Hensingham House,

Phase One and Two,

Cumbria

Flood Risk Statement and Drainage Strategy

February 2021

FAIRHURST

CONTROL SHEET

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Contents

1. Introduction

Fairhurst have been appointed to undertake a Flood Risk Statement and Drainage Strategy in support of the full planning application for a proposed residential development at Hensingham House, Hensingham. The location of the development site is provided in Figure 1. As the site is less than 1 ha in size and located entirely within Flood Zone 1 a full Flood Risk Assessment has not been carried out for the development.

The aim of this report is to evaluate the current proposals with regard to flood risk and identify potential flood risk to and from the development site. Fairhurst have carried out the following:

i. Overview assessment of the redevelopment potential of the site with regards to the main sources of flood risk in line with the National Planning Policy Framework (NPPF) and Flood Risk and Coastal Change Planning Practice Guidance (PPG).

ii. An assessment of the surface water runoff.

iii. An assessment of the foul water flows.

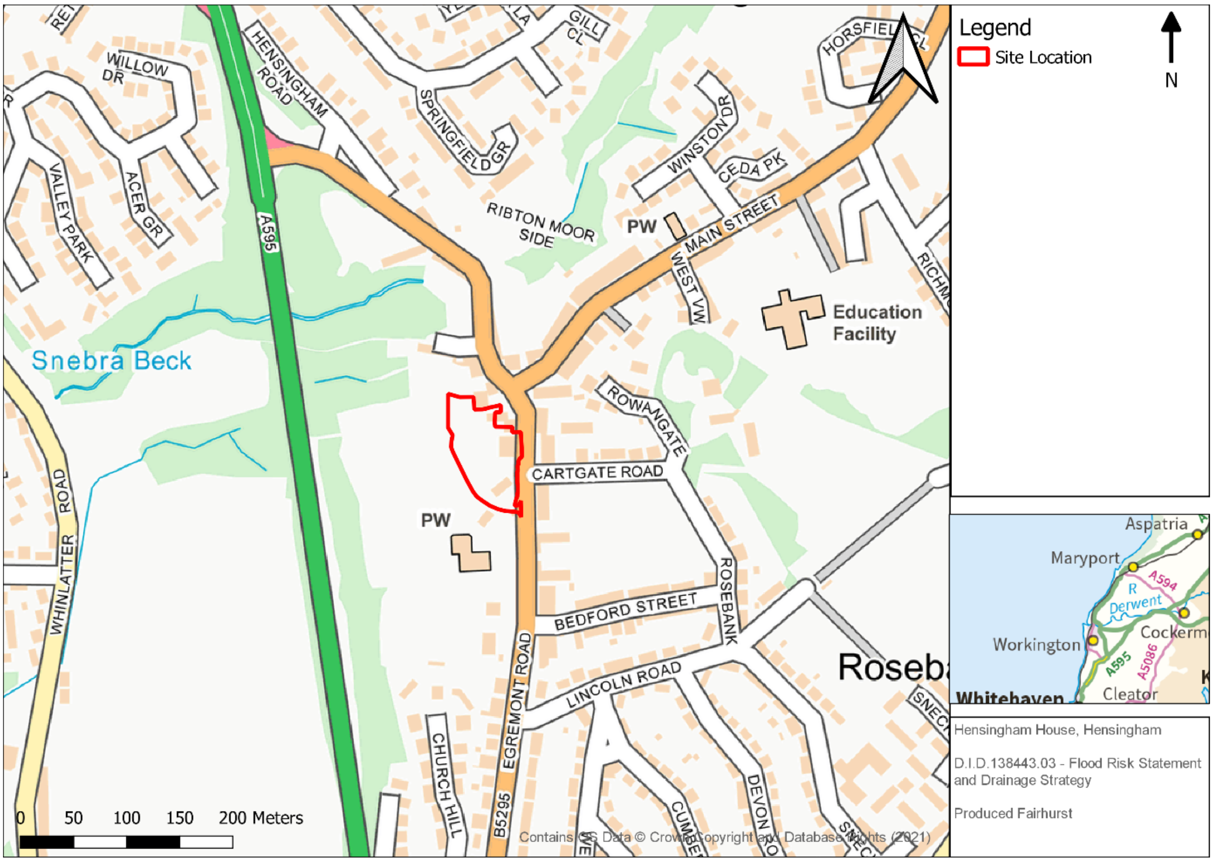


Figure 1 - Site Location

2. Legislative Framework

2.1 National Planning Policy

One of the key aims of the National Planning Policy Framework (NPPF) and Planning Policy Guidance (PPG) is to ensure that flood risk is taken into account at all stages in 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, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.

A risk-based approach should be adopted at all levels of planning. Applying the source pathway-receptor model to planning for development in areas of flood risk requires:

- a strategic approach which avoids adding to the causes or "sources" of flood risk, by such means as avoiding inappropriate development in flood risk areas and minimising run-off from new development onto adjacent and other downstream property, and into the river systems;

- managing flood "pathways" to reduce the likelihood of flooding by ensuring that the design and location of the development maximises the use of SuDS, and takes account of its susceptibility to flooding, the performance and processes of river/coastal systems and appropriate flood defence infrastructure, and of the likely routes and storage of floodwater, and its influence on flood risk downstream; and

- reducing the adverse consequences of flooding on the "receptors" (i.e. people, property, infrastructure, habitats and statutory sites) by avoiding inappropriate development in areas at risk of flooding.

A FRA should be carried out to the appropriate degree at all levels of the planning process, to assess the risks of all forms of flooding to and from development taking climate change into account. **The Sequential Test is not required for this development which is classified as a Non-Major development but located within Flood Zone 1.**

In areas at risk of river or sea flooding, preference should be given to locating new development in Flood Zone 1. If there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3. Within each Flood Zone new development should be directed to sites at the lowest probability of flooding from all sources.

Flood risk has been categorised as High, Medium and Low based on the probability of inundation. Extracts from Tables 1, 2 and 3 of the Flood Risk and Coastal Change PPG are provided below, which highlights the likely response to planning applications within each Flood Zone.

Residential development is categorised as “more vulnerable” and therefore should only take place within Flood Zones 1, 2 or 3a provided suitable mitigation measures have been undertaken.

Table 1 - Extract from the Flood Risk and Coastal Change Planning Practice Guidance

Zone 1 Low Probability **Definition** 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%). **Appropriate uses** All uses of land are appropriate in this zone. **Flood risk assessment requirements** For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention. **Policy aims** In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.
Zone 2 Medium Probability **Definition** 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. **Appropriate uses** Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are *only* appropriate in this zone if the Exception Test is passed. **Flood risk assessment requirements** All development proposals in this zone should be accompanied by a flood risk assessment. **Policy aims** In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

Zone 3a High Probability

Definition
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.

Appropriate uses

The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.

The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

Flood risk assessment requirements
All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims
In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- relocate existing development to land in zones with a lower probability of flooding; and create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b The Functional Floodplain

Definition
Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses
Only the water-compatible uses and the essential infrastructure listed in Table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

Flood risk assessment requirements All development proposals in this zone should be accompanied by a flood risk assessment. **Policy aims** In this zone, developers and local authorities should seek opportunities to: • reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and • relocate existing development to land with a lower probability of flooding.

Where required an exception test must be passed in order for developments of that nature to be justified within the Flood Zone. For the Exception Test to be passed the following must be demonstrated:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The site is located entirely within Flood Zone 1 and as such the exception test is not required.

Table 2 - Flood risk vulnerability classification from the Flood Risk and Coastal Change Planning Practice Guidance

Essential infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines
Highly vulnerable • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use3. • 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 and cafes, hot food takeaways, offices, general industry, storage and distribution, non–residential institutions not included in "more vulnerable", 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.**

Table 3 - Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×
Extract from the Flood Risk and Coastal Change Planning Practice Guidance **Key:** ✓ Development is appropriate. × Development should not be permitted.						

The proposed development is classified as a residential development. Thus the development is classified as being 'more vulnerable' and in accordance with the NPPF PPG and is located within Flood Zone 1. Thus neither the Sequential nor the Exceptions tests are required for the development.

2.2 Local Planning Policy

The Copeland Local Plan – Core Strategy and Development Management Policies was adopted in December 2013 and sets out the council's policies and proposals for development and land use in the local area. The Local Plan contains several key policies relating to flood risk:

Policy ENV1 – Flood Risk and Risk Management:

The Council will ensure that development in the Borough is not prejudiced by flood risk through:

- *a. Permitting new build development only on sites located outside areas at risk of flooding, with the exception of some key sites in Whitehaven;*
- *b. Ensuring that developments on important regeneration sites in Whitehaven Town Centre and Harbourside and Pow Beck Valley are designed to address the existing levels of flood risk without increasing flood risk elsewhere;*
- *c. Ensuring that new development does not contribute to increased surface water run-off through measures such as Sustainable Drainage Systems, where these are practical. Where they are not this should be achieved by improvements to drainage capacity;*
- *d. Supporting measures to address the constraints of existing drainage infrastructure capacity and avoiding development in areas where the existing drainage infrastructure is inadequate; and*
- *e. Support for new flood defence measures to protect against both tidal and fluvial flooding in the Borough, including appropriate land management as part of a catchment wide approach.*

Individual development proposals will be assessed with regard to Development and Flood Risk under Policy DM24.

Policy DM24 – Development Proposals and Flood Risk:

Where a proposed development is likely to be at risk from flooding or increases risk of flooding elsewhere, a Flood Risk Assessment (FRA) will be required to be submitted as part of the planning application.

Development will not be permitted where it is found that:

- *a. There is an unacceptable risk of flooding; or*
- *b. The development would increase the risk of flooding elsewhere; or*
- *c. The development would cause interference with or loss of access to a watercourse and the benefits of the development do not outweigh the risks of flooding.*

Where a development requires the provision of additional flood defence and mitigation works, any costs, including maintenance, should be met by the developer.

3. Development Site

3.1 Existing Site Conditions

The development site comprises Hensingham House and land surrounding it, located off Egremont Road in Hensingham. Table 4 presents the key details of the site:

Table 4 - Key site details

Site location	Hensingham House, Hensingham
Site area (ha)	0.52
National grid reference	NX 98598 16737
Nearest Postcode	CA28 8QW
Existing land use	Residential
Local Planning Authority	Copeland Borough Council (CBC)
Lead Local Flood Authority	Cumbria County Council (CCC)

The site currently comprises the Hensingham House building, currently used for residential purposes. The site is bounded by residential developments to the north, east and south and open fields to the west. Access to the site is from Egremont Drive immediately east.

3.2 Site Topography

A topographical survey was carried out for the grounds surrounding Hensingham House in May 2020. The survey did not cover the full area of the site but does give enough indication of likely levels beyond the survey extents. Generally it was found that the grounds slope from east to west. High points are located north east of Hensingham House on the pathway of Egremont Road (~ 85.95m AOD). Low points are located south west of the main building, towards the open fields to the west (~ 84.55m AOD).

The topographical survey can be viewed in Appendix A.

3.3 Existing Watercourses

The nearest watercourse is small brook marked on OS mapping located c.80m north of the site. The watercourse appears to connect with the Pow Beck west of the site (based on the EA's flood risk mapping). Flow appears to travel from east to west past the site. LiDAR data shows that the banks of the watercourse sit approximately 15m lower than the development site.

Another watercourse, the Snebra Beck is located approximately 140m north of the site. The Snebra Beck flows westwards, eventually joining with the Pow Beck approximately 700m to the west.

There are no other watercourses relevant to the site.

3.4 Proposed Development

The proposed development is for the conversion of the existing Hensingham House building to provide 5 no. residential properties and the construction of an additional 4 no. residential properties on land immediately west of Hensingham House. The development also includes associated road access, parking space and green areas.

The proposed site layout plan is provided in Appendix B.

3.5 Historic Features

Historical mapping for the site and surrounding area has been examined from 1867 in order to identify changes which may be relevant to flood risk.

The earliest available mapping shows the site to be within the boundary of an agricultural field. The Snebra Beck is located to the north following a similar flow route as is shown in present day mapping. Some development is located north east of the site comprising Hensingham. A railway line is also mapped west of the site, following the same line as can be observed present day.

By 1879 a ‘Hall’ (later referred to as Hensingham Hall) is located within the footprint of the current Hensingham House building.

In 1899 a vicarage is marked immediately south of the site. In 1925 St John’s Church is marked for the first time to the north of the vicarage. Land east of the site has also become more developed comprising residential developments with allotment gardens mapped from 1925.

From 1961 a building referred to as Hensingham House is located within the site footprint. It appears to be the same building previously referred as Hensingham Hall; however this could not be confirmed from the mapping alone.

The site remains unchanged until the most recent historical maps from 1979, with the surrounding area gradually becoming more developed over that time. The Hensingham Bypass immediately west of the site was constructed some time during the 1980s.

4. Sources of Flood Risk Information

4.1 Environment Agency (EA)

The EA flood map for planning shows the entire site to be located within Flood Zone 1 (Figure 2). This means that the site is not considered to be at risk from fluvial flooding during the 0.1% AEP (1 in 1000 year Annual Exceedance Probability) event. The nearest flood zone is located ~80m north west of the site boundary, associated with the tributary of the Pow Beck.

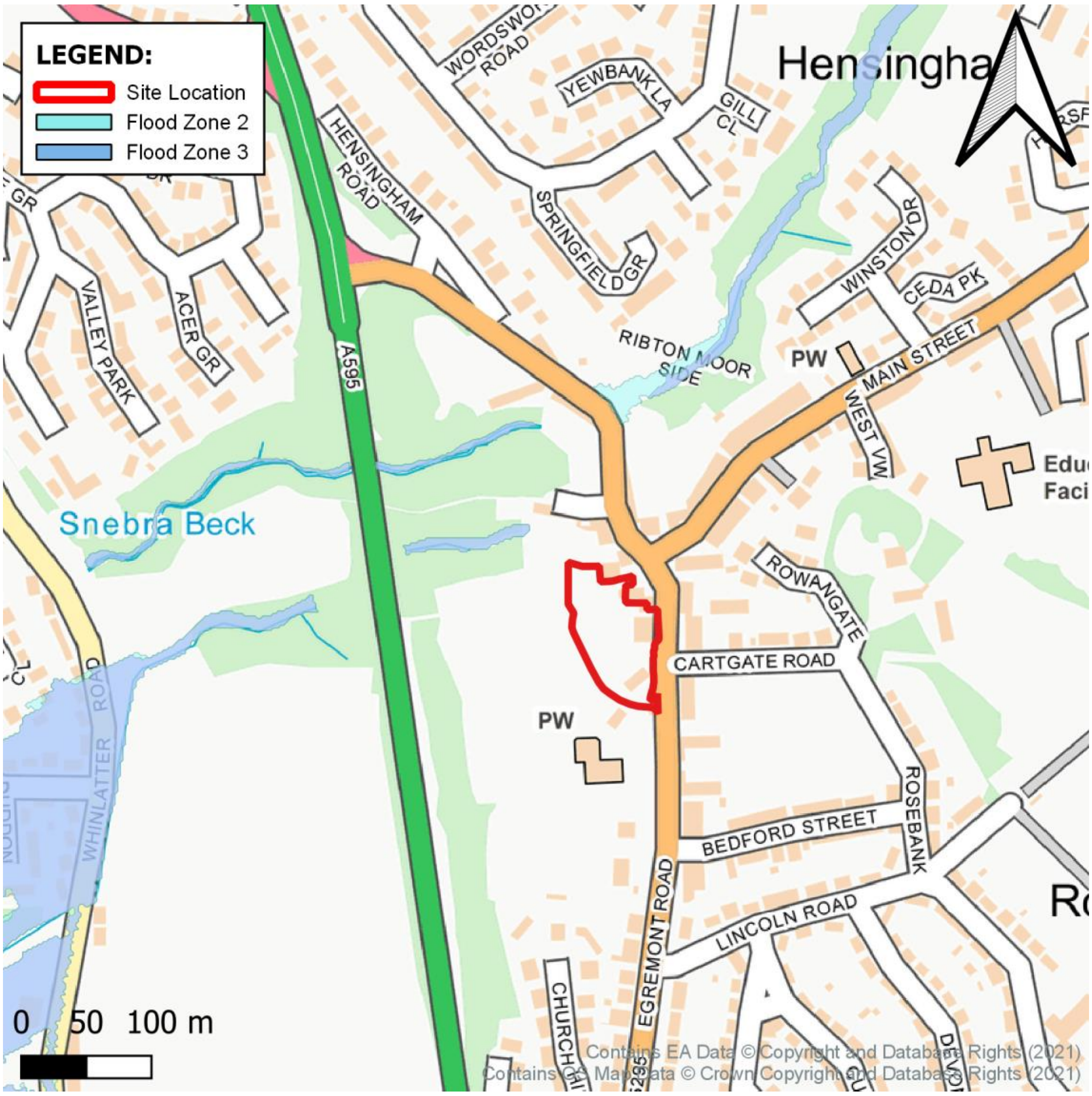


Figure 2 - Extract from the EA's Flood Map for Planning

The EA's risk from surface water map shows the entire site to be at a very low risk from surface water flooding (Figure 3). This means that the site is outside of the area of risk during the 0.1% AEP (1 in 1000 year) rainfall event.

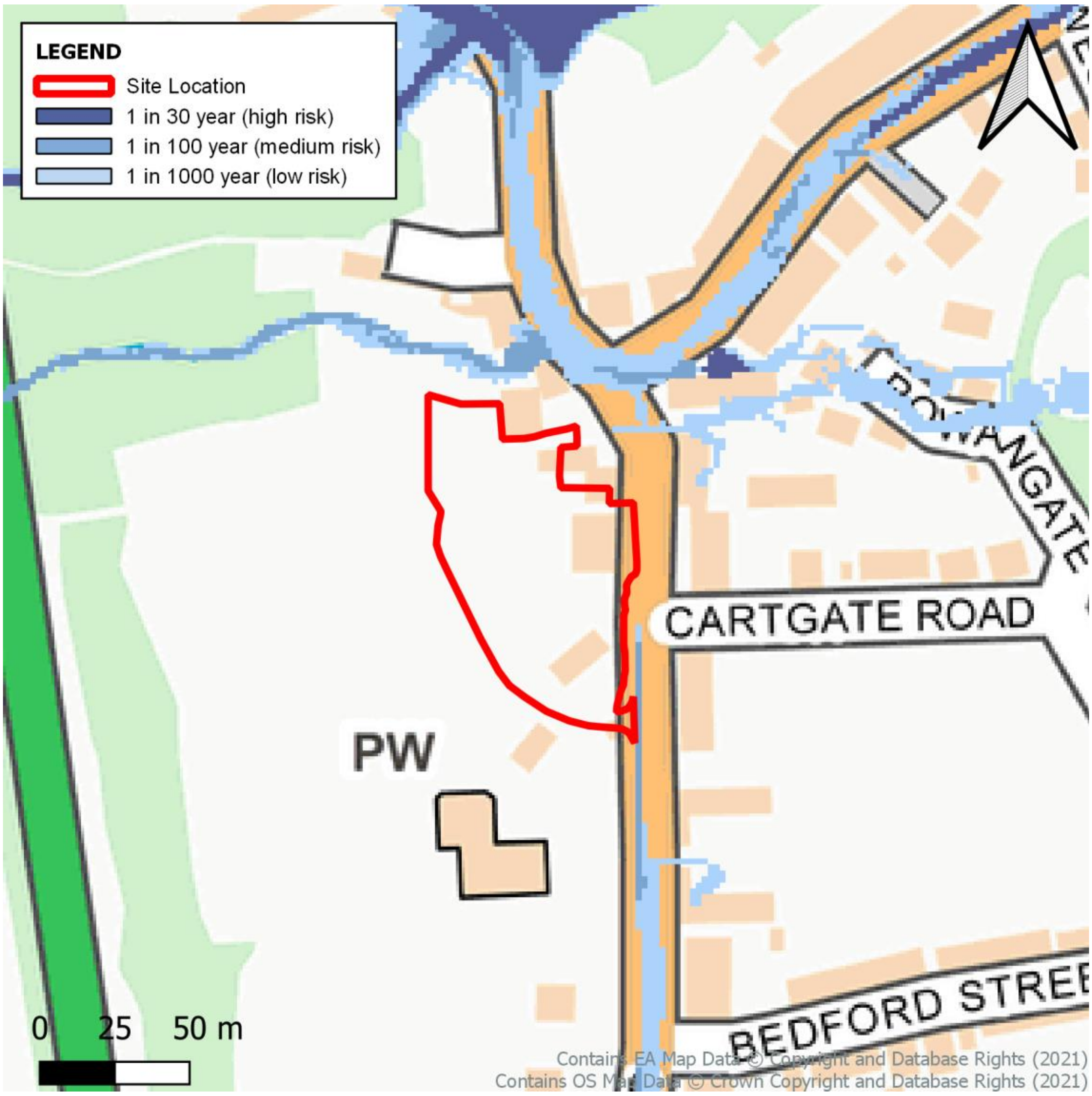


Figure 3 - Extract from EA's Risk of Flooding from Surface Water map.

The EA's recorded flood outline map shows that the site is not located within an area that has been recorded to flood in the past (Figure 4). The nearest record of flooding is approximately 550m west of the site. Flooding was recorded along the banks of the Pow Beck in November 1999 when the channel capacity of the beck was exceeded.

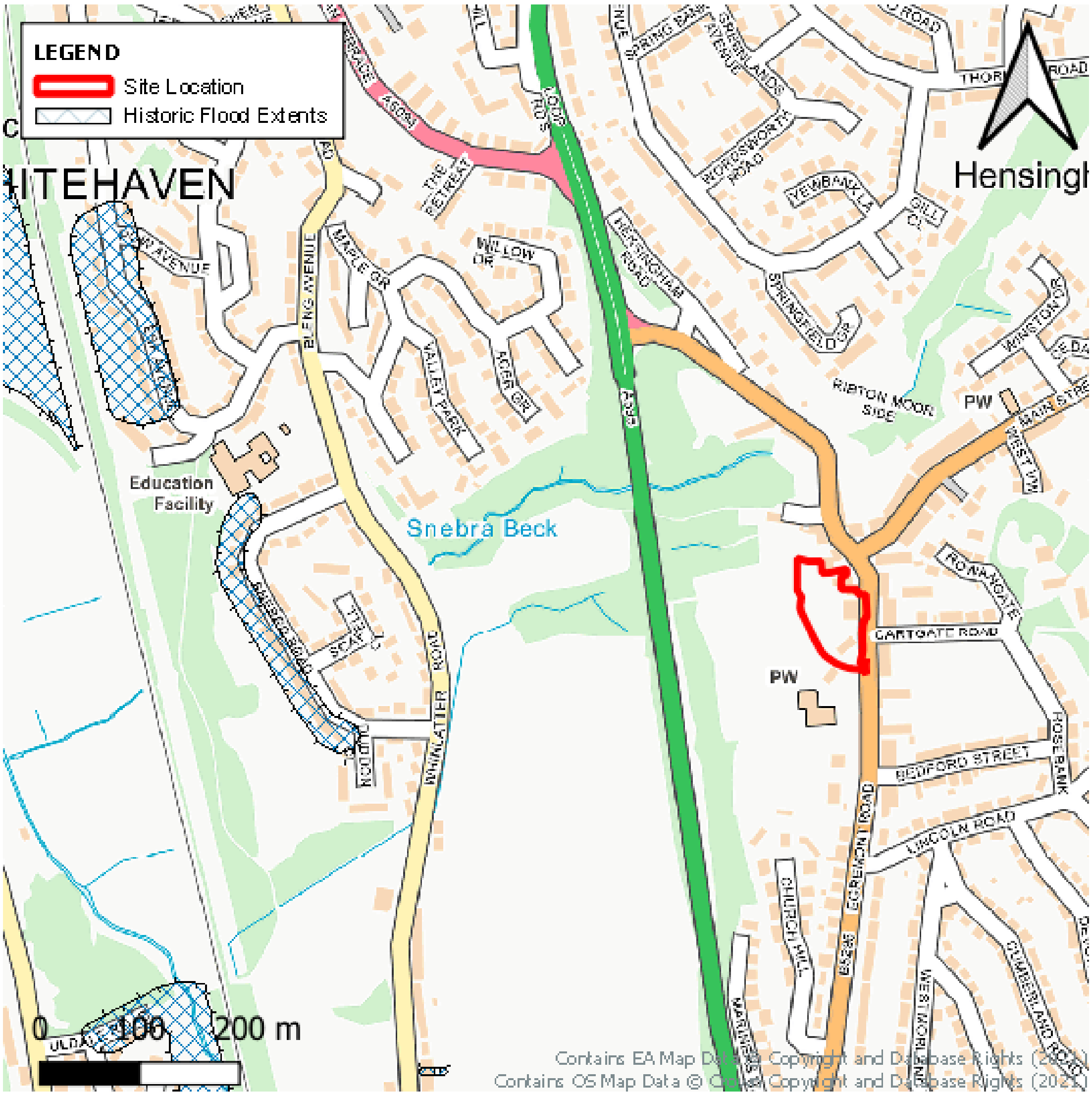


Figure 4 - Extract from EA's Risk Recorded Flood Outlines map.

4.2 Strategic Flood Risk Assessment (SFRA)

The Copeland Borough Council SFRA (August 2007) provides a summary of the main sources of flood risk in the council area. The SFRA describes the main source of flood risk in the council area to be tidal, with many settlements along the Copeland coastline located within the tidal surge limit. Fluvial flooding is described as the next biggest source of risk, followed by culvert related problems and sewer flooding.

The SFRA provides some information regarding the Snebra Beck, which is one of the nearest sources of fluvial flood risk to the site:

- Some settlements located along the banks of the Snebra Beck are at risk from fluvial flooding, particularly at Bleng Avenue and Ribton Moor;

- Area of flood risk at Ribton Moor pose a risk of life, with modelling showing the area to be within the functional floodplain (Flood Zone 3B). Deep, fast moving flows are recorded during flood events; and

- Informal defences are located downstream of the confluence between Snebra Beck and Pow Beck, providing protection to nearby properties.

The SFRA also describes there to be limited potential for groundwater flooding within the council area, with only 10 properties within the whole borough considered to be at risk.

The SFRA does not identify any flood risk information specific to the site.

4.3 Sewerage Company

United Utilities (UU), the sewerage operator in the region, is required by OFWAT to maintain a record of flooding incidents due to hydraulic capacity problems on the sewerage network. Properties are placed on the register following investigations to determine the cause and risk of flooding and are placed on the appropriate register depending on risk – not on the number of occurrences of flooding.

UU have been contacted to determine if they have any records of sewer flooding relevant to the site, they responded confirming that have no current records of sewer flooding within the vicinity of the site. The full response can be found in appendix C.

5. Potential Sources of Flood Risk

5.1 Fluvial (Rivers)

Extreme fluvial flood events have the potential to cause rapid inundation of properties whilst posing a threat to the welfare of occupants and potentially preventing emergency access to properties and essential infrastructure. The entire site is located within Flood Zone 1, meaning that it is not identified as being at risk from fluvial flooding up to the 0.1% AEP (1 in 1000 year) fluvial flood event.

The nearest flood zone is located approximately 80m north west of the site, associated with the tributary to the Pow Beck. 1m composite LiDAR data suggests a difference in elevation of at least 15m between the grounds surrounding Hensingham House and elevations at the flood zone boundary of the watercourse. Thus flood risk from this source is considered to be low.

Due to the difference in elevation between the site and nearest flood zone, it is considered unlikely that the site will become at risk from fluvial flooding in the future due to the effects of climate change.

5.2 Infrastructure Failure

The failure of conveyance infrastructure such as culverts and bridges could increase the risk of flooding to the site. Both the small tributary to the Pow Beck north west of the site and the Snebra Beck located further north are culverted in close proximity to the site. Blockage at either of these culverts could lead to a significant body of flow building up behind the blockage and extend onto the surrounding area.

EA 1m composite LiDAR data suggests a difference in elevation of approximately 15m between the northern boundary of the site and the banks of the watercourse immediately north. Based on this it is considered unlikely that a culvert blockage at either watercourse would cause water levels to rise so significantly that they provide a risk of flooding to the site as flows would more likely overtop the blockage and flow within the watercourse channel.

The nearest bridge is located over 200m North West of the site, allowing the Hensingham Bypass to cross over the Snebra Beck. It is considered unlikely that failure of this bridge will pose a significant risk of flooding to the site, due to the distance of the site from the bridge and difference in elevation between the site and the watercourse.

The nearest EA maintained flood defences are located approximately 2km North West of the site at Whitehaven Harbour. The CBC SFRA (August 2007) identifies that some informal flood defences exist downstream of the confluence between Snebra Beck and Pow Beck. Although the exact location of these defences is unknown; the confluence between the two watercourses is located approximately 800m west of the site. Given the distance from the site from all known flood defences, flood risk due to the failure of defence infrastructure is considered to be low.

5.3 Pluvial (Overland Flow)

The EA's surface water flood mapping shows the site to be at a very low risk from pluvial flooding. This means that no areas of the site are identified as being at risk during events up to the 0.1% AEP (1 in 1000 year) rainfall event.

The nearest area of risk is located immediately south west of the site associated with Egremont Road. It is assumed that any surface water reaching Egremont Drive will be conveyed into the associated highway drainage. The topographic survey shows eight road gullies in the adjacent highway.

5.4 Sewer Flooding

United Utilities have responded to the enquiry for historical sewer flooding information stating that they have no records of sewer flooding within the vicinity of the site. The full response can be found in appendix I.

United Utilities sewer plans (Appendix C) show Hensingham House to be in close proximity to the UU combined sewer that flows in a north easterly direction, it is assumed a connection to this sewer currently exists. There are also sewers immediately south of the site on Egremont Drive where an existing connection may occur. These are shown to convey flow southwards via Egremont Drive away from the site, two manholes associated with this sewer are shown on the topographic survey.

In the event of a sewer (private or public) exceedance event flows can be expected to pool at low lying spots within the adjacent areas. As there are existing connections within the site boundary it is possible that sewer exceedance could pose a risk of flooding to the development.

6 Surface Water Drainage

The development is located entirely within Flood Zone 1. In accordance with the NPPF, the drainage strategy will focus on the management of surface water to ensure that flood risk is not increased on or off site. The surface water strategy for the site has been developed in accordance with the Building Regulations Part H hierarchy.

6.1 Surface Water Runoff Rates

6.1.1 Existing rates

The full site occupies an area of approximately 0.52 ha, based on the proposed layout (Appendix B) approximately 0.23 ha of the site will remain impermeable following development.

6.1.2 Proposed rates

For developments on brownfield land, CCC (i.e. the LLFA for the site) state in their Non-Statutory Technical Standards for Sustainable Drainage – Practice Guidance that *“for developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.”*

In line with this guidance, as the site is a combination of both brownfield and greenfield land, it is proposed that surface water from the proposed development should be restricted as close to the greenfield runoff rate for Q_{BAR}. The greenfield runoff rates for the area of the site which is to remain impermeable is 1.9l/s. Micro Drainage outputs for the rural runoff rates can be viewed in Appendix E.

To satisfy guidance from CCC it is proposed that surface water will be restricted as close to the greenfield Q_{BAR} rate as can feasibly be provided without an increased risk in blockage. It is proposed that surface water will be discharged at a maximum rate of 3.4 l/s. This is considered to be the lowest discharge rate that can be allowed without creating an increased risk of blockage occurring (due to the small hydro-brake orifice size that would be required to allow a lower maximum rate).

6.2 Proposed Surface Water Drainage

The Building Regulations Part H sets out a hierarchy for the choice of discharge point for a rainwater system. In order of priority, the possibilities are given as:

- An adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,
- A watercourse; or where that is not reasonably practicable,
- A sewer.

6.2.1 Discharge Via Infiltration

FSR SOIL values range from 0.15 to 0.5 with 0.15 representing freely draining soils and 0.5 representing impeded drainage. Descriptors for the site area indicate a SOIL value of 0.45 for the site, indicating there is limited scope to discharge surface water into the ground.

In May 2020 Geoinvestigate Ltd. carried out a review of the natural drainage potential for SuDS schemes at the site. The review states *"the silty clay soils which are recorded to a depth of ca. 2m at or very close to the study site and the underlying siltstone or mudstone bedrock would all be expected to exhibit intrinsically low or very low permeability and it is therefore concluded that the use of natural drainage such as soakaways, permeable paving or infiltration trenches will not be feasible at this site".* Thus the report concludes that *"natural recharge via infiltration into subsoils is extremely unlikely to be feasible at this site".* A copy of the report is provided in Appendix F.

Given the SOIL value for the site and the main conclusions from the SuDS review it is considered that infiltration will not be suitable for removing surface water from the site. In order to confirm this it is recommended that site specific infiltration should be carried out for the site to confirm this as even partial infiltration can help to manage the volume of runoff that is drained elsewhere.

6.2.2 Discharge to a Watercourse

The nearest watercourse is the small tributary to the Pow Beck located approximately 80m North West of the site. However a direct connection to this watercourse would involve passing through a significant stretch of assumed private land. Furthermore UU asset plans (Appendix C) indicate that there is already a sewer in close proximity to the site where it is assumed a connection exists. In order to minimise disruption resulting from the development, utilising the existing connections to the surrounding sewers is considered to be more appropriate for the development which is a redevelopment of existing buildings.

6.2.3 Discharge to a Sewer

UU asset plans (Appendix C) indicate that there are sewers in close proximity to Hensingham House, it is assumed a connection exists to these sewers however at the time of writing no CCTV survey has been undertaken to confirm this.

It is proposed that surface water from the site continues to drain to the local sewer but with rates restricted as close to the greenfield Q_{BAR} rate as can feasibly be provided.

Note that the exact nature of the assumed sewer connection(s) is unknown. The plans show a combined sewer extending out from the north western section of the site, shown to convey flows north westwards away from the site. Based on the latest site plans, the existing combined sewers run to the north of the site boundary, this can be seen in Fairhurst drawing 138443/2002 in appendix H. A sewer diversion will be required for assets on site to accommodate this plot in line with the 3m easement required for adopted sewers.

Plans also show a sewer connection immediately south of the site on Egremont Drive, shown to convey flow southward away from the site. It is recommended that further investigative works (i.e. CCTV surveying) are carried out to identify which sewers are currently used (or if there is a split) to discharge surface water away from the site to ensure additional flows are not introduced to the other network.

6.2.4 Climate Change

To ensure that the proposed discharge rates can be achieved, it will be necessary to provide surface water attenuation within the development. The EA generally advises that a lifespan of 100 years should be used for developments. The Technical Guidance to the NPPF states that for the time period 2085 to 2115, peak rainfall intensity should be increased by 20% to account for the possible impacts of climate change.

The latest Technical Guidance from the NPPF also states that new developments should understand the flooding implications for the effect of a 45% increase in the peak rainfall intensity. If these implications are significant and could potentially impact the site, another site or put people at risk then measures would need to be looked at to provide more attenuation working up towards 45% climate change increase, or provide additional mitigation allowances, for example a higher freeboard to ensure that there is no risk to the site or offsite developments for the extreme 45% climate change scenario.

In order to ensure no increase in risk as a result of the development, the oversized pipes used for storage has considered a 45% increase in climate change for 1% AEP. Taking into account the lifespan of the development and the anticipated increase in rainfall intensity due to climate change, an estimate for the surface water attenuation volume has been carried out for the development using the industry standard software, Micro Drainage. The Micro Drainage calculations can be found in appendix G.

6.3 SuDS

The SuDS Manual (CIRIA C753) details a wide range of drainage techniques some of which may be incorporated within the proposed drainage design.

- Some which may be suitable for the site include: Permeable paving.

The small size of the site means that there is limited space within the proposed layout to provide open SuDS such as basins or ponds. However it is proposed that permeable paving is used in the car parking spaces incorporated into the site. This will provide additional storage capacity and can allow some treatment of surface water to occur prior to it being discharged into UU sewers. The available information on ground conditions indicate that infiltration is not viable for the site. This strategy therefore recommends that permeable paving is lined and drains to the wider drainage system.

All SuDS installed will attenuate and store surface water runoff from the proposed development prior to discharging into the surface water sewer. The proposed drainage layout for the site can be seen on the Fairhurst drawing 138443/2002 – Proposed Drainage Layout (Appendix H).

The feasibility and suitability of each SuDS solution has been appraised as part of the drainage design development. Introducing SuDS onto the development will help to reduce the volume of storage needed. It is considered that the information provided demonstrates that a feasible solution is available. This will ensure that flood risk will not increase on, or off, site as a result of the proposed development.

6.4 Water Quality – Simple Index Approach

The Simple Index Approach has been used to help inform the proposed drainage layout for the site. The proposed development contains two key areas that will generate surface water runoff where new drainage is to be constructed: the roofs of the buildings and proposed car parking areas.

Based on the classifications in Table 26.2 from the CIRIA SuDS Manual the proposed roofs of the buildings are classified as a 'residential roof', which is designated as having a 'very low' pollution hazard level. The proposed car parking bays are classified as being an individual property driveways', which is designated as having a 'low' pollution hazard level.

Roof runoff from the proposed buildings will be discharged via pipework into the drainage system with no opportunity for treatment to be provided. As residential roof runoff is shown to have a 'very low' pollution hazard level in the SuDS Manual, there is considered to be a very low pollution risk from this source. As such, treatment to roof runoff prior to discharge is not deemed necessary.

Runoff from the proposed car parking spaces is considered to have a 'low' pollution hazard level, and is shown to have higher pollution hazard indices than the roof runoff from the proposed development. It is proposed that permeable paving will be used in the proposed car parking spaces to provide treatment of surface water prior to discharging into UU sewers.

Table 5 shows the mitigation indices that permeable paving provides against the main pollution hazard indices. The mitigation indices from permeable paving exceed the pollution hazard indices from the proposed car park for the indices considered within the Simple Index Approach. Thus the proposed drainage layout for the development is shown to satisfy the Simple Index Approach and will provide adequate treatment of surface water passing through the proposed site.

Table 5 - Simple Index Approach: Pollution hazard indices and proposed SuDS

POLLUTION HAZARD INDICES				
LAND USE	**Pollution Hazard Level**	**Total Suspended Solids (TSS)**	**Metals**	**Hydro-carbons**
ROOF RUNOFF	Very Low	0.2	0.2	0.05
CAR PARK	Low	0.5	0.4	0.4
MITIGATION INDICES				
TYPE OF SUDS COMPONENT		**TSS**	**Metals**	**Hydro-carbons**
PERMEABLE PAVING		0.7	0.6	0.7

7. Foul Water Drainage

Foul flows from the proposed development are calculated to be 0.45 l/s, using the design flow of 0.05 litres/seconds/dwellings. This is in accordance with The Design and Construction Guidance ('The Code') 2022.

It is proposed that foul flows from the conversion will be discharged into UU sewers via existing sewer connections currently in place on site and the new development units will be connected via a new connection.

An updated pre development enquiry will need to be submitted to UU to confirm that there is capacity within their sewers to handle flows from the development. A pre-development enquiry has been carried out using the old site layout, the advice from UU is no longer valid as 12 months has elapsed since it was received. It did accept the foul water connection as was proposed in the initial enquiry.

8. Conclusions

This Flood Risk Statement and Drainage Strategy has been produced for the proposed development of Hensingham House, Hensingham. The proposed development is for the conversion of the existing Hensingham House into 5 no. residential properties and the construction of an additional 4 no. residential plots to the west of Hensingham House. The proposal also includes car parking areas, road access and green space. The report has been prepared in accordance within the NPPF, the Flood Risk and Coastal Change Planning Practise Guidance, and the local planning policy documents.

The application boundary is located entirely within Flood Zone 1 in accordance with the flood map for planning and is shown to be at a very low risk from surface water flooding. It is identified that there may be a residual risk of sewer flooding from existing assets on site and in the surrounding area.

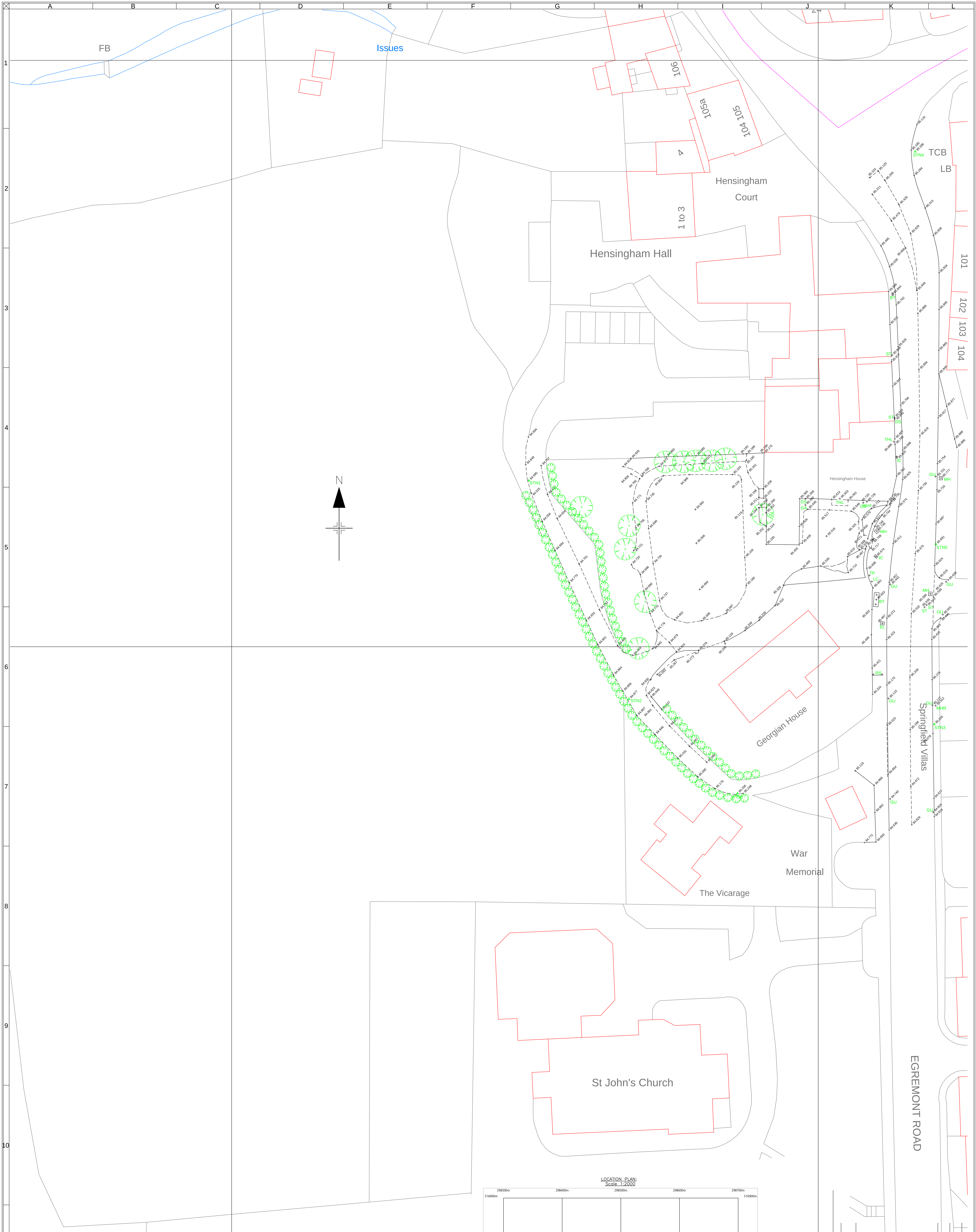
It is proposed that surface water from the development will be discharged using the assumed existing connections to UU assets currently in place or equivalent. In line with local guidance surface water rates will be restricted as close to the greenfield Q_{BAR} rate as can be achieved without presenting a risk from blockage. Attenuation via oversized pipes will be provided to ensure that the development can handle flows up to the 1 in 100 year rainfall event with a 45% allowance for climate change.

It is proposed that foul flows are discharged into UU assets via existing connections on site. An updated pre planning sewerage enquiry should be submitted to UU to confirm that there is capacity their assets to handle flows from the development.

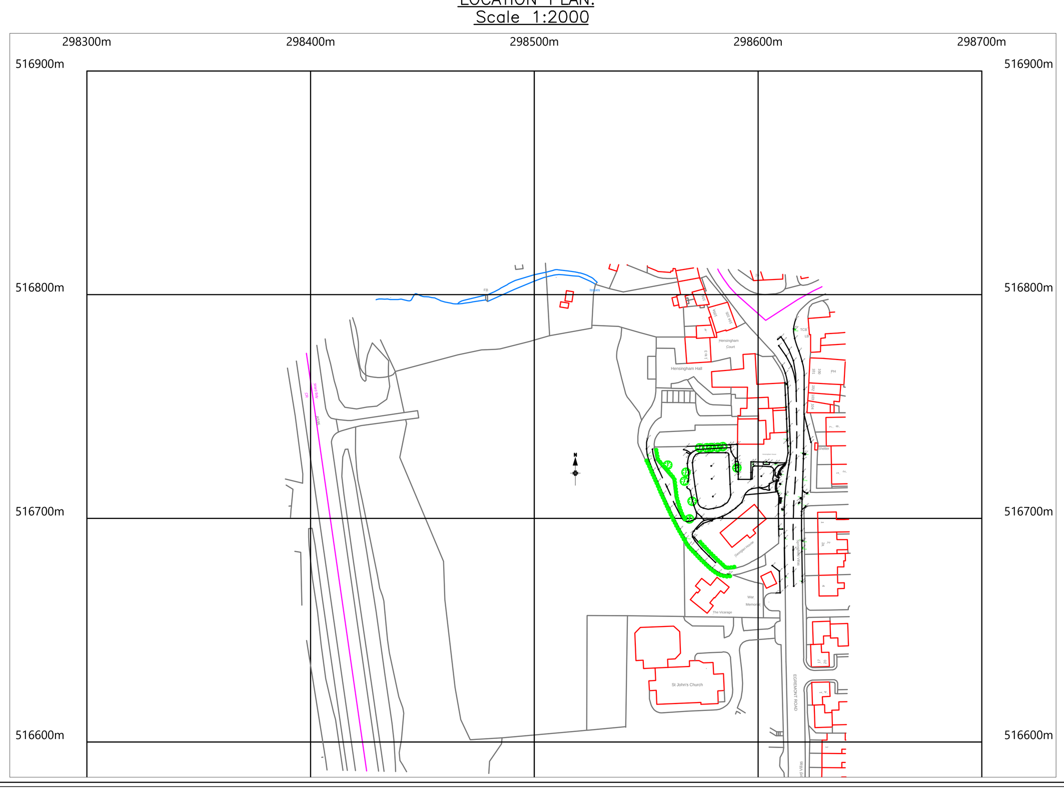
It is concluded that the proposed development is appropriate for the site.

Appendix A

Topographical Survey



LOCATION PLAN:
Scale 1:2000



KEY:

Code	Description
GU	Gully
ST	Stop Tap
TP	Telegraph Pole
STN	Survey Station
EL	Electric
BT	British Telecon
RS	Road Sign
EP	Electric Pole
LC	Lighting Column
MH	Manhole
DS	Down Spout
IC	Inspection Cover

Notes:

1. This site has been surveyed OS GB36(15) grid using a local scale factor of 1.000000 about STN5.
2. All levels are in metres unless stated otherwise.
3. Levels are to Ordnance Survey GB36(15) datum.
4. The services indicated are 'as found on site'.

NO.	Date	Amendment Details	BY	DES	CLIENT
A	01/09/19	Issued for Information.	JAF		
-	28/08/19	Draft Issue.	JAF		

Revisions — Approvals

JAF Limited
Winnow Barn
Syke Farm, Syke Road,
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Tel: 016973 49495
Mobile: 07712677809
E-Mail: JAFSERV@aol.com
Construction, Engineering and Surveying Services

CLIENT NAME: Tom Milburn

PROJECT TITLE: Site @ Hensingham, Whitehaven.

DRAWING TITLE: Topographical Survey

DRAWN BY	CHECKED BY	DATE	REVISION
J. Fitzsimmons	JAF	07/08/19	A

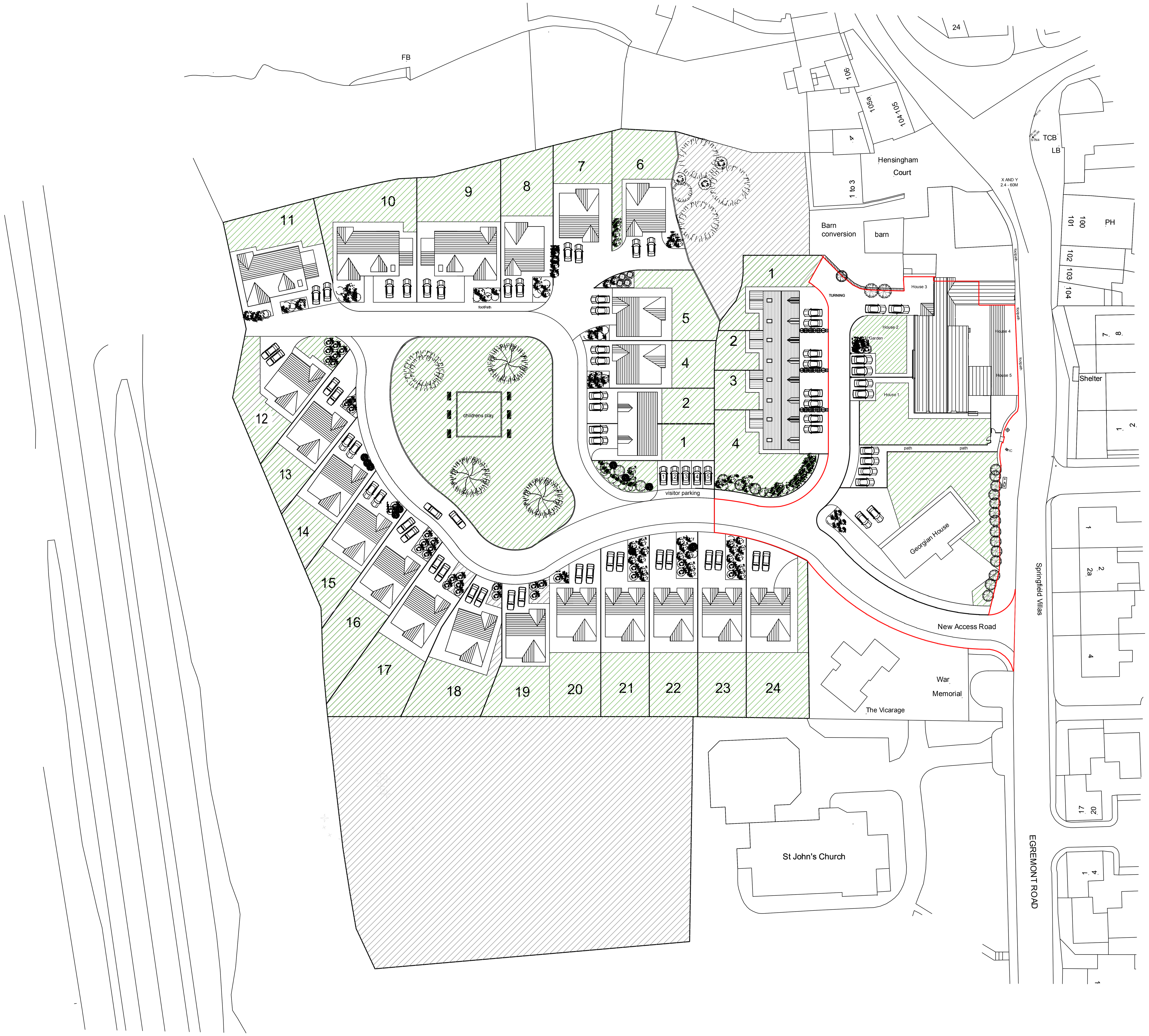
SCALE: 1:200 @ A0

DRAWING No.: CDL-012-001

FILE NAME: CDL-012-001A

Appendix B

Proposed Layout



ARCHITECTURE
cdl
Planning & Design

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E Mail : cdlarcdesign@gmail.com

Client :	THOMAS MILBURN PROPERTY LTD		
Drwg No :	DS/TMP/2/RD/23	Checked By : DS	REVISION D
Date :	MARCH 23		
Scales :	Elevations :	Detail :	PHASE 1 - RED LINE ENCLOSURE
	Floor Plans :	Title :	SITE PLAN DETAIL
	Block Plan : 1 : 500		
	Location Plan :	Address :	HENSINGHAM HOUSE, HENSINGHAM, WHITEHAVEN
	Sections :		CUMBRIA . CA28 8QB

Appendix C

United Utilities Sewer Plans

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Jack Shelton

1
Arngrove Court, Barrack Road
Newcastle Upon Tyne,
NE4 6DB

FAO:

Your Ref: Hensingham
Our Ref: UUPS-ORD-166133
Date: 02/06/2020

Dear Sirs

Location: Hensingham

I acknowledge with thanks your request dated 01/06/2020 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

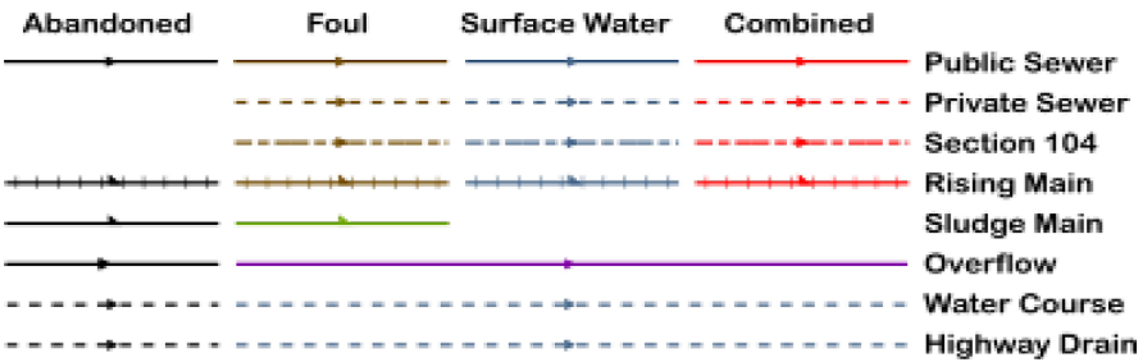
These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

Wastewater Symbology

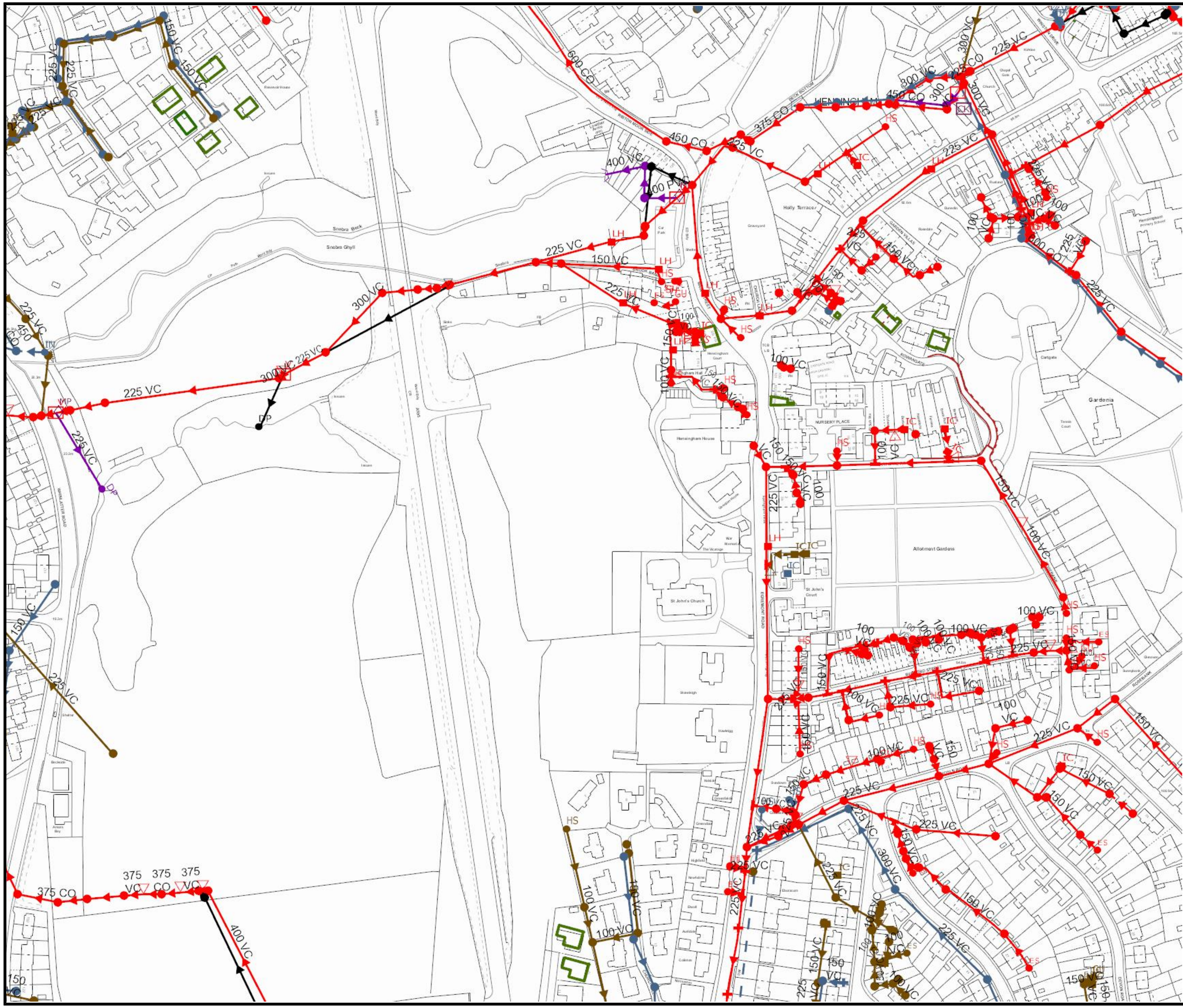


All point assets follow the standard colour convention: red – combined; brown - foul; blue – surface water; purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate

- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk

- Change of Characteristic



United Utilities
helping life flow smoothly

SEWER RECORDS

Address or Site Reference

Hensingham,

Scale: 1:2500
Date: 02/06/2020

Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Appendix D

Micro Drainage – Rural Runoff Rates

ICP SUDS Mean Annual Flood

Input

Return Period (years)	5	SAAR (mm)	999	Urban	0.000
Area (ha)	0.290	Soil	0.450	Region Number	Region 10

Results	**l/s**
QBAR Rural	1.9
QBAR Urban	1.9
Q5 years	2.3
Q1 year	1.7
Q30 years	3.3
Q100 years	4.0

Appendix E

Geoinvestigate report – SuDS feasibility assessment (May 2020)

20th May 2020

Our ref. G20165

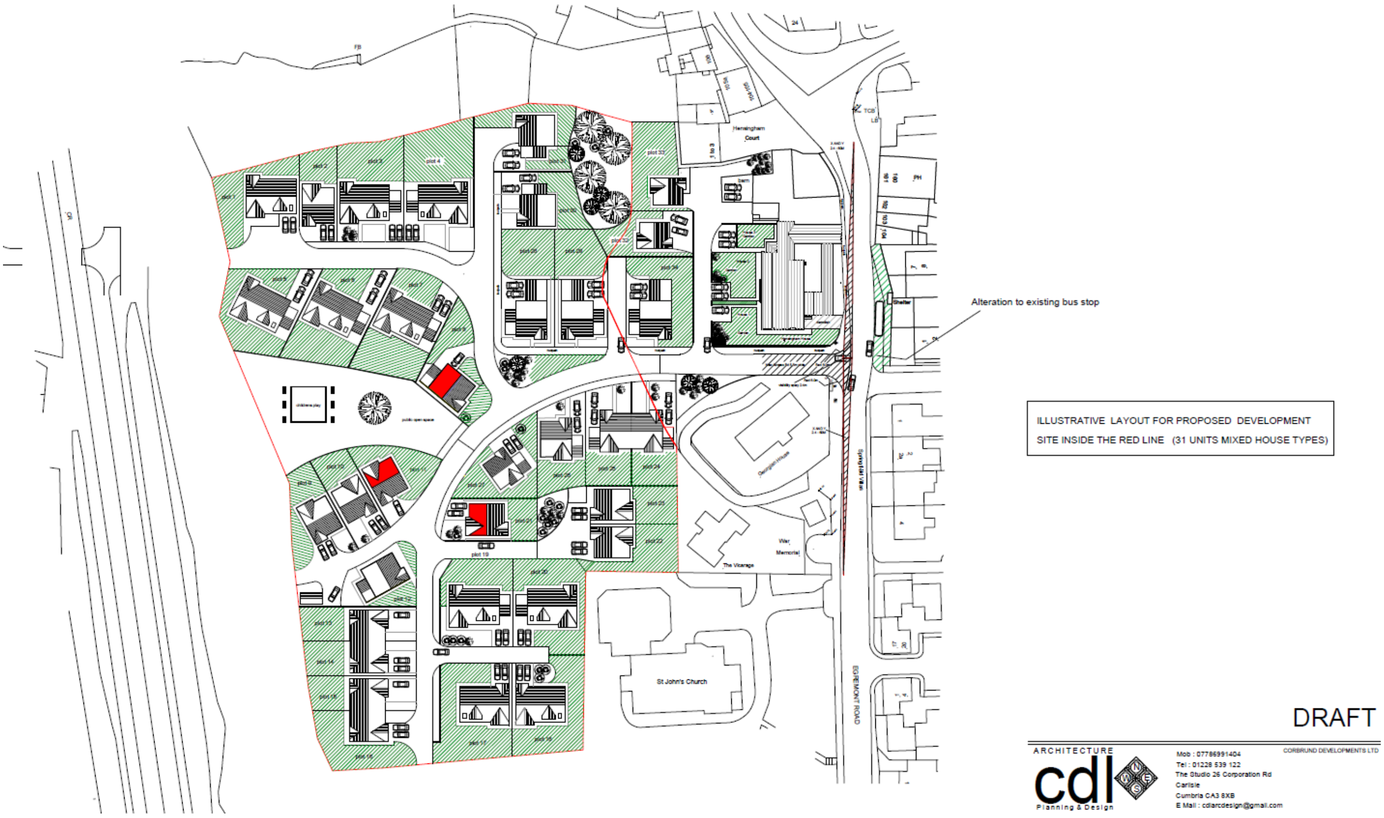
Review of Natural Drainage Potential for SuDS Schemes

Proposed Residential Development at Georgian House, Egremont Road, Hensingham, CA28 8QB

Geoinvestigate has been asked to assess the drainage potential of the geology at the above site via a desk-based exercise with regard to the potential implementation of various Sustainable Drainage Systems (SuDS) options.

It is currently proposed to construct a new residential development of some 31 dwellings at the site which currently comprises undeveloped grassed space in the suburbs of Whitehaven. Wooded areas lie adjacent to and beyond the northern and western boundaries of the proposed development site, residential properties and St. John's Church lie to the east of the site, and an extended grassed area lies to the south (with further residential properties beyond). The A595 (Hensingham Bypass) lies downslope and beyond the wooded area to the west of the site. The proposed development plan is understood not to have been finalised at this stage but an outline plan has been provided and is presented in Figure 1 below:

Figure 1: Outline Proposed Development Layout



Recorded Geology

BGS 1:5,000 Sheet number 28 (Whitehaven) shows the site to be underlain by Devensian Till with sandstone bedrock belonging to the Hensingham Formation (also referred to as the Stainmore Formation). A fault is shown to run in and east-west direction to the north of (but outside of) the site through the adjacent wooded area, a stream appears to roughly follow the line of this fault on the OS map and goes below ground to the west below the A595.

The Bedlam Gill Coal Seam is shown on the BGS map to outcrop in an approximate north-south orientation roughly along the eastern boundary of the study area, perhaps encroaching into the site. However, the Coal Authority's interactive online map viewer does not show this outcrop, nor any associated development high risk area but does show what may be the same coal seam further to the north beyond a more distant fault. While it is beyond the scope of this report, perhaps the potential for shallow historical coal mining might need to be further explored by means of a Coal Mining Risk Assessment (CMRA).

Borehole records

BGS borehole scans referenced: NX91NE101, NX91NE127, NX91NE112 and NX91NE103 are all recorded as being very close to, or possibly inside of, the western boundary of the site, and records NX91NE128 and NX91NE114 slightly further to the west and south respectively but still relatively close to the site.

Table 1: Summary of BGS Borehole Records

Borehole:	**NX91NE101**	**NX91NE127**	**NX91NE112**	**NX91NE103**	**NX91NE128**	**NX91NE114**
Surface:	0.50m Topsoil	0.30m Topsoil	0.90m Topsoil	0.45m Topsoil	0.30m Topsoil	0.80m Topsoil
Subsoil:	Slightly sandy silty CLAY to 2.20m	Slightly sandy silty CLAY to 1.90m	Slightly sandy silty CLAY to 1.80m, silty CLAY to 2.50m	Silty CLAY to 2.10m	Silty CLAY to 1.20m	Silty, initially sandy, CLAY to 2.00m. Silty SAND to 2.90m
Rock:	Weathered siltstone into silty mudstone 4.30m. Mostly Sandstone below 13.64m.	Silty clay noted to probably be completely weathered siltstone 1.90m to 2.60m.	Highly weathered silty mudstone to 3.45m.	Variably weathered bands of silty mudstone and mudstone to 7.54m, mostly sandstone below.	Highly weathered mudstone to 2.15m, siltstone to 2.30m.	Highly weathered siltstone and silty mudstone to 3.45m.
Other Notes:	COAL 15.24m-15.51m below a band of mudstone. Perched groundwater ca. 1.9-4.0m during early drilling, GW at 13m in deeper sandstone.	Trial pit. Halted at 2.60m.	Trial pit. Halted at 3.45m.	Thin COAL 7.54m-7.75m. Groundwater at 1.6m on 19/7/85 and 11.45m on 20/7/85.	Trial pit. Halted at 2.30m.	Borehole halted at 3.45m.
Implications on Drainage:	Clay soils to between 1.90m and 2.50m likely to be extremely low permeability. Underlying siltstone and mudstone likely low and extremely low permeability respectively.				Similar to others, though a lesser depth of clay subsoils over the bedrock. Further from site.	0.90m thick silty sand band present in this more distant borehole unlikely to be sufficient for soakaways etc.

<u>Summary</u>

The silty clay soils which are recorded to a depth of ca. 2m at or very close to the study site and the underlying siltstone or mudstone bedrock would all be expected to exhibit intrinsically low or very low permeability and it is therefore concluded that the use of natural drainage such as soakaways, permeable paving or infiltration trenches will not be feasible at this site.

Other SuDs features might be incorporated into the development such as green roofs, storage ponds and other attenuation/retention features such as tanks and swales placed to slow runoff from the site prior to discharge into local sewers, but the use of natural recharge via infiltration into subsoils is extremely unlikely to be feasible at this site.

Kind regards,

Jack Harper BSc(Hons) MSc CSci MIEnvSc
Contaminated Land Division Manager
Geoinvestigate Ltd.
www.geoinvestigate.co.uk
Tel. (01642) 713779 / 07795 845729

GEO INVESTIGATE
GEOLOGICAL GEOTECHNICAL GEOENVIRONMENTAL

Appendix F

Micro Drainage – Model Outputs

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	17.100	Add Flow / Climate Change (%)	0
Ratio R	0.252	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.211	4-8	0.051

Total Area Contributing (ha) = 0.261

Total Pipe Volume (m³) = 105.217

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	24.899	0.050	498.0	0.026	5.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.001	14.183	0.028	506.5	0.012	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.002	20.575	0.041	501.8	0.031	0.00	0.0	0.600	o	1200	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	46.53	5.25	82.802	0.026	0.0	0.0	0.0	1.67	1888.3	3.3
S1.001	46.08	5.39	82.752	0.038	0.0	0.0	0.0	1.66	1872.2	4.8
S1.002	45.44	5.60	82.724	0.070	0.0	0.0	0.0	1.66	1881.0	8.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.003	9.869	0.020	500.0	0.044	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S2.000	4.165	0.800	5.2	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	4.579	0.800	5.7	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	23.000	0.046	500.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.005	23.648	0.158	150.0	0.147	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.003	45.14	5.70	82.683	0.114	0.0	0.0	0.0	1.67	1884.5	14.0
S2.000	47.29	5.02	84.500	0.000	0.0	0.0	0.0	4.45	78.6	0.0
S3.000	47.29	5.02	84.500	0.000	0.0	0.0	0.0	4.24	74.9	0.0
S1.004	44.47	5.93	82.663	0.114	0.0	0.0	0.0	1.67	1884.5	14.0
S1.005	43.15	6.41	82.617	0.261	0.0	0.0	0.0	0.82	14.5«	30.6

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.026	0.026	0.026
1.001	User	-	100	0.012	0.012	0.012
1.002	User	-	100	0.031	0.031	0.031
1.003	User	-	100	0.014	0.014	0.014
	User	-	100	0.006	0.006	0.020
	User	-	100	0.020	0.020	0.041
	User	-	100	0.003	0.003	0.044
2.000	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	User	-	100	0.006	0.006	0.006
	User	-	100	0.066	0.066	0.072
	User	-	100	0.041	0.041	0.113
	User	-	100	0.034	0.034	0.147
				Total	Total	Total
				0.261	0.261	0.261

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.005	S	84.730	82.459	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.100	Storm Duration (mins)	30
Ratio R	0.252		

Storage Structures for Storm

Porous Car Park Manhole: S5, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.6
Membrane Percolation (mm/hr)	1000	Length (m)	10.4
Max Percolation (l/s)	16.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	84.500	Cap Volume Depth (m)	0.550

Porous Car Park Manhole: S6, DS/PN: S3.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.4
Membrane Percolation (mm/hr)	1000	Length (m)	32.3
Max Percolation (l/s)	57.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	84.500	Cap Volume Depth (m)	0.550

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.261
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	16.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	180 Winter	1	+0%	100/180 Winter				82.994
S1.001	S2	180 Winter	1	+0%	100/120 Winter				82.995
S1.002	S3	180 Winter	1	+0%	100/120 Winter				82.995
S1.003	S4	180 Winter	1	+0%	100/120 Winter				82.995
S2.000	S5	15 Summer	1	+0%					84.500
S3.000	S6	15 Summer	1	+0%					84.500
S1.004	S5	180 Winter	1	+0%	100/120 Winter				82.995
S1.005	S5	180 Winter	1	+0%	1/15 Summer				82.995

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-1.008	0.000	0.00			0.5	OK	
S1.001	S2	-0.957	0.000	0.00			0.6	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.929	0.000	0.00			1.0	OK	
S1.003	S4	-0.888	0.000	0.00			1.5	OK	
S2.000	S5	-0.150	0.000	0.00			0.0	OK	
S3.000	S6	-0.150	0.000	0.00			0.0	OK	
S1.004	S5	-0.868	0.000	0.00			1.8	OK	
S1.005	S5	0.228	0.000	0.19			2.5	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.261
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 16.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	240 Winter	30	+0%	100/180 Winter				83.406
S1.001	S2	240 Winter	30	+0%	100/120 Winter				83.407
S1.002	S3	240 Winter	30	+0%	100/120 Winter				83.407
S1.003	S4	240 Winter	30	+0%	100/120 Winter				83.407
S2.000	S5	15 Summer	30	+0%					84.500
S3.000	S6	15 Summer	30	+0%					84.500
S1.004	S5	240 Winter	30	+0%	100/120 Winter				83.407
S1.005	S5	240 Winter	30	+0%	1/15 Summer				83.407

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.596	0.000	0.00			1.1	OK	
S1.001	S2	-0.545	0.000	0.00			0.7	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.517	0.000	0.00			1.0	OK	
S1.003	S4	-0.476	0.000	0.00			1.5	OK	
S2.000	S5	-0.150	0.000	0.00			0.0	OK	
S3.000	S6	-0.150	0.000	0.00			0.0	OK	
S1.004	S5	-0.456	0.000	0.00			1.7	OK	
S1.005	S5	0.640	0.000	0.19			2.5	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.261
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	16.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	480 Winter	100	+45%	100/180 Winter				84.611
S1.001	S2	480 Winter	100	+45%	100/120 Winter				84.611
S1.002	S3	480 Winter	100	+45%	100/120 Winter				84.611
S1.003	S4	480 Winter	100	+45%	100/120 Winter				84.611
S2.000	S5	480 Winter	100	+45%					84.602
S3.000	S6	480 Winter	100	+45%					84.570
S1.004	S5	480 Winter	100	+45%	100/120 Winter				84.611
S1.005	S5	480 Winter	100	+45%	1/15 Summer				84.612

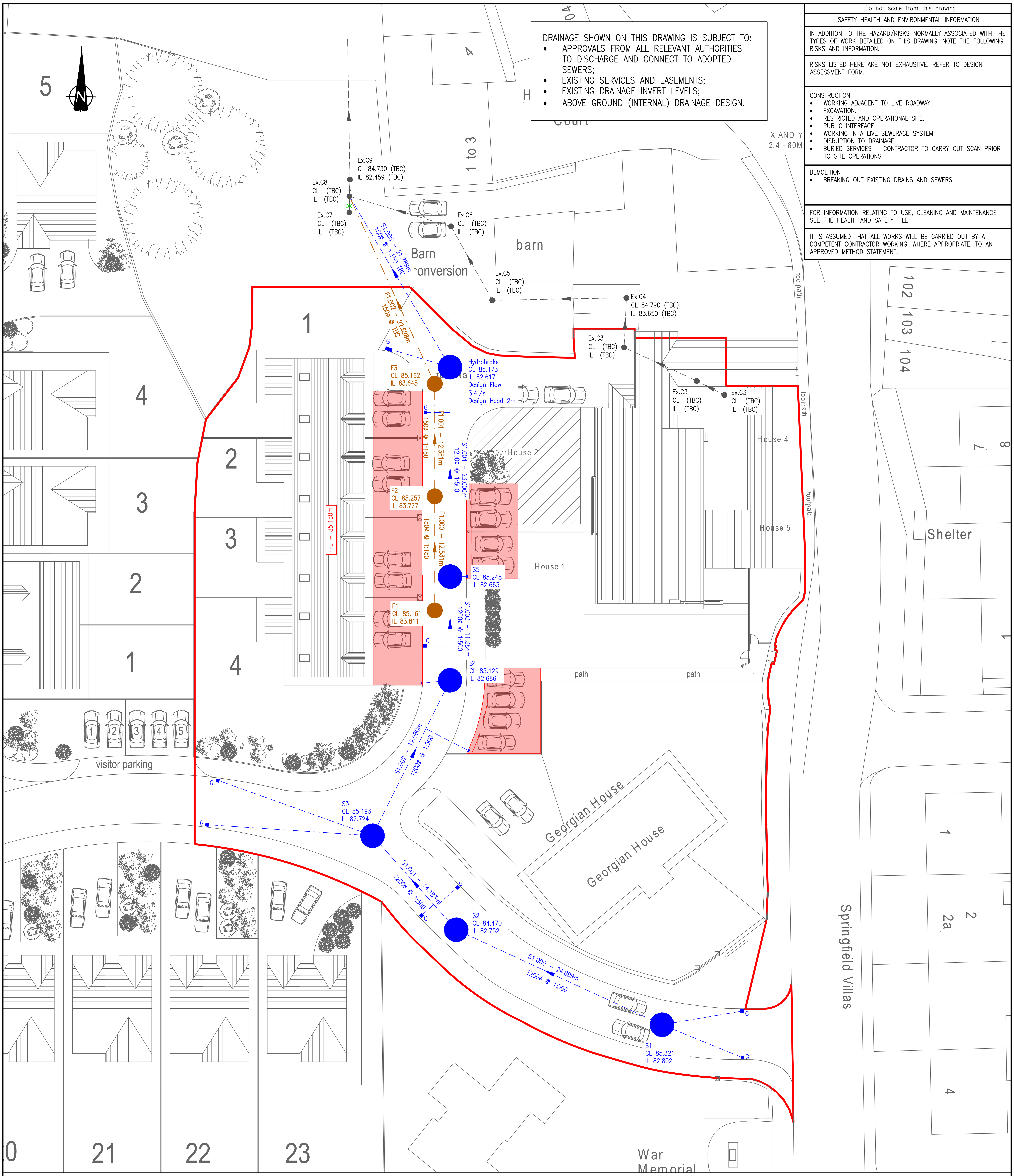
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.609	0.000	0.00			1.4	SURCHARGED	
S1.001	S2	0.659	0.000	0.00			2.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	0.687	0.000	0.00			3.0	SURCHARGED	
S1.003	S4	0.728	0.000	0.00			3.2	SURCHARGED	
S2.000	S5	-0.048	0.000	0.01		112	0.6	OK	
S3.000	S6	-0.080	0.000	0.03		64	1.9	OK	
S1.004	S5	0.748	0.000	0.00			3.7	SURCHARGED	
S1.005	S5	1.845	0.000	0.25			3.4	SURCHARGED	

Appendix G

Proposed Drainage Layout



Do not scale from this drawing.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.

RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DESIGN ASSESSMENT FORM.

CONSTRUCTION
- WORKING ADJACENT TO LIVE ROADWAY.
- EXCAVATION.
- RESTRICTED AND OPERATIONAL SITE.
- PUBLIC INTERFACE.
- WORKING IN A LIVE SEWERAGE SYSTEM.
- DISRUPTION TO DRAINAGE.
- BURIED SERVICES – CONTRACTOR TO CARRY OUT SCAN PRIOR TO SITE OPERATIONS.

DEMOLITION
- BREAKING OUT EXISTING DRAINS AND SEWERS.

FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE SEE THE HEALTH AND SAFETY FILE

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

NOTES

1. This drawing is based on the following received information:
   CDL Architecture Site Plan Detail – DS/TMP/2/RD/23 – Rev D
2. This drawing is to be read in conjunction with the following FAIRHURST drawings:
   - 138443/1002 – Proposed Site Levels
   - 138443/2003 – Drainage Construction Details Sheet 1
   - 138443/2005 – Manhole Schedules
   - 138443/2006 – Drainage Notes
3. Topographical data is based off LIDAR data downloaded from the EA.

KEY

- Site boundary (Phase 1 and 2)
- Proposed surface water sewer
- Proposed foul water sewer
- Existing combined water sewer
- Sewer to be grouted
- Proposed permeable paving

Rev.	Date	Description	Drawn	Checked	Approved
C	28/04/23	DRAINAGE STRATEGY UPDATED TO SUIT REVISED SITE LAYOUT	FM	SNK	JG
B	19/02/21	DRAINAGE REVISED IN LINE WITH UPDATED SITE LAYOUT RECEIVED 26.01.2021.	AC	AL	MT
A	15/06/20	MINOR TITLEBOX AMENDMENTS.	JH	MT	MT

Client:
THOMAS MILBURN PROPERTY LTD.

Project Title:
HENSINGHAM HOUSE PHASE ONE AND TWO

Drawing Title:
HENSINGHAM HOUSE PROPOSED DRAINAGE LAYOUT

FAIRHURST
1 Arngrove Court, Barrack Road, Newcastle-upon-Tyne, NE4 6DB
Tel: 0191 221 0505 Fax: 0844 381 4412

Scale at A1:	Status:	
1:200	Planning	
Drawn: JF	Checked: DN	Approved: MT
Date: 08/06/20	Date: 08/06/20	Date: 08/06/20
Drawing No.: 138443/2002	Revision: C	

Appendix H

United Utilities Sewer Flood Record Response

Frank Moore

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 10 June 2020 07:37
To: Jack Shelton
Cc: Wastewater Developer Services
Subject: FW: 138443 - Historical sewer flooding CA28 8QW - UU Reference: 4200031872
Attachments: Overview.png

Good morning, Jack

Hensingham House off Egremont Road, Hensingham CA28 8QW
UU Reference: 4200031872

I can confirm that we do have current records of sewer flooding on our DG5 register within the vicinity of the proposed development. The DG5 register is a register of properties that have flooded as a result of hydraulic inadequacy of the public sewer network.

Please note that United Utilities Water Limited (UUW) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the register.

Our response does not include:

- any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which UUW has no control and not a facet of sewer capacity; or

- any historical sewer flooding events that have been removed from the register as a result of investment in our infrastructure.

As with all development sites, we recommend you liaise with our water and wastewater engineers by contacting our Developer Services team so the details of your development proposal can be considered further. Details can be found at the following link.

https://www.unitedutilities.com/services/builders-developers/

Should you require any further information please do not hesitate to contact me.

Many thanks.

Regards,

United Utilities
Water for the North West

Josephine Wong
Wastewater Developer Engineer
Developer Services & Metering
Customer Services
unitedutilities.com

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry https://www.unitedutilities.com/builders-developers/ or you can email us at WastewaterDeveloperServices@uuplc.co.uk

From: Jack Shelton [mailto:jack.shelton@fairhurst.co.uk]
Sent: 04 June 2020 19:43
To: EIRRequests <EIRRequests@uuplc.co.uk>
Subject: 138443 - Historical sewer flooding

Dear Sir/Ma'am,

I am investigating flood risk for a site at Hensingham House off Egremont Road, Hensingham. The postcode for the site is CA28 8QW and the grid reference is NX 98598 16737. I have also attached a site boundary.

Please could you inform if United Utilities have any records of sewer flooding at the site or in the surrounding area?

If there is a charge associated within this information, please can you inform before processing the request.

Kind Regards,

Jack

Jack Shelton
Graduate Engineer Water Services

FAIRHURST
engineering solutions, delivering results

1 Arngrove Court,
Barrack Road,
Newcastle upon Tyne, NE4 6DB
Tel: 0191 2210505
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Inverness	Watford

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