SUBTENO ENGINEERING CONSULTANTS LTD

FLOOD CONSEQUENCES ASSESSMENT & DRAINAGE STRATEGY REPORT

CEFN ISAF REDEVELOPMENT, MERTHYR TYDFIL

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Approved By	Andrew Dye	Director	31 July 2023

Revision	Author	Date	Reason
01	Nathan Rowe	31/07/23	Initial Issue
02	Nathan Rowe	14/11/23	Stage 3 Updates. Section 6.8 & Appendix K added.
03	Nathan Rowe	16/02/24	Section 2.5, Section 6, Appendix C & K Updated. Updated following SW outfall investigations.

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CONTENT

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1 INTRODUCTION

Subteno Engineering Consultants have been commissioned by Simple Works on behalf of Merthyr Valleys Homes Limited to carry out a Flood Consequences Assessment report (FCA) and Drainage Strategy for a proposed redevelopment of the Cefn Isaf Flats, Pontycapel Road, Cefn Coed, Merthyr Tydfil, CF48 2RH. A site location plan is enclosed in Appendix A.

The climate change allowances and flood consequence assessments planning policy guidance, published by the Welsh Government September 2021, states that:

"Flooding is already a serious risk to the people, economy and environment in Wales. Climate change is expected to increase this risk over the coming decades… Development should be resilient to future flood risks and must demonstrate that such risks can be appropriately managed to provide a safe and secure living and/or working environment throughout its lifetime."

Technical Advice Note 15 (TAN15, 2004): Development and Flood Risk, supplements Planning Policy Wales (PPW), and states that:

"Managing flooding is an important part of contributing towards achieving sustainable development. Relevant sustainable development considerations from the flooding perspective include:-

- *Guiding development to locations at little or no risk from river, tidal or coastal flooding or from run off arising from development in any location*
- *Managing the consequences of flooding where development can be justified and the consequences are considered acceptable*
- *Making provision for future changes in flood risk, for example taking account of climate change*

This report has been prepared to address the requirements of Planning Policy Wales (PPW) and has derived the following data/information from various sources including:

- Information published or explicitly provided by Natural Resources Wales (NRW);
- Information published by the Local Planning Authority and SuDS Approving Body;
- Information published by the Welsh government, including TAN15 and the Statutory Standards for Sustainable Drainage Systems;
- Information published by the British Geological Survey (BGS) mapping;
- A site specific topographical survey;
- A site specific drainage (CCTV) survey;
- Intrusive Site Investigation and Report;
- Specific design works carried out for this report.

TAN 15 was revised in December 2021. Although not yet enforced, it has been referred to during the development of this Flood Consequences Assessment and Drainage Strategy report, including the use of the updated 'Flood Map for Planning' produced by Natural Resources Wales and the associated redefined flood zones, vulnerability categories and development location justification.

The no longer updated Development Advice Map is still used whilst the revised TAN15 becomes implemented by the Welsh Government and as such has been referred to within this report.

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2 THE EXISTING SITE

2.1 Site Conditions

The proposed development is located at National Grid Reference (NGR) 303257, 207669 off Pontycapel Road, Cefn Coed, Merthyr Tydfil, CF48 2RH.

The site currently consists of the existing Cefn Isaf apartment buildings. Details of the existing development site are enclosed in Appendix B and illustrated in Figure 2.1.1 below:

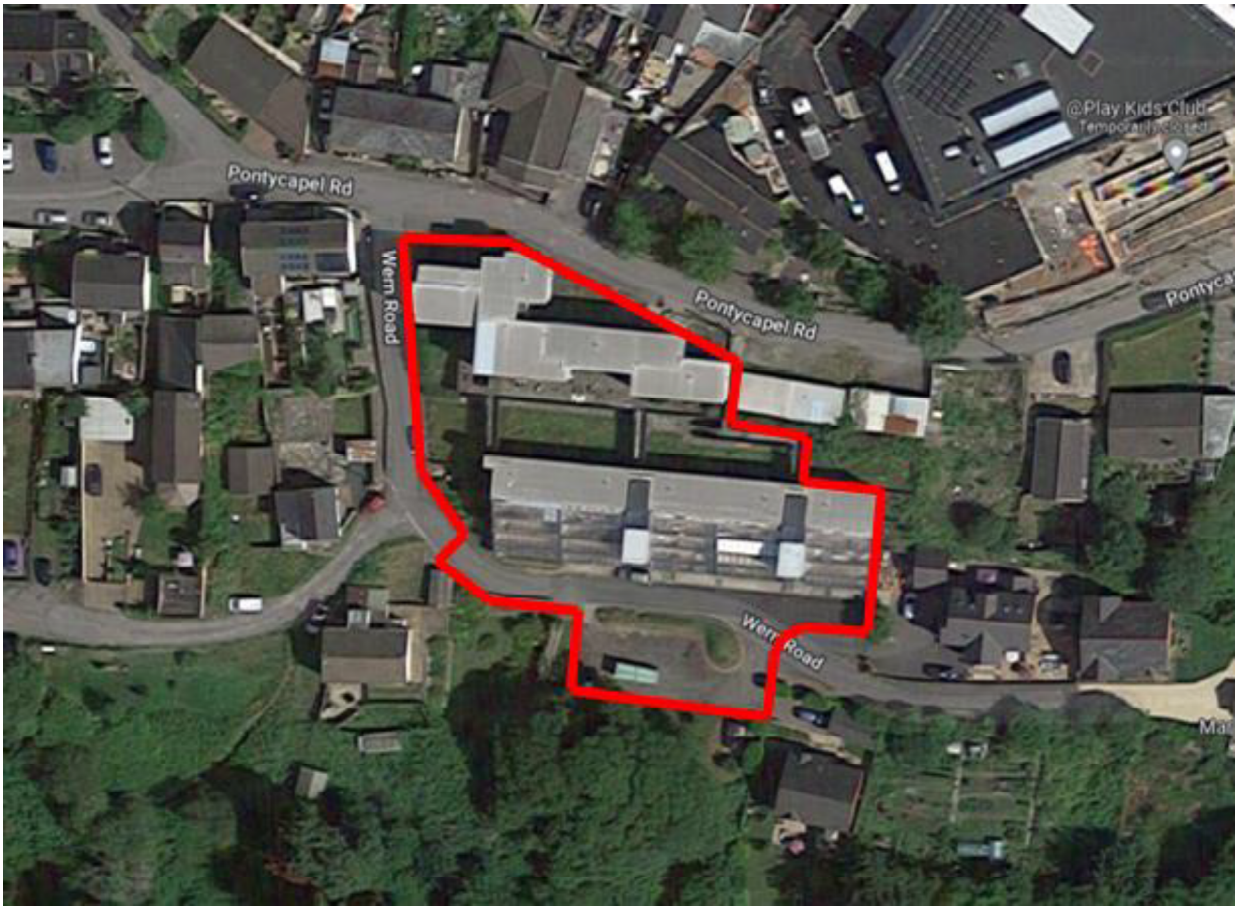

Figure 2.1.1 – Satellite View of the site (approximate site boundary edged red)

2.2 Topography

The existing topography of the site is steep. There is approximately 11m level difference between the north and south boundaries of the site; Pontycapel Road to the north is approximately 212mAOD, with the existing level at the south parking area approximately 201mAOD.

Wern Road to the west of the existing apartment buildings traverses these levels at steep gradients.

Details of existing site levels are enclosed in Appendix B.

2.3 Geological Ground Conditions

The focus of a Flood Consequences Assessment study on geology is on the potential movement of water through Made Ground, Drift Geology and Solid Geology.

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British Geology Survey (BGS) mapping has been referred to understand existing superficial deposits and bedrock. The BGS mapping shows the site as underlain by Till deposits. Bedrock is shown as the Bishopston Mudstone Formation.

Numerous local borehole logs are available from the British Geological Survey, and are present along the A470 and A465 trunk roads to the north and west of the site. These show varying thicknesses of silty clays, clays, sands, gravels and boulders over varying siltstones and sandstones.

A site investigation report was undertaken by Integral Geotechnique on behalf of Merthyr Valleys Homes Limited in September 2022, report reference 14067/GNS/22/SI. Window samples and trial pits were undertaken, and logs provided to understand the make-up of the existing ground.

The log for WS1, located to the southern parking area, shows 0.5m of made ground followed by 1.5m (end of borehole) of red brown slightly silty sandy GRAVEL with frequent cobbles of subrounded and subangular sandstone and siltstone.

The log for WS3, located just below the southern apartment building, adjacent to Wern road, shows 3.7m of made ground, underlain by slightly silty sandy GRAVEL with cobbles of sandstone and rarely limestone.

Formation	Description
Artificial Ground (Made Ground)	Between 0.5m and 3.7m across the site.
Superficial Deposits (Drift Deposits)	A mixture of clays, sands, gravels and cobbles of sandstones, siltstone and occasional limestone varying in size and shape.
Bedrock	The Bishopston Mudstone Formation – Mid to dark grey mudstones, with some beds of mid grey siltstone and beds of interbedded siltstone and mudstone. With sporadic, minor grey quarzitic sandstones and rare thin coals.

Table 2.3.1 – Geological Ground Conditions

2.4 Hydrogeology

The hydrogeological features of the site are depicted below, and are taken from British Geology Survey mapping records. The findings are summarised within Table 2.4.1.

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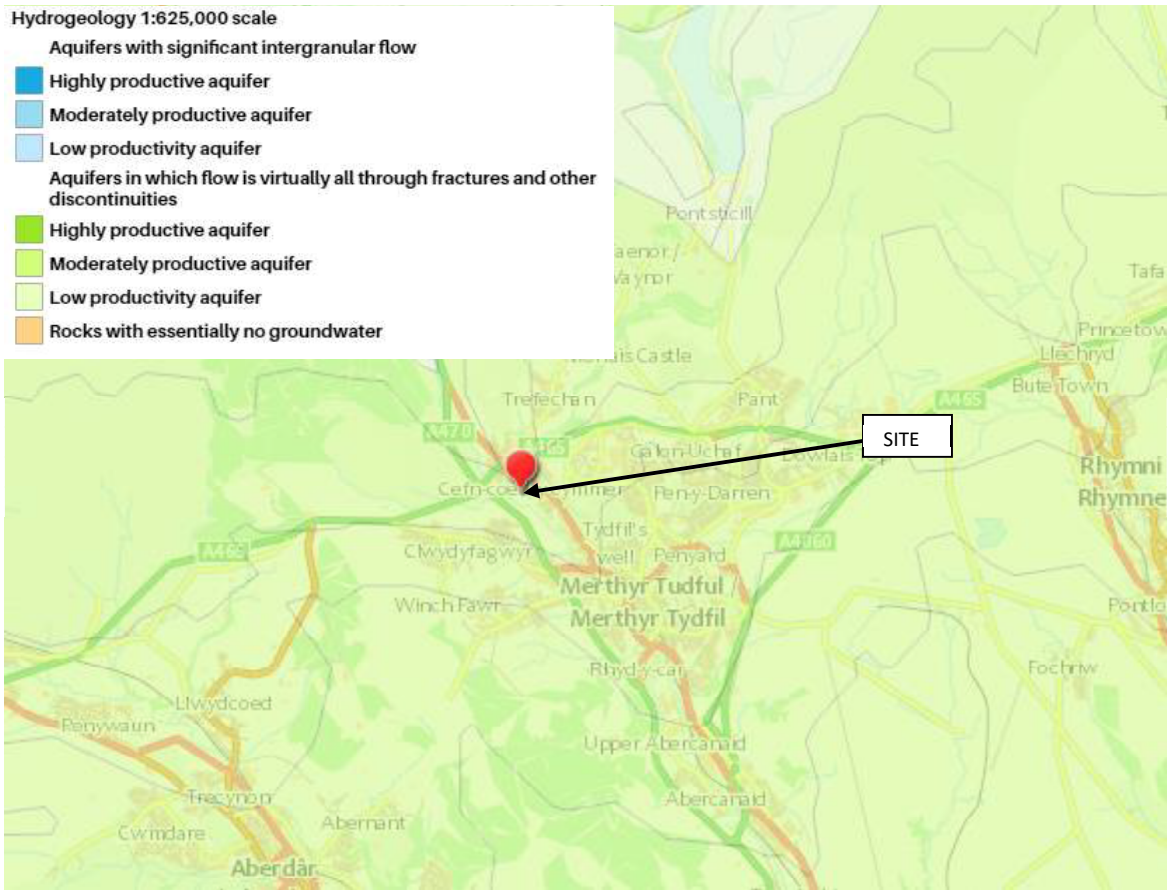

Figure 2.4.1 – Hydrogeology Map (approximate site location marked red)

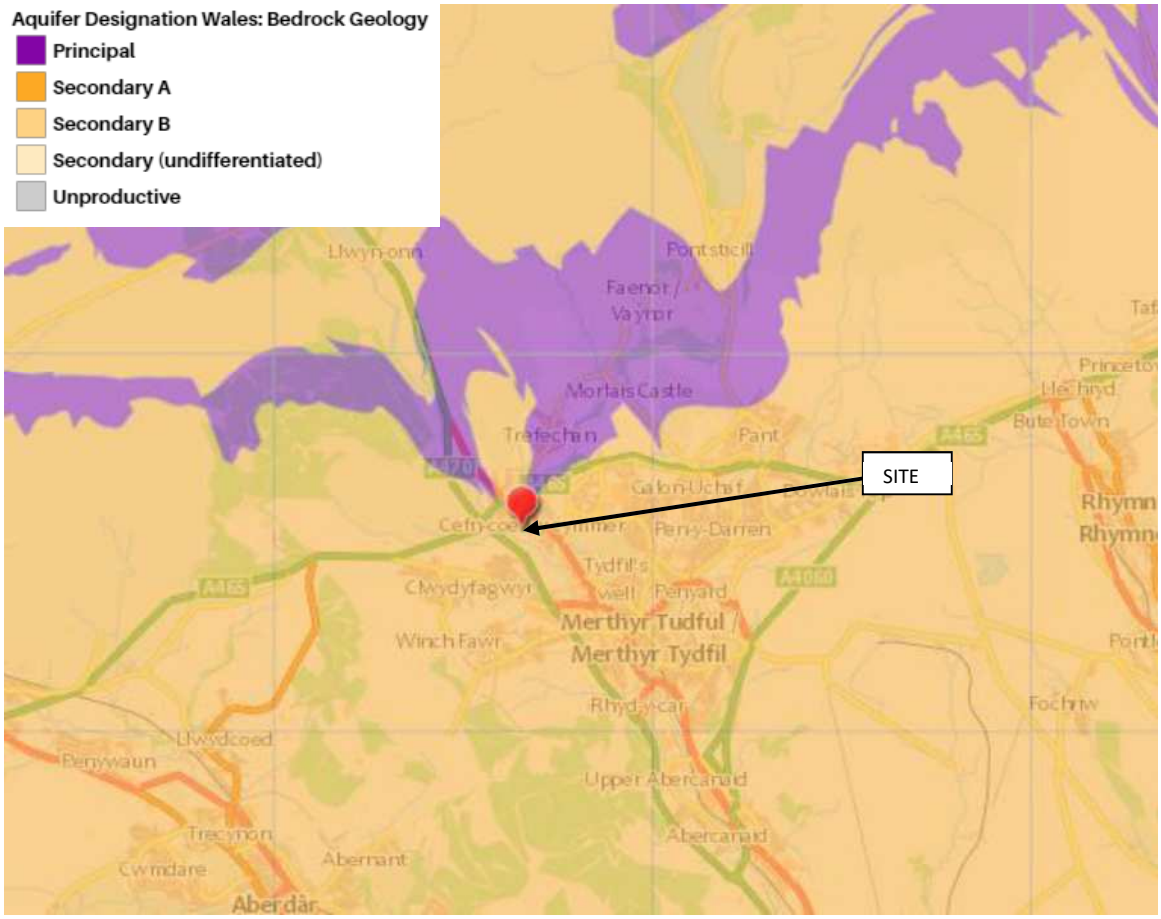

Figure 2.4.2 – Aquifer Designation Map (Bedrock) (approximate site location marked red)

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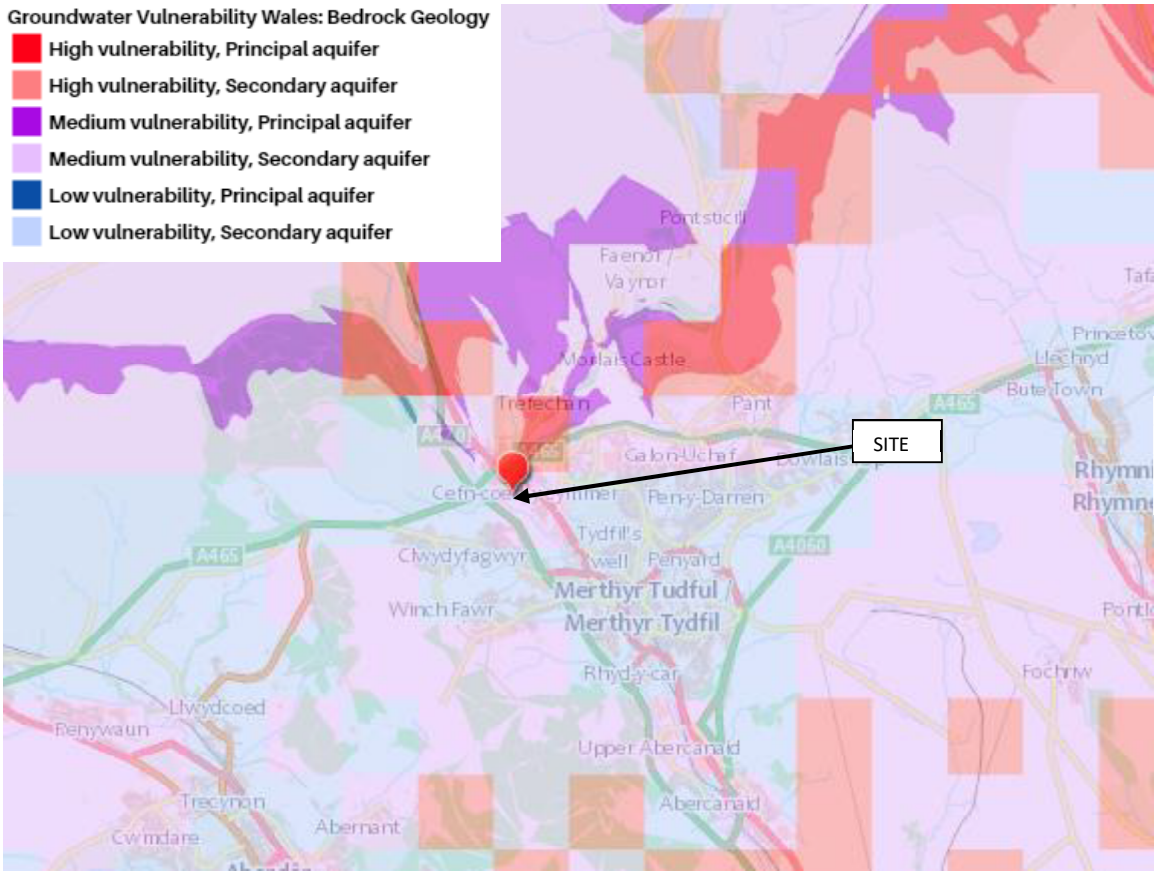

Figure 2.4.3 – Groundwater Vulnerability Map (Bedrock) (approximate site location marked red)

Figure 2.4.4 – Aquifer Designation Map (Superficial Deposits) (approximate site location marked red)

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Figure 2.4.5 – Groundwater Vulnerability Map (Superficial Deposits) (approximate site location marked red)

Map Dataset	Designation	Comment
Hydrogeology Overview Map	Moderately productive Aquifer	Figure 2.4.1 indicates that the site overlay a 'moderately productive Aquifer'. This is an aquifer in which flow is virtually all through fractures and other discontinuities. Millstone Grit Group - Regionally significant multi-layered aquifer up to 900m thick with yields of 5-10l/s, rarely 50l/s, with many springs.
Aquifer Maps: Bedrock Designation	Secondary A	This category identifies the type of aquifer present in the solid permeable formations. Figure 2.4.2 indicates that the existing bedrock deposits are in the 'Secondary A' classification which consist of permeable strata capable of supporting local water supplies and in some cases forming an important source of base flow to rivers.
Aquifer Maps: Superficial Deposits Designation	Secondary (undifferentiated)	This category identifies the type of aquifer present in the permeable unconsolidated (loose) deposits. Figure 2.4.4 indicates that the superficial deposits are in the 'Secondary (Undifferentiated)' designation. It is unable to apply either a Secondary A or B definition before of the variable characteristics of rock type and have only a minor value.

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Groundwater Vulnerability (Bedrock)	Medium Vulnerability (Secondary Aquifer)	These maps provide an overview assessment of the vulnerability of groundwater to a pollutant discharged at ground level, based on the hydrological, geological, hydrogeological and soil properties within a 1km grid. Figures 2.4.3 and 2.4.3 indicates a 'Medium Vulnerability' to pollutants discharged from activities carried out at the surface.
Groundwater Vulnerability (Superficial Deposits)	Medium Vulnerability (Secondary Aquifer)	
Ground Water Source Protection Zone (SPZ)	-	The site is not located in a source protection zone for the abstraction of drinking water.

Table 2.4.1 – Summary of Hydrogeological conditions

2.5 Existing Surface Water Management

The topographical survey together with a CCTV drainage survey was undertaken at the site to determine the existing drainage arrangements.

The existing northern block of flats discharges foul and partial surface water to a private combined sewer along the northern boundary, which discharges into the existing Welsh Water combined sewer located adjacent to Pontycapel Road.

There is a central private surface water drain located between the north and southern blocks receiving the remainder of roof run-off from the northern block and partial surface roof run-off from the south block of flats.

The topographical survey identified a number of manholes directly outside the west elevation of the south block, however were seized and unable to CCTV survey. The Welsh Water asset map identifies these as adopted foul manholes, and as such it is assumed that the south block foul drainage discharges to these manholes. The asset map shows these connecting into the existing Welsh Water combined sewer within Wern Road.

There is a shared drain beneath Wern Road which receives the central private surface water drain as well as highway drainage and the remainder of roof run-off from the south block. This drainage ultimately leaves the site to the south of the existing parking area, where it enters a small watercourse before terminating overland just north of the Taf Fawr river. This is discussed further later within this report in Section 6.

Refer to Appendix C for details of the existing drainage survey and mark-up.

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3 DEVELOPMENT PROPOSALS

The proposed development will comprise the demolition of the existing Cefn Isaf flats and redevelopment of the site to provide two new modern apartment buildings providing a total of 40 apartments, with associated parking, pedestrian access arrangements and landscaping.

The proposed development plans are enclosed in Appendix D.

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4 PROBABILITY OF FLOODING

The following six potential sources of flooding have been assessed within this report:-

- Flooding from rivers (fluvial flooding);
- Flooding from the sea (tidal flooding);
- Flooding from surface water and small watercourses;
- Flooding from sewers;
- Flooding from groundwater; and
- Flooding from reservoirs, canals, and other artificial sources.

The revised TAN15 has not yet been fully implemented and as such the previous Development Advice Map and previous zone descriptors have still been referred to within this report. The NRW Flood Map for Planning displays the latest, up to date information with regards to flood risk.

The assessment of flood risk in this report is based on the NRW Flood Map for Planning and the definitions shown within Figure 2 of TAN15, 2021. This updated the previous zone descriptors (A, B, C1 and C2) provided within Figure 1 of TAN15, 2004 and the previous Development Advice Map. The following are the zones referred to within the Flood Map for Planning and referred to within this report:

Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.		
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.
TAN15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard).	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard).	Not applicable.

Table 4.1 – Definition of Flood Map for Planning Flood zones (reproduced from Figure 2 of TAN15, 2021).

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4.1 Flooding from Rivers (Fluvial) & the Sea (Tidal)

The Development Advice Map and TAN15, 2004 is the current framework for assessing flood risk to and from new development and is used as a screening tool by Local Authorities. It was last updated in January 2020 with no future updates planned whilst the transition to the revised TAN15 takes place.

The Development Advice Map is based on the definitions within Figure 1 of TAN15, 2004 which recognises the following zones:

- Zone A – Considered to be at little or no risk of fluvial or tidal/coastal flooding.
- Zone B – Areas known to have been flooded in the past evidenced by sedimentary deposits.
- Zone C – Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal), subdivided into two further zones:
    - Zone C1 – Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
    - Zone C2 – Areas of the floodplain without significant flood defence infrastructure.

Figure 4.1.1 – Development Advice Map Extract (Site location marked red)

The above shows the redevelopment site as located within Zone A, considered to be at little or no risk of fluvial flooding.

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With reference to the NRW Flood Map for Planning, the proposed redevelopment is located within Flood Zone 1. An extract of the flood map can be seen below, with the closest area of flood risk is approximately 100m south of the site, from the Taf Fawr River, identified as a Main River on the mapping.

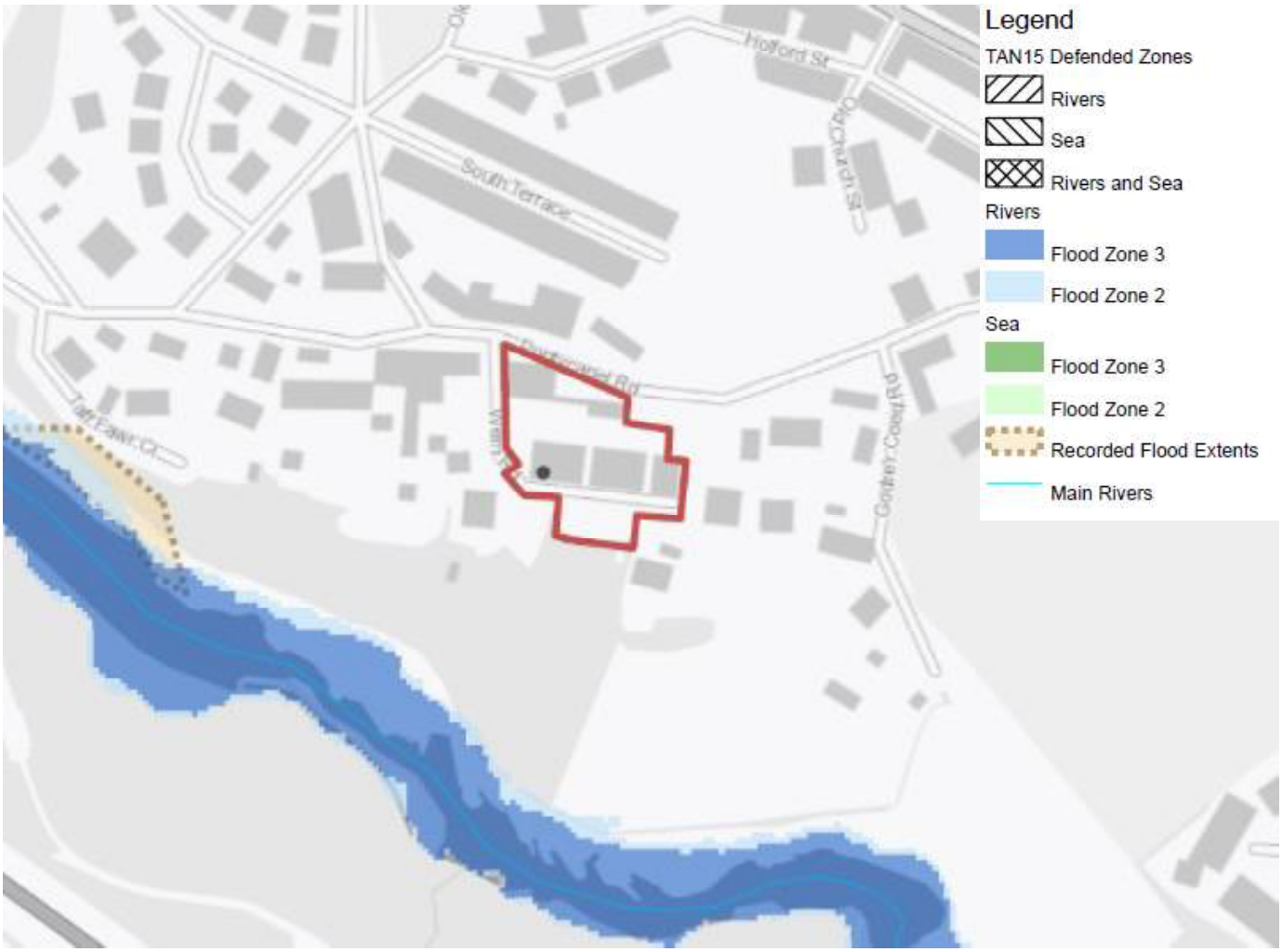

Figure 4.1.2 – NRW Flood Map for Planning Extract- Rivers and Sea (Approximate Site Extents Edged Red)

The above extract shows that the site is deemed at low risk of flooding from Rivers and the Sea. A full copy of the Flood Map For planning can be found within Appendix E.

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4.2 Flooding from Surface Water, Small Watercourses and Sewers

The potential for flooding because of small watercourses and existing local sewerage systems becoming overwhelmed during an extreme storm event is always a potential risk in urban areas. Surface water (pluvial) flooding can occur as a result of run-off accumulating in an area that is unable to drain away. This can result in surface water run-off flows following the natural topography into neighbouring properties or land, as well as sewer flooding on-site due to insufficient capacity in the downstream network.

With reference to the NRW Flood Map for Planning, the proposed redevelopment is located within Flood Zone 1:

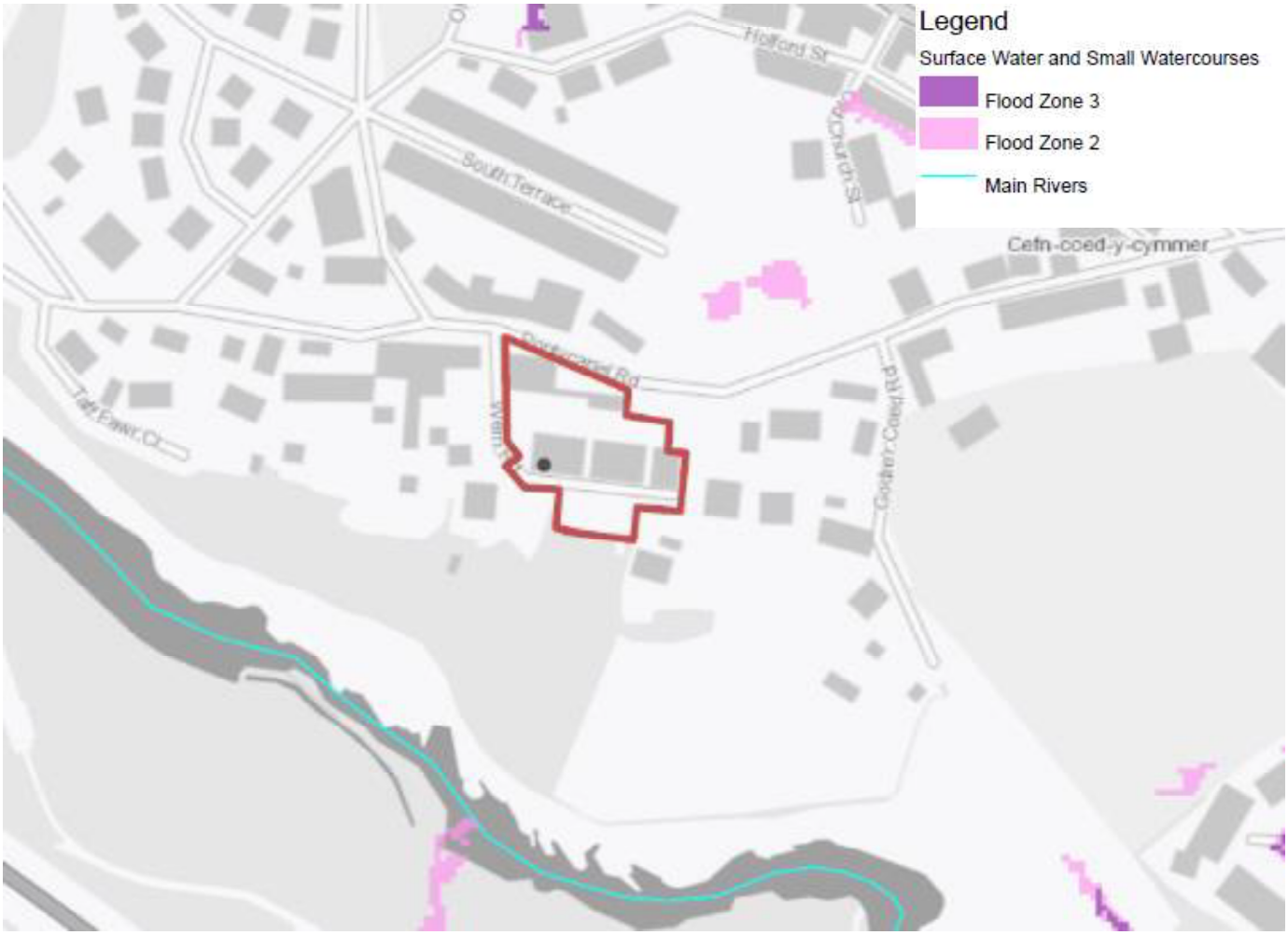

Figure 4.2.1 – NRW Flood Map for Planning Extract – Surface Water (Approximate Site Extents Edged Red)

The mapping takes into account rainfall, topographic and soil data to predict flooding but does not take into consideration any positive drainage systems that may be present. The mapping does not indicate flood risk on site and does not indicate an overland flow pathway from neighbouring land through or adjacent to the development site.

If surface water flooding was to occur north of the site as a result of blocked drains, Pontycapel Road would act as a natural channel contained by kerbing, directing water westwards along Pontycapel Road and southwards down Wern Road, ultimately flowing to the southern parking area and offsite towards the Taf Fawr river. This can be seen from the existing levels shown on the topographical survey shown within Appendix B.

The site is therefore deemed at low risk of flooding from these sources. A full copy of the Flood Map For planning can be found within Appendix E.

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4.3 Flooding from Groundwater

The geological and hydrogeological ground conditions have been investigated within section 2.3 and 2.4 of this report.

The geological study within section 2.3 showed made ground from the surface to up to 3.7mBGL, overlaying a mixture of clays, sands and gravels. BGS mapping shows these superficial deposits overlaying the Bishopston Mudstone Formation.

The hydrogeological study within section 2.4 shows the bedrock as a Secondary A aquifer with medium groundwater vulnerability to activities discharged at ground level, the superficial deposits are designated as a Secondary (undifferentiated) aquifer with medium groundwater vulnerability.

Whilst this indicates the movement of groundwater through the strata due to the permeability of the soils, there were no water strikes during the window sampling/trial pitting and no groundwater level recorded during the site investigation undertaken in September 2022.

Window Sample 3, located just to the south of the existing southern apartment building, noted soils as becoming wet at 3mBGL within the made ground. Given the steep topography of the site, this could be due to the movement of water settling beneath this plateaued area as it infiltrates into the natural strata below.

Due to the geology at the site, the groundwater levels are unlikely to rise to the surface at the site and cause flooding.

Given the nature of extensive made ground across the site and the medium groundwater pollution vulnerability, the drainage and SuDS strategy for the site will need to take these into consideration.

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4.4 Flooding from Reservoirs, Canals and other Artificial Sources

The Llyn-on reservoir is located approximately 4.3km to the northwest and the Pontsticill reservoir approximately 5.1km to the northeast.

Whilst the failure these structures poses a significant flood risk to the downstream settlements and areas surrounding the site, the proposed development is outside an area at risk of flooding:

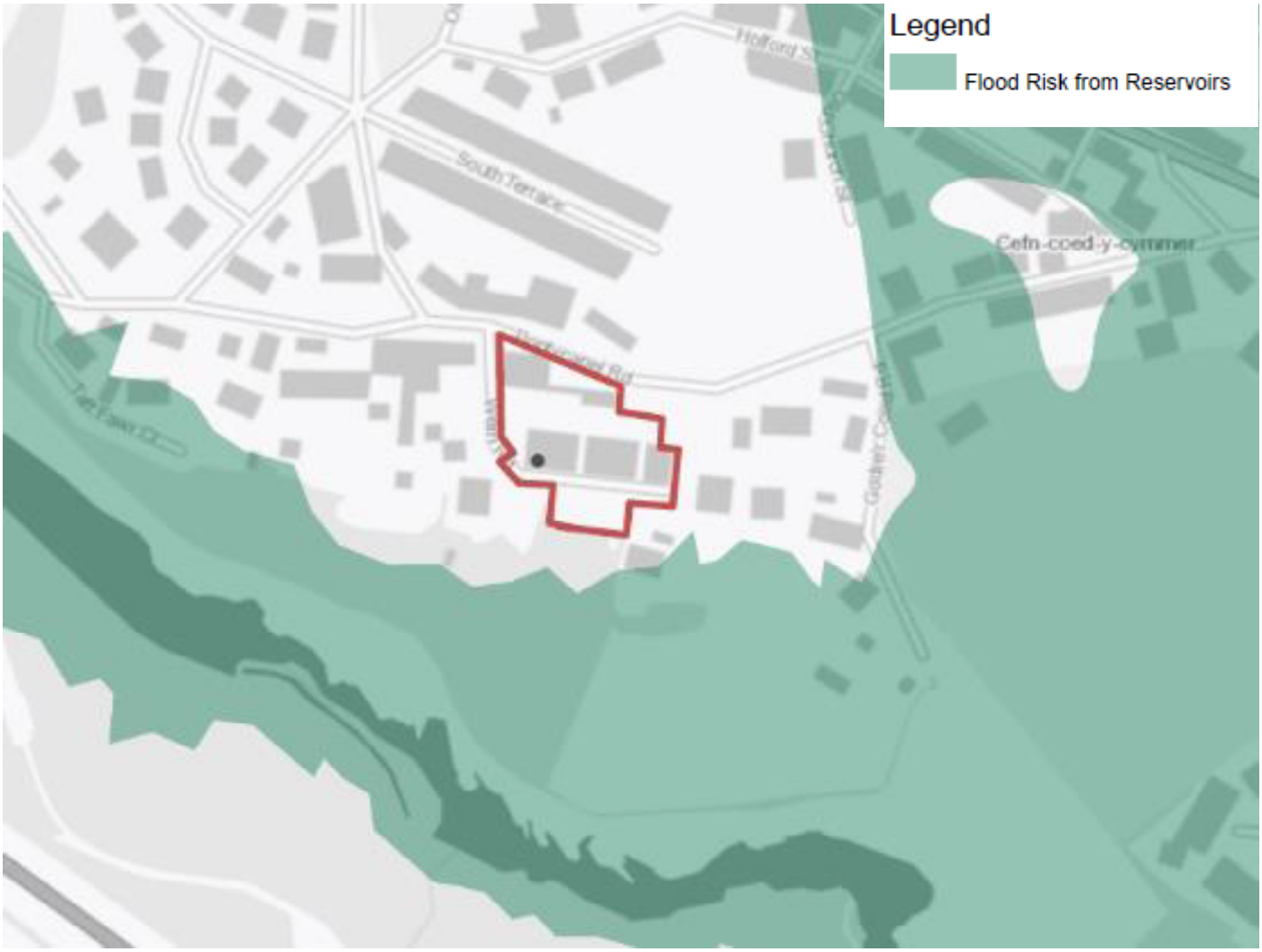

Figure 4.3.1 – NRW Flood Map for Planning Extract – Reservoir (Approximate Site Extents Edged Red)

The direction of flood waters from the failure or breaching of this infrastructure flow southwards along the Taf Fawr and Taf Fechan rivers from the Llyn-on and Pontsticill reservoirs respectively. These combine into the River Taff to the southeast of the site where large areas of flooding is shown to occur.

A full copy of the Flood Map For planning can be found within Appendix E.

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4.5 Flood Risk Summary

Source of Flooding	Flood Zone / Risk
Development Advice Map	Zone A
Rivers (Fluvial)	Zone A / FZ1 / Low
The Sea (Tidal)	N/A
Surface Water and Small Watercourses	FZ1 / Low
Sewers	Low
Groundwater	Low
Reservoirs and Artificial Sources	Low

Table 4.5 – Flood risk summary

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5 POLICY STATUS FOR PROPOSED DEVELOPMENT

5.1 Vulnerability Category

The proposed development complies with the following principles:

- The proposed development lies within Zone A / Flood Zone 1 / Low risk;
- The proposed development is classified as 'Highly vulnerable Development' in accordance with Figure 2 of the TAN15, 2004 and Figure 3 of the TAN15, 2021 (Figure 3 reproduced as Table 5.1 below).

Highly Vulnerable Development	All residential premises (including hotels, Gypsy and Traveler sites and caravan parks and camping sites). Schools and childcare establishments, colleges and universities. Hospitals and GP surgeries. Especially vulnerable industrial development (e.g power generating and distribution elements of power stations, transformers, chemical plants, incinerators), and waste disposal sites. Emergency services, including: ambulance stations, fire stations, police stations, command centres, emergency depots. Buildings used to provide emergency shelter in time of flood.
Less Vulnerable Development	General industrial, employment, commercial and retail development. Transport and utilities infrastructure. Car parks. Mineral extraction sites and associated processing facilities (excluding waste disposal sites). Public buildings including libraries, community centres and leisure centres (excluding those identified as emergency shelters). Places of worship. Cemeteries. Equipped play areas. Renewable energy generation facilities (excluding hydro generation).
Water Compatible Development	Boatyards, marinas and essential works required at mooring basins. Development associated with canals. Flood defenses and management infrastructure. Open spaces (excluding equipped play areas). Hydro renewable energy generation.

Table 5.1 – Flood Risk Vulnerability Classification

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5.2 Location of Development Justification

Section 6 of the TAN15, 2004 states that new development should be directed away from zone C and towards suitable land in zone A, otherwise to zone B, where river or coastal flooding will be less of an issue.

Section 10 of the TAN15, 2021 states the following in relation to justifying the location of development:

Zone 1	All types of development are acceptable in principle providing it does not increase flood risk elsewhere. Planning authorities should develop locally specific planning policies for localised areas at risk of flooding.
Zone 2	Development will be justified if: • It will assist, or be part of, a strategy supposed by the Development Plan to regenerate an existing settlement or achieve key economic or environmental objectives, AND • Its location meets the definition of previously developed land, AND • The potential consequences of a flooding event for the type of development have been considered, and found to be acceptable in accordance with accepted criteria for flooding consequences.
Zone 3 (Rivers and Sea)	Development will **only** be justified if: • There are exceptional circumstances that require its location in Zone 3 such as national security, energy security, public health or to mitigate impacts of climate change, AND • Its location meets the definition of previously developed land, AND • The potential consequences of a flooding event for the type of development have been considered, and found to be acceptable in accordance with accepted criteria for flooding consequences.
TAN 15 Defended Zones	Development will be justified in the TAN 15 Defended Zone if: • Its location meets the definition of previously developed land, AND • The potential consequences of a flooding event for the type of development have been considered, and found to be acceptable in accordance with accepted criteria for flooding consequences.

Table 5.2.1 – Development Location Justification

Vulnerability Categories		Flood Event Type	
		Rivers	Sea
Highly Vulnerable Development	Emergency services (command centres and hubs)	0.1% + CC (1 in 1,000)	0.1% + CC (1 in 1,000)
	All other types	1% + CC (1 in 100)	0.5% + CC (1 in 200)
Less vulnerable Development Water compatible development (limited to those built elements of development that may be occupied by people)		1% + CC (1in 100)	0.5% + CC (1 in 200)

Table 5.2.2 – Flood Events in which Development must be flood-free (Reproduced from Figure 6 of TAN15, 2021)

The site is in Development Advice Map Zone A and within Flood Zone 1 on the NRW Flood Map for Planning. Therefore, the development is in accordance with Table 5.2.1 and Table 5.2.2 above and is considered appropriate.

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6 FLOOD RISK AND DRAINAGE STRATEGY

6.1 Existing Surface Water Discharge and Brownfield Runoff Rates

Existing Surface Water Discharge/Outfall

As discussed within section 2.5, the surface water run-off from the existing apartment site has multiple drainage connections across the site:

- Partial north block to Welsh Water combined sewer located adjacent to Pontycapel Road (CCTV MH ref S5)
- Remaining north block and partial south block to on-site central surface water drain (CCTV MH ref S8). This ultimately discharges into the surface water drain under Wern Road.
- Remaining south block and southern hardstandings to on-site surface water drain located under the private extent of Wern Road (CCTV MH ref G11)

The drain under Wern Road is a shared drain receiving runoff from the site and runoff from the highway. Although receiving highway runoff, this is not believed to be owned by Merthyr Tydfil County Borough Council and is therefore a private drain. The drain leaves site south of the southern parking area, and has been subject to extensive investigations to understand where it terminates. These investigations found that the existing 225mm outfall pipe leaves the southern parking area and discharges into a small open stream via a brick headwall approximately 20m south of the site (confirmed via CCTV survey and dye testing):

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This open stream spans for a further 20m or so, before it appears to disperse onto open ground south of the site. The water either infiltrates from here or makes its way to the Taff Fawr River overground. It may be possible that the open stream originally continued further, becoming overgrown or deteriorating over time resulting in the water making a new path for itself (although this is just a theory as no further indication was found by the surveyors on-site). The re-use of this outfall is discussed further within this report. Appendix C includes a plan mark-up of this investigation.

Existing Runoff Rates

Using the CCTV and topographical surveys conducted at the site, the existing on-site surface water drainage has been modelled using Causeway Flow software (v10.7) to understand existing brownfield runoff rates. This shows the following:

Return Period (Critical Storm)	**S5 (0.043Ha of site)**	**S8 (0.085Ha of site)**	**G11 (0.112Ha of site)**	**Total Discharge**
1 year	4.8 l/s	9.4 l/s	12.2 l/s	**26.4 l/s**
30 year	11.7 l/s	23.1 l/s	29.9 l/s	**64.7 l/s**
100 year	15.1 l/s	29.7 l/s	38.5 l/s	**89.6 l/s**
100 year 360-minute volume	29.9 m^3	57.7m^3	76.2m^3	**163.8m^3**

Table 6.1 – Brownfield Runoff Rates

Refer to appendix C for the CCTV drainage survey drawing and an existing drainage mark-up. Refer to appendix F for brownfield runoff calculations.

6.2 Proposed Surface Water Discharge Location (Policy S1 of SuDS Statutory Standards)

The Statutory Standards for Sustainable Drainage Systems, policy S1 gives the following hierarchy for surface water runoff destination:

- Priority Level 1: Collect for use;
- Priority Level 2: Infiltrated to ground;
- Priority Level 3: Discharged to a surface water body;
- Priority Level 4: discharged to a surface water sewer, highway drain, or another drainage system;
- Priority Level 5: Discharged to a combined sewer.

Priority Level 1

In accordance with priority level 1, the top roof level of the two apartment blocks are to consist of green roofs. This allows for the use of water as a resource to create and maintain biodiversity. Raingardens are proposed to the central corridor of the site, between the two apartment blocks, providing similar benefits.

Rainwater harvesting measures and greywater systems are unknown at this stage and have not been considered within this report. Specific harvesting/re-use systems are to be confirmed by the Architect and Client.

Priority Level 2

The site geology and hydrogeology were discussed in section 2.3 and 2.4 respectively.

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The site investigation undertaken by Integral Geotechnique in 2022 and summarised in Table 2.3.1 of this report found made ground up to 3.7mBGL across the site close to the existing apartment buildings to be demolished. The existing parking area construction showed made ground to 0.5mBGL over red brown slightly silty sandy GRAVEL.

Table 2.4.1 shows a medium groundwater vulnerability to pollutants discharged from activities carried out at the surface with designated Secondary aquifers.

Infiltrating run-off into made ground is not recommended due to the pollution pathway it could create for existing contaminants present in the made ground into the below receptors/aquifers. Potential remediation of up to 3.7m of made ground would be excessive. Areas of infiltration is to be restricted to the southern parking area where the depths of made ground are much less, allowing for infiltration into natural ground. This will be in the form of 'Type B' permeable paving, allowing for partial infiltration and a positive drainage outlet due to the nature of the soils unlikely to permit full infiltration. BRE365 soakage tests are to be undertaken to confirm this.

Priority Level 3

There are no watercourses present on-site and as such it is not possible to discharge directly to a water body. The existing surface water outfall discharging south of the site discharges to a small watercourse that ultimately drains to the Taff Fawr River overground or via infiltration.

Priority Level 4

It proposed to discharge into the existing surface water drain leaving the site to the south of the parking area at restricted discharge rates. This has been discussed with the SAB and all investigation information provided to them. This is discussed further within Section 6.8.

Priority Level 5

There are no other private or adopted surface water sewers at the site.

6.3 Surface Water Discharge Control (Policy S2 of SuDS Statutory Standards)

An Existing and proposed impervious area drawing can be found in Appendix G, reproduced in table 6.3.1 below:

	Area (m^2)	% Site Area
Existing Impervious Area	2412m^2	81%
Existing Permeable Area	572m^2	19%
Proposed Impervious Area	2192m^2	73%
Proposed permeable area	792m^2	27%

Table 6.3.1 – Existing and Proposed Impervious Areas

Whilst the development reduces the areas drained, Policy S2 of the Statutory Standards for SuDS requires discharge rates to be controlled to mitigate downstream impacts on the environment, receiving waterbodies, infrastructure and people/property.

An initial meeting was held with the local MTCBC SAB Officer, Huw Williams, and initial thoughts gauged on the scheme. It was agreed that a formal pre-app submission would be made prior to the full SAB approval submission to agree the principles outlined in this report strategy. During the meeting, it was accepted that controlling surface water runoff to Greenfield runoff rates would not be expected, given the brownfield nature of the existing development and the existing flows.

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The below table 6.3.2 shows calculated greenfield runoff rates for the site:

Return Period	Flow Rate
1 year	4.0l/s
30 year	8.1l/s
100 year	9.9l/s
100 year 360 minute	140m^3

Table 6.3.2 – Pre-development/Greenfield runoff rates

It is proposed to discharge the surface water drainage at the site to maximum 8.0l/s for all events up to and including the 1-100yr return period plus an allowance for climate change. Whilst this does not provide greenfield run-off rates, this provides a significant betterment on the existing discharge situation for all return period events, as demonstrated below in Table 6.3.3:

Return Period (Critical Storm)	Pre-developed / Greenfield runoff rate	Existing Brownfield Runoff Rate	Proposed Runoff	
			Rate	Betterment on Existing
1 year	4.0 l/s	26.4 l/s	**8.0 l/s**	**70%**
30 year	8.1 l/s	64.7 l/s	**8.0 l/s**	**88%**
100 year	9.9 l/s	89.6 l/s	**-**	-
100 year + 40% Climate Change Allowance	-	-	**8.0l/s**	**91%**
100 year 360-minute volume	140m^3	163.8m^3	**145m^3**	**11%**

Table 6.3.3 Existing and Proposed Discharge Rates

The above demonstrates the significant betterment that will be provided with a proposed maximum flow rate of 8.0l/s for all events up to and including the 100 year + c/c allowance storm event.

It is stated within Policy S2 that surface water should be managed to prevent, so far as possible, any discharge from the site for majority of rainfall events of less than 5mm. The use of blue roofs, raingardens and permeable paving to the site will provide interception and source control to the majority of run-off and therefore comply with this requirement.

6.4 Surface Water Management, Treatment and Storage Strategy (Policy S3, S4, S5 of SuDS Statutory Standards)

During the initial meeting with the SAB, their requirements and what they expect to see for a successful approval were discussed. A formal 'pre-app' submission has been made to the SAB in advance of the planning application and subsequent full SAB approval submission to agree the principles outlined in this report strategy. Refer to Section 6.8 for further details on the pre-app.

As discussed within the previous sections, it is proposed to restrict the surface water discharge to 8.0l/s for all events up to and including the 100 year + c/c allowance storm event, into the existing surface water drain on-site which discharges to the south of the site. In order to facilitate this, careful management of surface water will be required to control and store runoff for gradual release.

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In accordance with good practice, CIRIA C753 SuDS Manual ("The SuDS Manual") has been referred to in the design of the on-site surface water drainage system.

Table 4.3 of the SuDS Manual sets out the water quality management requirements for discharges to receiving surface waters. In accordance with Table 4.3, the Pollution Hazard Level of "Low" has been determined for the site, characterised by "*residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads)*". Therefore, the Simple Index Approach is applicable for the treatment design.

Table 26.2 of the SuDS Manual sets out the SuDS pollution mitigation indices to be used when following the Simple Index Approach (SIA). For a Pollution Hazard Level of 'Low', the pollution mitigation indices for total suspended solids (TSS), metals and hydrocarbons are 0.5, 0.4 and 0.4 respectively.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones and general access road) and non-residential car parking with infrequent change.	Low	0.5	0.4	0.4

Table 6.4.1 – Required SuDS Mitigation Indices

It is proposed to implement various elements of sustainable drainage measures on the site:

Green Roofs

It is proposed to implement green roofs to the top-level rooftops of both proposed apartment buildings. These cover approximately 258m^2 for the west block and 229m^2 for the east block. The green roof design will encompass a cellular attenuation layer to store water at source and slow down the run-off entering the below ground drainage network serving the site.

It is currently proposed to restrict discharge to 1l/s from each roof. Preliminary storage calculations estimate that approximately 20m^3 of storage would be required on each roof, at 100mm deep. The appointed green/blue roof designer will determine the exact volumes of storage required as part of their detailed design package.

Green roofs contribute significantly during common storm events, particularly in warmer periods when soil moisture deficit is high, generating very little runoff during common intense short duration events. Figure 12.1 of Ciria C753 The SuDS Manual shows that during 70-80% of rain events there is no runoff from green roofs when 100mm of substrate is present.

The green roofs will therefore provide interception, treatment and storage of runoff at source, as well as biodiversity benefits.

Raingardens

The communal areas between the proposed apartment blocks will have staggered pathways surrounded with landscaping to combat the steep topography through the site.

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The landscape design will include rainwater gardens at appropriate locations to receive run-off, which will provide interception, treatment and storage to slow run-off as it travels downward through the site. These also provide biodiversity benefits as well as amenity benefits to the residents navigating through the site. Flush edge kerbing will be used along pathway edges adjacent to the raingardens to direct runoff into the bioretention areas.

These cascading raingardens serving the central corridor will have a lined storage stone layer below-ground with perforated underdrainage to collect and convey runoff, preventing large volumes of infiltration into the existing deep made ground. Catchpit gullies will be located on the outlets at low points in the raingardens to drain ponding run-off in rare intense storm events. Link pipes will be provided with 'Aco Swale Inlet' type inlets to inter-connect the raingardens. Due to the land gradients and the potential velocities in intense storm events, a stone channel will be formed with gravel bedding to prevent plant washout/erosion.

The inter-connecting raingardens will ultimately discharge into the new below-ground drainage network towards the south of the site.

The type and spread of the planting and species within the raingardens will be specified by the landscape architect.

Whilst the raingardens won't be receiving any untreated run-off from vehicular areas, these bioretention areas are able to provide the following mitigation indices:

SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Bioretention System	0.8	0.8	0.8

Table 6.4.2 – Bioretention SuDS Mitigation indices (reproduced from Table 26.3 of C753 The SuDS Manual)

Permeable Paving

Permeable paved parking bays will be implemented to provide interception and treatment of run-off to vehicular areas. The permeable sub-base will provide attenuation of run-off, even where infiltration is not possible.

The very northern parking bays along the northwestern boundary of the site will be under-drained, with the treated runoff connected into the most northern of the raingardens. A 500Ø 'controflow' weir chamber will be provided to slow-down the runoff leaving the porous paving. This area of permeable paving will be a 'Type C' system with approximately 300mm of porous sub-base (subject to CBR testing and detailed external works designs) to provide storage. The paving will have an impermeable liner to prevent infiltration of runoff into the made ground beneath.

The 5no parking bays located adjacent the refuse store to the south of the site (north of the large parking area), and the 2no parking bays located to the southeast of the site will be provided in the same way, with under-drainage and contraflow chambers into the on-site drainage network.

The larger parking area to the very south of the site will be constructed as a 'Type B' permeable paving system, allowing for partial infiltration, due to the shallow depths of existing made ground in this location and the opportunity to rest on natural strata (as discussed previously and the findings of the initial site investigation undertaken by Integral Geotechnique). An infiltration coefficient has been assumed as 0.036m/hr (Table 25.1 of C753 SuDS Manual) for current design purposes. The exact infiltration rate will be determined on receipt of site specific BRE365 testing to this area. This area of permeable paving is located on the proposed surface water discharge location and will be provided with 600mm of porous sub-base to provide additional attenuation and maintain the maximum 8.0l/s discharge rate whilst ensuring of no on-site flooding. The porous sub-base will be locally increased/deepened where the surface water pipework from the site passes through, and the pipework

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perforated to allow for backflow of water into the porous sub-base storage during intense rare storm events. The total volume of storage required will be determined during the detailed design process on receipt of site specific BRE365 soakage test results.

Wern Road is not an adopted highway along its full length and becomes a private shared access road to the south, under the ownership of the developer. A cut-off channel will be installed on the ownership boundary and connected into the existing surface water drain (bypassing the flow control) to prevent runoff from the public highway entering the private on-site drainage network.

The privately owned extent of Wern Road will be re-surfaced and drained as part of the redevelopment and subjected to surface water treatment and run-off flow control. It will be re-graded with a crossfall towards the permeable paved parking area for draining, and the existing road gullies removed.

In accordance with Table 26.3 of the SuDS Manual, permeable pavements achieve mitigation indices of 0.7 for TSS, 0.6 for metals and 0.7 for hydrocarbons for discharges to surface waters:

SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7
Required	**0.5** ✓	**0.4** ✓	**0.4** ✓

Table 6.4.3 – Permeable Paving Mitigation indices (reproduced from Table 26.3 of C753 The SuDS Manual)

The above table 6.4.3 demonstrates that the vehicular areas meet the required pollution mitigation shown within table 6.4.1.

SuDS Component	Interception	Source Control / Storage	Primary Treatment
Green Roof	✓	✓	✓
Raingarden	✓	✓	✓
Permeable Paving	✓	✓	✓

Table 6.4.4 – SuDS Component Summary (reproduced from Table G3.3 of the Statutory Standards for SuDS)

Flow Control Device and Outfall Connection

A ‘hydro-brake’ flow control chamber will be provided at the downstream end of the drainage network to restrict runoff to 8l/s. The outlet pipe from this chamber will connect into the existing drainage leaving the site with a new manhole constructed on the existing pipe.

The existing surface water drain that passes through the site will be maintained, bypassing the new drainage system and flow control, as this is receiving runoff from the adopted highways extent of Wern Road as well as small some runoff from Pontycapel Road.

The entire on-site system is to remain in private ownership and under the future maintenance of the developer.

The proposed drainage drawing can be found within Appendix H and Calculations within Appendix I.

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6.5 Surface Water Network Design Calculations Parameters

Drainage calculations have been undertaken to the Modified Rational Method, with location specific FSR rainfall data used to simulate various rainfall event durations for the 1 year, 30 year and 100 year + Climate Change (C/C) allowance return periods. Causeway Flow software (v10.7) has been utilised to demonstrate capability of the surface water drainage system.

As the green roofs are not a below-ground/ground level drainage element, these have been modelled as depth/area storage structures with a head/flow 'flow control' and associated catchment area to simulate the 1l/s entering the below ground drainage network for the various storm events and return periods.

The raingardens have been modelled as storage 'flow through ponds' in the software and permeable paving sub-base storage 'car park' storage with a porosity of 30% to represent the void ratio of the sub-base.

The surface water drainage network has been designed to suit the following conditions:

- 1:1 year pipe full.
- 1:30 year surcharged.
- 1:100 year + 40% C/C minor flooding acceptable but to be contained within the site boundary.

Whilst controlled flooding is often acceptable in the 1:100 year + Climate Change allowance event, the current drainage design ensures of no flooding in all modelled events with the "critical" results showing no flooding.

Surface water drainage calculations can be found with Appendix I.

6.6 Flood Risk Elsewhere (Policy S2 of SuDS Statutory Standards)

As discussed within section 6.3, the proposed discharge rate of 8.0l/s is a significant betterment on the existing scenario. This therefore provides a reduction in Flood Risk Elsewhere when compared with the existing situation.

Flood exceedance flow pathways have been identified should there be an exceedance event or failure of the drainage systems. This drawing can be found within Appendix J.

The existing surface water outfall has been investigated as discussed earlier within this report. This outfall discharges to land south of the development. Although this isn't ideal, by restricting the discharge entering this outfall, flood risk elsewhere will be significantly reduced and therefore so will the overland flows. This has been discussed with the SAB, who has advised on the re-use of this outfall. This is discussed further in Section 6.8.

6.7 Foul Water Drainage

The foul drainage network serving the site is to discharge to the existing Welsh Water foul drain on-site, subject to the standard S106 approval with the water authority.

Due to the topography of the site and the proposed finished floor levels to the lower-ground flat apartments of the proposed east block, approximately 14 apartments will need to be served by a private pump station on-site, discharging into the on-site private gravity drainage serving the site. Pump rates are to be confirmed, however based on nine two-person and five three-person apartments, 4950L 24hr of emergency storage will be required within the GRP pump chamber.

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The pump chamber has been located beneath an area of parking bays, ensuring of full accessibility from the access road for maintenance purposes and away from the residential apartments.

The foul network has been designed in accordance with BS EN 752 and Building Regulations Part H, to self-cleansing velocities. The foul drainage system is fully accessible with the use of inspection chambers as well as full-size man-entry manholes.

The entire on-site system is to remain in private ownership and future maintenance of the developer.

The proposed drainage drawing can be found within Appendix H.

6.8 SuDS Approval Body (SAB) Pre-Application Review, Advice and Consultation

As discussed within this report, a formal 'Pre-App' submission was made to Merthyr Tydfil County Borough Council (MTCBC) SAB to obtain a formal commentary on the current proposals, in advance of the planning application and formal SAB Approval process. This provides the SAB an opportunity to pass comment on the proposals early in the design process, allowing for a better degree of design certainty during design development and in advance of the subsequent formal approvals.

The initial pre-application submission pre-dated the extensive investigations into the surface water outfall. The SAB Pre-Application review dated 31/10/2023, reference SAB/PRE/23/0008, is positive and accepts that the restricted nature and steep topography of the site provides relatively limited SuDS opportunities. The response advises that MTCBC SAB offer no objection to the proposals and acknowledges that the current proposals carefully consider the SuDS Statutory Standards.

The SAB advised within the Pre-Application review that the following further information is required for the full SAB Approval submission in due course:

- Details of rainwater harvesting systems for grey water re-use or valid reasoning for their omission in accordance with Standard S1 of the Statutory SuDS Standards.
- Confirmed condition, capacity and destination of the existing surface water outfall is suitable for re-use (since confirmed, see below)
- Full Ground Investigation Report including groundwater levels, BRE365 testing where required etc.
- Full SuDS Storage calculations for 1:100 +40% C/C (Stage 4 Design)
- Dimensioned section drawings for all SuDS components (Stage 4 Design)
- Site sections with SuDS components included (Stage 4 Design)
- Manhole Schedule (Stage 4 Design)
- Green/Blue Roof Specification
- Green/Blue roof maintenance requirements
- Landscaping plan with SuDS planting specification

As described earlier within this report and requested by the SAB in their pre-app response, extensive investigations into the existing surface water outfall were undertaken on 19/12/2023. This confirmed that the 225mm outfall pipe leaves the southern parking area and discharges into a small open stream via a brick headwall approximately 20m south of the site. This watercourse spans for a further 20m or so, before it appears to disperse onto open ground south of the site. The water either infiltrates here or makes its way to the Taff Fawr River overground. It may be

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possible that the watercourse originally continued further towards the Taff Fawr river embankment but became overgrown or deteriorated over time, although there was no indication of this found by the surveyors.

The SAB were re-consulted in January 2024 with the results of these investigations to gauge their thoughts on the findings and whether this outfall is still suitable for re-use given the current outfall also receives highway run-off from Wern Road as well as Pontycapel road.

The SAB advised that although not ideal, the current arrangement should be left as is and re-used as part of the re-development. The development is providing a significant betterment and as such will see a reduction in any overland flows in any case.

The SAB advised that the area where the surface water is discharging to is low risk from surface water flooding and should the land be developed in the future, the developer would need to install some formal drainage to cater for any overland flows.

Full MTCBC SAB consultation/correspondence can be found within Appendix K of this report.

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7 MAINTENANCE SCHEDULE

(Policy S6 of SuDS Statutory Standards)

7.1 Drainage channels and gullies

Channel sumps and gullies are to be inspected and cleaned if required every six months. Gratings are also to be checked during this operation to ensure adequate seating and fastening is maintained to prevent the forming of trip hazards and the impediment of water flow.

Channel inverts are to be inspected and jetted or rodded every twelve months. The sumps should also be cleared out following this operation to prevent blockages.

7.2 Surface water flow control device (Hydro-Brake)

Inspection is to be carried out every six months. Any silt accumulation is to be disposed of and any damage present should be reported to the manufacturer/supplier for review.

There is an emergency drain-down door on the front of the device which can be opened from the surface using the pull-wire. This is only to be used during a blockage of the device to allow for draining of the manhole to facilitate clearance/maintenance of the flow control device and should be shut as soon as the maintenance is complete.

7.3 Catchpit manholes

The sump of each catchpit manhole is to be checked and emptied of silt/debris every six months.

7.4 Chamber covers and adjacent areas

Chamber covers, and abutting pavements are to be checked on an annual basis. Any damage or deformities are to be amended to prevent the formation of a trip hazard. Covers are to be replaced with similar performance products as those initially specified by the Civil Engineer.

7.5 Surface and foul water drainage pipes and chambers

The surface and foul water systems have been designed in accordance with current UK standards and good practice to ensure a self-cleansing regime. Any blockages that occur are to be rectified by rodding or jetting as required by a suitably certified organisation.

Chambers are to be visually inspected by lifting the covers every twelve months. Any silt or debris is to be removed. Anyone undertaking this task should ensure that they take relevant safety precautions before accessing the chambers.

For surface water, catchment areas should be well maintained, free of debris and excessive vegetation kept to a minimum to prevent the ingress of debris and silting up of the system.

7.6 External hardstandings

All external hardstandings (excluding permeable paving – see section 7.7 below) should be mechanically cleaned of debris by a truck mounted sweeper to remove silt and any build-up of hydrocarbons on a yearly basis.

Any petrol/oil spillages should be cleaned up as soon as possible after occurrence.

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7.7 Permeable paving

Maintenance Schedule	Activity	Typical Frequency
Regular	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 or clogging or manufacturer's recommendations - Paying attention to areas where water runs onto pervious surface from adjacent areas (area most likely to collect sediment)
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required.
	Removal of weeds or management using glyphosate applied directly to weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Monitoring	Initial inspection	Monthly or three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial actions	Three-monthly, 48hr after large storms in the first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually
Remedial Action	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 substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)

7.8 Foul water pump station

A formal maintenance contract must be entered for the pump station with either the supplier or an approved contractor. Maintenance is to be carried out strictly in accordance with the manufacturer recommendations and instructions and a log kept demonstrating service intervals and repairs.

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7.9 Rain gardens

Maintenance Schedule	Activity	Typical Frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain 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 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 aesthetic or tidiness reasons.
	Replace and 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, improv erosion protection is required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years

The landscape architect is to further define any detailed maintenance requirements to suit specific planting/species of the rain gardens.

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8 CONCLUSION

Section 4 reviewed flood risk to the site from various sources including rivers, surface water and small watercourses, sewers, groundwater and artificial sources. This review found the site to be within flood zone 1 / low risk from all identified sources. The site is located within Zone A on the Development Advice Map.

The development is classified as 'Highly Vulnerable Development' as shown in Table 5.1. In accordance with table 5.2.1, the development location is justified.

Due to unsuitable ground conditions and excessive depths of made ground, the use of infiltration methods as a primary discharge solution is not considered a viable option for the disposal of surface water runoff.

SuDS have been proposed throughout the site, with the use of green roofs to the apartment buildings, which will encompass a cellular attenuation drainage layer to store water at source and slow down run-off entering the below-ground drainage serving the site.

The landscape design of the site will include raingardens at appropriate locations along the central pedestrian corridor, providing interception, treatment and storage to slow run-off as it travels downward through the site. This will also provide biodiversity and amenity benefits to the scheme.

The proposed parking bays at the site are to be provided as permeable paving, providing interception, source control and treatment of runoff from vehicular areas. The large car park area to the very south of the site will allow for partial infiltration, due to favourable ground conditions in this location, and will also drain the private extent of Wern Road with the use of a crossfall across the access road.

The Simple Index Approach as set out within Ciria C753 'The SuDS Manual' has been followed to demonstrate pollution mitigation.

Additional water quality measures will be provided by the inclusion of appropriate deep silt trapped gullies and silt boxes to all channel drains.

The existing drainage network has been analysed and existing flow rates calculated as shown in Table 6.1. It is proposed that the rate of surface water runoff from the proposed development be restricted to 8l/s, providing a significant betterment on the existing scenario. The necessary attenuation will be provided using the porous paving, raingardens and blue roof systems throughout the site.

The surface water drainage design ensures of no flooding in all events up to and including the 1:100 year + 40% climate change allowance return period event.

Foul water is to discharge to the existing Welsh Water foul sewer located on-site. Due to the topography of the site and the finished floor levels, 14 apartments within the proposed east block will require a GRP pump station to dispose of foul drainage.

Finished levels will ensure that any flood exceedance pathways are directed away from people and property.

The on-site foul and surface water drainage systems are to remain in private ownership, maintained by the developer in accordance with the maintenance schedule.

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APPENDIX A – SITE LOCATION PLAN

Subteno
Engineering Consultants

PROJECT: Cefn Isaf Redevelopment	REF 220807	REVISION 01
TITLE: Site Location Plan	BY NR	DATE JULY 2023

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Cefn Isaf Flats Redevelopment, Pontycapel Road, Cefn Coed, Merthyr Tydfil, CF48 2RH

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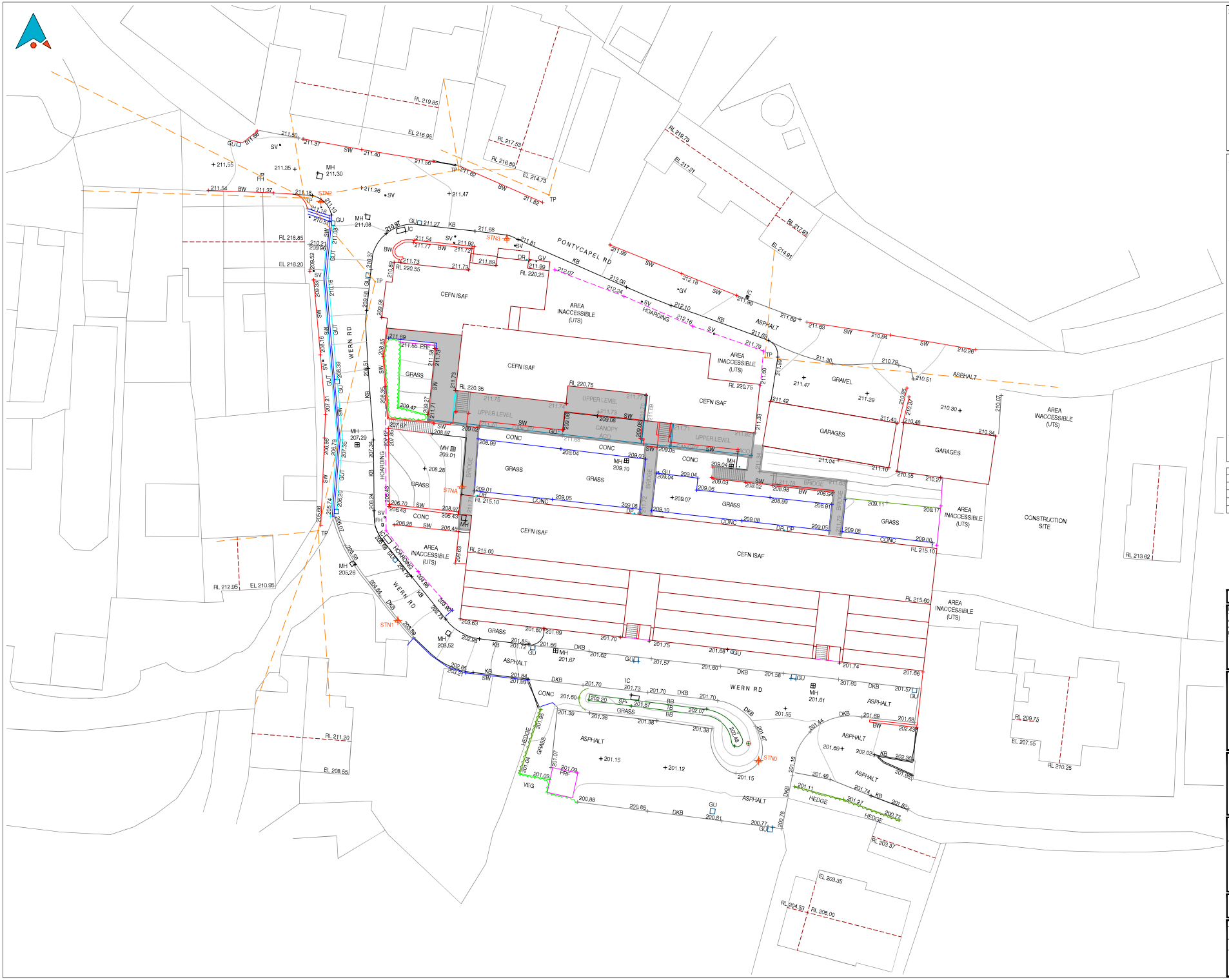
APPENDIX B – TOPOGRAPHICAL SURVEY



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5. This survey has been undertaken to OS National Grid & Datum (OSTN15) with a calculated local scale factor for this location.

LEGEND

BUILDING		DRAIN	
CANOPY	CPY	DROP KERB	DKB
DOORLINE	DRL	EARTH ROD	ER
DOWNPIPE	DP	ELECTRICITY BOX	EB
EAVES	EV	FIRE HYDRANT	FH
GUTTER	GUT	FOOTPATH	FP
RIDGE	RG	GAS VALVE	GV
ROOF LINE	RFL	GULLY	G
VENT PIPE	VP	HIGH VOLTAGE OVERHEAD	HVO
WINDOW LINE	WDL	INSPECTION CHAMBER	IC
		KERB BOTTOM	KB
BOUNDARIES		KERB OUTLET	KO
ARMCO BARRIER	AB	LAMP POST	LP
BARRIER	BAR	LOW VOLTAGE OVERHEAD	LVO
BRICK WALL	BW	MANHOLE	MH
CHAIN LINK FENCE	CLF	REFLECTOR POST	RP
CLOSE BOARD FENCE	CBF	ROAD SIGN	RS
CONCRETE PANEL	CPF	SLOT DRAIN	SDR
CORRUGATED IRON	CIF	STOP TAP	W
GABION WALL	GW	TACTILE PAVING	TPV
GATE		TELECOM POST	TP
GRATED HEADWALL	GHW	TRAFFIC LIGHT	TL
HEADWALL	HW	WATER METER	WM
HOARDING / HERAS	HF		
INTERNAL WALL	IW	STRUCTURE	
PALISADE FENCE	PF	COLUMN	COL
PARTITION WALL	PW	CONCRETE PLINTH	CP
POST & RAIL FENCE	PRF	CONTAINER	CONT
POST & WIRE FENCE	PWF	RAMP	RMP
RETAINING WALL	RW	STEPS	ST
STONE WALL	SW		
		GENERAL	
TOPOGRAPHY		APPROXIMATE	~
BANK BASE	BB	BED LEVEL	BL
BANK TOP	TB	CONTROL STATION	✚
CLUSTER TREE	CLT	COVER LEVEL	CL
HEDGE	HE	DIAMETER	Ø
TREE	O	EAVES LEVEL	EL
TRUNK DIA / SPREAD	X.X / X	FINISHED FLOOR LEVEL	FFL
VEGETATION	VEG	HEIGHT	HT
WATERCOURSE	WC	INVERT LEVEL	IL
		RIDGE LEVEL	RL
FURNITURE		SOFFIT LEVEL	SL
ACO DRAIN	ADR	SPOT LEVEL	+ X.XX
BOLLARD	BD	UNABLE TO LIFT	UTL
BT MANHOLE	BT	UNABLE TO SURVEY	UTS
CABLE TV	CATV	WATER LEVEL	WL

CONTROL STATIONS

STN0	207652.455	303277.459	201.297
STN1	207668.722	303295.559	204.213
STN2	207717.433	303226.605	211.222
STN3	207713.106	303248.193	211.911

Rev	Date	Description	By

Dimensions to be verified on site.
This drawing should not be scaled. Use figured dimensions only
Any discrepancies should be referred to the Engineer prior to work being put in hand.
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THE SURVEY ASSOCIATION ASSOCIATE MEMBER

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Corner Point Surveys Limited
Columbus House, Village Way
Greenmeadow Business Park
Cardiff
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029 2080 100
contactus@cornerpointsurveys.co.uk
www.cornerpointsurveys.co.uk

Client: MERTHYR VALLEYS HOMES

Project: CEFN ISAF

Title: TOPOGRAPHICAL SURVEY

Drawing Status: INFORMATION

Surveyed by	Processed by	Checked by	Date	Scale @ A1 size
JPW	JPW	ACV	AUG22	1:200
Project No		Drawing No		Revision
S22044		001		0

File name: S22044-01-Cefn Isaf - Topographical Survey.dwg

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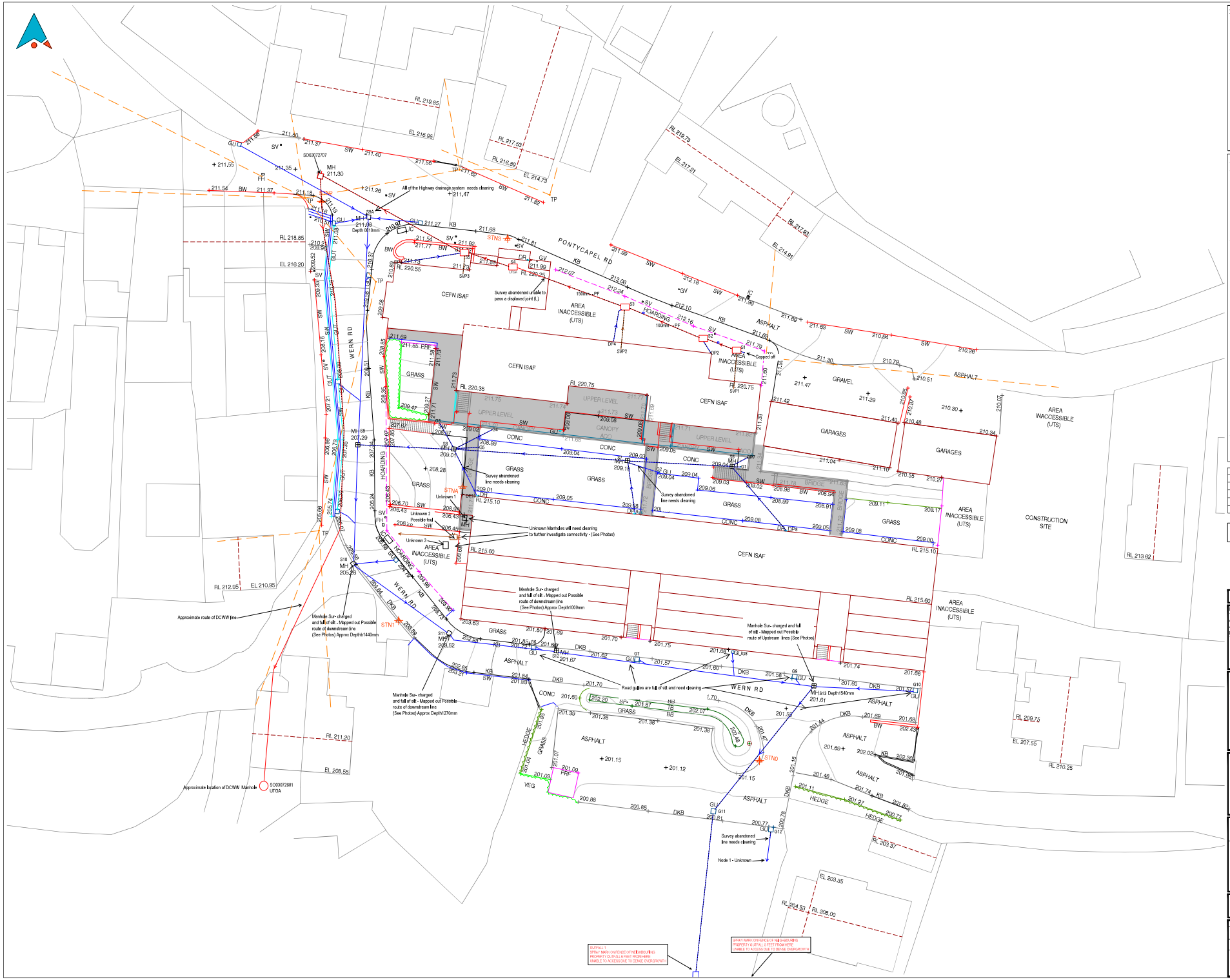
Registered in England 10891962.
www.subteno.co.uk

APPENDIX C – CCTV DRAINAGE SURVEY & EXISTING DRAINAGE MARK-UP



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LEGEND

BUILDING		DRAIN	DR
CANOPY	CPY	DROP KERB	DKB
DOORLINE	DRL	EARTH ROD	ER
DOWNPIPE	DP	ELECTRICITY BOX	EB
EAVES	EV	FIRE HYDRANT	FH
GUTTER	GUT	FOOTPATH	FP
RIDGE	RG	GAS VALVE	GV
ROOF LINE	RFL	GULLY	G
VENT PIPE	VP	HIGH VOLTAGE OVERHEAD	HVO
WINDOW LINE	WDL	INSPECTION CHAMBER	IC
		KERB BOTTOM	KB
BOUNDARIES		KERB OUTLET	KO
ARMCO BARRIER	AB	LAMP POST	LP
BARRIER	BAR	LOW VOLTAGE OVERHEAD	LVO
BRICK WALL	BW	MANHOLE	MH
CHAIN LINK FENCE	CLF	REFLECTOR POST	RP
CLOSE BOARD FENCE	CBF	ROAD SIGN	RS
CONCRETE PANEL	CPF	SLOT DRAIN	SDR
CORRUGATED IRON	CIF	STOP TAP	W
GABION WALL	GW	TACTILE PAVING	TPV
GATE		TELECOM POST	TP
GRATED HEADWALL	GHW	TRAFFIC LIGHT	TL
HEADWALL	HW	WATER METER	WM
HOARDING / HERAS	HF		
INTERNAL WALL	IW	STRUCTURE	
PALISADE FENCE	PF	COLUMN	COL
PARTITION WALL	PW	CONCRETE PLINTH	CP
POST & RAIL FENCE	PRF	CONTAINER	CONT
POST & WIRE FENCE	PWF	RAMP	RMP
RETAINING WALL	RW	STEPS	ST
STONE WALL	SW		
		GENERAL	
TOPOGRAPHY		APPROXIMATE	~
BANK BASE	BB	BED LEVEL	BL
BANK TOP	TB	CONTROL STATION	✚
CLUSTER TREE	CLT	COVER LEVEL	CL
HEDGE	HE	DIAMETER	Ø
TREE	O	EAVES LEVEL	EL
TRUNK DIA / SPREAD	X.X / X	FINISHED FLOOR LEVEL	FFL
VEGETATION	VEG	HEIGHT	HT
WATERCOURSE	WC	INVERT LEVEL	IL
		RIDGE LEVEL	RL
FURNITURE		SOFFIT LEVEL	SL
ACO DRAIN	ADR	SPOT LEVEL	+ X.XX
BOLLARD	BD	UNABLE TO LIFT	UTL
BT MANHOLE	BT	UNABLE TO SURVEY	UTS
CABLE TV	CATV	WATER LEVEL	WL

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STN0	207652.455	303277.459	201.297
STN1	207668.722	303295.559	204.213
STN2	207717.433	303226.605	211.222
STN3	207715.106	303248.193	211.911

Draintech Surveys Ltd
Job/Plan Ref: 17187 - 01 - 001

Rev	Date	Description	By

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www.cornerpointsurveys.co.uk

Client: MERTHYR VALLEYS HOMES

Project: CEFN ISAF

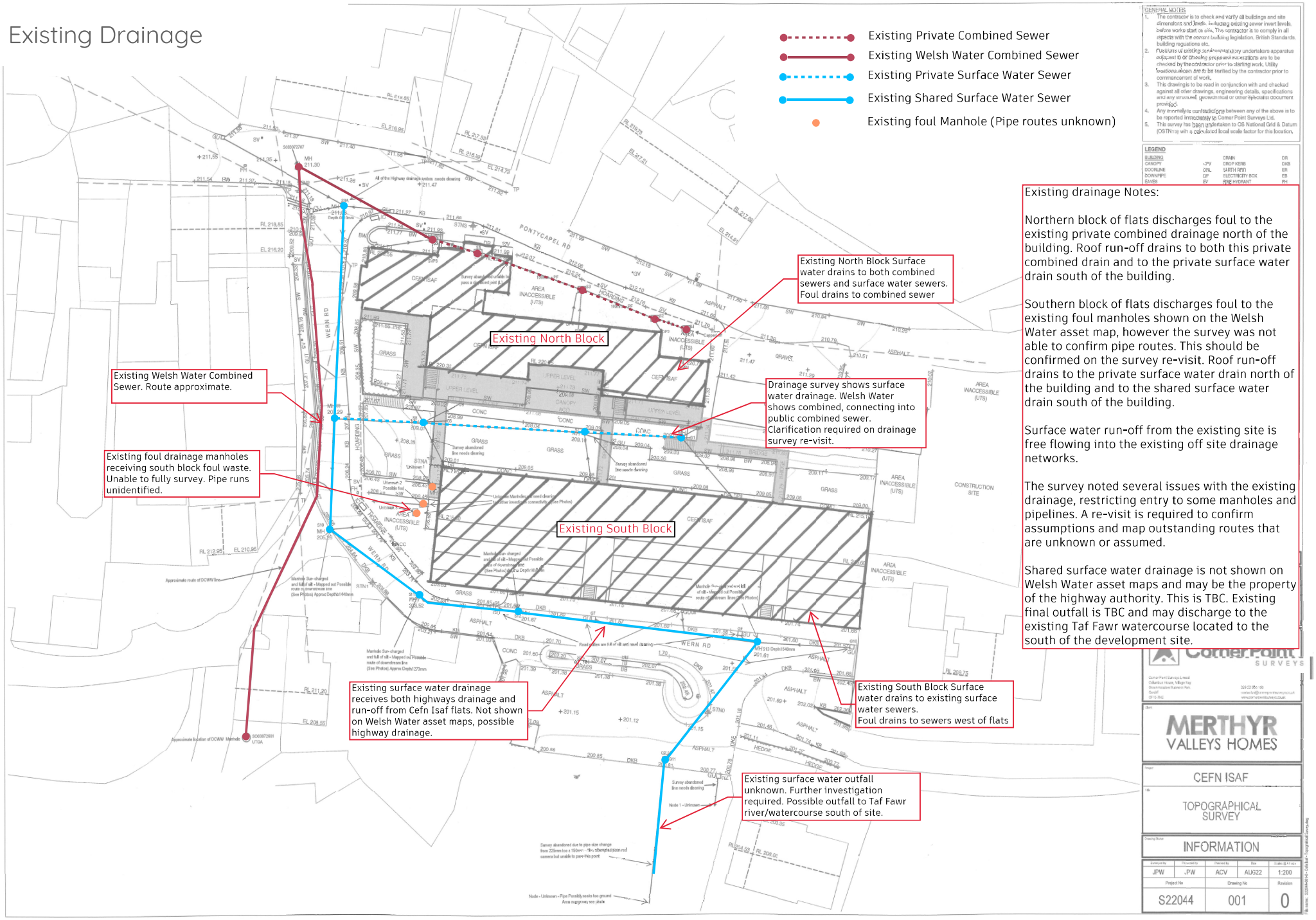
Title: TOPOGRAPHICAL SURVEY

Drawing Status: INFORMATION

Surveyed by	Processed by	Checked by	Date	Scale @ A1 size
JPW	JPW	ACV	AUG22	1:200
Project No		Drawing No		Revision
S22044		001		0

File name: S22044-001-CEFN ISAF - Topographical Survey.dwg

Existing Drainage



Existing drainage Notes:

Northern block of flats discharges foul to the existing private combined drainage north of the building. Roof run-off drains to both this private combined drain and to the private surface water drain south of the building.

Southern block of flats discharges foul to the existing foul manholes shown on the Welsh Water asset map, however the survey was not able to confirm pipe routes. This should be confirmed on the survey re-visit. Roof run-off drains to the private surface water drain north of the building and to the shared surface water drain south of the building.

Surface water run-off from the existing site is free flowing into the existing off site drainage networks.

The survey noted several issues with the existing drainage, restricting entry to some manholes and pipelines. A re-visit is required to confirm assumptions and map outstanding routes that are unknown or assumed.

Shared surface water drainage is not shown on Welsh Water asset maps and may be the property of the highway authority. This is TBC. Existing final outfall is TBC and may discharge to the existing Taf Fawr watercourse located to the south of the development site.

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CANOPY	CPY	DROP KERB	DKB
DOORLINE	DRL	EARTH PATH	ER
DOWNPIPE	DP	ELECTRICITY BOX	EB
EAVES	EV	FIRE HYDRANT	FH

Corner Point SURVEYS

MERTHYR VALLEYS HOMES

CEFN ISAF

TOPOGRAPHICAL SURVEY

INFORMATION

Surveyed by	Reviewed by	Checked by	Date	Scale @ A1 size
JPW	JPW	ACV	AUG22	1:200
Project No		Drawing No		Revision
S22044		001		0

PROJECT: CEFN ISAF
SKETCH No: 1759-XX-SK-10
REV: P1
DATE: 26/05/23
TITLE: EXISTING DRAINAGE MARKUP
DRAWN BY (CHECK): NR (LH)

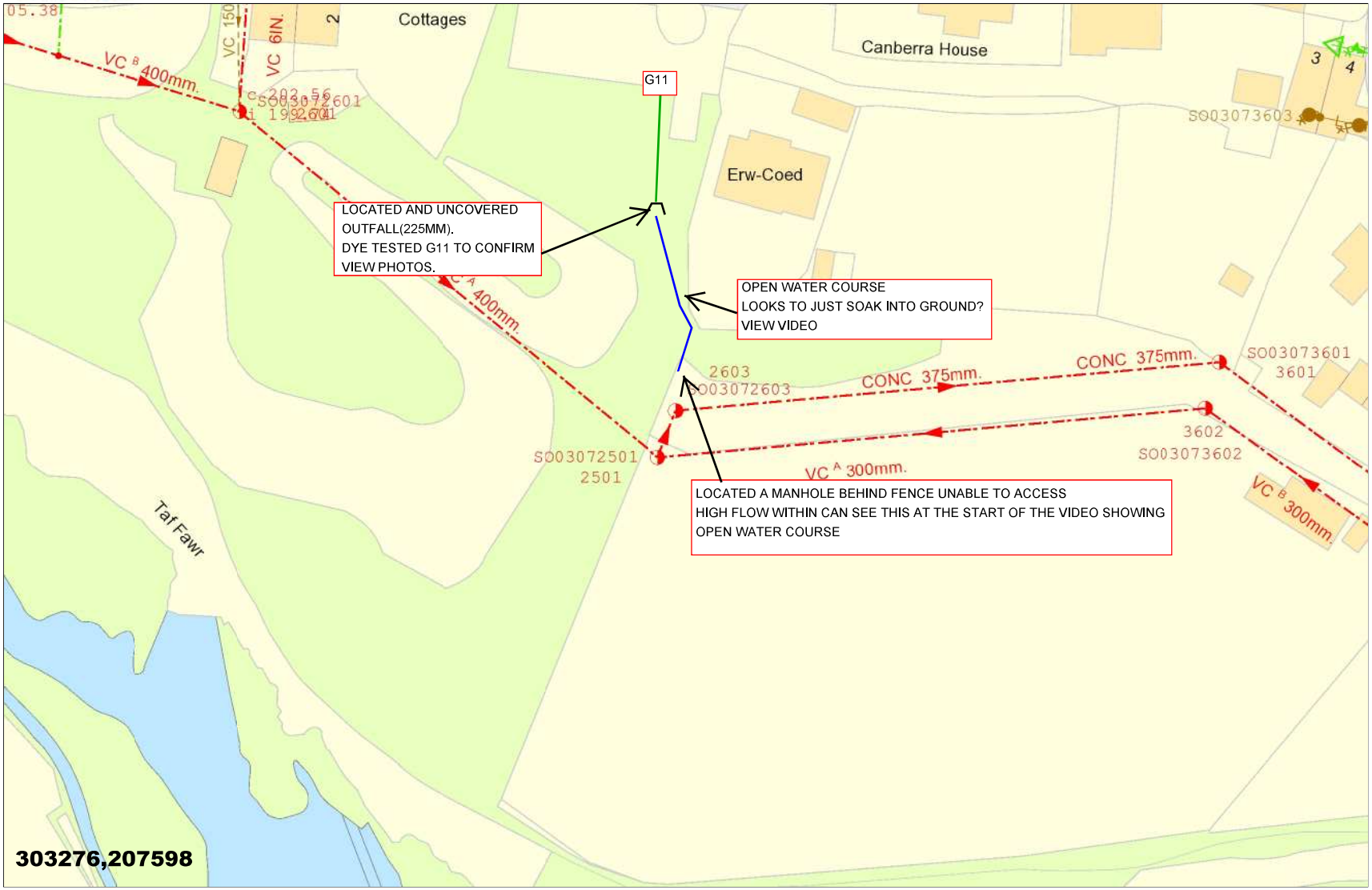
SIMPLE WORKS, UNIT 301, 203/213
MARE ST STUDIOS, LONDON, E8 3JS

Dŵr Cymru
Welsh Water

19/12/2023

N
W E
S

Scale: 1: 800



LEGEND

Clean Water

- Sluice Val
- Air Val, SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- BULK Meter
- FH
- Cap
- Existing Main
- NON COMPANY

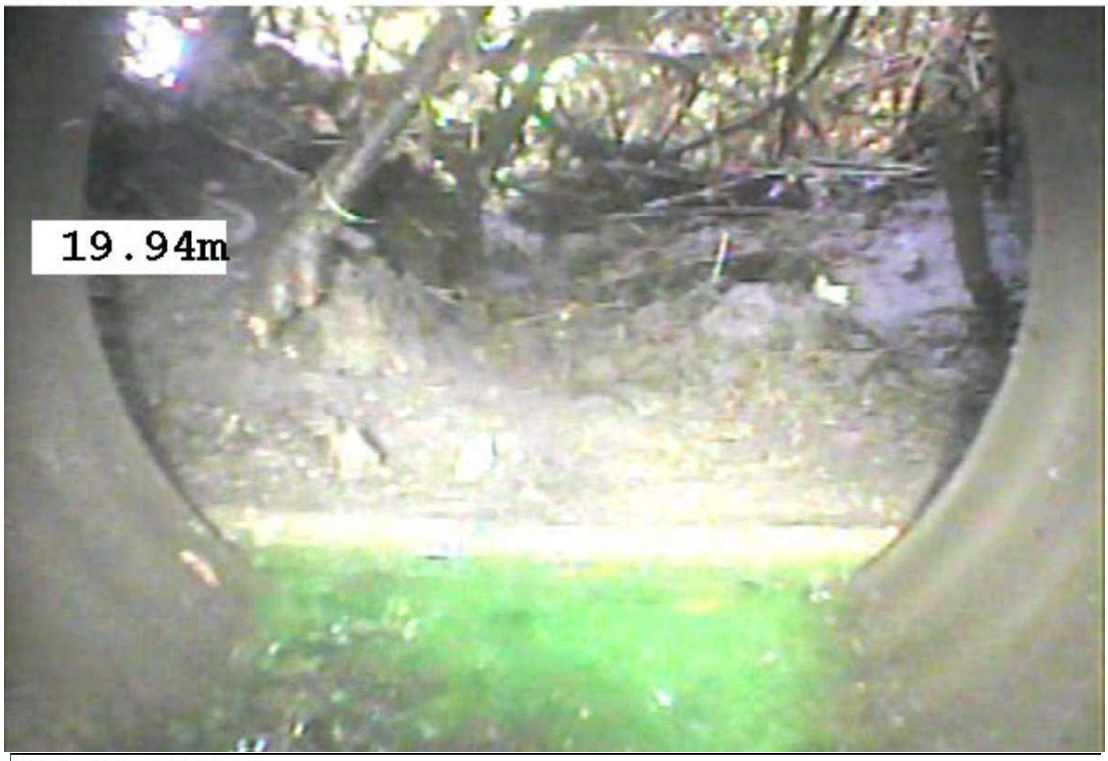
Sewerage External

- Foul
- Surface Water
- Combined
- Rising Main
- Private
- Treatment Works
- Pumping Station
- Special Purpose
- Unknown End
- Change, Combined Overflow
- Outfall, FOUL
- Lamp Hole, Foul
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

EXACT LOCATION OF ALL APPARATUS TO BE DETERMINED ON SITE

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be Asbestos Cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

CEFN ISAF



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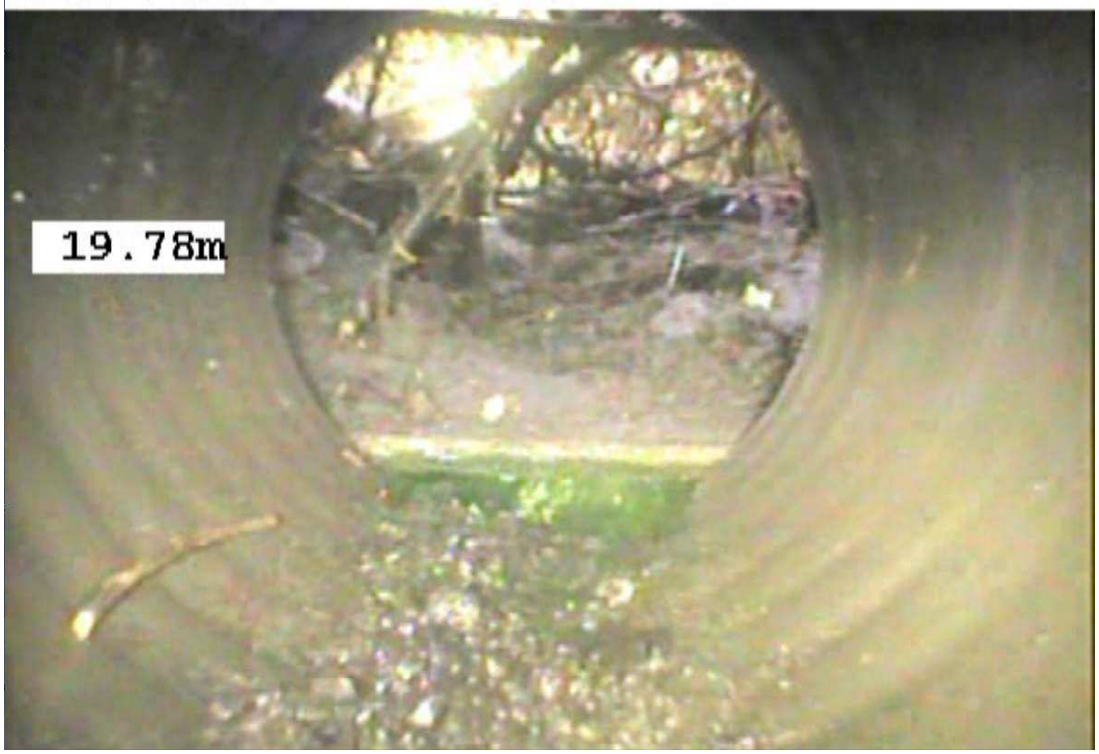

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APPENDIX D - PROPOSED DEVELOPMENT PLANS

Location Plan

N

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Revision

REV	DATE	DESCRIPTION
P01	30/06/2023	STAGE 2 ISSUE
P02	30/10/2023	DRAFT - PLANNING

Notes

COFFEY / ARCHITECTS
11-12 Great Sutton Street, London, EC1V 0BX / +44 (0)20 7549 2141
www.coffeyarchitects.com

Project Name	Project No.
CEFN ISAF	1187

Drawing Name
LOWER GROUND FLOOR PLAN

Status
PLANNING

Drawn	Checked	Scale	Sheet
TL	LM	1:200	A1

Code Origin	Vol. Lvl. Typ. Rl. Identifier	Revision
CEF-CoA-	00-00-DR-A-100	P02

Location Plan

N

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Revision

REV	DATE	DESCRIPTION
P01	30/06/2023	STAGE 2 ISSUE
P02	30/10/2023	DRAFT - PLANNING

Notes

COFFEY / ARCHITECTS
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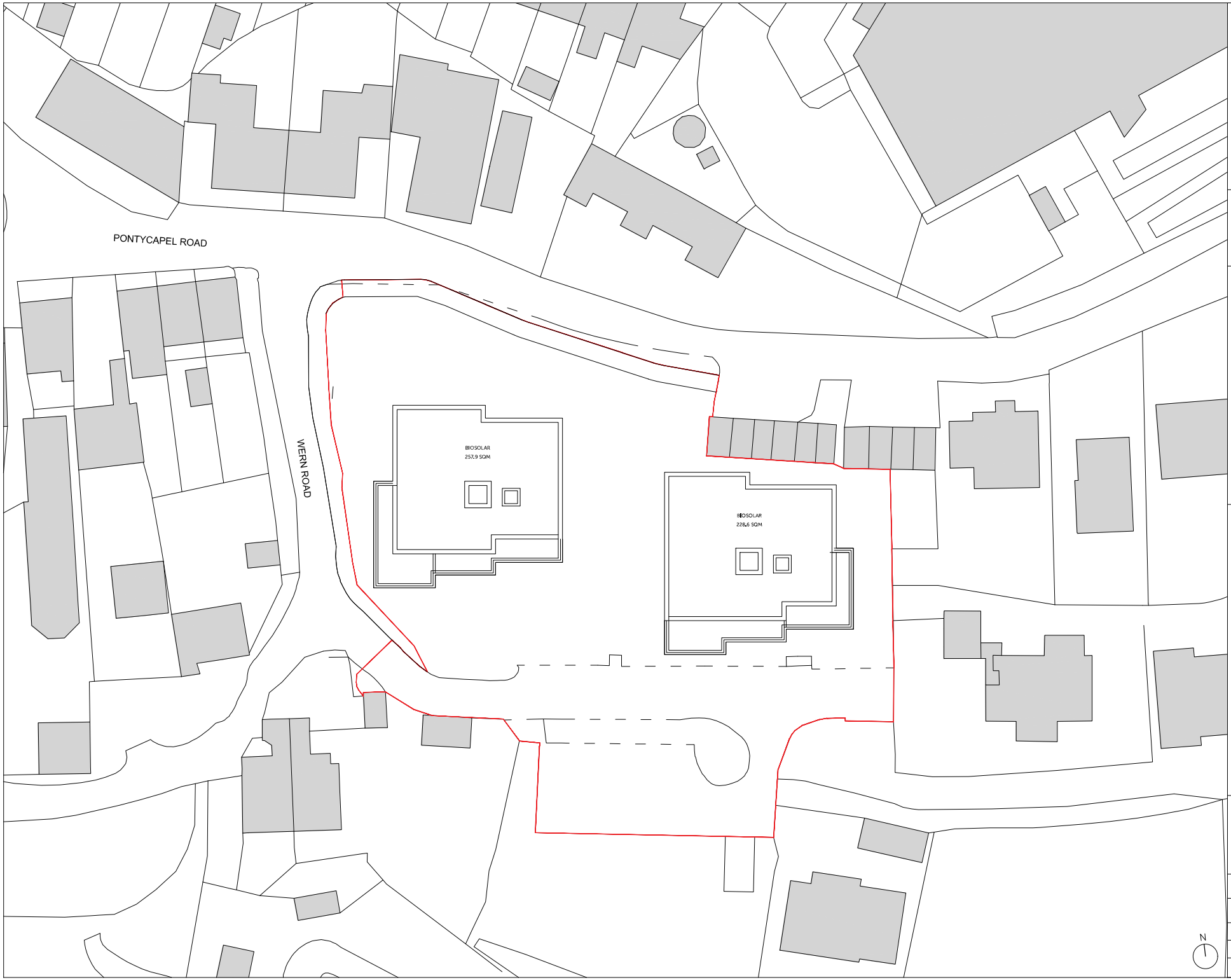
Project Name: CEFN ISAF	Project No.: 1187
Drawing Name: GROUND FLOOR PLAN	
Status: PLANNING	
Drawn: TL / Checked: LM / Scale: 1:200 / Sheet: A1	
Code: CEF-CoA- / Origin / Vol. / Lvl. / Type / R. / Identifier: 00-00-DR-A-101	Revision: P02



Location Plan

N

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Revision

REV	DATE	DESCRIPTION
P01	30/06/2023	STAGE 2 ISSUE
P02	30/10/2023	DRAFT - PLANNING

Notes

COFFEY / ARCHITECTS
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Project Name: CEFN ISAF
Project No.: 1187
Drawing Name: ROOF PLAN
Status: PLANNING
Drawn: TL
Checked: LM
Scale: 1:200
Sheet: A1
Code Origin: CEF-CoA-
Vol. Lvl. Type R. Identifier: 00-00-DR-A-105
Revision: P02

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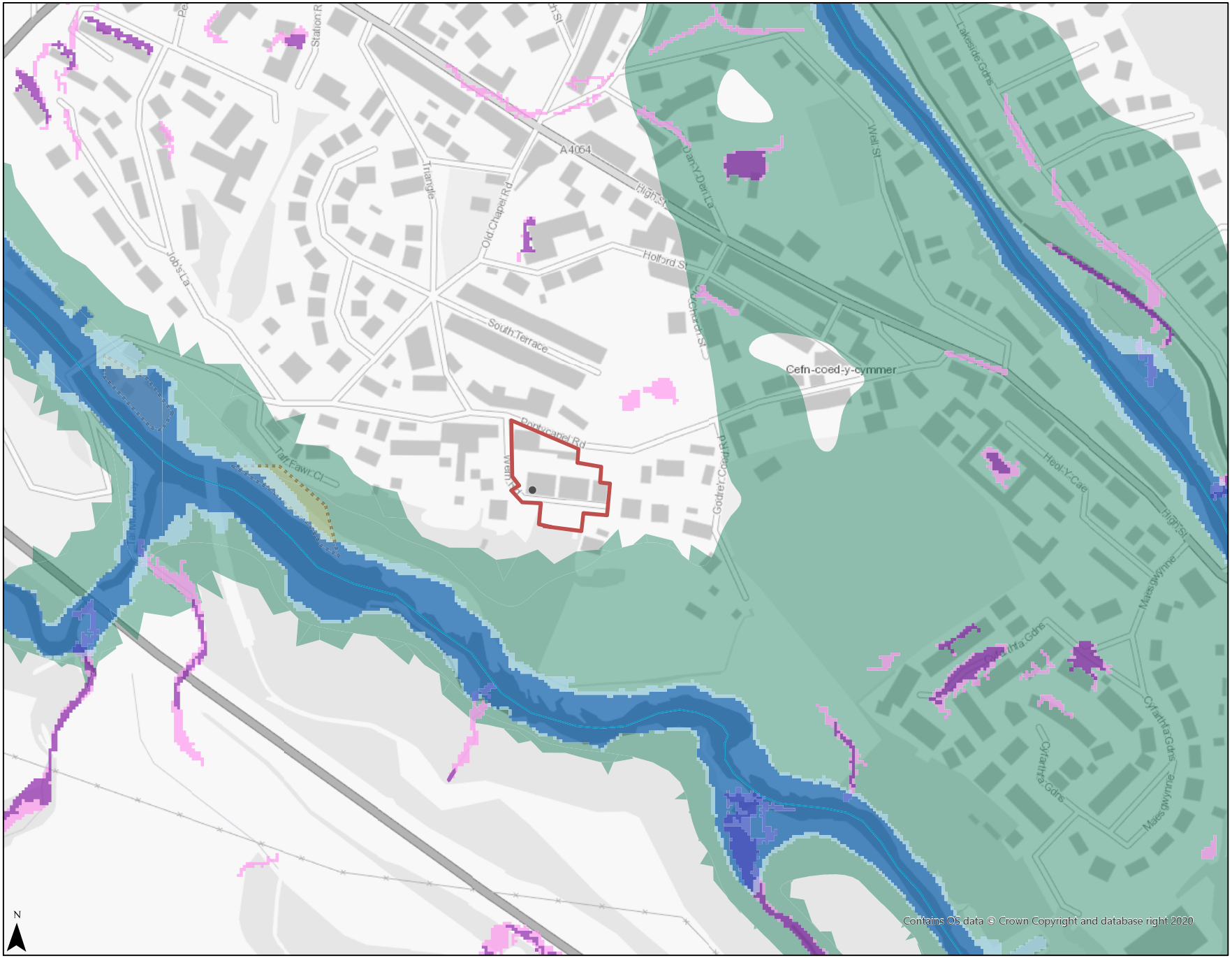
APPENDIX E – FLOOD MAP FOR PLANNING



Cyfoeth Naturiol Cymru
Natural Resources Wales

Flood Map for Planning - Detail

Cefn Isaf Redevelopment

Legend

- Flood Defence Locations

TAN15 Defended Zones

- Rivers
- Sea
- Rivers and Sea

Rivers

- Flood Zone 3
- Flood Zone 2

Sea

- Flood Zone 3
- Flood Zone 2

Surface Water and Small Watercourses

- Flood Zone 3
- Flood Zone 2
- Recorded Flood Extents
- Flood Risk from Reservoirs
- Main Rivers

Scale at A3: 1:2,500

Date: 27/07/2023

110 55 0 110

m

British National Grid

Disclaimer

https://naturalresources.wales/flooding/disclaimer-for-our-flood-and-coastal-erosion-risk-maps/?lang=en

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APPENDIX F – BROWNFIELD RUNOFF CALCULATIONS

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
S13	0.083	5.00	201.610	1000		303283.783	207661.142	1.540
G11	0.028	5.00	200.771	600		303272.107	207646.561	1.280
G11-OFFSITE			200.700	600		303269.743	207637.707	1.265
S5	0.043	5.00	211.650	1280	600	303243.352	207711.499	1.670
SO03072707			211.300	1140	760	303226.467	207720.363	1.820
S8	0.085	5.00	209.043	660	500	303241.969	207688.660	0.760
S9			207.314	750	600	303230.819	207689.156	0.990

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	18.680	32.3	225	Circular	201.610	200.070	1.315	200.771	199.491	1.055
3.001	9.164	163.6	225	Circular	200.771	199.491	1.055	200.700	199.435	1.040
1.000	19.070	38.1	150	Circular	211.650	209.980	1.520	211.300	209.480	1.670
2.000	11.161	5.7	150	Circular	209.043	208.283	0.610	207.314	206.324	0.840

Link	US Node	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
3.000	S13	1000		Manhole	Standard	G11	600		Manhole	Standard
3.001	G11	600		Manhole	Standard	G11-OFFSITE	600		Manhole	Standard
1.000	S5	1280	600	Manhole	Standard	SO03072707	1140	760	Manhole	Standard
2.000	S8	660	500	Manhole	Standard	S9	750	600	Manhole	Standard

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.200	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S13	10	200.118	0.048	9.3	0.0896	0.0000	OK
15 minute winter	G11	10	199.582	0.091	12.4	0.0658	0.0000	OK
15 minute winter	G11-OFFSITE	10	199.519	0.084	12.2	0.0000	0.0000	OK
15 minute winter	S5	10	210.022	0.042	4.8	0.0543	0.0000	OK
15 minute winter	SO03072707	10	209.521	0.041	4.8	0.0000	0.0000	OK
15 minute winter	S8	10	208.320	0.037	9.5	0.0953	0.0000	OK
15 minute winter	S9	10	206.360	0.036	9.4	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S13	3.000	G11	9.2	0.888	0.100	0.1977	
15 minute winter	G11	3.001	G11-OFFSITE	12.2	0.859	0.302	0.1305	5.8
15 minute winter	S5	1.000	SO03072707	4.8	1.193	0.165	0.0761	2.2
15 minute winter	S8	2.000	S9	9.4	2.844	0.126	0.0370	4.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S13	10	200.146	0.076	22.8	0.1416	0.0000	OK
15 minute winter	G11	10	199.651	0.160	30.4	0.1156	0.0000	OK
15 minute winter	G11-OFFSITE	10	199.577	0.142	29.9	0.0000	0.0000	OK
15 minute winter	S5	10	210.049	0.069	11.8	0.0890	0.0000	OK
15 minute winter	SO03072707	10	209.546	0.066	11.7	0.0000	0.0000	OK
15 minute winter	S8	10	208.344	0.061	23.2	0.1552	0.0000	OK
15 minute winter	S9	10	206.381	0.057	23.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S13	3.000	G11	22.7	1.078	0.247	0.3911	
15 minute winter	G11	3.001	G11-OFFSITE	29.9	1.058	0.738	0.2590	14.1
15 minute winter	S5	1.000	SO03072707	11.7	1.513	0.405	0.1474	5.5
15 minute winter	S8	2.000	S9	23.1	3.603	0.307	0.0715	10.7

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S13	10	200.157	0.087	29.4	0.1620	0.0000	OK
15 minute winter	G11	10	199.687	0.196	39.1	0.1422	0.0000	OK
15 minute winter	G11-OFFSITE	10	199.600	0.165	38.5	0.0000	0.0000	OK
15 minute winter	S5	10	210.061	0.081	15.2	0.1039	0.0000	OK
15 minute winter	SO03072707	10	209.557	0.077	15.1	0.0000	0.0000	OK
15 minute winter	S8	10	208.354	0.070	29.8	0.1801	0.0000	OK
15 minute winter	S9	10	206.389	0.065	29.7	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S13	3.000	G11	29.2	1.114	0.318	0.4752	
15 minute winter	G11	3.001	G11-OFFSITE	38.5	1.128	0.950	0.3111	18.1
15 minute winter	S5	1.000	SO03072707	15.1	1.607	0.521	0.1788	7.0
15 minute winter	S8	2.000	S9	29.7	3.829	0.395	0.0864	13.7

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APPENDIX G – EXISTING AND PROPOSED IMPERVIOUS AREAS

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NOTES:

1. NO DIMENSIONS TO BE SCALED FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES AND ENGINEERS DRAWINGS TOGETHER WITH THE RELEVANT SPECIFICATION AND GENERAL NOTES
3. ANY NON STRUCTURAL ITEMS SUCH AS WATERPROOFING, CLADDING, FINISHES, FIRE STOPPING ARE TO BE THE ARCHITECTS SPECIFICATIONS.
4. ALL PROPRIETARY PRODUCTS ARE TO BE USED AND INSTALLED STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS DETAILS AND REQUIREMENTS.
5. THE STRUCTURE IS DESIGNED AND DETAILED FOR THE PERMANANT CONDITION ONLY THE CONTRACTOR IS RESPONSIBLE FOR THE STRUCTURE IN ITS TEMPORARY CONDITION, ANY TEMPORARY WORKS REQUIRED DURING CONSTRUCTION AND ANY TEMPORARY LOADS ONTO THE EXISTING AND NEW STRUCTURE WHICH SHALL BE LESS THAN THOSE FOR WHICH IT HAS BEEN CONFIRMED OR DESIGNED RESPECTIVELY.
6. ALL WORKS UNDERTAKEN BY CONTRACTOR TO BE COMPLIANT WITH RELEVANT AND CURRENT BUILDING CODES, REGULATIONS AND GOOD PRACTICES.

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REV.	DATE	DESCRIPTION	BY
P2	13.11.23	STAGE 3 COORDINATION UPDATES	NR
P1	27.07.23	FIRST ISSUE	ADB

PROJECT NAME: CEFN ISAF REDEVELOPMENT

CLIENT NAME: MERTHYR VALLEYS HOMES

PROJECT No.: 1759

SCALE @ A1: 1:250

DRAWN / CHECKED: ADB NR

STATUS: STAGE 3

TITLE: EXISTING AND PROPOSED IMPERMEABLE AREAS

Project	Org	Zone	Level	Type	Disc	Sheet	Rev	DATE
1759-SMW-XX-00-DR-D-0100-P2								27.07.23

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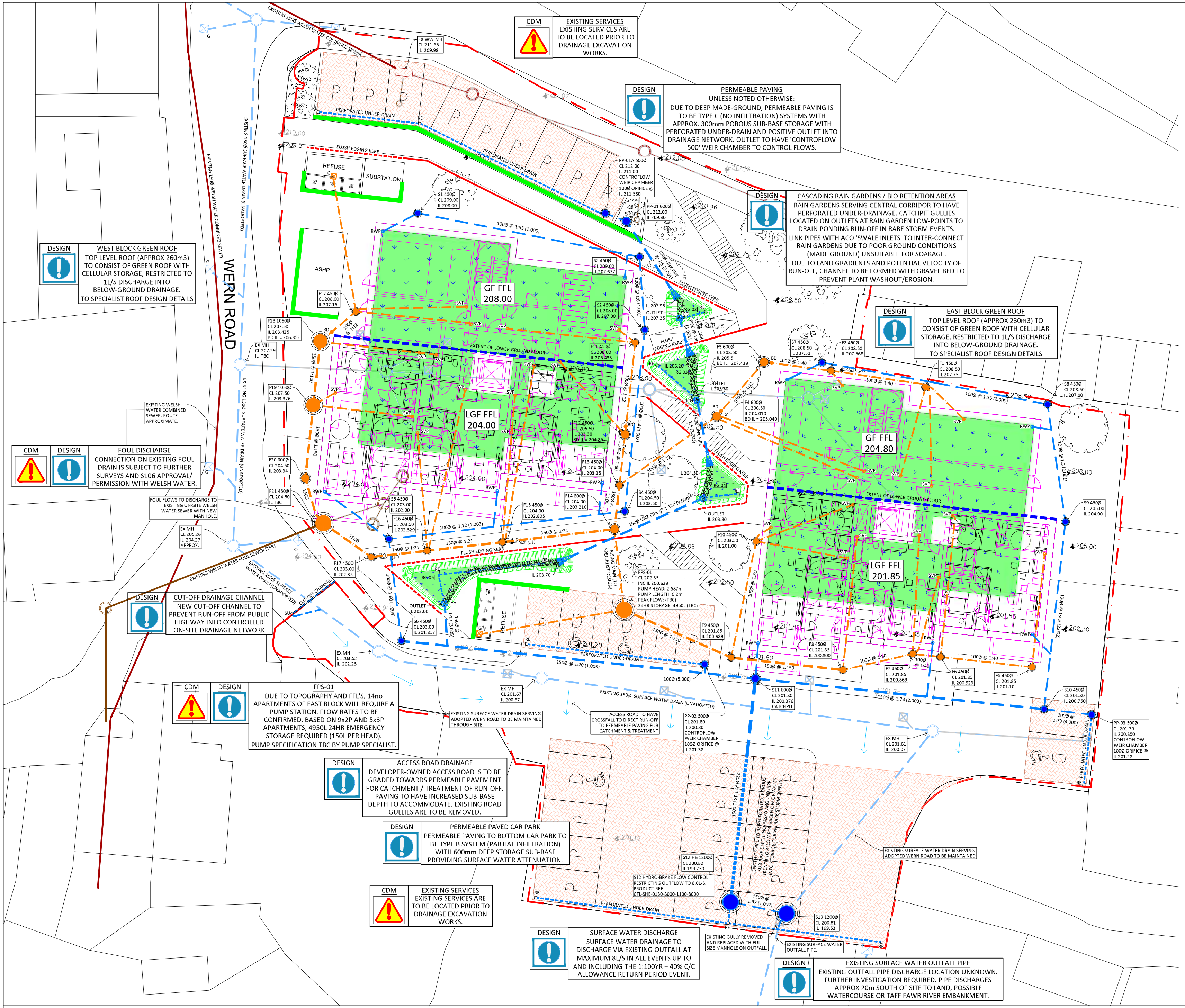
APPENDIX H – PROPOSED DRAINAGE STRATEGY PLAN



DRAINAGE NOTES.

1. ALL PRECAST CONCRETE UNITS ARE TO BE TO BS 5911 (CLASS 3 SULPHATE RESISTANT CEMENT).
2. ALL PROPOSED MANHOLE COVERS AND FRAMES ARE TO BE DUCTILE IRON COMPLYING WITH BS EN 124.
3. ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH PART H OF THE BUILDING REGULATIONS AND BS EN 752
4. ALL MANHOLE COVER LEVELS ARE APPROXIMATE AND TO BE ADJUSTED TO SUIT THE ARCHITECT'S PROPOSED LEVELS
5. THE CONTRACTOR IS TO ALLOW FOR ALL ABANDONED DRAINAGE RUNS TO BE REMOVED OR GROUTED UP AS NECESSARY
6. THE CONTRACTOR IS TO ALLOW FOR JET WASHING OF ALL LENGTHS OF EXISTING SEWERS WHICH ARE TO BE RETAINED.
7. THE CONTRACTOR IS TO ALLOW FOR JET WASHING OF THE ENTIRE DRAINAGE SYSTEM ON COMPLETION OF WORKS.
8. THE CONTRACTOR MUST CHECK THE LEVELS AND CONDITION OF ALL EXISTING DRAINAGE OUTFALLS PRIOR TO CONSTRUCTION OF ANY DRAINAGE, UNLESS OTHERWISE AGREED, TO ENSURE THE PROPOSED DESIGN MAY BE ACHIEVED. ANY DISCREPANCIES MUST BE REPORTED TO SIMPLE WORKS IMMEDIATELY.
9. ALL RWP, SVP AND FOUL DRAINAGE POSITIONS, INCLUDING UNDERSLAB GULLIES, ARE TO BE CONFIRMED BY THE ARCHITECT.
10. WHERE RWP'S STUB STACKS AND SVP'S ARE CONNECTED DIRECT TO THE DRAIN, RODDING ACCESS PLATES ARE TO BE PROVIDED.
11. ALL FOUL WATER DRAINS ARE TO BE 100Ø @ 1:40 U.N.O.
12. ALL SURFACE WATER DRAINS ARE TO BE 100Ø @ 1:60 U.N.O

DESIGN NOTES

1. THE BELOW GROUND SURFACE WATER SYSTEM HAS BEEN DESIGNED TO THE FOLLOWING CONDITIONS:
   1 YEAR - PIPE FULL
   30 YEAR - SURCHARGING ALLOWED WITH NO FLOODING.
   100 YEAR + 40% C/C - SURCHARGING ALLOWED WITH NO FLOODING
2. THIS DRAWING IS BASED ON ARCHITECT DRAWING REF CEF-COA-00-00-M2-A-100, CEF-COA-00-00-M2-A-101, AND TOPOGRAPHICAL SURVEY REF S22044-001-0.
3. FOUL CONNECTION TO THE PUBLIC SEWER ARE SUBJECT TO FORMAL S106 APPLICATIONS WITH WELSH WATER. NO WORK ON THE PUBLIC SEWER IS TO TAKE PLACE WITHOUT PRIOR PERMISSION.
4. SURFACE WATER DRAINAGE TO DISCHARGE VIA EXISTING OUTFALL AT MAXIMUM 8L/S IN ALL EVENTS UP TO AND INCLUDING THE 1:100YR + 40% C/C ALLOWANCE RETURN PERIOD EVENT. EXISTING OUTFALL PIPE DISCHARGE LOCATION UNKNOWN. FURTHER INVESTIGATION REQUIRED. POSSIBLY DISCHARGES TO TAF FAWR WATERCOURSE SOUTH OF SITE.
5. THE DRAINAGE DESIGN IS SUBJECT TO APPROVAL WITH THE LPA, SAB AND THE SUBSEQUENT DISCHARGE OF RELEVANT PLANNING CONDITIONS AND SAB APPROVAL, AND IS THEREFORE SUBJECT TO CHANGE TO SUIT STATUTORY VETTING COMMENTS.
6. FULL DETAILS OF THE GREEN ROOFS ARE TO BE CONFIRMED BY SPECIALIST DESIGNER. PROPOSED DISCHARGE FROM EACH ROOF = 1L/S.
7. CASCADING RAIN GARDENS SERVING CENTRAL CORRIDOR TO HAVE PERFORATED UNDER-DRAINAGE. CATCHPIT GULLIES LOCATED ON OUTLETS AT RAIN GARDEN LOW-POINTS TO DRAIN PONDING RUN-OFF IN RARE STORM EVENTS. LINK PIPES WITH ACO 'SWALE INLETS' TO INTER-CONNECT RAIN GARDENS DUE TO POOR GROUND CONDITIONS (MADE GROUND) UNSUITABLE FOR SOAKAGE. DUE TO LAND GRADIENTS AND POTENTIAL VELOCITY OF RUN-OFF, CHANNEL TO BE FORMED WITH GRAVEL BED TO PREVENT PLANT WASHOUT/EROSION.
8. DUE TO TOPOGRAPHY AND FINISHED FLOOR LEVELS, 14no APARTMENTS OF EAST BLOCK WILL REQUIRE A FOUL PUMP STATION. FLOW RATES TO BE CONFIRMED. BASED ON 9x2BP AND 5x3P APARTMENTS, 4950L 24HR EMERGENCY STORAGE REQUIRED (150L PER HEAD). PUMP SPECIFICATION TBC BY PUMP SPECIALIST.
9. PERMEABLE PAVING TO BOTTOM CAR PARK TO BE TYPE B SYSTEM (PARTIAL INFILTRATION) WITH 600mm DEEP STORAGE SUB-BASE PROVIDING SURFACE WATER ATTENUATION.
10. DEVELOPER-OWNED ACCESS ROAD IS TO BE GRADED TOWARDS PERMEABLE PAVEMENT CAR PARK FOR CATCHMENT / TREATMENT OF RUN-OFF.

LEGEND

- PROPOSED PRIVATE SURFACE WATER SEWER
- PROPOSED PRIVATE FOUL SEWER
- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING PRIVATE FOUL WATER SEWER
- EXISTING PUBLIC FOUL WATER SEWER
- EXISTING PUBLIC COMBINED SEWER
- DRAINAGE RUN TO BE ABANDONED
- PROPOSED SURFACE WATER CHANNEL
- BD — PROPOSED FOUL WATER MANHOLE BACKDROP
- G — PROPOSED SURFACE WATER GULLY
- ICG — INSPECTION CATCHPIT W/ GULLY COVER
- G — PROPOSED FOUL WATER GULLY
- RE — RODDING EYE
- SU — SUMP UNIT
- SVP — SOIL VENT PIPE
- FIT — FOUL INTERCEPTOR TRAP
- RWP — RAINWATER DOWNPIPE
- PROPOSED ATTENUATION TANK
- PROPOSED PERMEABLE PAVING CAR PARK
- PROPOSED RAIN GARDEN
- RAIN GARDEN INLET (ACO SWALE INLET)
- PROPOSED GREEN ROOF WITH CELLULAR ATTENUATION LAYER
- UPSTAND KERB / FLUSH EDGING KERB — KERBING REQ'D TO DIRECT OVERLAND RUN-OFF TO RAIN GARDENS ALONG CENTRAL PATH
- ANTICIPATED RETAINING WALL / STRUCTURE
- 202.50 — ARCHITECT PROPOSED LEVEL
- 25.300 — EXISTING LEVEL (TOPOGRAPHICAL SURVEY)
- INDICATIVE SITE BOUNDARY (REFER TO ARCHITECT DRAWINGS)

N
S

NOTES:

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REV.	DATE	DESCRIPTION	BY
P2	14.11.23	STAGE 3 COORDINATION UPDATES, RAIN GARDEN 01 OMITTED.	NR
P1	31.07.23	STAGE 3 ISSUE	NR

PROJECT NAME:	CEFN ISAF
CLIENT NAME:	MERTHYR VALLEYS HOMES LTD
PROJECT No.:	1759
SCALE @ A0:	1:100
DRAWN / CHECKED:	NR AJD
STATUS:	STAGE 3
TITLE:	PROPOSED DRAINAGE GENERAL ARRANGEMENT
Project - Orig - Zone - Level - Type - Disc - Sheet - Rev:	1759-SMW-XX-XX-DR-C-0001-P2
DATE:	31.07.23

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APPENDIX I – PROPOSED SURFACE WATER DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.031	5.00	209.000	450	303244.383	207700.778	1.000
2			209.000	450	303261.352	207697.437	1.323
3	0.000	5.00	208.000	450	303261.762	207691.853	1.000
4	0.006	5.00	204.500	450	303260.219	207677.959	1.000
5	0.006	5.00	203.000	450	303242.177	207675.845	1.000
RG-05	0.006	5.00	203.000	250	303246.418	207670.898	1.000
6			203.000	450	303243.126	207668.045	1.183
7	0.031	5.00	208.500	450	303275.323	207689.344	1.000
8			208.500	450	303292.576	207686.144	1.500
9	0.005	5.00	205.000	450	303293.951	207677.162	1.000
PP-03	0.006	5.00	201.700	500	303295.961	207662.408	0.850
10	0.003	5.00	201.800	450	303292.314	207662.822	1.050
PP-02	0.010	5.00	201.800	500	303266.337	207666.256	1.000
11	0.004	5.00	201.800	600	303270.224	207665.168	1.424
12	0.062	5.00	200.800	1200	303268.326	207648.076	1.050
13			200.800	1200	303272.607	207647.186	1.270
13_OUT			200.000	450	303269.743	207637.707	0.562
RG-04	0.002	5.00	204.800	250	303266.208	207678.957	1.000
RG-05_INLET			204.000	150	303255.369	207674.175	0.844
RG-02_INLET			208.250	150	303264.276	207694.242	0.300
RG-03	0.003	5.00	206.500	250	303265.756	207686.440	1.000
RG-04_INLET			204.800	150	303266.685	207681.697	0.300
RG-02	0.003	5.00	208.250	250	303264.427	207692.751	1.000
RG-03_INLET			206.500	150	303265.940	207690.111	0.300
PP-01	0.018	5.00	212.000	600	303260.348	207700.212	2.700

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.008	13	13_OUT	9.164	0.600	199.530	199.438	0.092	99.6	150	6.13	50.0
1.007	12	13	8.154	0.600	199.750	199.530	0.220	37.1	150	5.98	50.0
1.006	11	12	11.138	0.600	200.376	199.750	0.626	17.8	225	5.89	50.0
1.005	6	11	27.250	0.600	201.817	200.451	1.366	19.9	150	5.83	50.0
5.000	PP-02	11	4.036	0.600	200.800	200.501	0.299	13.5	100	5.03	50.0
2.003	10	11	22.214	0.600	200.750	200.451	0.299	74.3	150	5.64	50.0
4.000	PP-03	10	3.670	0.600	200.850	200.800	0.050	73.4	100	5.07	50.0
2.002	9	10	14.433	0.600	204.000	200.800	3.200	4.5	100	5.32	50.0
2.001	8	9	9.087	0.600	207.000	204.000	3.000	3.0	100	5.26	50.0
2.000	7	8	17.547	0.600	207.500	207.000	0.500	35.1	100	5.22	50.0
1.004	5	6	7.858	0.600	202.000	201.867	0.133	59.1	100	5.63	50.0
3.005	RG-05	6	3.020	0.600	202.000	201.817	0.183	16.5	150	5.02	50.0
1.003	4	5	18.165	0.600	203.500	202.000	1.500	12.1	100	5.50	50.0
1.002	3	4	13.979	0.600	207.000	203.500	3.500	4.0	100	5.37	50.0
1.001	2	3	5.599	0.600	207.677	207.000	0.677	8.3	100	5.31	50.0
1.000	1	2	17.295	0.600	208.000	207.677	0.323	53.5	100	5.27	50.0
3.004	RG-04	RG-05_INLET	12.000	0.600	203.800	203.700	0.100	120.0	150	5.22	50.0
3.001	PP-01	RG-02_INLET	7.147	0.600	209.300	207.950	1.350	5.3	150	5.03	50.0
3.003	RG-03	RG-04_INLET	5.000	0.600	205.500	204.500	1.000	5.0	150	5.02	50.0
3.002	RG-02	RG-03_INLET	4.000	0.600	207.250	206.200	1.050	3.8	150	5.01	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.008	1.007	17.8	22.9	1.120	0.412	0.169	0.0	150	1.025
1.007	1.658	29.3	22.9	0.900	1.120	0.169	0.0	100	1.830
1.006	3.117	123.9	14.5	1.199	0.825	0.107	0.0	51	2.097
1.005	2.265	40.0	6.6	1.033	1.199	0.049	0.0	41	1.685
5.000	2.114	16.6	1.4	0.900	1.199	0.010	0.0	19	1.262
2.003	1.168	20.6	6.0	0.900	1.199	0.045	0.0	55	1.014
4.000	0.899	7.1	0.8	0.750	0.900	0.006	0.0	22	0.586
2.002	3.666	28.8	4.9	0.900	0.900	0.036	0.0	28	2.728
2.001	4.477	35.2	4.2	1.400	0.900	0.031	0.0	24	3.053
2.000	1.306	10.3	4.2	0.900	1.400	0.031	0.0	45	1.246
1.004	1.004	7.9	5.8	0.900	1.033	0.043	0.0	64	1.096
3.005	2.491	44.0	0.8	0.850	1.033	0.006	0.0	14	0.942
1.003	2.232	17.5	5.0	0.900	0.900	0.037	0.0	36	1.920
1.002	3.897	30.6	4.2	0.900	0.900	0.031	0.0	25	2.708
1.001	2.704	21.2	4.2	1.223	0.900	0.031	0.0	30	2.104
1.000	1.055	8.3	4.2	0.900	1.223	0.031	0.0	50	1.058
3.004	0.916	16.2	0.3	0.850	0.150	0.002	0.0	15	0.361
3.001	4.409	77.9	2.4	2.550	0.150	0.018	0.0	18	2.022
3.003	4.537	80.2	0.4	0.850	0.150	0.003	0.0	7	1.120
3.002	5.200	91.9	0.4	0.850	0.150	0.003	0.0	7	1.285

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.200	1 year (l/s)	8.0
Summer CV	0.750	30 year (l/s)	8.0
Winter CV	0.840	100 year (l/s)	8.0
Analysis Speed	Detailed	Check Discharge Volume	✓
Skip Steady State	✓	100 year 360 minute (m³)	145

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Growth Factor 1 year	0.88
Brownfield Method	Greenfield	Growth Factor 30 year	1.78
Greenfield Method	IH124	Growth Factor 100 year	2.18
Positively Drained Area (ha)	0.290	Betterment (%)	0
SAAR (mm)	1537	QBar	4.6
Soil Index	5	Q 1 year (l/s)	4.0
SPR	0.53	Q 30 year (l/s)	8.1
Region	9	Q 100 year (l/s)	9.9

Pre-development Discharge Volume

Site Makeup	Brownfield	Return Period (years)	100
Brownfield Method	Greenfield	Climate Change (%)	0
Greenfield Method	FSR/FEH	Storm Duration (mins)	360
Positively Drained Area (ha)	0.290	Betterment (%)	0
Soil Index	5	PR	0.594
SPR	0.53	Runoff Volume (m³)	140
CWI	126.343		

Node 1 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Depth (mm)	50
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	3
Depression Storage Area (m²)	258		

Applies to All storms

Node 7 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Depth (mm)	50
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	3
Depression Storage Area (m²)	228		

Applies to All storms

Node PP-01 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Depth (mm)	5
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	3
Depression Storage Area (m²)	122		

Applies to All storms

Node PP-02 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Area (m²)	68	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		

Applies to All storms

Node PP-03 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Area (m²)	30	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		

Applies to All storms

Node 12 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Depth (mm)	5
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	3
Depression Storage Area (m²)	366		

Applies to All storms

Node RG-02 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Area (m²)	7	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	50		

Applies to All storms

Node RG-03 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Area (m²)	14	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	50		

Applies to All storms

Node RG-04 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Area (m²)	9	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	50		

Applies to All storms

Node RG-05 Design Modifiers (Hydrograph)

Overrides Design Area	x	Depression Storage Area (m²)	24	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	50		

Applies to All storms

Node 1 Online Head/Flow Control

Flap Valve	x	Invert Level (m)	208.000	Design Flow (l/s)	1.0
Replaces Downstream Link	✓	Design Depth (m)	0.100		

Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.010	1.000	0.100	1.000

Node 7 Online Head/Flow Control

Flap Valve	x	Invert Level (m)	207.500	Design Flow (l/s)	1.0
Replaces Downstream Link	✓	Design Depth (m)	0.100		

Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.010	1.000	0.100	1.000

Node 12 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	199.750	Product Number	CTL-SHE-0130-8000-1100-8000
Design Depth (m)	1.100	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.0	Min Node Diameter (mm)	1200

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	208.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	258.0	0.0	0.100	258.0	0.0	0.110	0.0	0.0

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	207.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	228.0	0.0	0.100	228.0	0.0	0.110	0.0	0.0

Node RG-02 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	2.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	207.950	Main Channel Slope (1:X)	25.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.035

Inlets

RG-02_INLET

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	3.0	0.0	0.300	6.4	0.0

Node PP-01 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	211.580	Slope (1:X)	50.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	24.500		

Node RG-03 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	4.100
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	206.200	Main Channel Slope (1:X)	25.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.035

Inlets

RG-03_INLET

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7.5	0.0	0.300	13.4	0.0

Node RG-04 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	3.200
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	204.500	Main Channel Slope (1:X)	25.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.035

Inlets

RG-04_INLET

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	5.8	0.0	0.300	9.1	0.0

Node RG-05 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.03600	Porosity	1.00	Main Channel Length (m)	11.400
Side Inf Coefficient (m/hr)	0.03600	Invert Level (m)	202.700	Main Channel Slope (1:X)	25.0
Safety Factor	3.0	Time to half empty (mins)	0	Main Channel n	0.035

Inlets

RG-05_INLET

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.9	0.0	0.300	24.0	0.0

Node PP-02 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	201.380	Slope (1:X)	240.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.800	Inf Depth (m)	
Porosity	0.30	Length (m)	14.200		

Node PP-03 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03600	Invert Level (m)	201.280	Slope (1:X)	999.0
Side Inf Coefficient (m/hr)	0.03600	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.800	Inf Depth (m)	
Porosity	0.30	Length (m)	6.200		

Node 12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03600	Invert Level (m)	199.990	Slope (1:X)	20.0
Side Inf Coefficient (m/hr)	0.03600	Time to half empty (mins)	96	Depth (m)	0.600
Safety Factor	3.0	Width (m)	27.300	Inf Depth (m)	
Porosity	0.30	Length (m)	13.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 92.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	1	1410	208.000	0.000	0.1	0.0761	0.0000	OK
1440 minute winter	2	1410	207.680	0.003	0.0	0.0005	0.0000	OK
1440 minute winter	3	1410	207.003	0.003	0.0	0.0004	0.0000	OK
15 minute winter	4	10	203.513	0.013	0.7	0.0037	0.0000	OK
15 minute winter	5	11	202.028	0.028	1.4	0.0079	0.0000	OK
120 minute summer	RG-05	70	202.016	0.016	1.0	0.0026	0.0000	OK
120 minute summer	6	70	201.838	0.021	1.7	0.0034	0.0000	OK
960 minute winter	7	930	207.501	0.001	0.1	0.2042	0.0000	OK
960 minute winter	8	930	207.004	0.004	0.1	0.0006	0.0000	OK
30 minute summer	9	19	204.009	0.009	0.5	0.0024	0.0000	OK
30 minute summer	PP-03	18	200.870	0.020	0.6	0.0066	0.0000	OK
30 minute summer	10	19	200.776	0.026	1.4	0.0056	0.0000	OK
30 minute summer	PP-02	19	200.817	0.017	1.0	0.0069	0.0000	OK
30 minute summer	11	19	200.404	0.027	3.9	0.0093	0.0000	OK
60 minute summer	12	35	199.966	0.216	9.0	0.4990	0.0000	SURCHARGED
60 minute summer	13	35	199.604	0.074	7.8	0.0838	0.0000	OK
60 minute summer	13_OUT	35	199.507	0.069	7.8	0.0000	0.0000	OK
120 minute summer	RG-04	66	203.828	0.028	1.2	0.0027	0.0000	OK
120 minute summer	RG-05_INLET	70	203.163	0.007	1.2	0.0001	0.0000	OK
60 minute summer	RG-02_INLET	33	208.058	0.108	1.6	0.0019	0.0000	OK
60 minute summer	RG-03	36	205.514	0.014	1.3	0.0014	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	1	Head/Flow	2	0.0				
1440 minute winter	2	1.001	3	0.0	0.000	0.001	0.0003	
1440 minute winter	3	1.002	4	0.0	0.000	0.001	0.0012	
15 minute winter	4	1.003	5	0.7	0.569	0.038	0.0220	
15 minute winter	5	1.004	6	1.3	0.728	0.164	0.0139	
120 minute summer	RG-05	3.005	6	1.1	0.837	0.024	0.0038	
120 minute summer	RG-05	Infiltration		0.0				
120 minute summer	6	1.005	11	1.7	1.119	0.042	0.0411	
960 minute winter	7	Head/Flow	8	0.1				
960 minute winter	8	2.001	9	0.1	0.900	0.003	0.0009	
30 minute summer	9	2.002	10	0.5	1.385	0.017	0.0052	
30 minute summer	PP-03	4.000	10	0.6	0.526	0.081	0.0040	
30 minute summer	PP-03	Infiltration		0.0				
30 minute summer	10	2.003	11	1.3	0.656	0.065	0.0453	
30 minute summer	PP-02	5.000	11	1.0	1.134	0.060	0.0036	
30 minute summer	11	1.006	12	3.9	0.785	0.032	0.2280	
60 minute summer	12	Hydro-Brake®	13	7.8				
60 minute summer	12	Infiltration		0.0				
60 minute summer	13	1.008	13_OUT	7.8	0.936	0.436	0.0760	7.9
120 minute summer	RG-04	3.004	RG-05_INLET	1.2	0.528	0.072	0.0264	
120 minute summer	RG-05_INLET	Flow through pond	RG-05	1.0	0.271	0.000	0.0440	
60 minute summer	RG-02_INLET	Flow through pond	RG-02	1.6	0.284	0.002	0.0141	
60 minute summer	RG-03	3.003	RG-04_INLET	1.4	1.784	0.017	0.0424	

Results for 1 year Critical Storm Duration. Lowest mass balance: 92.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	RG-04_INLET	66	204.632	0.132	1.2	0.0024	0.0000	OK
60 minute summer	RG-02	33	207.264	0.014	1.6	0.0015	0.0000	OK
60 minute summer	RG-03_INLET	36	206.369	0.169	1.6	0.0030	0.0000	OK
30 minute summer	PP-01	19	209.315	0.015	1.7	0.0064	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	RG-04_INLET	Flow through pond	RG-04	1.2	0.150	0.001	0.0247	
60 minute summer	RG-02	3.002	RG-03_INLET	1.6	1.790	0.017	0.0367	
60 minute summer	RG-03_INLET	Flow through pond	RG-03	1.3	0.158	0.001	0.0348	
30 minute summer	PP-01	3.001	RG-02_INLET	1.7	1.083	0.022	0.0511	

Results for 30 year Critical Storm Duration. Lowest mass balance: 92.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	1	600	208.007	0.007	1.0	1.6082	0.0000	OK
960 minute winter	2	600	207.690	0.013	0.7	0.0020	0.0000	OK
960 minute winter	3	600	207.010	0.010	0.7	0.0017	0.0000	OK
30 minute summer	4	18	203.521	0.021	1.7	0.0058	0.0000	OK
15 minute winter	5	11	202.047	0.047	3.3	0.0133	0.0000	OK
60 minute summer	RG-05	35	202.034	0.034	4.4	0.0055	0.0000	OK
30 minute summer	6	20	201.861	0.044	7.0	0.0069	0.0000	OK
600 minute winter	7	390	207.509	0.009	1.3	1.9034	0.0000	OK
600 minute winter	8	390	207.011	0.011	0.9	0.0017	0.0000	OK
15 minute winter	9	11	204.015	0.015	1.3	0.0038	0.0000	OK
30 minute summer	PP-03	18	200.883	0.033	1.5	0.0110	0.0000	OK
30 minute summer	10	18	200.792	0.042	3.5	0.0090	0.0000	OK
15 minute winter	PP-02	10	200.830	0.030	2.8	0.0118	0.0000	OK
30 minute winter	11	19	200.425	0.049	12.8	0.0164	0.0000	OK
60 minute winter	12	46	200.329	0.579	21.5	10.0671	0.0000	SURCHARGED
15 minute summer	13	10	199.605	0.075	8.0	0.0853	0.0000	OK
60 minute winter	13_OUT	28	199.508	0.070	8.0	0.0000	0.0000	OK
30 minute summer	RG-04	19	203.857	0.057	4.7	0.0055	0.0000	OK
60 minute summer	RG-05_INLET	34	203.172	0.016	4.5	0.0003	0.0000	OK
15 minute winter	RG-02_INLET	10	208.064	0.114	4.9	0.0021	0.0000	OK
15 minute winter	RG-03	11	205.525	0.025	4.7	0.0026	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	1	Head/Flow	2	0.7				
960 minute winter	2	1.001	3	0.7	1.323	0.031	0.0028	
960 minute winter	3	1.002	4	0.7	1.209	0.021	0.0079	
30 minute summer	4	1.003	5	1.7	0.712	0.095	0.0437	
15 minute winter	5	1.004	6	3.3	0.928	0.415	0.0277	
60 minute summer	RG-05	3.005	6	4.4	1.253	0.101	0.0108	
60 minute summer	RG-05	Infiltration		0.0				
30 minute summer	6	1.005	11	7.1	1.695	0.177	0.1140	
600 minute winter	7	Head/Flow	8	0.9				
600 minute winter	8	2.001	9	0.9	1.684	0.025	0.0049	
15 minute winter	9	2.002	10	1.3	1.843	0.045	0.0102	
30 minute summer	PP-03	4.000	10	1.5	0.685	0.212	0.0080	
30 minute summer	PP-03	Infiltration		0.0				
30 minute summer	10	2.003	11	3.5	0.862	0.169	0.0896	
15 minute winter	PP-02	5.000	11	2.8	1.499	0.167	0.0075	
30 minute winter	11	1.006	12	12.8	0.838	0.103	0.2565	
60 minute winter	12	Hydro-Brake®	13	8.0				
60 minute winter	12	Infiltration		0.7				
15 minute summer	13	1.008	13_OUT	8.0	0.943	0.450	0.0778	9.7
30 minute summer	RG-04	3.004	RG-05_INLET	4.6	0.775	0.286	0.0717	
60 minute summer	RG-05_INLET	Flow through pond	RG-05	4.4	0.448	0.001	0.1136	
15 minute winter	RG-02_INLET	Flow through pond	RG-02	4.8	0.410	0.007	0.0296	
15 minute winter	RG-03	3.003	RG-04_INLET	4.7	1.745	0.059	0.0466	

Results for 30 year Critical Storm Duration. Lowest mass balance: 92.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	RG-04_INLET	18	204.638	0.138	4.7	0.0025	0.0000	OK
15 minute winter	RG-02	10	207.273	0.023	4.8	0.0026	0.0000	OK
15 minute winter	RG-03_INLET	11	206.374	0.174	4.8	0.0031	0.0000	OK
15 minute winter	PP-01	10	209.326	0.025	4.9	0.0106	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	RG-04_INLET	Flow through pond	RG-04	4.7	0.260	0.005	0.0575	
15 minute winter	RG-02	3.002	RG-03_INLET	4.8	2.491	0.053	0.0387	
15 minute winter	RG-03_INLET	Flow through pond	RG-03	4.7	0.260	0.005	0.0744	
15 minute winter	PP-01	3.001	RG-02_INLET	4.9	1.083	0.063	0.0585	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 92.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	1	344	208.034	0.034	2.8	8.4080	0.0000	OK
240 minute summer	2	140	207.693	0.016	1.0	0.0025	0.0000	OK
240 minute summer	3	140	207.012	0.012	1.0	0.0020	0.0000	OK
15 minute winter	4	10	203.528	0.028	3.1	0.0079	0.0000	OK
15 minute winter	5	10	202.070	0.070	6.1	0.0196	0.0000	OK
60 minute summer	RG-05	34	202.061	0.061	11.8	0.0098	0.0000	OK
60 minute summer	6	34	201.886	0.069	16.6	0.0110	0.0000	OK
600 minute winter	7	420	207.545	0.045	2.5	9.6797	0.0000	OK
120 minute summer	8	126	207.012	0.012	1.0	0.0018	0.0000	OK
15 minute winter	9	10	204.020	0.020	2.4	0.0051	0.0000	OK
15 minute winter	PP-03	10	200.898	0.047	2.8	0.0156	0.0000	OK
15 minute winter	10	10	200.809	0.059	6.5	0.0125	0.0000	OK
15 minute winter	PP-02	10	200.841	0.041	5.0	0.0164	0.0000	OK
120 minute winter	11	96	200.683	0.307	15.7	0.1033	0.0000	SURCHARGED
120 minute winter	12	96	200.681	0.931	29.4	38.1326	0.0000	FLOOD RISK
240 minute winter	13	312	199.605	0.075	8.0	0.0853	0.0000	OK
240 minute winter	13_OUT	312	199.508	0.070	8.0	0.0000	0.0000	OK
30 minute summer	RG-04	19	203.892	0.092	10.2	0.0090	0.0000	OK
30 minute summer	RG-05_INLET	19	203.182	0.026	10.3	0.0005	0.0000	OK
15 minute winter	RG-02_INLET	10	208.070	0.120	8.9	0.0022	0.0000	OK
30 minute summer	RG-03	18	205.536	0.036	10.1	0.0038	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	1	Head/Flow	2	1.0				
240 minute summer	2	1.001	3	1.0	1.497	0.047	0.0038	
240 minute summer	3	1.002	4	1.0	1.454	0.033	0.0123	
15 minute winter	4	1.003	5	3.1	0.803	0.175	0.0698	
15 minute winter	5	1.004	6	5.9	1.054	0.746	0.0440	
60 minute summer	RG-05	3.005	6	11.8	1.610	0.268	0.0221	
60 minute summer	RG-05	Infiltration		0.0				
60 minute summer	6	1.005	11	16.6	2.124	0.414	0.2442	
600 minute winter	7	Head/Flow	8	1.0				
120 minute summer	8	2.001	9	1.0	1.830	0.028	0.0060	
15 minute winter	9	2.002	10	2.4	2.200	0.083	0.0156	
15 minute winter	PP-03	4.000	10	2.8	0.797	0.390	0.0127	
15 minute winter	PP-03	Infiltration		0.0				
15 minute winter	10	2.003	11	6.4	1.018	0.310	0.1396	
15 minute winter	PP-02	5.000	11	5.0	1.736	0.299	0.0116	
120 minute winter	11	1.006	12	15.6	0.741	0.126	0.4430	
120 minute winter	12	Hydro-Brake®	13	8.0				
120 minute winter	12	Infiltration		1.3				
240 minute winter	13	1.008	13_OUT	8.0	0.943	0.450	0.0778	118.5
30 minute summer	RG-04	3.004	RG-05_INLET	10.3	0.939	0.635	0.1313	
30 minute summer	RG-05_INLET	Flow through pond	RG-05	10.2	0.584	0.001	0.2016	
15 minute winter	RG-02_INLET	Flow through pond	RG-02	8.8	0.491	0.012	0.0451	
30 minute summer	RG-03	3.003	RG-04_INLET	10.1	1.435	0.126	0.0515	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 92.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	RG-04_INLET	18	204.644	0.144	10.1	0.0026	0.0000	OK
30 minute summer	RG-02	18	207.283	0.033	10.1	0.0037	0.0000	OK
30 minute summer	RG-03_INLET	18	206.380	0.180	10.1	0.0032	0.0000	OK
15 minute winter	PP-01	10	209.334	0.034	8.9	0.0142	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	RG-04_INLET	Flow through pond	RG-04	10.1	0.351	0.010	0.0920	
30 minute summer	RG-02	3.002	RG-03_INLET	10.1	0.817	0.110	0.0410	
30 minute summer	RG-03_INLET	Flow through pond	RG-03	10.1	0.349	0.010	0.1185	
15 minute winter	PP-01	3.001	RG-02_INLET	8.9	0.975	0.114	0.0647	

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APPENDIX J – FLOOD EXCEEDANCE FLOW PATHWAYS

simple works

NOTES:

1. NO DIMENSIONS TO BE SCALED FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES AND ENGINEERS DRAWINGS TOGETHER WITH THE RELEVANT SPECIFICATION AND GENERAL NOTES.
3. ANY NON STRUCTURAL ITEMS SUCH AS WATERPROOFING, CLADDING, FINISHES, FIRE STOPPING ARE TO BE THE ARCHITECTS SPECIFICATIONS.
4. ALL PROPRIETARY PRODUCTS ARE TO BE USED AND INSTALLED STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS DETAILS AND REQUIREMENTS.
5. THE STRUCTURE IS DESIGNED AND DETAILED FOR THE PERMANANT CONDITION ONLY THE CONTRACTOR IS RESPONSIBLE FOR THE STRUCTURE IN ITS TEMPORARY CONDITION. ANY TEMPORARY WORKS REQUIRED DURING CONSTRUCTION AND ANY TEMPORARY LOADS ONTO THE EXISTING AND NEW STRUCTURE WHICH SHALL BE LESS THAN THOSE FOR WHICH IT HAS BEEN CONFIRMED OR DESIGNED RESPECTIVELY
6. ALL WORKS UNDERTAKEN BY CONTRACTOR TO BE COMPLIANT WITH RELEVANT AND CURRENT BUILDING CODES, REGULATIONS AND GOOD PRACTICES.

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION
P1	31.07.23	ISSUED FOR PLANNING

PROJECT NAME	CEFN ISAF
CLIENT NAME	MERTHYR VALLEYS HOMES LTD
PROJECT No.	1759
SCALE @ A0	1:100
DRAWN / CHECKED	ADB NR
STATUS	STAGE 3
TITLE	FLOOD EXCEEDANCE FLOWS
Project / Originator / Zone / Level / Type / Discipline / Sheet / Number / Revision	1759-SMW-XX-XX-DR-C-0101-P2
DATE	31.07.23

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APPENDIX K – MTCBC SAB PRE-APP CONSULTATION

MERTHYR TYDFIL
County Borough Council
Cyngor Bwrdeistref Sirol
MERTHYR TUDFUL

Nathan Rowe
Subteno Ltd.
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Senior SAB and Land Drainage Engineer
Our Reference: SAB/PRE/23/0008
Telephone: 01685 726271
Email: SAB@merthyr.gov.uk
Date: 31/10/23

FLOOD AND WATER MANAGEMENT ACT 2010 (Schedule 3 – Sustainable Drainage)

PRE-APPLICATION REVIEW AND ADVICE

Application Number: SAB/PRE/23/0008

Proposal: Redevelopment of Cefn Isaf Flats

Location: Cefn Isaf Flats, Cefn Coed y Cymmer, Merthyr Tydfil, South Wales. E303263 N207692

Dear Nathan,

Further to your valid submission for SAB pre-application advice made on the 29/08/23, please find enclosed the pre-application informative report and details of what further information may be deemed and adoptable SuDS that will be acceptable to MTCBC SAB.

Huw Williams is your case officer and we would be grateful if you would quote the application reference number SAB/PRE/23/0008 in any future correspondence.

Yours sincerely,

Huw Williams

Senior SAB and Land Drainage Engineer

Background

The Flood and Water Management Act 2010 (Schedule 3) came into effect in Wales on 7th January 2019, requiring new developments to include Sustainable Drainage Systems (SuDS) that comply with national standards *(Statutory Standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems (2018).*

From 7th January 2019, new developments of more than one dwelling or where the area covered by construction work equals or exceeds 100 square metres require approval before construction can commence. Approval is considered by the Sustainable Drainage Approval Body (SAB).

Adoption and management arrangements, including funding mechanisms for maintenance of SuDS infrastructure and all drainage elements are to be agreed by the SAB as part of this approval. The objective being to ensure SuDS infrastructure is correctly maintenance and functions effectively for its design life.
An application for Sustainable Drainage Approval is required to comply with:

- Flood and Water Management Act 2010 (Schedule 3)
- Statutory Standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems (2018)

The SuDS approach mimics natural drainage, managing surface runoff at or close to the surface and as close to its source as practicable, controlling the flow (volume and rate of runoff) and providing a range of additional benefits. It contrasts with traditional drainage techniques, which are based on underground pipes to convey rainwater away from properties as quickly as possible. The use of SuDS is a way of helping to achieve sustainable development in both new and existing developments.

Key elements of the SuDS design approach include:

- Drainage systems should be considered at the earliest stages of site design to influence the layout of roads, buildings and public open spaces.
- Planning of a new site layout should be informed by the topography and the requirements of surface water management systems to both effectively drain and treat the runoff.
- Any existing watercourse, ditches, and other drainage features both within and adjoining the site should help inform proposals.
- SuDS should work as a management train to control flow rates and reduce volumes of runoff, providing treatment to protect water quality and opportunities to encourage biodiversity and amenity.
- Well designed, easy to maintain SuDS will deliver a range of important benefits for the local environment, the development and local communities.
- Surface based sustainable drainage components are visible in their operation and performance and are generally simpler and easier to operate, monitor and maintain.
- Take account of existing flood risk management policies and procedures.

Documentation

- *5_suds-pre-application-approval-form*
- *1759-SMW-XX-00-DR-D-0001-P1*
- *S220807-SUB-99-XX-FCA-C-00001 Rev 01_MERGED*

Overall Summary

MTCBC SAB have received an application for pre full SAB application advice in relation to sustainable drainage proposals for the redevelopment of Cefn Isaf Flats, Cefn Coed y Cymmer, Merthyr Tydfil. The site is located approximately 2km north west of Merthyr Tydfil town centre at National Grid reference E303263 N207692. The existing site is a 0.35Ha multi storey residential area to be demolished and will see new, residential multi-storey apartment blocks built in its place therefore, the development site can be considered brownfield for the purposes of discharge rate estimations. The site is restricted and steep with and 11m level drop from north to south and is surrounded by existing residential areas with the exception of an existing parking area immediately to the south of the site.

The Ground investigation report indicates the site is predominantly made ground to a max depth of 3.7m, reducing to 0.5m towards the southern parking area. Predicted infiltration rates are relatively high.

The Taf Fawr river is 120m to the south and there are no known ordinary watercourses within the vicinity of the site. DCWW maps show existing development is served by a combined sewer discharging to a combined sewer on Wern Road. The development area is designated as zone A on TAN15 development advice maps and Low Risk from surface water flooding. BGS show the area as low risk from ground water although due to the steep nature of the site, groundwater is likely to be encountered across the site during the construction phase.

Due to the restricted and steep topography across the site, effective SUDS selection is relatively limited. Due to the restrictive nature of the site, the proposal sees the introduction of green/blue rooves to serve the two residential blocks both with a combined, estimated discharge rate of 2l/s. Communal areas and footpaths are served by a series of bio-retention zones that are generally located adjacent to the footpaths and stepped areas. All parking areas are to be constructed using permeable paving. The proposed discharge from the site is at 8l/s to an existing surface water sewer to the south of the large parking area serving the flats.

Standard S1 – Surface water destination

Level 1 – Rainwater collected for use

- G1.4 Water is a valuable resource and rainwater should be collected (harvested) for non-potable use where practicable. This not only reduces potable water demand, but it can also reduce the volume of surface water runoff requiring disposal. One or more of the following **exception criteria** needs to be demonstrated if rainwater harvesting (RWH) is not used:

    1. There is no foreseeable demand for non-potable water on the site throughout its design life;
    2. There is no foreseeable need to harvest water at the site as the relevant water undertaker's water resources and drought management plans do not identify potential stresses on mains water supplies;
    3. The use of rainwater harvesting is not a viable/ cost-effective part of the solution for managing surface water runoff on the site, taking account of the potential water supply benefits of such a system.

- G1.5 Rainwater harvesting tanks can be sized for capturing the runoff from large rainfall events as well as water supply. The design of rainwater harvesting systems for management of large events should be in accordance with BS 8515 appendix A (2009, revision 2013)6. This can contribute to a significant reduction in runoff volume, helping to meet the requirements of volume control of runoff (Standard S2).
- G1.6 In most cases, rainwater harvesting alone will not be adequate to deal with the site drainage and provision will be required for an overflow to a Level 2 or lower priority destination.
- G1.7 RWH systems, whether designed for water supply or surface water management as well, will contribute effectively to meeting the criterion on Interception (Standard S2).

Summary

The current proposal doesn't consider rain water harvesting systems for grey water reuse and no specific reasoning for their omission has been included in report "*S220807-SUB-99-XX-FCA-C-00001 Rev 01_MERGED".* Harvesting systems should always be considered in order to reduce the negative impact on receiving drainage systems. Although the introduction of green/blue rooves is commended, should the outfall pipe from the site interact with the public combined sewer to the south, as a statutory consultee, the water company may dictate the discharge requirements, potentially resulting in consideration of alternative/additional systems to reduce the impact on receiving drainage systems.

Level 2 – Discharge of surface water to the ground

- G1.8 Surface runoff not collected for use in accordance with Level 1 should be discharged by infiltration (a process that allows water to percolate into the ground) to the maximum extent possible at any location across the site. A lower priority destination should only be used for any residual runoff that cannot be served by infiltration provided one or more of the following **exception criteria** can be demonstrated:

    - **Permeability**: the use of infiltration drainage is not practicable due to

the lack of permeability of the soil for disposing of runoff;
- **Ground Instability**: the use of infiltration drainage would result in a risk of instability through ground movement or subsidence;
- **Pollution of groundwater or receiving surface waters**: the use of infiltration drainage would pose an unacceptable risk of pollution of groundwater or surface water bodies:
  - as a result of existing contaminants on the site being mobilised; or
  - as a result of activities in the area draining to the infiltration device (for example an area where there is the storage or handling of chemicals or fuels); or
  - as a result of the sensitivity of the groundwater or surface waterbody;
- **Groundwater flooding**: the use of infiltration drainage would result in an unacceptable risk of flooding from groundwater;
- I**nfiltration into a combined sewer**: the use of infiltration may cause ingress of flow into a combined sewer which might result in an increased risk of flooding or pollution on the site or downstream.

- Guidance on meeting the exception criteria can be found within the clauses from page 9 within the statutory national standards for SuDS at: https://gov.wales/national-standards-sustainable-drainage-systems-suds

Summary

Although the *Integral Geotechnique* ground investigation report hasn't been provided within this pre-application, based on the comments within report "*S220807-SUB-99-XX-FCA-C-00001 Rev 01_MERGED",* the nature of the made ground within development area may not be suitable for infiltration. This applies to all permeable surfaces and consideration should be made as to whether all SuDS systems at ground level should be suitably lined to negate any risk of pollutants entering the water table or any perched groundwater systems. Should the site discharge directly to the Taf Fawr, green/blue rooves would be deemed acceptable although some more cost effective, conventional methods of harvesting surface water should also be considered.

Level 3 – Discharge to a surface water body

G1.31 Surface runoff not collected for use in accordance with Level 1 or discharged to ground in accordance with Level 2 should be discharged to a receiving surface water body. A lower priority destination should only be used provided one or more of the following **exception criteria** can be shown to apply:

- **Access**: It is not reasonably practicable to convey the surface runoff to the water body – See Box 1 for further guidance;
- **Drainage by use of pumps**: Discharge to a surface water body would require the use of pumping, and discharge to a lower level destination would not require pumping and could be delivered more cost-effectively.– see Box 2 for further guidance;
- **Increase in flood risk**: The discharge would result in an unacceptable increase in the risk of flooding – see Box 3 for further guidance.

Summary

The proposed site surface water discharge is to an existing surface water system to the south which it is assumed discharges directly to the Taf Fawr river. The condition and capacity of this system in unknown at this stage. Further survey work will be required to confirm its, condition, capacity and destination. All survey information should be provided to support the full application.

Level 4 – Discharge to a surface water sewer or highway drain

Summary

As per level 3.

Level 5 – Discharge to combined sewer

Summary

It is assumed that the surface water sewer to the south discharges directly to the Taf Fawr river. There is a possibility that the private surface water sewer interacts with a 400mm combined sewer 50m to the south of the site. Should this be the case, Dwr Cymru/Welsh Water should be engaged at the earliest opportunity to ensure viability of connection.

Standard S2 – Surface water runoff hydraulic control

The aim of Standard S2 is to manage the surface water runoff from and on a site to protect people on the site from flooding from the drainage system for events up to a suitable return period, to mitigate any increased flood risk to people and property downstream of the site as a result of the development, and to protect the receiving water body from morphological damage.

S2 Surface water runoff hydraulic control:

1. Surface water should be managed to prevent, so far as possible, any discharge from the site for the majority of rainfall events of less than 5mm.
2. The surface water runoff rate for the 1 in 1 year return period event (or agreed equivalent) should be controlled to help mitigate the negative impacts of the development runoff on the morphology and associated ecology of the receiving surface water bodies.
3. The surface water runoff (rate and volume) for the 1% (1 in 100 year +30%) return period event (or agreed equivalent) should be controlled to help mitigate negative impacts of the development on flood risk in the receiving water body.

4. The surface water runoff for events up to the 1% (1 in 100 year) return period (or agreed equivalent) should be managed to protect people and property on and adjacent to the site from flooding from the drainage system.
5. The risks (both on site and off site) associated with the surface water runoff for events greater than the 1% (1 in 100 year) return period should be considered. Where the consequences are excessive in terms of social disruption, damage or risk to life, mitigating proposals should be developed to reduce these impacts.
6. Drainage design proposals should be examined for the likelihood and consequences of any potential failure scenarios (e.g. structural failure or blockage), and the associated flood risks managed where possible.

Clauses relating to the Guidance related to the guidance for hydraulic control can be found on page 20 of the Statutory Standards for Sustainable Drainage Systems at:
https://gov.wales/national-standards-sustainable-drainage-systems-suds

Summary

Hydraulic control of surface water is to be achieved by a series of SuDS components including Green/Blue rooves, permeable parking bays and a number of bio-retention zones. The attenuation within these systems are likely to retain surface water within the site for majority of rainfall events of less than 5mm. The selected SuDS components provide adequate source control with the green/blue rooves limiting surface water discharge to 1 l/s per building. The estimated discharge rate at the flow control chamber is 8 l/s although it's currently unclear as to the level of storage required beneath the car park to the south in order to achieve site control and the estimated rate – particularly if any infiltration is not viable. A discharge rate of 8 l/s would only be deemed acceptable upon satisfactory surveying and analysis of the downstream sewer system.

Standard S3 - Water Quality

Standard S3 addresses the drainage design requirements to minimise the potential pollution risk posed by the surface water runoff to the receiving water body.

S3 Surface water quality management
Treatment for surface water runoff should be provided to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers.

Guidance for S3 can be found from page 29 of the Statutory Standards for Sustainable Drainage Systems at:
https://gov.wales/national-standards-sustainable-drainage-systems-suds

Summary

Due to the nature of the site, the overall risk for contaminants entering the surface water system is LOW. The primary risk for water quality is from the permeable parking areas. It is well documented that permeable type systems are highly efficient at managing the majority of vehicular pollution incidents. The mitigation indices provided within report, ""*S220807-SUB-99-XX-FCA-C-00001 Rev 01_MERGED",* demonstrate the effectiveness of the SuDS components in relation to water quality and are therefore deemed acceptable.

Further consideration should be made to the possibly of lining the SuDS serving the car park area to the south and increase the storage requirement in order to protect any groundwater regime in the area.

Standard S4 – Amenity

Standard S4 addresses the design of SuDS components to ensure that, where possible, they enhance the provision of high quality, attractive public space which can help provide health and wellbeing benefits, they improve liveability for local communities and they contribute to improving the climate resilience of new developments.

S4 - Amenity
The design of the surface water management system should maximise amenity benefits.
Guidance on standard S4 can be found from page 38 of the Statutory Standards for Sustainable Drainage Systems at:
https://gov.wales/national-standards-sustainable-drainage-systems-suds

Summary

It is noted that the site is restricted for space, amenity value has been considered for the overall SuDS scheme with the inclusion of a series vegetated above ground drainage features within the communal areas, pathways etc. and is deemed acceptable. No landscaping plan has been provided within this pre-application and should be provided within the full application for review.

Standard S5 – Biodiversity

Standard S5 addresses the design of SuDS to ensure, where possible, they create ecologically rich green and blue corridors in developments and enrich biodiversity value by linking networks of habitats and ecosystems together. Biodiversity should be considered at the early design stage of a development to ensure the potential benefits are maximised.
S5 - Biodiversity
The design of the surface water management system should maximise biodiversity benefits.

Guidance on standard S5 can be found from page 41 of the Statutory Standards for Sustainable Drainage Systems at:
https://gov.wales/national-standards-sustainable-drainage-systems-suds

Summary

Biodiversity values have been considered for the overall SuDS scheme with the inclusion of green/blue rooves serving the apartment buildings and vegetated above ground drainage features within the communal areas of the development is deemed acceptable. The inclusion of such features with careful design and consideration of species type that attract various habitats will ensure residents will live in an environment that improves wellbeing, provides the necessary resilience and makes the development an attractive place to live reside. Vegetated surface drainage features should include native species chosen that are appropriate for the area with known benefits for local biodiversity and wildlife thus, increasing the bio-diversity score.

Standard S6 – Design of Drainage for Construction, Operation and Maintenance and Structural Integrity

Standard S6 deals with designing robust surface water drainage systems so they can be easily and safely constructed, maintained and operated, taking account of the need to minimise negative impacts on the environment and natural resources.

S6 – Design of drainage for Construction, Operation and Maintenance

- All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
- All elements of the surface water drainage system should be designed to ensure maintenance and operation can be undertaken (by the relevant responsible body) easily, safely, cost effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
- The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, taking into account the requirement for reasonable levels of maintenance.

Guidance on standard S6 can be found from page 44 of the Statutory Standards for Sustainable Drainage Systems at:
https://gov.wales/national-standards-sustainable-drainage-systems-suds

Summary

The ground SuDS components selected for this development can be considered relatively low cost to install. Once established with appropriate vegetation, rain gardens can be easily constructed and although maintenance can be frequent can be done so in a safe manner for the designated body. Due to steep nature of the connecting pipework between raingardens in the communal areas, consideration should be given to the incorporation of backdrop manholes at the rain garden outlets in order to reduce surface water velocity, prevent over-scouring of receiving rain gardens thus, reducing maintenance and repair burdens.

Permeably paved areas are relatively expensive to install, although more cost effective than cellular storage systems, when considering installation and long term maintenance costs. Once installed and if installed correctly, maintenance can be limited to ensuring paviour joints are cleaned periodically.

If SuDS components are installed correctly and are operating efficiently, contaminants are dealt with prior to entry to traditional drainage systems and maintenance requirements can be effectively seen as negligible.

A maintenance schedule for the green/blue rooves hasn't been provided within this pre-application and full details of the maintenance schedule should be provided in support of the full application.

Conclusion

In general, with exception to any previous comments in this report, the design carefully considers the statutory standards and MTCBC offer no objection to the proposals.

Further information will be required to support the full SAB application:

- Ground investigation report
- SuDS storage calculations for 1in100 +40% CC
- Dimensioned section drawings of all SuDS components
- Site sections with SuDS components included
- Manhole schedule
- Green/Blue roof specification
- Full maintenance schedule inc. Green/Blue rooves
- Landscaping plan with SuDS planting specification
- Details of any adoption requirements
- Adoption plan indicating components to be adopted by the SAB (if required)

Consultee Responses

No external organisations or statutory consultees were consulted in the preparation of this pre-application report. MTCBC Development Control will be consulted on this pre-application and response.

Adoption criteria

It is currently unclear if there are any adoption requirements for the SAB. The surface water drainage is not subject to mandatory adoption although a formal adoption application could be made where it is deemed necessary to ensure future maintenance.

Under the bespoke adoption agreement, **ALL** surface water drainage components in the public domain will be adopted by MTCBC SAB with a requirement to secure commuted sums for replacement and future maintenance of adopted assets - for the lifetime of the development. MTCBC SAB in is unable to calculate an estimated commuted sum at this stage as no detail on what elements are proposed for adoption have been provided.

Upon formal request to adopt by the applicant, MTCBC will instruct solicitor's for legal representation to assist in drafting the bespoke legal agreement. All associated legal costs will be recoverable from the applicant. Full approval of the SAB application will not be issued until the SAB agreement is in place.

Non-Performance bond

Should adoption of SuDS features by the SAB be required, the applicant should be made aware that a Non-Performance bond should be made available for the construction costs of all SuDS subject to adoption prior to the decision notice being issued. Accurate construction estimates for SuDS requiring adoption should be provided be included in support of a full application. The non-performance bond should be made available, should things not go to plan and SuDS construction activities require completion by the MTCBC SAB.

Nathan Rowe

From: Williams, Huw (Engineers) <Huw.Williams@merthyr.gov.uk>
Sent: 30 January 2024 08:59
To: Nathan Rowe
Cc: Baker, Gregory; Andrea Carapia; Laura Hannigan
Subject: RE: S220807 / 1759 - Cefn Isaf Redevelopment - SAB Pre-App and Consultation - SAB REF SAB/PRE/23/0008 [NOT PROTECTIVELY MARKED] [Filed 30 Jan 2024 10:44]

Categories: Filed by Mail Manager

Classification: NOT PROTECTIVELY MARKED
Hi Nathan,

Apologies for the delay in getting back to you on this query.

Although not ideal, the current arrangement should be left as is and you should look to connect to the nearest available chamber. The fact the development is providing betterment, will see a reduction in any overland flows in any case.

The area where the surface water is discharging to is low risk from surface water flooding and should the land be developed in the future, the developer would need to install some formal drainage to cater for any overland flows.

Thanks,

Huw.

From: Nathan Rowe <nathan.rowe@subteno.co.uk>
Sent: 11 January 2024 15:01
To: Williams, Huw (Engineers) <Huw.Williams@merthyr.gov.uk>
Cc: Baker, Gregory <Gregory.Baker@merthyr.gov.uk>; SAB <SAB@merthyr.gov.uk>; Andrea Carapia <Andrea@simple-works.co.uk>; Laura Hannigan <Laura@simple-works.co.uk>
Subject: S220807 / 1759 - Cefn Isaf Redevelopment - SAB Pre-App and Consultation - SAB REF SAB/PRE/23/0008

Hi Huw,

Further to the initial Pre-App that has been undertaken regarding the proposed development at Cefn Isaf Flats, Merthyr Tydfil (your ref is SAB/PRE/23/0008), as mentioned in our submission and highlighted in your response, we have now undertaken further investigation into the existing surface water outfall that currently serves the site, as well as a large portion of the public highway (Wern Road) and Pontycapel Road.

The findings are somewhat surprising to say the least and we're looking to engage with you to understand the next steps given the implications to both the proposed site and the existing highway. I have provided a link below to download the findings, this includes photographs and video footage to better demonstrate what was found. Please note this link will expire after one week so please let me know if I need to send a refreshed link.

Download Link: https://we.tl/t-uNr8fTgjSD

In summary, we discovered the following:

- The existing 225mm outfall pipe that leaves the southern parking area discharges into a small open stream via a brick headwall. This was confirmed by CCTV survey and dye testing.
- This open stream spans for a further 20m or so, before it appears to disperse onto open ground south of the site.
- The water either infiltrates from here or makes its way to the Taff Fawr river overground.
- It may be possible that the open stream did originally continue further, becoming overgrown or deteriorating over time resulting in the water making a new path for itself. This is just a possibility as no further indication was found by the surveyors.

Could you please advise on next steps required please?

Our thoughts are that if the land south of the site were ever to be developed (unknown whether this is possible) then the current nature of the outfall poses a flood risk if not carefully considered by any development plan/strategy. Our thoughts are the following:

- Leave as is, proposed flows will be significantly reduced providing a significant betterment to the situation. Any development in the future of the southern land would need to consider this flow and culvert or direct it through the development via ditches etc. It is no known whether this will ever be developed or whether it will stay as it is.
- Undertake further investigations and design work to extend the stream/watercourse through the land to a suitable location to discharge to the Taff Fawr River. Constraints would need to be understood further.
- Abandon existing outfall, direct proposed development to the Welsh Water Combined Sewer, consultation on flow rates would be required and the flows would need to be pumped due to the topography. The public highway authority would also need to undertake works to the highway drainage.

Feel free to give me a call if you want to discuss. Look forward to hearing from you,

Thank you,
Kind regards

Nathan Rowe
BSc(Hons) IEng MICE
Principal Engineer

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Croesawn ohebu yn Gymraeg a fydd hyn ddim yn arwain at oedi.

Mae'r e-bost hwn ac unrhyw ffeiliau a drosglwyddir gydag ef yn gyfrinachol ac wedi'u bwriadu ar gyfer pwy bynnag y cyfeirir ef ato neu atynt. Mae cynnwys yr e-bost hwn cynrychioli barn y sawl a enwir uchod, felly nid ydyw'n dilyn ei fod yn cynrychioli barn Cyngor Bwrdeistref Sirol Merthyr Tudful.

Darllenwch ein hysbysiadau preifatrwydd i ddarganfod mwy am sut rydym yn defnyddio eich gwybodaeth bersonol.

Cyngor Bwrdeistref Sirol Merthyr Tudful
Canolfan Dinesig
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We welcome correspondence in Welsh and this will not lead to a delay.

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