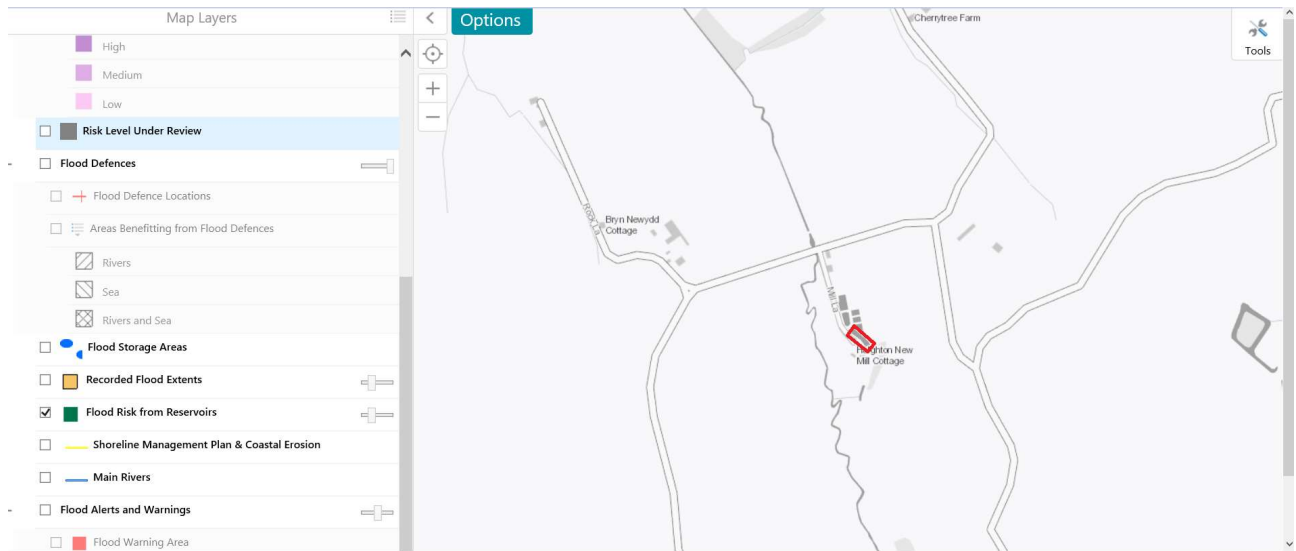


Figure 5 – Reservoir flooding

No flood water from the reservoir is noted on the development areas. The flooding risk from reservoirs is therefore low.

2.5 Pluvial Flood Risk

No development proposals will impact on over land flood flows and no development proposals are currently at risk from overland flooding or surface water flooding. The flooding risk from Pluvial sources is therefore low.

2.6 Flood Risk from Sewerage systems

Sewer record maps have yet to been obtained to identify the location of foul and surface water sewers within or in the vicinity of the site and to highlight any development constraints and/or current sewer flood issues.

A system of small diameter 150mm foul and surface water drainage provide sewerage drainage for the existing mill buildings and small external areas but the precise routing has yet to be confirmed.

Surface water drainage is collected via gullies and conveyed to the Cumbers brook watercourse.

Foul water is collected and conveyed to the underground system. It is not yet known where this foul system terminates or whether the flows are pumped/treated.

No indication is given to suggest flooding from the sewer network is significant and pluvial flooding is based largely on-site topography and not linked to sewer locations on site.

The flooding risk from sewerage sources is therefore low.

2.7 Flood Risk From Groundwater

The mapping data accessible via the gov.uk website for groundwater shows the site to be underlain by a Secondary B Aquifer. In terms of groundwater vulnerability, the aquifer is considered to be a Minor aquifer with medium vulnerability.

Risk from ground water flooding is considered low.

The site is not believed to be in a ground source protection zone (SPZ)

2.8 Flood Risk Vulnerability & Compatibility

The proposals are for residential dwellings and as such are classified as 'highly vulnerable' in accordance with Figure 2: Flood Risk Vulnerability Classification table within the Technical Advice Note 15.

The proposed development land use is considered to be appropriate for Flood Zone A, B in accordance with chapter 7 of TAN15 providing that there is no increase in flood risk elsewhere due to the proposals and that the development criteria of TAN15 is met. As the development proposals are mainly refurbishment and renovation and not a defined as change in use it is considered that sequential testing is not required.

The access road leading into the site is noted to be breached by low risk flood waters but not by the high risk water levels.

Water levels crossing the road due to the low risk flooding are noted at been less than 600mm in depth.

3.0 FLOOD RISK MITIGATION MEASURES

3.1 Mitigation Measures

The development does not alter the flood risk situation on the site and all the development proposals are considered to be at low risk of the various flood situations. Because of this no mitigation measures are deemed necessary other than to ensure that the building floor levels remain at or above 36.800m – this minimum level is set at approximately 300mm above low risk flooding areas and 600mm above the high risk flooding levels. – this level is based on flood mapping data obtained and local topography.

3.2 Residual Risks

In the event of extreme rainfall it is likely that there will be some overland flows that are not able to enter the surface water drainage system sufficiently. Therefore, the proposed layout and external levels need to give due consideration to these potential overland and exceedance flows in the event that the capacity of the drainage system is exceeded. The refurbishing nature of this development poses no increased flood risk to onsite facilities nor to neighbouring properties in these exceedance events situations. The exceedance flows will be managed on site as previously experienced but with betterments seen through improved drainage facilities provided as part of the development works.

The Cumbers Brook has not been assessed for any blockage situations.

4.0 FLOOD RISK CONCLUSIONS

The site covers approximately 0.015Ha and is located wholly outside the low risk flood area so can be said to be in Flood Zone A based on the Natural Resources Flood Development Active Map for Planning. The proposals are for conversion of existing industrial buildings to residential use.

The Flood Risk Assessment Maps provided by Natural Resources Wales show the development site to be outside the low risk flooding areas (less than 0.1-1% flooding probability)

The report has considered all sources of flood risk to the proposed development.

The nearest Ordinary Watercourse is located alongside the site boundary (Cumber brook) some 50m from the development building. The nearest Main River, the Dee, is located some 6km to the Northeast of the site.

The flood risk associated with fluvial sources is identified to be low and the flood risk associated with tidal, reservoir, groundwater and sewer sources are also considered to be low.

Flood risk pre and post development associated with surface water and pluvial flooding is considered to be low.

The development is therefore considered to be appropriate in accordance with National Planning Policy Framework and Planning Practice Guidance. The proposals meet the requirements of TAN15 for Highly Vulnerable development

5.0 SURFACE WATER MANAGEMENT

5.1 Pre-Development Surface Water Run-off

The total site area covers approximately **0.015Ha** and at present is circa 95% impermeable. The topographical survey along with existing drainage mapping provides sufficient evidence to suggest that existing impermeable areas is positively drained. The drainage for the site is provided via a system of collection gullies and channels that discharge to an underground network of surface water drainage pipes. These pipes convey surface water run off to the nearby watercourse, Cumber's Brook. The permeable areas are understood to drain to the low points on the site and over time infiltrate into the existing landscaping features.

The peak rates of run-off generated by the site pre-development have been calculated as shown in **Table 1** below.

Table 1 – Summary of Run-Off Rates

Site Area	Run-off Rates			
	1 in 1 Year	1 in 30 Year	1 in 100 Year	QBar
0.15 Ha (brownfield)	2L/s	5L/s	6L/s	na

5.2 Post-Development Surface Water Run-off

The impermeable area is not proposed to increase and therefore post development discharge would not increase as a result of the development.

Although no increase in surface water discharge is generated by an increase in impermeable area it is proposed to offer a discharge betterment inline with planning policy and SAB requirements. Any restriction below a minimum of 1L/s maximum discharge is deemed to be impractical due to maintenance issues and blockage risks associated with the very small control orifice. For this reason a maximum post development discharge of 1L/s is proposed for all storm events up to 100 year plus climate change allowance, this offering a 50% betterment over the 1 year storm event run off rate.

Post development run off rates noted below in Table 1a

Table 1a – Summary of Post Development Run-Off Rates

Site Area	Post development Run-off Rates			
	1 in 1 Year	1 in 30 Year	1 in 100 Year	1 in 100 year + 40%cc
Post Development	1L/s	1L/s	1/s	1L/s

5.3 SuDS Parameters

Given the nature and location of the proposed development there are opportunities to accommodate new and utilize existing SuDS features providing multiple benefits including improvement of biodiversity, aesthetics, ecology and water quality. Such features will enable the conveyance and attenuation of surface water flows in lieu of traditional below ground storage methods.

Discharge via Infiltration

The British Geological Survey (BGS) mapping data indicates that ground conditions are as follows:

Bedrock Geology: Tarporley Siltstone Formation - Siltstone, Mudstone

Superficial Deposits: Alluvium - Clay, Silt, Sand And Gravel. Superficial Deposits

Nearby historical borehole records available via BGS mapping data indicate that the site is underlain by a mixture of soil types, some may be suitable for soil infiltration but mostly the soils are expected to be of low porosity.

At this stage, based on the above, and lack of evidence that existing infiltration methods are currently being employed on site further infiltration methods may not prove practical as a means of surface water discharge. Further investigation required.

Discharge to the ground via means of infiltration from the proposed footways and walkways should be considered and would be a preferable means of surface water drainage. However discharge from the renovated building via infiltration wouldn't appear practical at this stage based on the factors listed above.

Discharge to Watercourse

On review of the available map data the nearest watercourse has been located some 50m to the West of the site (Cumbers Brook). This ordinary watercourse is understood to discharge into the River Dee to the northeast of the development site.

Continued discharge to the watercourse from the proposed development works would be considered a suitable means of surface water drainage. The location of the discharge point should be as existing.

There is strong evidence that all the surrounding hardstanding and buildings ultimately drain to this watercourse. Drainage survey data will confirm on this.

Discharge to Public Sewer

Records have yet to be obtained to identify the nearest public sewers to the development site. At this stage it appears that there is little public sewerage in the area.

A system of private drainage looks to exist likely conveying surface water to the watercourse.

At this point discharge of surface water to a public sewer network doesn't appear practical.

5.3.6 SuDS Features

As mentioned in the post development discharge section the site is largely refurbishment and no increases to impermeable area is proposed. Using the discharge rates suggested would allow for maintaining and improving on current run off rates and any infiltration usage possible will further improve on this.

The drainage strategy drawing provided in Appendix D highlights the surface water design options recommended and table 2 below indicates possible attenuation volumes required.

If infiltration rates prove to be suitable and site control measures are required respective brownfield runoff rates shall be used for the control units. In this situation using a maximum greenfield/brownfield runoff limit to Qbar rates would be impractical given that these rates will give very small control devices, smaller than considered practical for use here without significant blockage and maintenance risk. For this reason, the smallest practical discharge limit of 1L/s has been used. This is in line with good design practice manuals and water authority guidelines and still provides a 50% betterment over existing 1 year run off rates.

Table 2 – Summary of Estimated Storage Volumes – new build works

Impermeable Area 0.015 ha	1 in 1 Year	1 in 30 Year	1 in 100 Year +CC
Restricted Run-Off Rate	1l/s	1l/s	1l/s
Estimated Stormwater Storage Volume	0.3-1m ³	2-4m ³	6-9m ³

This attenuation will be provided by means of underground storage units and or oversized pipes, either online or offline designs to suit the area available. Control devices will be via hydrobrake units installed in drainage manholes. Silt prevention systems should be employed up stream of the attenuation and control device.

The discharge from the flow control chamber will be routed to the existing on-site drainage systems at the point considered most suitable or direct to the existing watercourse if found to be more practical. Any new watercourse connection will be subject to EA/IDB/owner approval.

5.3.7 Climate Change

The proposed surface water system will be designed with an allowance of 40% increase for climate change effects.

6.0 FOUL WATER MANAGEMENT

Existing on site sewer records identify the nearest sewers to be around the existing buildings to the south east of the development building. Some nearer drains adjacent the development building could also be combined in nature.

New foul water points proposed as part of the development works and refurbishment works could be connected to the existing foul drainage network that surrounds the existing buildings. Details of these existing drains can be seen in appendix C. (yet to be obtained)

Any new discharge to the existing foul network will require the prior assessment of the downstream pumping station/ treatment plant if they are in use to establish suitable and satisfactory capacity.

An alternative foul drainage approach would be to install a new package treatment unit that serves the new dwellings and which then connects to the proposed surface water system.

This approach would appear practical but would need prior approval from the watercourse governing body.

7.0 DEVELOPMENT DRAINAGE CONCLUSIONS

Surface water drainage from the development is deemed minimal and no negative impacts on existing sewers or waterbodies will be felt from the development.

A system of surface water discharge rate betterment is proposed. Approximately 50% reduced current brownfield run off rate for 1 year storm events. This reduced rate will remain for all storm durations up to the 100 year plus climate change event.

The refurbishment nature of the development does not pose an increase in pollution risk and no pollution prevention measures are required. Any new car parking/and or external hardstanding proposals will be minimal and have been accounted for within the surface water strategy outlined. If possible new hardstanding areas should be permeable in nature.

Foul drainage is to connect to the existing foul network following capacity assessment of the downstream works system or utilising a new connection to the new surface water system following appropriate treatment.

Appendix A
Development Masterplan
Site plan As Existing 2032 D 02 / Site Plan As Proposed 2032 D12





SITE PLAN AS EXISTING (1/500 @ A1)

Notes

N

Revision	Description	Date
BLEAZARD & GALLETTA LLP PLANNING DESIGN AND CONSTRUCTION CONSULTANTS Maypole Court, 2 High Street, Wem, Shropshire, SY4 5AA Telephone: 01939 235 303 Fax: 01939 235 344 E-mail: info@bgukdesignconsultants.co.uk Web: www.bguldingconsultants.co.uk		
Project Location		
Haighton New Mill, Mill Lane, Hanmer, Nr Whitchurch, SY13 3DT		
Project Description		
Conversion of Barn to Dwelling		
Client		
Mr P. Taylor		
Drawing		
Site Plan As Existing		
Scale 1:500 @ A1		Date Jan 2022
Drawing Number		2032 D 02

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Appendix B
Topographical Survey – B&G\Halghton\01



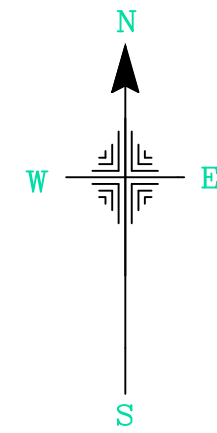
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E342900
E342950
E343000
E343050
E343100
E343150
E343200
E343250
E343300

PERMANENT STATIONS:			
S01: E 342950.056	S08: E 343280.820		
N 341773.180	N 341554.555		
L 37.670	L 57.210		
S02: E 342983.285	S12: E 343228.760		
N 341781.990	N 341642.890		
L 36.545	L 53.120		
S03: E 343057.440	S15: E 343223.250		
N 341666.150	N 341710.200		
L 36.760	L 54.000		
S07: E 343268.877	S20: E 343019.870		
N 341603.175	N 341792.280		
L 55.095	L 36.614		
S50: E 343078.250	N 341640.425		
L 36.770			

*** NOTE ***
SURFACE SERVICE FEATURES
& POINTS SURVEYED WHERE
VISIBLE. THERE MAY BE MISSING
COVERS DUE TO PARKED CARS
AND VEGETATION ETC.

STUDY OF EXISTING DRAINAGE
PLANS & A DRAINAGE SURVEY
SHOULD BE CARRIED OUT BEFORE
DESIGN \ EXCAVATION.

REMARKS:
ALL LEVELS RELATED TO ORDNANCE
SURVEY DATA USING G.P.S.

FOOTPATH \ VERGE LINES
SHOWN IN BROWN

GRASSED AREAS

SMALL TREE \
BUSH \ PLANTING
AREAS

SOME INDIVIDUAL
TREES SHOWN

PLAN REF:
1:500 @ A0
PLAN REF:
BKG\HALGHTON\01
SURVEYED:- OCTOBER 2020.

Appendix C

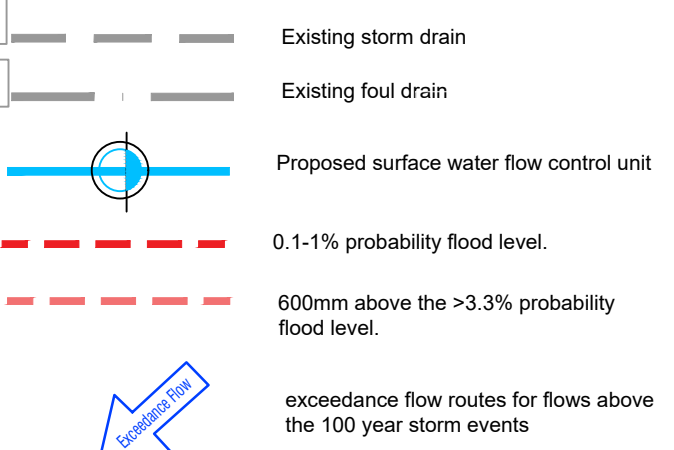
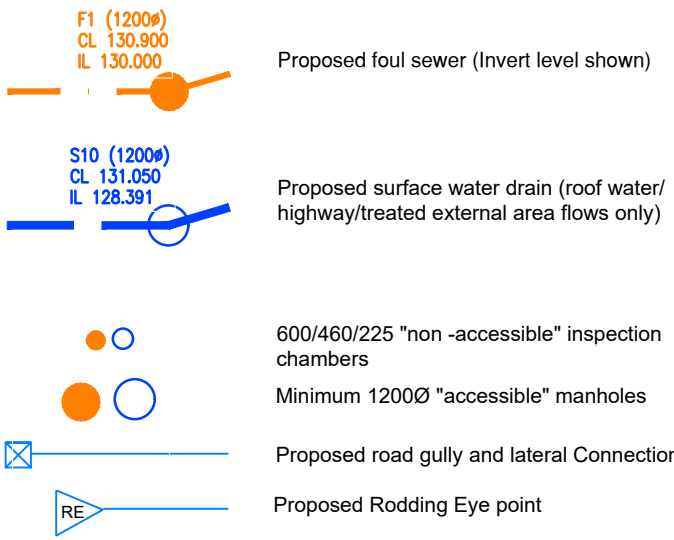
No Sewers in close proximity to the Site available



Appendix D
Drainage Strategy
15480-900



Key.



SUDS STRATEGY	
Planning Constraints	Planning guidance followed with SUDS proposed as suitable. Ground infiltration not considered possible. Greenfield rate impractical due to very small office site.
Drainage Authority Constraints	No definitive conditions have been noted by the water authority with regards to discharge conditions other than to follow standard practice.
FRA Constraints	FCA Guidance followed for site levels and building locations.
other	1/1s discharge agreement proposed in line with greenfield/brownfield connection policy.

General Notes

- Do not scale this drawing. If in doubt, consult with the Engineer
- This drawing is to be read in conjunction with all other relevant Engineers, Architects and Specialist design drawings and specifications.
 - All dimensions and levels are in metres unless noted otherwise.
 - This drawing is for information purposes and all information displayed is subject to detailed design.
 - Cover levels noted are indicative or best design levels, constructed levels should take into account as-built surfacing levels and gradients.
 - The Contractor shall be responsible for checking all tie-ins for line and level with existing foul and surface water systems before commencing any works.
 - The Engineer shall be notified immediately, in writing, should any errors or discrepancies be found prior to the commencement or continuation of any works. All work is to be carried out in accordance with current British Standards, Building Regulations and NHBC Standards.
 - All drainage work is to be strictly in accordance with the requirements of the Building Regulations 2010, Approved Document Part H, "Drainage and waste disposal".
 - It is the responsibility of the Contractor to execute the works at all times in strict accordance with the requirements of the Health and Safety at Work Act 1974, and the C.D.M. Regulations 2015. The Contractor will be deemed to have allowed for full compliance, including full liaison with the Principle Contractor, within his rates.
 - All existing land drains encountered on site during construction are to be re-connected.
 - Should any departure from the proposed slab or external levels be considered, agreement shall be sought from the Engineer immediately and prior to the commencement or continuation of any works. Proposals should take full account of all restrictions to the slab level.
 - Temporary protection to be provided to drainage work during construction as necessary.
 - Power supply to separator/treatment units, alarm, panel, vent etc to be provided by contractor in accordance with manufacturers recommendations.
 - Topographical survey shown is based upon NJC Survey drawing no. B&G/Halghton/01_ dated oct 2020
 - Architects layout yet to be received. layout drawing is for indicative purposes only.

Foul water treatment plant
or septic tank with drainage
field if soil infiltration
practical. Bio Disc or similar
approved product.

A pumping unit may be
required to provide
connection to the surface
water system.

Hydrobrake system or
similar approved.
1.5m max head
1L/s max discharge.

Control chamber capable of discharging 1l/s in a
100yr + 40% CC event.

Proposed barn conversion

Surface water attenuation to be provided. Online system
to provide water quality treatment in addition to
attenuation by means of a soil filtration unit or similar.
SDS tank system or similar approved

Storage 8m³
size shown: 3.5x5x0.5dp
incoming invert = 36.00
TOT = 36.30
CL approx 36.80
outgoing invert = 35.80

Tank design to allow infiltration

REV	DATE	DESCRIPTION	BY
SHEET SIZE A1			
CLIENT			

B&G building consultants

PROJECT
New Mill Cottage
Mill Lane, Halghton

DRAWING TITLE
Development Drainage
Strategy

Information



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Appendix E

Typical drainage maintenance schedule



Operation and maintenance requirements for pervious pavements

Maintenance Schedule	Required action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required - once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required.
	Rehabilitation of surface and upper sub-structure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action.	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers	Annually.

Operation and maintenance requirements for detention basins

Maintenance Schedule	Required action	Frequency
Regular maintenance	Remove litter and debris.	Monthly.
	Cut grass - for spillways and access routes.	Monthly (during growing season), or as required.
	Cut grass - meadow grass in and around basin.	Half yearly (spring - before nesting season, and autumn).
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc. for evidence of physical damage.	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year, then annually as required).
	Check any penstocks and other mechanical devices	Annually.
	Tidy all dead growth before start of growing season.	Annually.
	Remove sediment from inlets, outlet and forebay.	Annually (or as required).
	Manage wetland plants in outlet pool - where provided.	Annually.
Occasional maintenance	Re-seed areas of poor vegetation growth.	As required.
	Prune and trim trees and remove cuttings.	Every 2 years, or as required.
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided).
Remedial actions	Repair erosion or other damage by re-seeding or re-turfing.	As required.
	Realignment of rip-rap.	As required.
	Repair/ rehabilitation of inlets, outlets and overflows.	As required.
	Re-level uneven surfaces and reinstate design levels.	As required.

Operation and maintenance requirements for bioretention systems

Maintenance Schedule	Required action	Frequency
Regular Inspections	Inspect infiltration surfaces for sitting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary.	Quarterly
	Check operation of underdrains by inspection of flows after rain.	Annually
	Assess plants for disease, infection, poor growth, invasive species etc. and replace as necessary.	Quarterly
	Inspect inlets and outlets for blockage.	Quarterly
Regular maintenance	Remove litter and surface debris and weeds.	Quarterly (or more frequently for tardiness or aesthetic reasons)
	Replace any plants, to maintain planting density.	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays.	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required.	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and	As required.
Remedial actions	Remove and replace filter medium and vegetation above.	As required (but likely to be > 20 years)

Operation and maintenance requirements for attenuation/soakaway units

Maintenance Schedule	Required action	Frequency
Regular maintenance	Remove litter and debris.	Monthly.
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc. for evidence of physical damage.	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year, then annually as required).
	Check any penstocks and other mechanical devices	Annually.
	Remove sediment from inlets, outlet and forebay.	Annually (or as required).
Occasional maintenance	Re-seed areas of poor vegetation growth.	As required.
	Prune and trim trees and remove cuttings.	Every 2 years, or as required.
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or asrequired (likely to be minimal requirements where effective upstream source control is provided).
	Inspect all manholes and inspection chambers for signs of debris and damage	Every 2 years, or as required.
	Camera survey surface water system (jet out debris as required)	Every 5 years, or asrequired

Operation and maintenance requirements for oil separator units

Maintenance Schedule	Required action	Frequency
Regular maintenance	Remove litter and debris.	Monthly.
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect trash, baffle plates and filters and remove any significant debris.	Monthly
	Inspect inlets , silt trap and upstream manholes for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year, then annually as required).
	Inspect and test alarm equipment	6 months
	Remove probe, clean and test. Reset and replace	6 months
Ongoing	Remove oil build up	As required or annually.
Occasional maintenance	Clean and replace filters and trash plates.	As required.
	Full empty and clean of the unit	Every 2-5 years, or as required.
	Replace probe and alarm equipment	Every 5 years, or as required by manufactures guidance.
	Inspect all manholes and inspection chambers for signs of debris and damage	Every 2 years, or as required.
	Camera survey surface water system (jet out debris as required)	Every 5 years, or as required