

LAND OFF BRIDGE STREET, WREXHAM

FLOOD CONSEQUENCES ASSESSMENT AND DRAINAGE STATEMENT

Final Report v2.0
March 2024

Report Title **Land Off Bridge Street, Wrexham**
Flood Consequences Assessment and Drainage Statement
Final Report v2.0

Client Central Buildings Two Ltd

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1 INTRODUCTION

1.1 Purpose of Report

Weetwood Services Ltd ('Weetwood') has been instructed by Central Buildings Two Ltd to prepare a Flood Consequences Assessment and Drainage Statement (FCADS) report to accompany a full planning application for the proposed development of land off Bridge Street, Wrexham ("the site") for residential use.

The assessment has been undertaken in accordance with the requirements of Technical Advice Note 15 (TAN15) dated July 2004 and taking into account the revised (draft) version of TAN15 (January 2023).

1.2 Background

Weetwood prepared a Flood Consequences Assessment (FCA) report for the site in August 2018 to accompany a planning application (Ref. P/2018/0915) for the conversion of the first and second floors of no. 4 Brook Street to provide 10 no. apartments, with commercial/retail use retained on the ground floor and the erection of a new residential block on the land to the south comprising 28 no. apartments.

The planning application was refused in January 2021 with the following reason; *"The site lies partially in zone C2 and as a result the development is at unacceptable risk of flooding, thus being in conflict with advice in TAN15: Development and Flood Risk and policy EC12 of the Wrexham Unitary Development Plan"*. The refusal was upheld at Appeal in January 2022.

This FCADS has subsequently been prepared to accompany a new full planning application for the construction of just the new build apartment block in the south.

1.3 Structure of the Report

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Provides background information relating to the development site
- Section 3** Presents national and local flood risk and drainage planning policy
- Section 4** Assesses the potential risk of flooding to the development site
- Section 5** Presents an illustrative surface water drainage scheme
- Section 6** Presents an illustrative foul water drainage scheme
- Section 7** Presents a summary of key findings and the recommendations

1.4 Relevant Documents

The assessment has been informed by the following documents:

- Wrexham Local Development Plan 2013-2028, Wrexham County Borough Council, December 2023
- Dee Preliminary Flood Risk Assessment, Natural Resources Wales, December 2018
- Preliminary Flood Risk Assessment Addendum, Wrexham County Borough Council, November 2017
- Flood Risk Management Plan 2016-2021, Wrexham County Borough Council, July 2016
- Local Flood Risk Management Strategy, Wrexham County Borough Council, April 2013

2 SITE DETAILS AND PROPOSED DEVELOPMENT

2.1 Site Location

The approximately 1.35 ha site is located to the west of Bridge Street, Wrexham at Ordnance Survey National Grid Reference SJ 333 501 as shown in **Figure 1**.

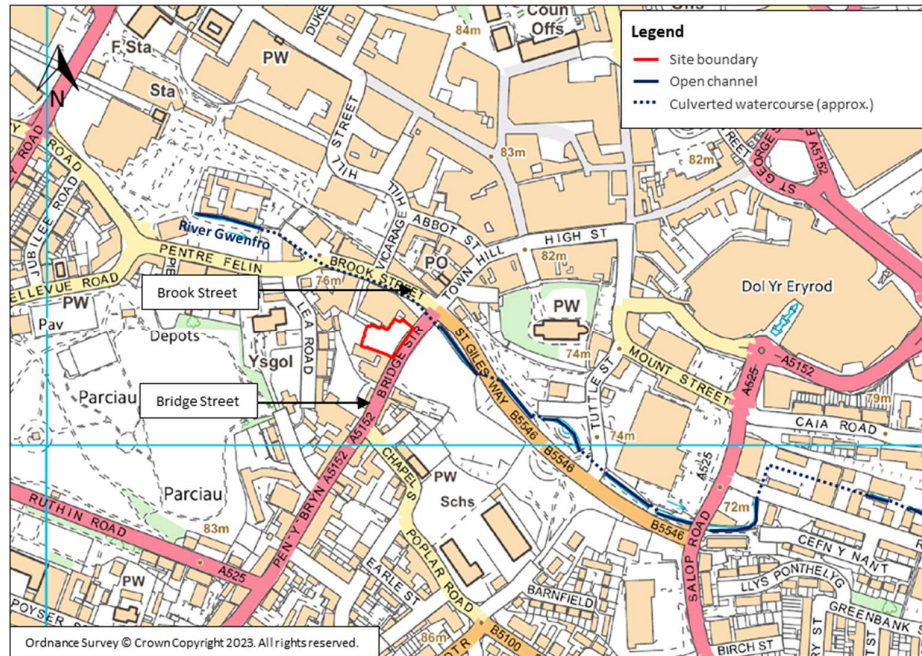


Figure 1: Site Location and Location of Surface Waterbodies

2.2 Existing and Proposed Development

The site currently comprises derelict and overgrown land that has been vacant since the demolition of the former terraced shops that occupied the site.

The development proposals are for the erection of a new four-storey residential apartment block, comprising 20 no. units, with associated access off Bridge Street and landscaping. The proposed site plan is provided in **Appendix A**.

TAN15 classifies residential development as Highly Vulnerable to flood risk.

2.3 Surface Waterbodies in the Vicinity of the Site

The River Gwenfro flows in a south-easterly direction in culvert approximately 20 m to the north of the site. Throughout the existing built-up area of Wrexham, the watercourse flows in both open channel and culvert (**Figure 1**) and is classified as an ordinary watercourse.

2.4 Topographic Levels

A topographic survey of the site was undertaken by Wrexham County Borough Council in August 2015, with a topographic survey of 4 Brook Street in the north undertaken by Cheshire Surveys Ltd in September 2010 (**Appendix B**). LiDAR data has also been used to develop a digital terrain model of the site and surrounding area as illustrated in **Figure 2**.

The topographic survey indicates that site levels are in the region of 76.07 - 77.55 m AOD.

Levels on Bridge Street are indicated to be in the region of 75.90 - 77.00 m AOD adjacent to the site, rising to the south.

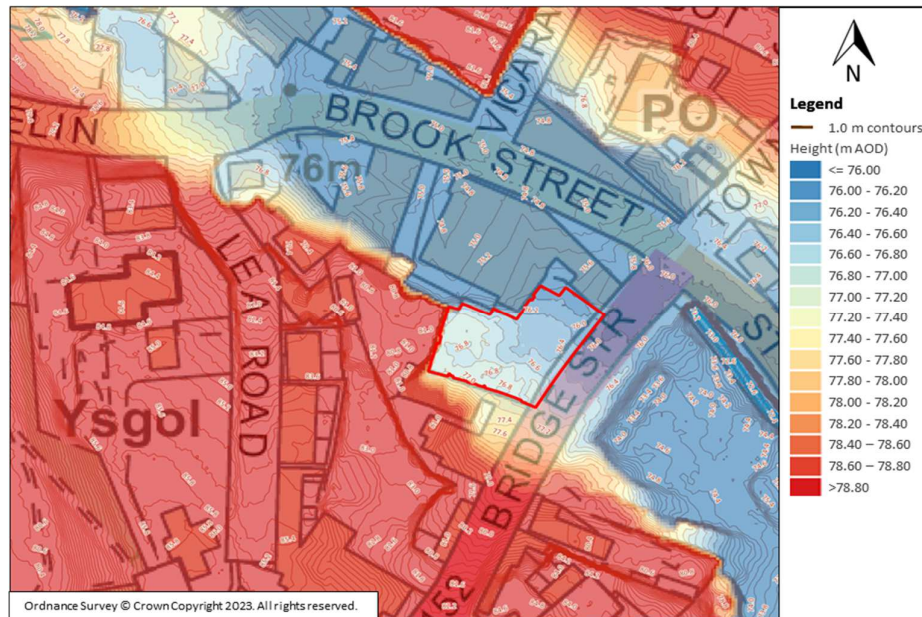


Figure 2: Digital Terrain Model from LiDAR Data

2.5 Ground Conditions

According to the Soilscape soils dataset produced by the Cranfield Soil and AgriFood Institute¹, soil conditions at the site and within the surrounding area are described as freely draining loamy soils.

The National Geoscience Data Centre's Single Onshore Borehole Index² holds records of two boreholes, located approximately 10.0 m south and 60.0 m south-east of the site. These show ground conditions to consist of sand, clay and gravel underlain by sandstone and shale.. The borehole record to the south of the site states that groundwater was struck at depths of 162 ft (49.4 m) bgl.

British Geological Survey mapping of surface geology³ indicates the underlying bedrock formation comprises 'Salop Formation - Mudstone, Sandstone and Conglomerate, overlain by 'Glaciofluvial Sheet Deposits, Devensian - Sand and Gravel' in the south and 'Alluvium - Clay, Silt, Sand and Gravel' in the north.

According to the British Geological Survey and Natural Resources Wales aquifer designation dataset⁴, the superficial deposits and underlying bedrock at the site are classified as a Secondary A aquifer. The site is not shown to be located within a designated groundwater source protection zone⁵.

¹ www.landis.org.uk/soilscape/

² <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>

³ <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>

⁴ <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>

⁵ <https://lle.gov.wales/catalogue/item/SourceProtectionZonesSPZMerged/?lang=en>

3 PLANNING POLICY AND GUIDANCE

3.1 National Planning Policy and Policy Guidance

Future Wales - the national Plan 2040 sets out the national development framework for Wales with a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of our communities.

Policy 8 - Flooding states that “*flood risk management that enables and supports sustainable strategic growth and regeneration in National and Regional Growth Areas will be supported. The Welsh Government will work with Flood Risk Management Authorities and developers to plan and invest in new and improved infrastructure, promoting nature-based solutions as a priority. Opportunities for multiple social, economic and environmental benefits must be maximised when investing in flood risk management infrastructure. It must be ensured that projects do not have adverse impacts on international and national statutory designated sites for nature conservation and the features for which they have been designated*”.

Planning Policy Wales (PPW) sets out government's planning policies for Wales and how these are expected to be applied. TAN15 provides technical guidance which supplements the policy within PPW and seeks to ensure that flood risk is taken into account at all stages in the planning process and is appropriately addressed.

The general approach of TAN15 is to set out a precautionary framework to guide planning decisions in areas at high risk of flooding. The overarching aim of the framework is, in order of preference, to:

- Direct new development away from those areas which are at a high risk of flooding.
- Where development has to be considered in high-risk areas (i.e. zone C) only those developments which can be justified should be located in such areas.

In accordance with paragraph 6 of TAN15, development will only be justified if it can be demonstrated that:

- i. Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; **or**,
- ii. Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region.

and,

- iii. It concurs with the aims of PPW and meets the definition of previously developed land (PPW Figure 2.1); and,
- iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable.

A revised version of TAN15 and updated Flood Map for Planning are due to be published in the near future (albeit the timing is yet to be confirmed by Welsh Government). The Flood Map for Planning currently holds no formal weight as it is not yet national policy, but Welsh Government advise that this best available information may be regarded as a material consideration.

National policy requires that planning applications for new development proposals should incorporate sustainable drainage systems (SuDS) to appropriate operational standards and with maintenance arrangements in place unless there is clear evidence that this would be inappropriate.

Statutory standards for sustainable drainage were published by Welsh Government in October 2018⁶ in relation to the design, construction, operation and maintenance of sustainable drainage systems serving new developments of more than one house or where the construction area is equal to or greater than 100 square metres (m²). These standards set out how surface water runoff generated during the present day 1 in 1, 1 in

⁶ Statutory Standards for Sustainable Drainage Systems – designing, constructing, operating and maintaining surface water drainage systems (<https://gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf>)

30 and 1 in 100 annual exceedance probability (AEP) rainfall events and for events exceeding the present day 1 in 100 AEP event should be managed, how peak runoff rates should be restricted and how runoff volumes should be controlled. Approval is subsequently required from the SuDS Approval Body (SAB) before construction can commence.

3.2 Local Planning Policy

The Wrexham Local Development Plan 2013 - 2028 was adopted by Wrexham County Borough Council in December 2023. The following policies are relevant in respect of flood risk and drainage:

Policy SP18 - Climate Change

To mitigate against the effects of climate change and adapt to its impacts, development proposals will need to demonstrate that they have considered the following:

- vi. Avoiding areas susceptible to flood risk in the first instance in accordance with the sequential approach set out in national guidance. Highly vulnerable development, as defined in TAN15: Development and Flood Risk, should not be located within zone C2;*
- vii. Preventing development that increases flood risk and;*
- viii. Assesses the potential effects of climate change when preparing a Flood Consequence Assessment for the site*

Policy DM1 Development Management Considerations

Development proposals, where relevant, must:

- vii. Not increase the risk of flooding but makes adequate provision for sustainably dealing with foul and surface water drainage and not result in an unacceptable impact upon the water environment.*

3.3 Water Framework Directive

The Water Framework Directive (WFD) provides a legal framework for the protection, improvement and sustainable use of inland surface waters, groundwater, transitional waters, and coastal waters across Wales, and seeks to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters
- Achieve at least 'good' status for all waterbodies by 2015
- Promote the sustainable use of water as a natural resource
- Conserve habitats and species that depend directly on water
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Contribute to mitigating the effects of floods and droughts.

The WFD applies to any proposed development which has the potential to impact on a waterbody. Where this is the case, the Natural Resources Wales may require evidence demonstrating that the proposed development does not compromise the aims of the WFD.

3.4 Environmental Permitting

Under the Environmental Permitting (England and Wales) Regulations 2016 an Environmental Permit for Flood Risk Activities⁷ is required from the Natural Resources Wales for any permanent or temporary works, including works:

- In, over or under a designated main river
- Within 8 m of the top of bank of a designated main river or of the landward toe of a flood defence (16 m if it is a tidal main river or a sea defence).

⁷ <https://naturalresources.wales/permits-and-permissions/environmental-permits/?lang=en>

In addition, any permanent or temporary works within the floodplain of a designated main river may also require an Environmental Permit for Flood Risk Activities. A permit is separate to and in addition to any planning permission granted.

4 REVIEW OF FLOOD RISK

4.1 Historical Records of Flooding

The Flood Map for Planning - Recorded Flood Extents and associated database⁸, indicate that there are no records of flooding at or within the immediate vicinity of the site.

4.2 Flood Risk from Rivers (Fluvial)

Figure 1 of TAN15 defines three development advice zones as follows:

- 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 the Natural Resources Wales flood outline, equal to or greater than 0.1% (river, tidal or coastal). Zone C is subdivided into the following two 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

The development advice zones are shown on the Development Advice Map⁹ and are defined by the predicted extent of the 1 in 1,000 (sea and rivers) AEP event (zone C) and British Geological Survey drift data (zone B). The zones do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

The Development Advice Map (**Figure 3**) indicates the site to be located in zone A and zone B, with zone C2 encroaching on the north-eastern boundary. However, detailed hydraulic modelling of the River Gwenfro has been undertaken (as detailed in **Section 4.2**) and indicates that no flooding of the site would be expected in up to a present day 1 in 1,000 AEP event. The site should therefore not be defined as being partially within zone c2.

The Flood Map for Planning - Rivers (**Figure 4**) indicates the site to be located predominately within flood zone 1, with the north-eastern area in flood zone 2 (rivers).

The flood zones are defined as follows and include the effects of climate change:

- Flood zone 1 (Rivers): Less than a 1 in 1,000 chance of flooding from rivers and the sea in a given year
- Flood Zone 2 (Rivers): Areas with a 1 in 1,000 to 1 in 100 chance of flooding from rivers in a given year
- Flood Zone 3 (Rivers): Areas with more than a 1 in 100 chance of flooding from rivers in a given year
- TAN15 Defended Zones: Areas that benefit from Risk Management Authority flood defences with a present day 1 in 100 AEP standard of protection for rivers

⁸ <http://lle.gov.wales/catalogue/item/HistoricFI/?lang=en>

⁹ <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>

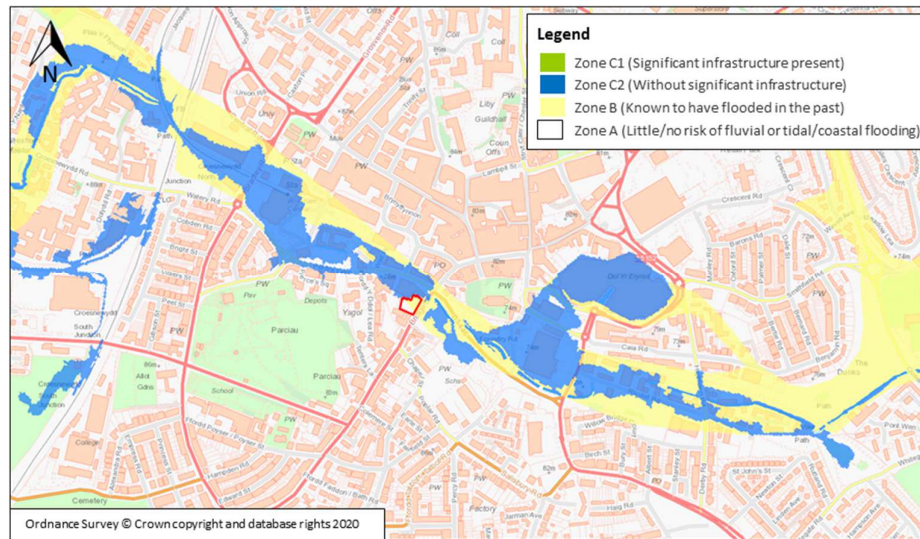


Figure 3: Development Advice Map

Source: Natural Resources Wales website; Accessed: February 2024

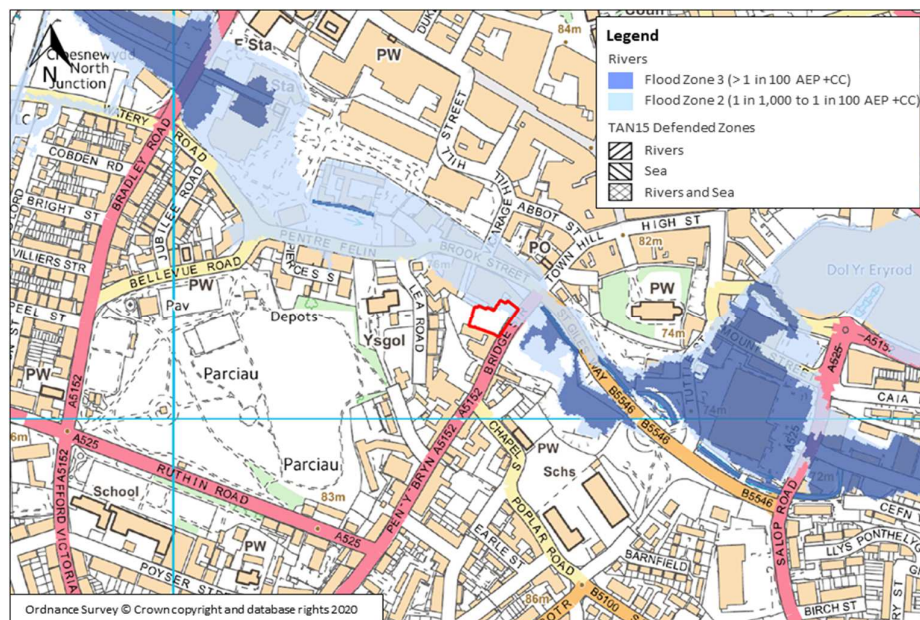


Figure 4: Flood Map for Planning - Rivers

Source: Natural Resources Wales website; Accessed: February 2024

A 1D-2D ISIS-TUFLOW hydraulic model of the River Gwefro was developed by Wrexham County Borough Council as part of River Gwefro Model Update (December 2016).

As part of the flood consequences assessment undertaken by Weetwood in August 2018, the site topographic survey was incorporated within the 2016 model to represent ground levels more accurately; however, no further amendments or refinements were made. The model was subsequently run for the present day 1 in 100 and 1 in 1,000 AEP events and the 1 in 100 AEP event +20% (central estimate) and +45% (upper end) climate change.

The modelled increases in peak river flow are in accordance with current Welsh Government guidance¹⁰ on climate change allowances (September 2021) for the Dee river basin district (2080s). The guidance recommends that the central estimate should be used to assess flood risk for the lifetime of the development and to inform design levels, whilst an assessment should also be made using the upper end estimate to inform mitigation measures that help to ensure the long-term resilience of a development.

The 2018 modelled outputs are provided in **Figure 5** and indicate that no flooding of the site or Bridge Street leading south would be expected in up to a present day 1 in 1,000 AEP event. The site should therefore not be defined as being partially within zone c2.

Floodwater is indicated to encroach slightly within the north-east of the site during a present day 1 in 1,000 AEP event; however, with existing site levels at a minimum of 76.07 m AOD and a maximum modelled flood level of 75.95 m AOD to the north, no flooding would be expected in reality. The area indicated to be at risk is therefore expected to be as a result of the model grid resolution.

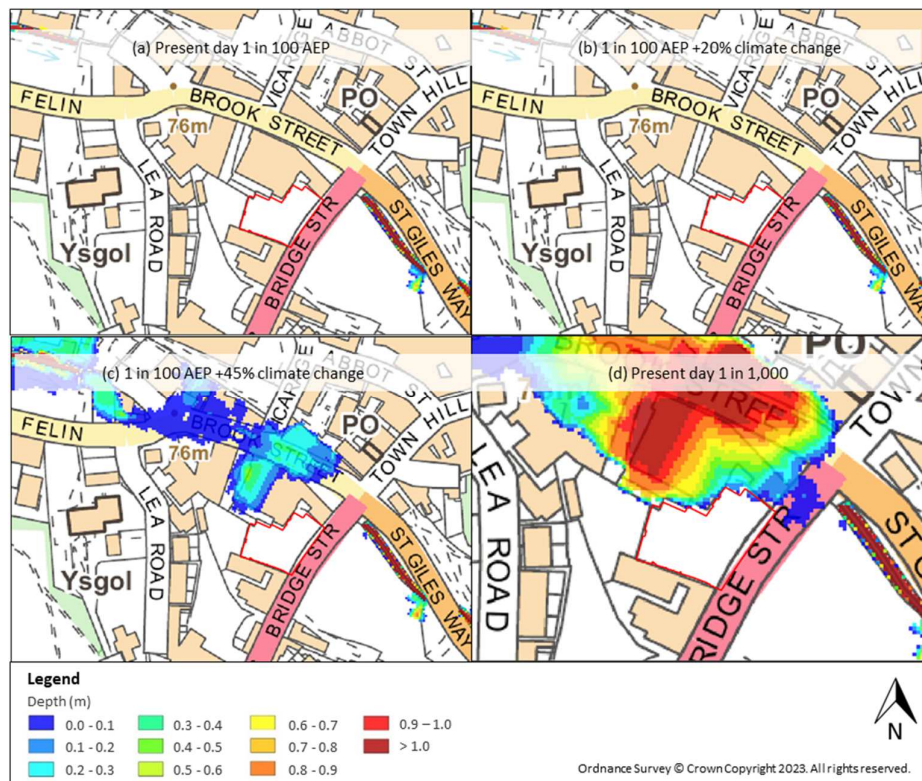


Figure 5: River Gwenfro Modelled Flood Extents - Baseline Scenario

Source: River Gwenfro Model Update, Wrexham County Borough Council, December 2016, as refined by Weetwood August 2018

A 30%, 67% and 100% blockage of both the Island Green and St Giles Way culverts was also modelled by Weetwood in August 2018 as a sensitivity assessment for the 1 in 100 AEP event +20% and +45% climate change, and the present day 1 in 1,000 AEP event.

The modelled outputs indicate that the site is more sensitive to a blockage of the Island Green culvert. The modelled outputs for the Island Green culvert blockage scenario are provided in **Figure 6**.

Table 1 summarises the maximum level, depth and velocity of floodwater expected on site during the respective blockage scenarios. No flooding of Bridge Street leading south from the proposed site access is expected during the modelled blockage scenarios.

¹⁰ Flood Consequences Assessments: Climate Change Allowances - https://gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf

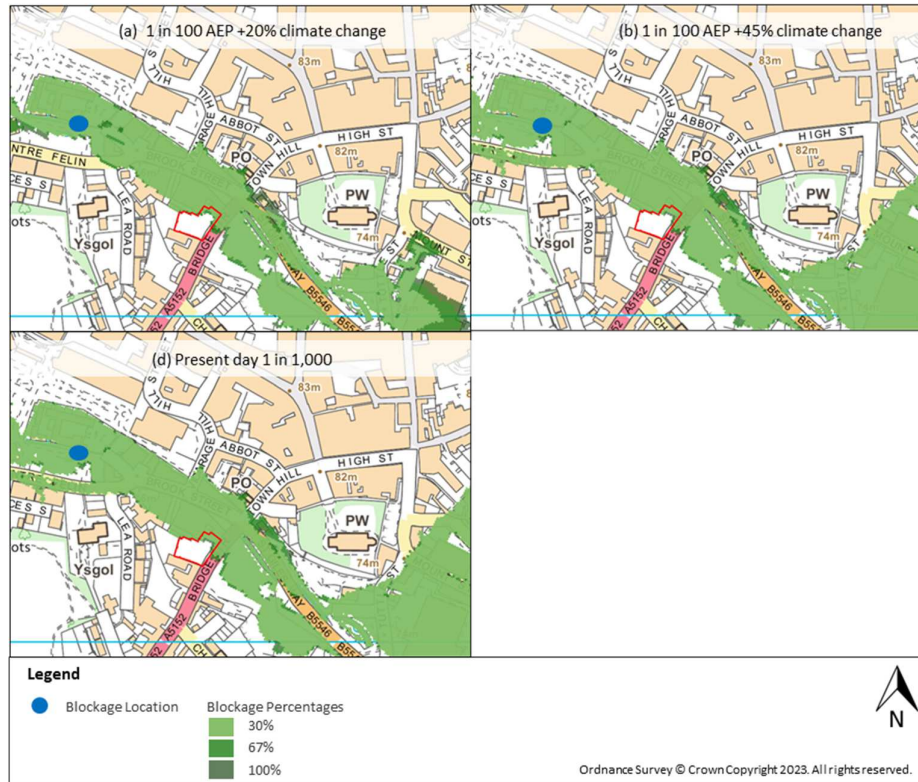


Figure 6: River Gwenfro Modelled Flood Extents - Blockage Scenario (Island Green Culvert)

Source: River Gwenfro Model Update, Wrexham County Borough Council, December 2016, as refined by Weetwood August 2018

Table 1: Site Flood Information - Blockage Scenario (Island Green Culvert)

Source: River Gwenfro Model Update, Wrexham County Borough Council, December 2016, as refined by Weetwood August 2018

Annual Probability Event	Max Level (m AOD)	Depth (m)		Velocity (m/s)	
		Greatest	Mean	Greatest	Mean
1 in 100 AEP +20% climate change					
30% blockage	76.22	0.43	0.16	0.20	0.07
67% blockage	76.35	0.57	0.21	0.44	0.17
100% blockage	76.39	0.61	0.24	0.51	0.21
1 in 100 AEP +45% climate change					
30% blockage	76.29	0.49	0.18	0.36	0.11
67% blockage	76.40	0.61	0.24	0.51	0.21
100% blockage	76.43	0.65	0.24	0.57	0.23
1 in 1,000 AEP					
30% blockage	76.32	0.53	0.19	0.37	0.13
67% blockage	76.41	0.63	0.24	0.55	0.23
100% blockage	76.45	0.66	0.25	0.59	0.25

4.3 Flood Risk from Small Watercourses and Surface Water (Pluvial)

There are no small watercourses located within the vicinity of the site. The Flood Map for Planning - Surface Water and Small Watercourses (**Figure 7**) indicates that no flooding of the site or Bridge Street leading north from pluvial surface water is expected in up to a 1 in 1,000 AEP event including an allowance for climate change.

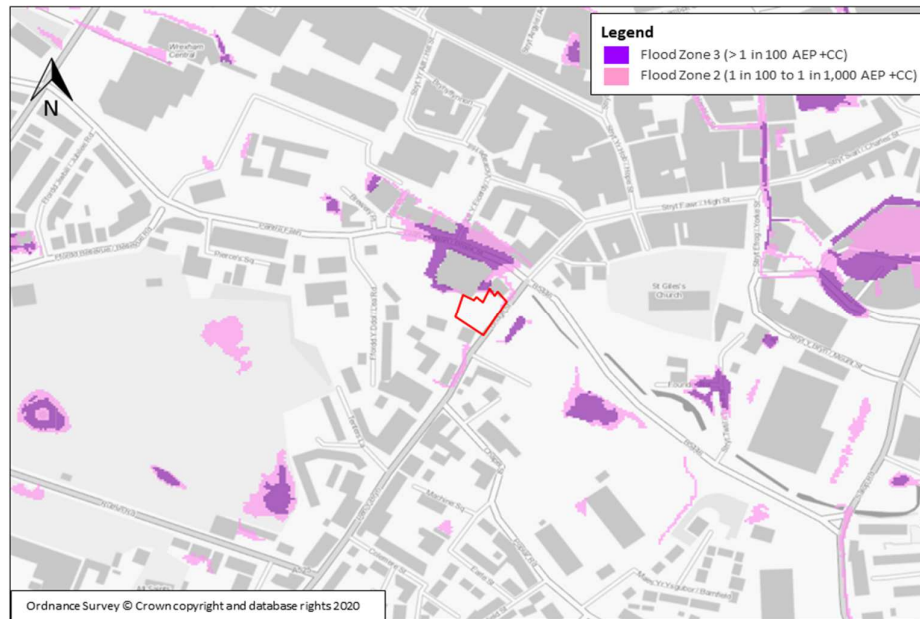


Figure 7: Flood Map for Planning - Surface Water and Small Watercourses

Source: Natural Resources Wales website; Accessed: February 2024

4.4 Flood Risk from Reservoirs, Canals and Other Water Impounding Structures

There are no canals or other impounded waterbodies located within the immediate vicinity of the site. The Flood Map for Planning - Flood Risk from Reservoirs (not shown) indicates that the site and access are not at risk of flooding from such sources.

4.5 Flood Risk from Groundwater

The JBA Groundwater Flood Risk Indicator map (**Figure 8**) indicates that the northern part of the site is at a Negligible risk during a 1 in 100 AEP groundwater flood event, whilst groundwater levels in the south may be 0.5 - 5m bgl (defined as Low risk).

As detailed in **Section 2.5**, the British Geological Survey borehole record to the south of the site recorded groundwater at 49.4 m bgl, which presents a Negligible risk.

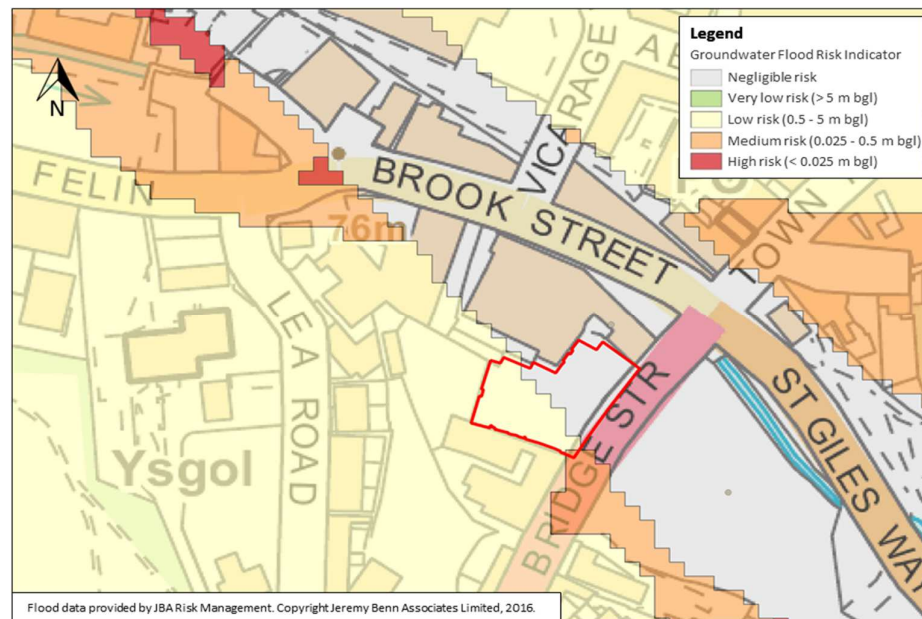


Figure 8: JBA Groundwater Flood Risk Indicator Map
Source: Blue Sky Maps; Accessed: January 2024

4.6 Flood Risk Mitigation

The risk of flooding to the proposed development from all identified sources is assessed to be low, with the exception of the River Gwenfro which poses a residual risk in the north-east of the site as a result of a culvert blockage. The risk of flooding to the proposed development will be mitigated through the implementation of the following measures:

- In accordance with A1.14 of TAN15, site levels including all ancillary areas should be set at a minimum of 76.39 m AOD. This is the flood level expected at the site in a 1 in 100 AEP 100% blockage event +20% climate change. This will also ensure that the proposed development complies with A1.15 of TAN15 during a 1 in 1,000 AEP 100% blockage event.
- Finished floor levels should be set at a minimum of 76.69 m AOD, which is 300 mm above the flood level expected at the site in a 1 in 100 AEP 100% blockage event +20% climate change and would be 260 mm above the flood level expected at the site in a 1 in 100 AEP 100% blockage event +45% climate change. In addition, the finished floor level should be at least 0.15 m above adjacent ground levels following any reprofiling of the site, with ground levels sloping down from the building.

These measures will, subject to the implementation of an appropriately designed surface water drainage scheme (**Section 5**), enable any potential overland flows to be conveyed safely across the site without affecting property.

The proposed mitigation measures as detailed above have been incorporated within the 2018 refined Weetwood hydraulic model of the River Gwenfro. This has subsequently been run for the 1 in 100 AEP event +20% climate change and the present day 1 in 1,000 AEP event for the 100% Island Green culvert blockage scenario.

The modelled outputs are provided in **Figure 9** and indicate that no flooding of the site would occur during the aforementioned events except for the landscaping area along the northern boundary of the site (refer to **Appendix A**), which has been retained at existing ground level..

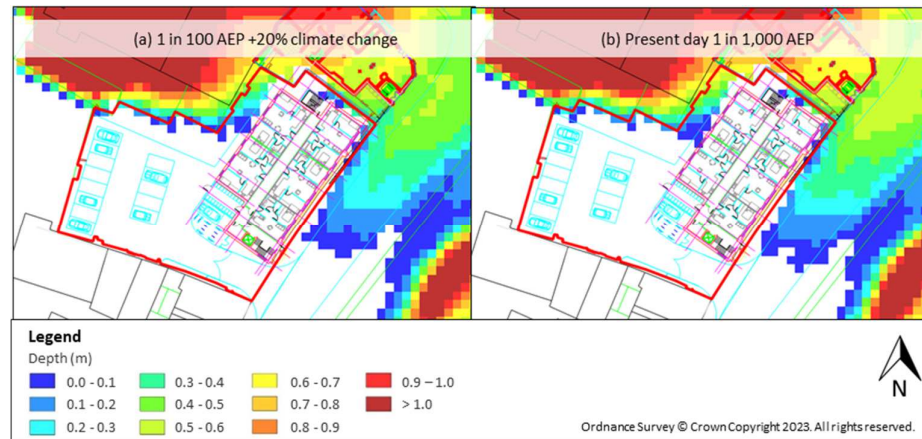


Figure 9: River Gwenfro Modelled Flood Extents - Proposed Scenario

Source: River Gwenfro Model Update, Wrexham County Borough Council, December 2016, as refined by Weetwood August 2018 and February 2024 (Run 010)

4.7 Flood Risk Elsewhere

In accordance with A1.2 of TAN15 developers must ensure there will be no loss of flood flow or flood storage capacity for floods up to the severity of the present day 1 in 1,000 AEP event. Whilst not specified by TAN15, Natural Resources Wales generally recommends that this should consider blockage where necessary.

No flooding of the site is expected in up to the present day 1 in 1,000 AEP ‘free flowing’ event (refer to **Figure 5**). As such the proposed development would not have an adverse impact on flood risk elsewhere during this scenario.

Modelled outputs comparing the pre-development, baseline and post-development, proposed scenario for the 1 in 100 AEP event +20% climate change and the present day 1 in 1,000 AEP event for the 100% Island Green culvert blockage scenario are provided in **Appendix C**. These indicate that the proposals would not be expected to have a significant impact on flood risk elsewhere. Whilst some localised increases in flood risk may be expected to the north-west of the site, the average increase in flood depth is 9.5 mm and 14.4 mm during the respective AEP events; however, the average flood depth within that area is shown to be 977 mm and 984 mm respectively. Such increases are not considered to materially impact flood risk to those areas given that they would already flood to significant depths.

The smaller area immediately adjacent to the northern site boundary that is indicated to be at a greater increased risk of flooding during the 1 in 1,000 AEP event (average increase in flood depth of 40 mm) does not impact any existing buildings and falls within the land ownership of the client.

It should be noted that the likelihood of floodwaters reaching the site during a blockage scenario to the extent and depth indicated, is considered low owing to the conservative way in which flooding to the site has been modelled. In reality, the presence of the existing buildings located along Brook Street to the north would be expected to protect the site from floodwater; whereas the model allows water to flow through walls of buildings.

In summary, whilst there are some small increases in flood risk indicated, these are either not considered to materially impact flooding elsewhere or only impact land within the ownership of the applicant. Although the policies set out in TAN15 aim to completely avoid increasing flooding elsewhere, it should be noted that para. 6.1 of TAN15 states that “Much urban development in Wales has taken place alongside rivers and in the coastal plain. It is therefore inevitable, despite the overall aim to avoid flood risk areas, that some existing development will be vulnerable to flooding and fall within zone C. Some flexibility is necessary to enable the risks of flooding to be addressed whilst recognising the negative economic and social consequences if policy were to preclude investment in existing urban areas, and the benefits of reusing previously developed land. Further development in such areas, whilst possibly benefiting from some protection, will not be free from risk and could in some cases exacerbate the consequences of a flood event for existing development and therefore

a balanced judgement is required". This should be taken into consideration for this proposed development, also noting that the small amount of flooding expected at the site is only during residual risk culvert blockage scenarios.

5 SURFACE WATER MANAGEMENT

5.1 Surface Water Drainage at the Existing Site

Whilst the site has been previously developed, there is minimal evidence on the topographic survey of an existing surface water drainage system at the site. Based on ground conditions and site topography, surface water runoff would be expected to slowly infiltrate where conditions allow and flow overland in a north-easterly direction.

5.2 Surface Water Drainage at the Redeveloped Site

5.2.1 Disposal of Surface Water (Standard S1)

In accordance with Welsh Government guidance¹¹, surface water runoff should be disposed of according to the following hierarchy: Rainwater collected for use; Into the ground (infiltration); To a surface water body; To a surface water sewer or highway drain; To a combined sewer.

As part of the drainage strategy on site, a rainwater harvesting system could be considered to collect non-potable water for reuse where possible. This could include the installation of water butts which would reduce demand on potable water supplies. However, the incorporation of rainwater harvesting systems within the apartment block will require pumped systems. In accordance with the principles of the Statutory Standards for SuDS, the use of pumping should be avoided where possible. Therefore, Priority Level 1 has been discounted as the primary method for disposal of surface water.

As detailed in **Section 2.5**, the site is underlain by freely draining soils. As such the disposal of surface water via infiltration may be feasible; however, infiltration tests have not been undertaken at this stage. Such tests should be undertaken at the detailed design stage in accordance with the guidelines in BRE365¹². In the absence of infiltration testing a rate of 0.036 m/hr (1×10^{-5} m/s) is assumed based on the lowest value for sand given in Table 25.1 of The CIRIA SuDS Manual.

In the event that infiltration is not a practicable method for the disposal of surface water (Priority Level 2), runoff from the redeveloped site could be directed to the River Gwenfro in accordance with Priority Level 3.

5.2.2 Post Development Impermeable Area

The area of impermeable surfaces within the proposed development has been calculated to be 0.115 ha, based on **Appendix A**.

5.2.3 Infiltration Rate (Standard S2)

For the purposes of this assessment, an infiltration rate of 0.036 m/hr (1×10^{-5} m/s) has been applied.

5.2.4 Attenuation Storage

Attenuation storage will be provided to store surface water runoff generated across roofs and hardstanding.

The attenuation storage facility has been modelled using Causeway Flow (**Appendix D**). The required storage volume has been sized to store the 1 in 100 AEP rainfall event including a 40% increase in rainfall intensity to allow for climate change in accordance with local guidance¹³.

Assuming an infiltration rate of 0.036 m/hr (1×10^{-5} m/s), a total storage volume of 92.0 m³ would be required.

The storage volume could be accommodated within an infiltration tank, with an area of 121.0 m² and a depth of 0.8 m.

A preliminary surface water drainage layout is provided in **Appendix E**.

¹¹ Footnote 6

¹² BRE Digest 365 Soakaway Design, Building Research Establishment, 2016

¹³ Email from Wrexham County Borough Council (SAB) to Weetwood on 8 February 2024

5.2.5 Urban Creep

Given that the proposed layout has no scope for an increase in impermeable area, no allowance for urban creep has been applied.

5.2.6 Exceedance Routes

Flows resulting from rainfall in excess of the 1 in 100 AEP rainfall event including an allowance for climate change will be managed in exceedance routes. It is assumed that as the development proposals progress, the design of the site would ensure flood flows are directed towards carriageways, with the site being profiled to ensure that flood flows are directed away from built development.

5.2.7 Water Quality and Pollution Control (Standard S3)

The CIRIA SuDS Manual identifies residential roofs and low traffic roads as having a very low to low pollution hazard level. Table 26.2 indicates that the pollution hazard indices associated with residential roofs and low traffic roads for total suspended solids, hydrocarbons and metals are 0.2, 0.2 and 0.05, and 0.50, 0.40 and 0.40 respectively.

It is proposed to incorporate permeable paving within parking bays and a filter drain to intercept surface water runoff.

Table 26.3 of the CIRIA SuDS Manual indicates that the SuDS mitigation indices for permeable pavements and filter drains for total suspended solids, hydrocarbons and metals are 0.70, 0.60 and 0.70, and 0.4, 0.4 and 0.4, respectively.

The use of permeable paving for the new car parking spaces will help prevent debris from entering the surface water drainage system, reducing the risk of blockage. In addition, filter drains and catchpit manholes will help prevent contaminants discharging into the downstream receptor.

5.2.8 Amenity and Biodiversity (Standard S4 and Standard S5)

The proposed layout includes landscaped areas/trees in a number of locations which will provide aesthetic benefits and interception of water surface, thus helping with volume control (via evapotranspiration).

It is generally recommended that native vegetation is used to maximise the biodiversity value of these areas. However, it may be valuable to include some non-native vegetation to support pollinators, such as butterflies and bees.

The implementation of soft landscaping will also help provide users of the site with health and wellbeing benefits.

5.2.9 Adoption and Maintenance of SuDS (Standard S6)

SuDS elements which serve more than one property will be adopted and maintained by the SAB, in accordance with the Statutory Standards for SuDS.

An indicative maintenance schedule is presented in **Table 2**.

Table 2: Maintenance Requirements

Schedule	Required action	Frequency
Permeable Paving		
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations.
	Stabilise and mow contributing and adjacent areas	As required

Schedule	Required action	Frequency
Occasional maintenance	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth- if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies accumulation rates and establish appropriate removal frequencies	Annually
	Monitor inspection chambers	
Geo-cellular infiltration tank		
Regular maintenance	Inspect and identify any areas that are not operating correctly	Monthly for 3 months, then annually
	Remove debris from the catchment surface	Monthly
	Remove sediment from internal forebays	Annually, or as required
Remedial action	Repair inlet/outlet and vents	As required
	Reconstruct infiltration structure and/or replace void fill, if performance deteriorates or failure occurs	
	Replacement of clogged geotextile (will require reconstruction)	
Monitoring	Inspect catchpit manholes and note rate of sediment accumulation	Monthly in the first year and then annually
	Inspect inlet/outlet and vents to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years, or as required
	Check infiltration tank to ensure emptying is occurring	Annually
Filter Drain		
Regular maintenance	Remove litter including leaf litter and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly (or as required)
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly (or as required)
	Clear perforated pipework of blockages	As required

6 FOUL WATER MANAGEMENT

6.1 Existing Assets

An extract of the public sewer record obtained from Dŵr Cymru Welsh Water is provided in **Appendix F**. The records indicate that a 740 x 480 mm combined sewer is located in Bridge Street to the east of the site.

6.2 New Connections

The anticipated domestic foul loading from the site has been calculated in accordance with Design and Construction Guidance¹⁴. The expected total peak flow rate from the development would be 1.0 l/s.

Under the Water Industry Act (1991), developers have a right to connect foul water flows from new developments to public sewer. The Act places a general duty on sewerage undertakers to provide the additional capacity that may be required to accommodate additional flows and loads arising from new domestic development.

Dŵr Cymru Welsh Water has advised, by way of a pre-planning sewerage enquiry response (**Appendix G**), that there is existing capacity in the local foul sewerage network to receive and treat domestic foul water from the proposed development and that foul water can discharge without restriction into the 740 x 480 mm combined sewer in Bridge Street.

A preliminary foul water drainage layout is provided in **Appendix E**.

¹⁴ Sewerage Sector Guidance Appendix C, Water UK, Approved Version 2.0, March 2020

7 SUMMARY AND RECOMMENDATIONS

This report has been prepared on behalf of Central Buildings Two Ltd and relates to the proposed redevelopment of land off Bridge Street, Wrexham for residential use.

The Development Advice Map indicates the site to be located in zone A and zone B, with zone C2 encroaching on the north-eastern boundary. However, detailed hydraulic modelling of the River Gwenfro has been undertaken and indicates that no flooding of the site would be expected in up to a present day 1 in 1,000 AEP event. The site should therefore not be defined as zone C2.

The Flood Map for Planning - Rivers indicates the site to be located predominately within flood zone 1, with the north-eastern area in flood zone 2 (rivers).

The risk of flooding to the proposed development and access from all identified sources is assessed to be negligible/low, with the exception of the River Gwenfro which poses a residual risk in the north-east of the site as a result of culvert blockage.

The assessment demonstrates that the proposed development may be completed in accordance with the requirements of planning policy subject to the following:

- Site levels including all ancillary areas to be set at a minimum of 76.39 m AOD.
- Finished floor levels to be set at a minimum of 76.69 m AOD and at least 0.15 m above adjacent ground levels following any reprofiling of the site, with ground levels sloping down from the building.

The proposals are not expected to materially impact on flood risk elsewhere.

Surface water runoff from the redeveloped site can be sustainably managed in accordance with planning policy. The site is underlain by freely draining soils and as such, the disposal of surface water via infiltration is assumed to be feasible. Runoff is to be treated with the use of permeable paving and a filter drain prior to discharging to ground via an infiltration storage tank. The detailed drainage design should be submitted to and approved by the SAB prior to the commencement of development.

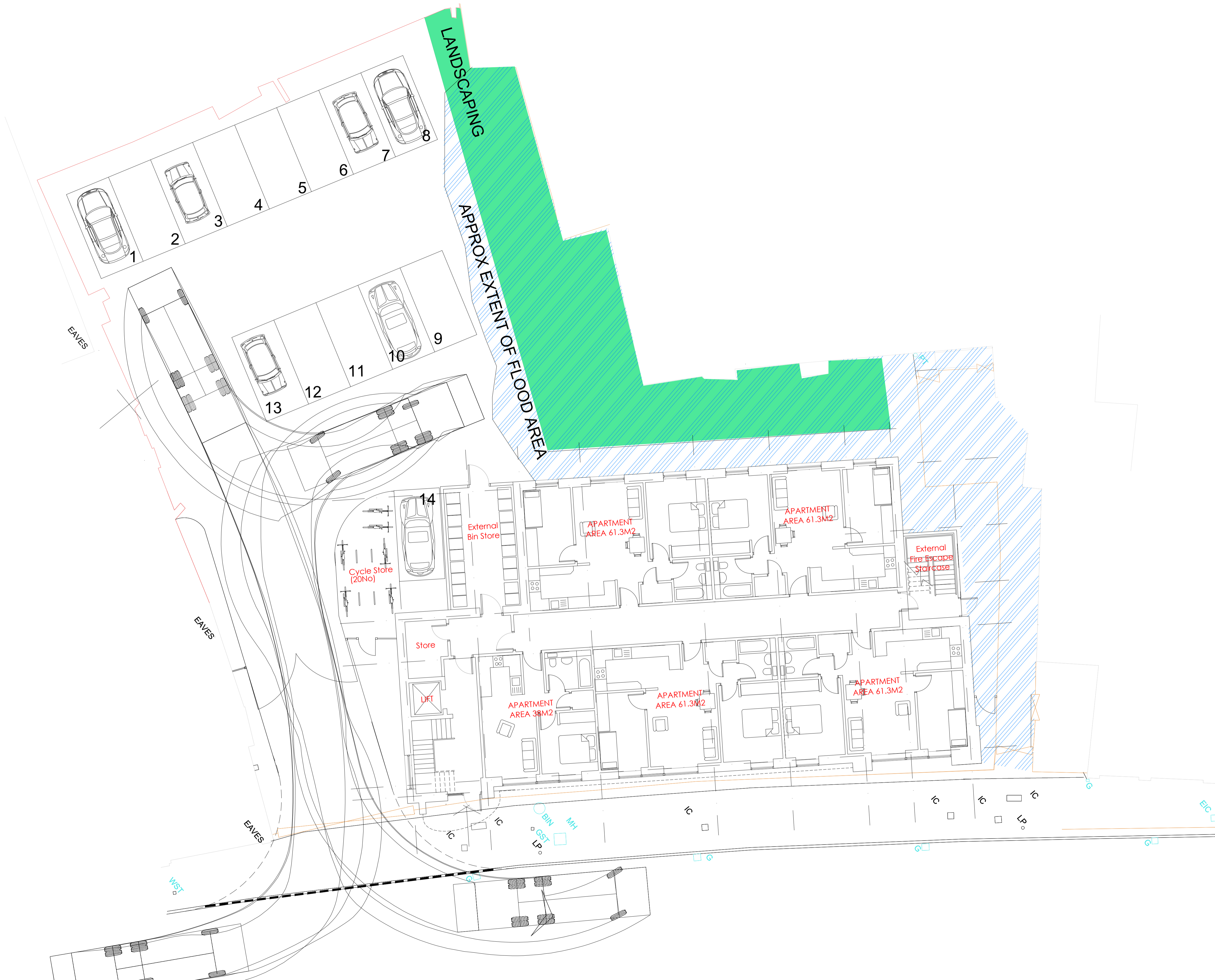
Foul water is to connect to the 740 x 480 mm combined sewer located in Bridge Street. Dŵr Cymru Welsh Water has advised, by way of a pre-planning sewerage enquiry response, that there is existing capacity in the local foul sewerage network to receive and treat domestic foul water from the proposed development.

APPENDIX A

Proposed Site Plan

Health & Safety Notes

- Contractor must ensure that all work on site is carried out in a safe & satisfactory manner, in accordance with Health & Safety At Work Act 1974, COSHH Regulations 2002 & requirements of C.D.M




PROPOSED CAR PARK PLAN.
1:100

Rev.	Description	Date
Client CB 2 Ltd		
Project Vacant land. Proposed Apartments		
Drawing Title Proposed Car Park Plan Bridge Street		
Drawn by	I.W.	Checked by
Status	Scale @ A1	Date
Job no.	11684	Rev.
Dwg no.	PL 03	Date
Cassidy+Ashton <small>www.cassidyashton.co.uk</small> Architecture + Building Surveying + Town Planning 7 East Cliff, Preston, Lancashire, PR1 3JE 01772 258 356 10 Hunters Walk, Canal Street, Chester, CH1 4EB 01244 402 900		

APPENDIX B

Topographic Survey

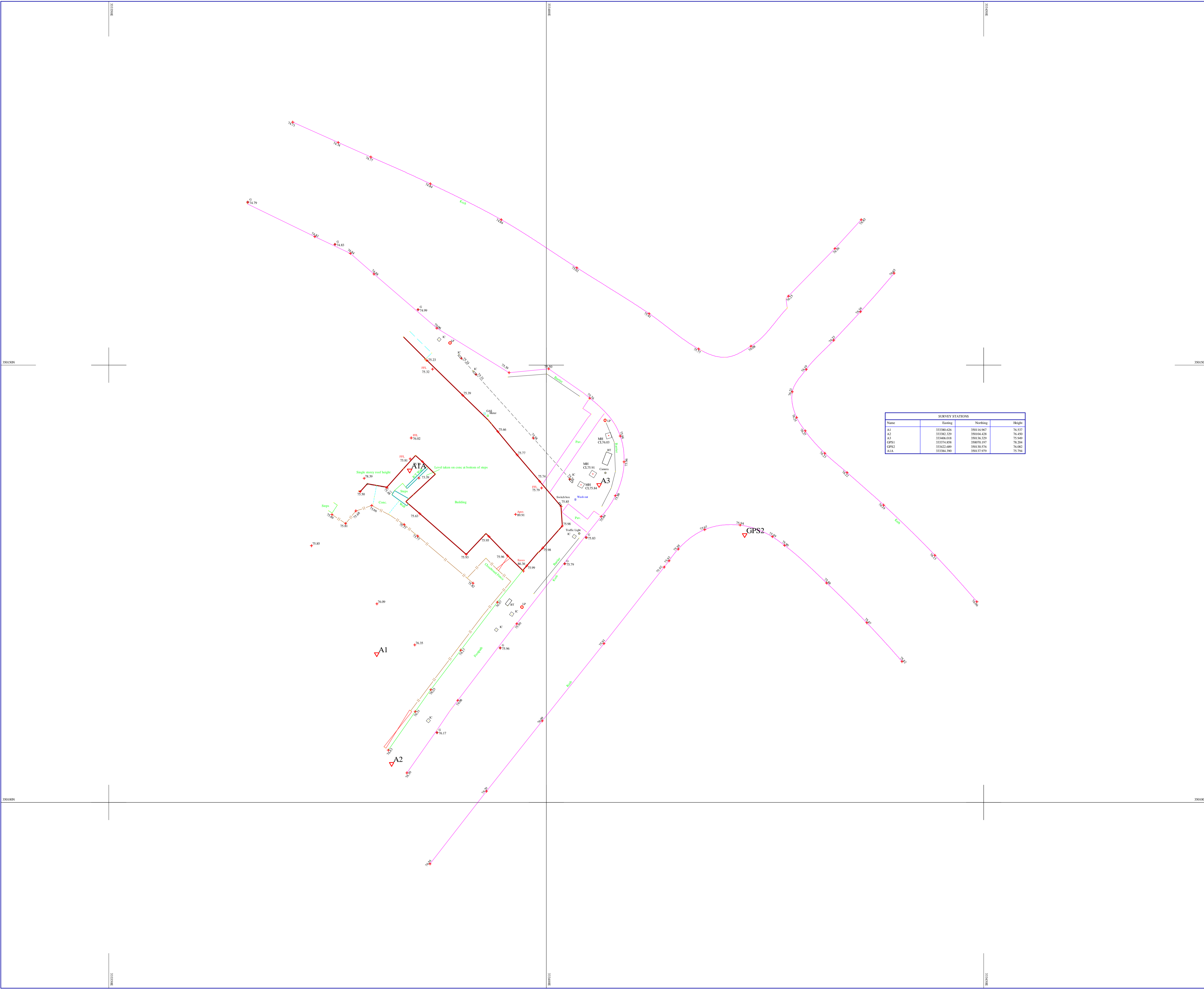



 STEPHEN T. BAYLEY
 HEAD OF ASSETS AND
 ECONOMIC DEVELOPMENT
 CROWN BUILDINGS
 WREXHAM, LL13 8BG
 Tel: 01978 292440 Fax: 01978 292445

Project: BRIDGE STREET SITE WREXHAM			
Detail: All levels to Ordnance Datum			
Drawn: MJ/RR	Date: 08/15	Print Issue Date:	
Checked:	Section:		
Scale: 1-500@A2	Drawing No:	Rev:	

Plan for reference purposes only

Disclaimer:
 All efforts have been made to survey all utility services within the boundary of the survey
 We can not guarantee that we have been able to locate everything and further investigation
 will be required to establish full extents of services



Notes:
 Horizontal and vertical control using SmartNet GPS Network and OSGB36(02) coordinate System
 This survey has been converted to a local grid orientated to OS grid. Position is only true at one point to OS coordinates

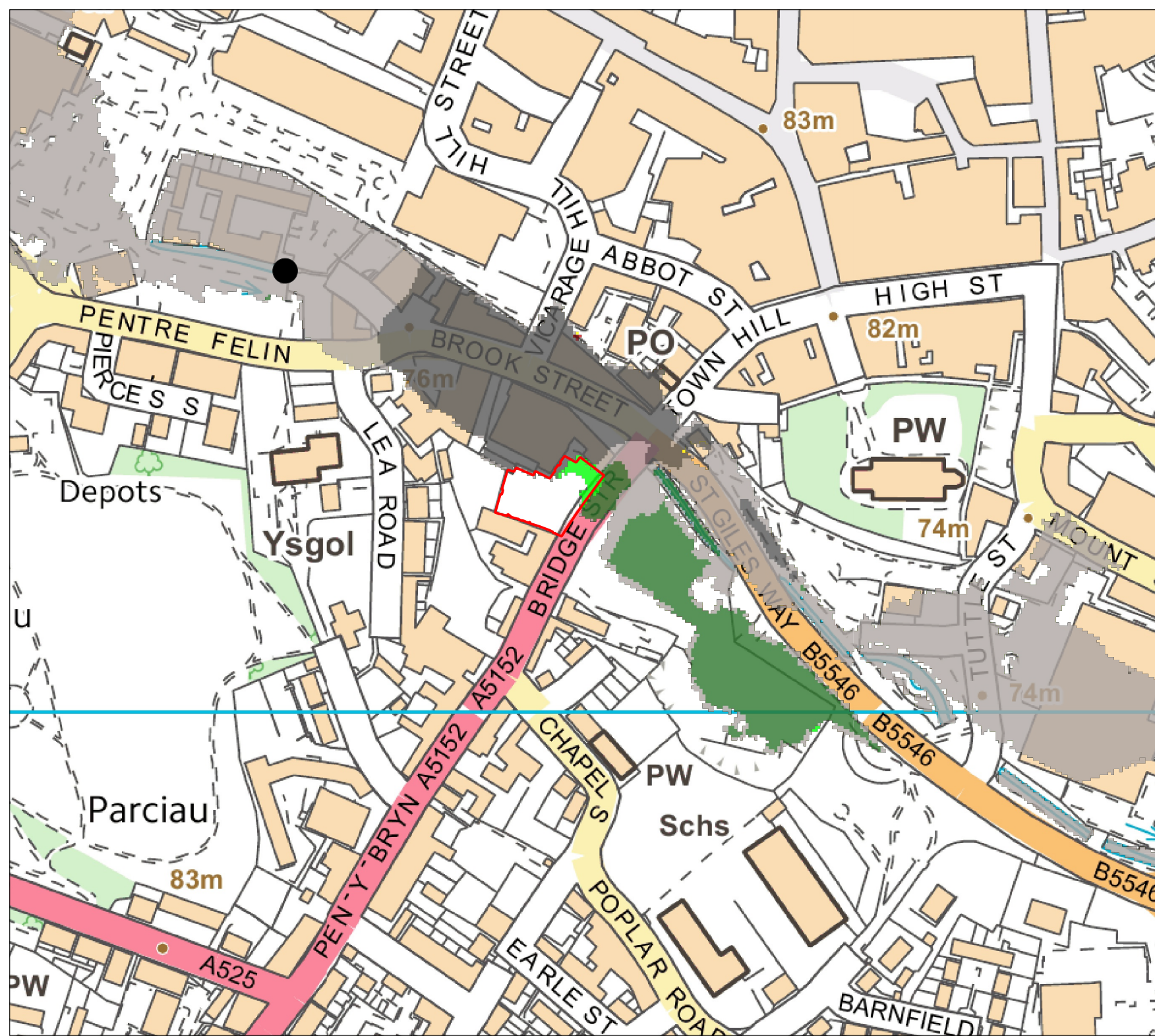


Unit 18, Barrowmore Enterprise Estate, GI Barrow, Chester CH3 7J8
 Email - martin@cheshiresurveys.com Tel/Fax 01829 741859 Mob: 077 9964 1118

Client	Weetwood		
Location	4 Brook St, Wrexham		
Description	Level Survey		
Drg. No.:	2140/1	Surveyed By:	GF
Scale:	1: 200/A1	Drawn By:	GF
Date:	20/09/10	Amend:	*

APPENDIX C

Modelled Outputs - Pre-Development, Baseline and Post-Development, Proposed Scenario Comparison



Notes:
 1. Do not scale from this drawing.
 2. Map background reproduced from Ordnance Survey digital map data. Crown Copyright under licence.

Legend

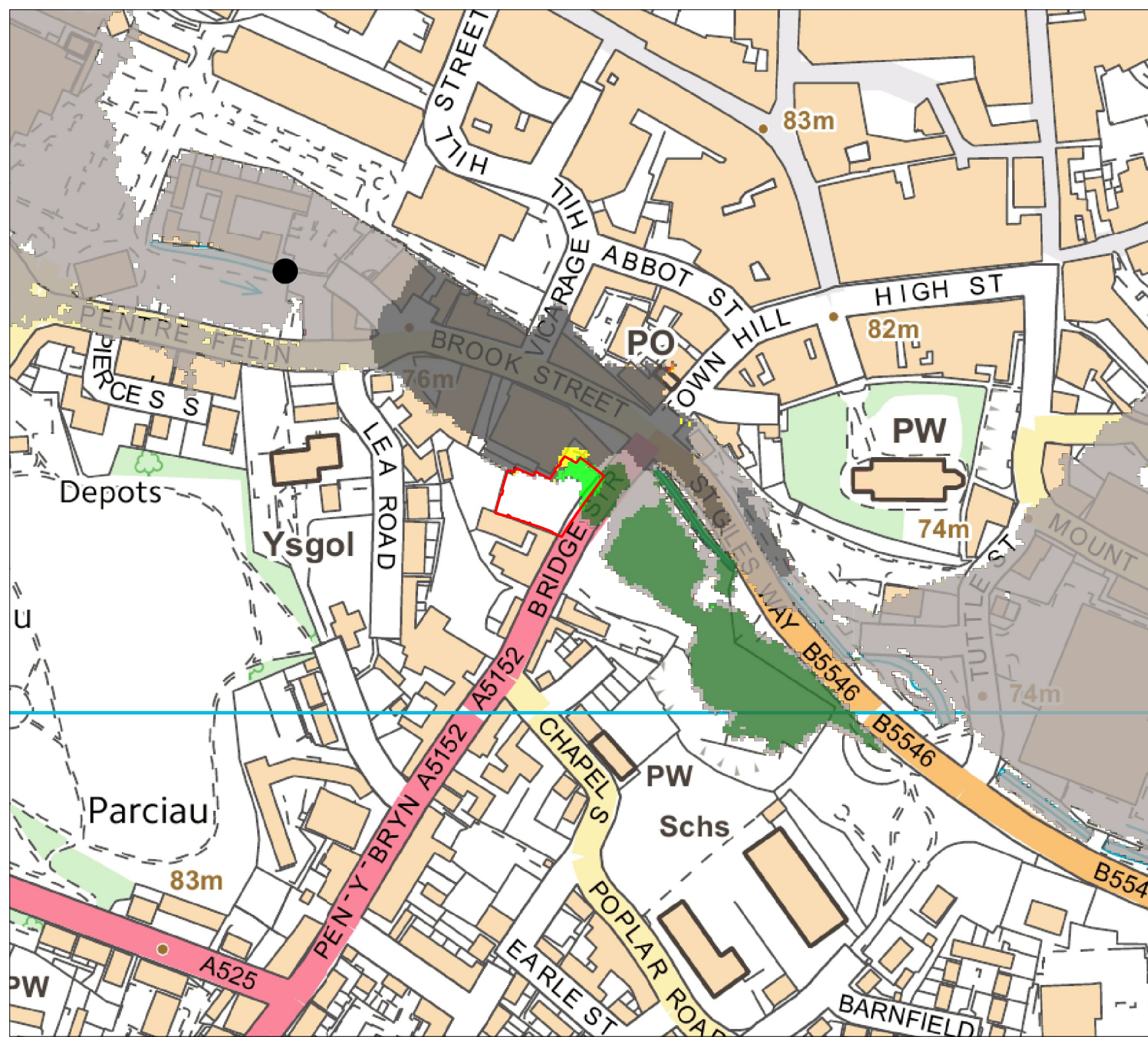
- Site Location
- Blockage Location

Change in Depth (m)

- Reduction < 0.03
- Reduction 0.03 to 0.005
- No Change
- Increase 0.005 to 0.03
- Increase 0.03 to 0.075
- Increase 0.075 to 0.15
- Increase 0.15 to 0.3
- Increase > 0.3

Weetwood
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 Park House
 Broncoed Business Park
 Ffordd Byrnwr Gwair
 Mold
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 E: info@weetwood.net
 W: www.weetwood.net

Client:		
Central Buildings Two Ltd		
Project Title:		
Land off Bridge Street, Wrexham		
Drawing Title:		
Fluvial 100% Blockage Scenario - Comparison Plot; 1 in 100 plus climate change (20%) AEP event		
Map Orientation:		Scale:
Drawn:	Checked:	Date:
FL	RMur	28 February 2024
Project No:	Drawing No:	Rev:
4183	4183_010-006_BLK5_ 100%_Q100CC20	A



Notes:

1. Do not scale from this drawing.
2. Map background reproduced from Ordnance Survey digital map data. Crown Copyright under licence.

Legend

- Site Location
- Blockage Location

Change in Depth (m)

- Reduction < 0.03
- Reduction 0.03 to 0.005
- No Change
- Increase 0.005 to 0.03
- Increase 0.03 to 0.075
- Increase 0.075 to 0.15
- Increase 0.15 to 0.3
- Increase > 0.3

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Client:		
Central Buildings Two Ltd		
Project Title:		
Land off Bridge Street, Wrexham		
Drawing Title:		
Fluvial 100% Blockage Scenario - Comparison Plot; 1 in 1,000 AEP event		
Map Orientation:	Scale:	
Drawn:	Checked:	Date:
FL	RMur	28 February 2024
Project No:	Drawing No:	Rev:
4183	4183_010-006_BLK5_ 100%_Q1000	A

APPENDIX D

Surface Water Attenuation - Storage Volume Calculation

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓ 1	0.026	5.00	76.390	Manhole	Adoptable	1200	333373.850	350128.276	1.390
✓ 2	0.028	5.00	76.700	Manhole	Adoptable	1200	333361.661	350111.236	1.850
✓ 3	0.047	5.00	76.700	Manhole	Adoptable	1200	333351.389	350118.333	1.700
✓ TANK			76.700	Junction			333349.708	350111.133	1.900
✓ DUMMY			76.700	Junction			333348.628	350102.492	1.950
✓ 4	0.014	5.00	76.700	Manhole	Adoptable	1200	333359.406	350103.820	1.850

Links (Input)


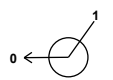

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
? 1.000	1	2	20.951	0.600	Colebrook-White	75.000	74.850	0.150	139.7	225	Circular	5.32	49.7
✓ 1.001	2	TANK	2.000	0.600	Colebrook-White	74.850	74.800	0.050	40.0	225	Circular	5.33	49.6
? 2.000	3	TANK	2.000	0.600	Colebrook-White	75.000	74.800	0.200	10.0	225	Circular	5.01	50.0
✓ 1.002	TANK	DUMMY	1.000	0.600	Colebrook-White	74.800	74.750	0.050	20.0	225	Circular	5.34	49.6
✓ 3.000	4	TANK	2.000	0.600	Colebrook-White	74.850	74.800	0.050	40.0	225	Circular	5.02	50.0

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)
1.000	20.951	139.7	225	Circular	76.390	75.000	1.165	76.700	74.850	1.625
1.001	2.000	40.0	225	Circular	76.700	74.850	1.625	76.700	74.800	1.675
2.000	2.000	10.0	225	Circular	76.700	75.000	1.475	76.700	74.800	1.675
1.002	1.000	20.0	225	Circular	76.700	74.800	1.675	76.700	74.750	1.725
3.000	2.000	40.0	225	Circular	76.700	74.850	1.625	76.700	74.800	1.675

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	TANK		Junction	
2.000	3	1200	Manhole	Adoptable	TANK		Junction	
1.002	TANK		Junction		DUMMY		Junction	
3.000	4	1200	Manhole	Adoptable	TANK		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
1	333373.850	350128.276	76.390	1.390	1200	Manhole	Adoptable		0	1.000	75.000	225 Circular
2	333361.661	350111.236	76.700	1.850	1200	Manhole	Adoptable		1	1.000	74.850	225 Circular
									0	1.001	74.850	225 Circular
3	333351.389	350118.333	76.700	1.700	1200	Manhole	Adoptable		0	2.000	75.000	225 Circular

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type	
TANK	333349.708	350111.133	76.700	1.900		Junction			1 2 3 0	3.000 2.000 1.001 1.002	74.800 74.800 74.800 74.800	225 225 225 225	Circular Circular Circular Circular
DUMMY	333348.628	350102.492	76.700	1.950		Junction			1	1.002	74.750	225	Circular
4	333359.406	350103.820	76.700	1.850	1200	Manhole	Adoptable		0	3.000	74.850	225	Circular

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Detailed	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	40	0	0
30	40	0	0				

Node DUMMY Online Pump Control

Flap Valve	x	Invert Level (m)	74.750	Switch off depth (m)	0.100
Replaces Downstream Link	✓	Switch on depth (m)	2.000		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.000	0.000	2.000	0.000

Node TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03600	Safety Factor	2.0	Invert Level (m)	74.800
Side Inf Coefficient (m/hr)	0.03600	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	121.0	121.0	0.800	121.0	121.0	0.801	0.0	121.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	103.970	29.420	2 year 720 minute winter	6.183	2.466
2 year 15 minute winter	72.961	29.420	2 year 960 minute summer	7.645	2.013
2 year 30 minute summer	68.560	19.400	2 year 960 minute winter	5.064	2.013
2 year 30 minute winter	48.112	19.400	2 year 1440 minute summer	5.644	1.513
2 year 60 minute summer	46.922	12.400	2 year 1440 minute winter	3.793	1.513
2 year 60 minute winter	31.174	12.400	30 year +40% CC 15 minute summer	403.779	114.255
2 year 120 minute summer	31.284	8.267	30 year +40% CC 15 minute winter	283.353	114.255
2 year 120 minute winter	20.784	8.267	30 year +40% CC 30 minute summer	270.602	76.571
2 year 180 minute summer	24.761	6.372	30 year +40% CC 30 minute winter	189.896	76.571
2 year 180 minute winter	16.095	6.372	30 year +40% CC 60 minute summer	186.359	49.249
2 year 240 minute summer	19.915	5.263	30 year +40% CC 60 minute winter	123.813	49.249
2 year 240 minute winter	13.231	5.263	30 year +40% CC 120 minute summer	114.649	30.298
2 year 360 minute summer	15.541	3.999	30 year +40% CC 120 minute winter	76.170	30.298
2 year 360 minute winter	10.102	3.999	30 year +40% CC 180 minute summer	87.779	22.589
2 year 480 minute summer	12.399	3.277	30 year +40% CC 180 minute winter	57.059	22.589
2 year 480 minute winter	8.237	3.277	30 year +40% CC 240 minute summer	69.144	18.273
2 year 600 minute summer	10.248	2.803	30 year +40% CC 240 minute winter	45.938	18.273
2 year 600 minute winter	7.002	2.803	30 year +40% CC 360 minute summer	52.408	13.486
2 year 720 minute summer	9.199	2.466	30 year +40% CC 360 minute winter	34.066	13.486

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +40% CC 480 minute summer	41.015	10.839	100 year +40% CC 120 minute winter	105.185	41.840
30 year +40% CC 480 minute winter	27.249	10.839	100 year +40% CC 180 minute summer	119.168	30.666
30 year +40% CC 600 minute summer	33.364	9.126	100 year +40% CC 180 minute winter	77.462	30.666
30 year +40% CC 600 minute winter	22.796	9.126	100 year +40% CC 240 minute summer	92.712	24.501
30 year +40% CC 720 minute summer	29.533	7.915	100 year +40% CC 240 minute winter	61.596	24.501
30 year +40% CC 720 minute winter	19.848	7.915	100 year +40% CC 360 minute summer	69.125	17.788
30 year +40% CC 960 minute summer	23.914	6.297	100 year +40% CC 360 minute winter	44.933	17.788
30 year +40% CC 960 minute winter	15.841	6.297	100 year +40% CC 480 minute summer	53.474	14.132
30 year +40% CC 1440 minute summer	16.906	4.531	100 year +40% CC 480 minute winter	35.527	14.132
30 year +40% CC 1440 minute winter	11.362	4.531	100 year +40% CC 600 minute summer	43.119	11.794
100 year +40% CC 15 minute summer	559.835	158.414	100 year +40% CC 600 minute winter	29.462	11.794
100 year +40% CC 15 minute winter	392.867	158.414	100 year +40% CC 720 minute summer	37.902	10.158
100 year +40% CC 30 minute summer	379.185	107.296	100 year +40% CC 720 minute winter	25.473	10.158
100 year +40% CC 30 minute winter	266.095	107.296	100 year +40% CC 960 minute summer	30.370	7.997
100 year +40% CC 60 minute summer	263.439	69.619	100 year +40% CC 960 minute winter	20.118	7.997
100 year +40% CC 60 minute winter	175.023	69.619	100 year +40% CC 1440 minute summer	21.177	5.676
100 year +40% CC 120 minute summer	158.321	41.840	100 year +40% CC 1440 minute winter	14.232	5.676

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.04%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	10	75.043	0.043	3.5	0.0642	0.0000	OK
360 minute winter	2	280	74.925	0.075	3.9	0.1077	0.0000	OK
15 minute winter	3	10	75.033	0.033	6.3	0.0547	0.0000	OK
360 minute winter	TANK	280	74.924	0.124	5.8	14.2939	0.0000	OK
360 minute winter	DUMMY	280	74.924	0.174	0.3	0.0000	0.0000	OK
360 minute winter	4	272	74.924	0.074	1.1	0.0953	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	3.4	0.606	0.078	0.1186	
15 minute winter	2	1.001	TANK	7.0	1.869	0.085	0.0105	
15 minute winter	3	2.000	TANK	6.3	2.504	0.038	0.0084	
30 minute summer	TANK	1.002	DUMMY	4.0	0.471	0.034	0.0150	
15 minute summer	TANK	Infiltration		0.6				
15 minute summer	DUMMY	Pump		0.0				0.0
120 minute winter	4	3.000	TANK	2.6	0.672	0.031	0.0269	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.04%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
600 minute winter	1	585	75.365	0.365	1.4	0.5493	0.0000	SURCHARGED
600 minute winter	2	585	75.365	0.515	6.9	0.7385	0.0000	SURCHARGED
600 minute winter	3	585	75.365	0.365	10.3	0.6147	0.0000	SURCHARGED
600 minute winter	TANK	585	75.365	0.565	13.2	64.9466	0.0000	SURCHARGED
600 minute winter	DUMMY	585	75.365	0.615	0.2	0.0000	0.0000	OK
600 minute winter	4	585	75.365	0.515	1.4	0.6602	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	13.4	0.819	0.306	0.3700	
15 minute winter	2	1.001	TANK	27.1	2.171	0.329	0.0729	
60 minute winter	3	2.000	TANK	24.7	2.288	0.149	0.0727	
15 minute winter	TANK	1.002	DUMMY	11.1	0.647	0.095	0.0397	
15 minute summer	TANK	Infiltration		0.6				
15 minute summer	DUMMY	Pump		0.0				0.0
60 minute summer	4	3.000	TANK	14.6	0.966	0.177	0.0795	

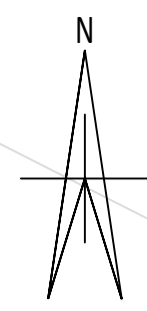
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.04%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
720 minute winter	1	705	75.574	0.574	1.5	0.8642	0.0000	SURCHARGED
720 minute winter	2	705	75.574	0.724	3.1	1.0385	0.0000	SURCHARGED
720 minute winter	3	705	75.574	0.574	3.0	0.9670	0.0000	SURCHARGED
720 minute winter	TANK	705	75.574	0.774	11.3	88.9950	0.0000	SURCHARGED
720 minute winter	DUMMY	705	75.574	0.824	0.2	0.0000	0.0000	OK
720 minute winter	4	705	75.574	0.724	1.7	0.9284	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	18.7	0.864	0.427	0.6158	
15 minute winter	2	1.001	TANK	37.2	2.240	0.451	0.0795	
60 minute winter	3	2.000	TANK	35.8	2.431	0.216	0.0795	
15 minute summer	TANK	1.002	DUMMY	14.1	0.649	0.120	0.0398	
15 minute summer	TANK	Infiltration		0.6				
15 minute summer	DUMMY	Pump		0.0				0.0
60 minute winter	4	3.000	TANK	14.5	1.018	0.176	0.0795	

APPENDIX E

Preliminary Drainage Layout

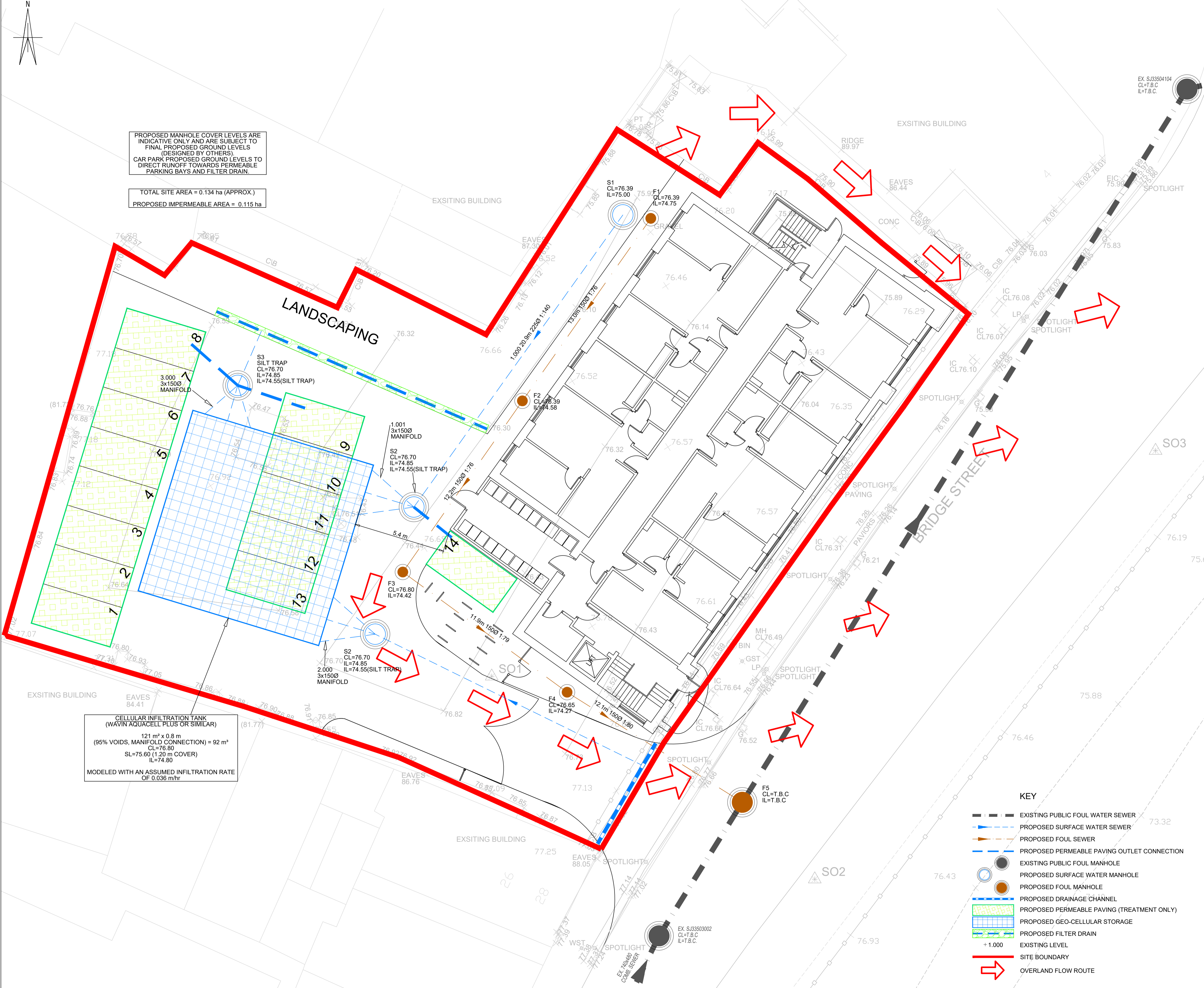


PROPOSED MANHOLE COVER LEVELS ARE INDICATIVE ONLY AND ARE SUBJECT TO FINAL PROPOSED GROUND LEVELS (DESIGNED BY OTHERS). CAR PARK PROPOSED GROUND LEVELS TO DIRECT RUNOFF TOWARDS PERMEABLE PARKING BAYS AND FILTER DRAIN.

TOTAL SITE AREA = 0.134 ha (APPROX.)
PROPOSED IMPERMEABLE AREA = 0.115 ha

CELLULAR INFILTRATION TANK (WAVIN AQUACELL PLUS OR SIMILAR)
121 m² x 0.8 m
(95% VOIDS, MANIFOLD CONNECTION) = 92 m³
CL=76.80
SL=75.60 (1.20 m COVER)
IL=74.80
MODELED WITH AN ASSUMED INFILTRATION RATE OF 0.036 m/hr

- NOTES**
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT WEETWOOD DRAWINGS.
 2. PROPOSED SITE LAYOUT TAKEN FROM CASSIDY+ASHTON 'PROPOSED SITE PLAN' DRAWING (REF: 11684 PL03 DATED JAN 2024).
 3. EXISTING LEVEL INFORMATION TAKEN FROM SURVEY OPERATIONS 'TOPOGRAPHIC SURVEY' (REF: 17K207/001 DATED AUGUST 2018).
 4. EXISTING DRAINAGE DETAILS TAKEN FROM DCWW PUBLIC SEWER RECORD DRAWINGS FEB 2024.



- KEY**
- EXISTING PUBLIC FOUL WATER SEWER
 - PROPOSED SURFACE WATER SEWER
 - PROPOSED FOUL SEWER
 - PROPOSED PERMEABLE PAVING OUTLET CONNECTION
 - EXISTING PUBLIC FOUL MANHOLE
 - PROPOSED SURFACE WATER MANHOLE
 - PROPOSED FOUL MANHOLE
 - PROPOSED DRAINAGE CHANNEL
 - PROPOSED PERMEABLE PAVING (TREATMENT ONLY)
 - PROPOSED GEO-CELLULAR STORAGE
 - PROPOSED FILTER DRAIN
 - EXISTING LEVEL
 - SITE BOUNDARY
 - OVERLAND FLOW ROUTE

P1	26.02.24	INITIAL ISSUE	DSH	TB
REV	DATE	DESCRIPTION	DRAWN	CHECK

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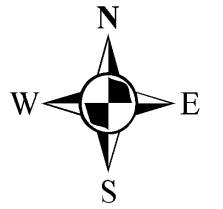
Park House, Ffordd Bynwyr Gwair, Mold CH7 1FQ
Tel 01352 700045
info@weetwood.net
www.weetwood.net

Client CENTRAL BUILDINGS TWO LTD	
Drawing Status PLANNING	Date FEB 2024
Project LAND OFF BRIDGE STREET WREXHAM	Scale (A1) 1:100
	Drawn DSH
	Checked TB
	Project No 4183
Title DRAINAGE LAYOUT	Drawing No 100
	Revision P1

APPENDIX F

Dŵr Cymru Welsh Water Public Sewer Record

Sewer plan



LEGEND(Representative of most common features)

Waste network:	
	Foul chamber
	Surface water chamber
	Combined chamber
	Combined sewer overflow
	Special purpose chamber
	Treatment works
	Pumping station
	Outfall
	Lamphole
	Storm Overflow
	Rising main
	Gravity sewer
	Private sewer
	Private sewer subject to Sect. 104 adoption agreement
	Private Sewer Transfer
	Lateral Drain
	Inspection Chamber

NB: Sewer symbol colour indicates the type.
 RED - Combined
 GREEN - Surface Water
 BROWN - Foul
 Purple - Former S24 sewers (for indicative purposes only)

Notes:

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.

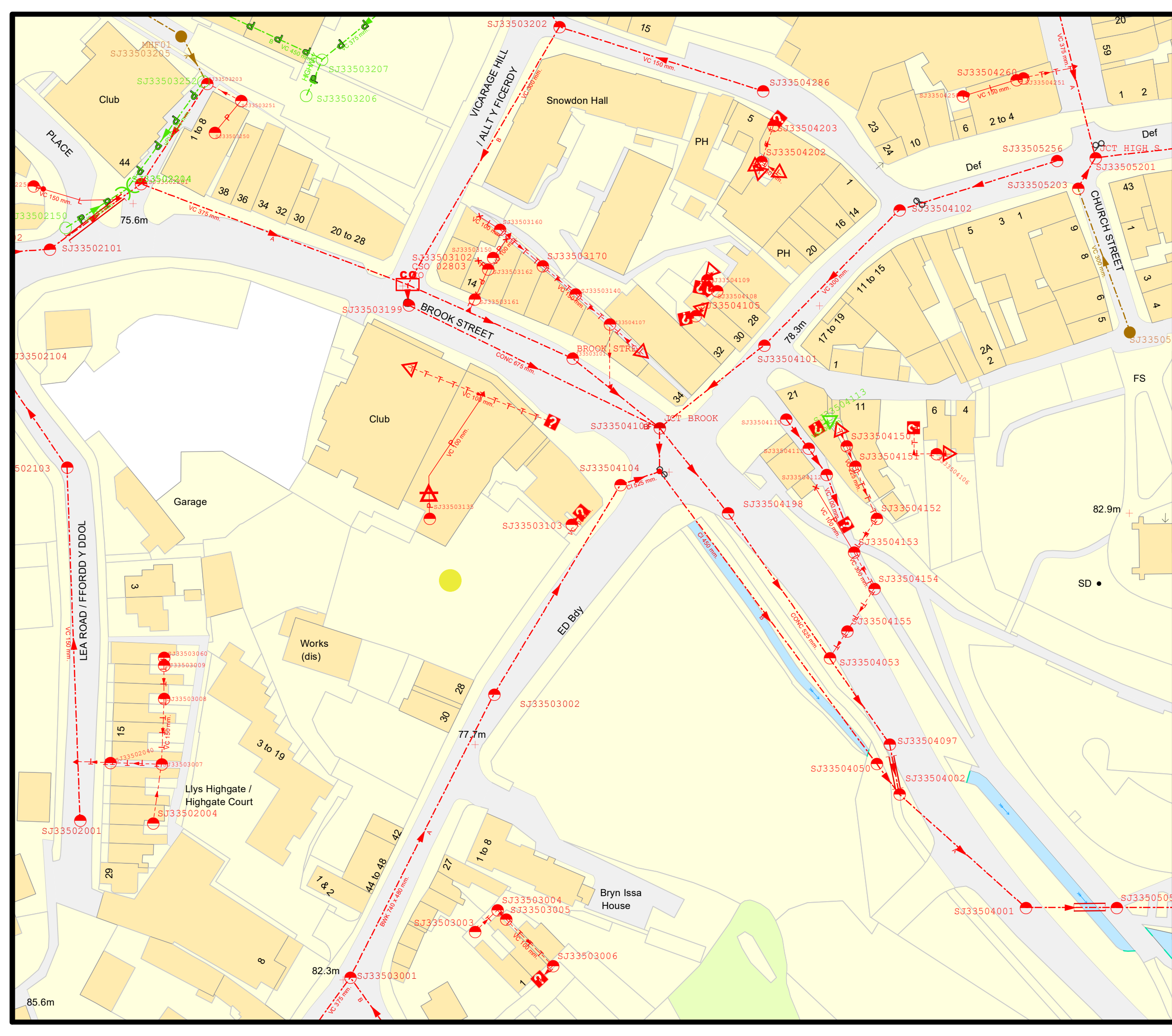
Dŵr Cymru Cylfyngedig (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map Ref: 333400,350128
 Map scale: 1:800
 Printed by: Stacey Harris
 Printed on: 01 Feb 2024



APPENDIX G

Dŵr Cymru Welsh Water Pre-Planning Enquiry

Mr Warren Chan
Weetwood Services
Park House
Ffordd Byrnwr Gwair
Mold
Flintshire
CH7 1FQ

Date: 01/02/2024
Our Ref: PPA0008552

Grid Ref: 333367 350114
Site Address: Bridge Street Wrexham
Development: 20 Residential dwellings

Dear Mr Chan

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

APPRAISAL

Firstly, we note that the proposal relates to 20 dwellings at Bridge Street and acknowledge that the site comprises of a potential windfall development with no allocated status in the Local Development Plan (LDP). Accordingly, whilst it does not appear an assessment has been previously undertaken of the public sewerage and watermains systems, we offer the following comments as part of our appraisal of this development.

Public Sewerage Network

The proposed development site is located in the immediate vicinity of a predominantly combined public sewerage system which drains to Five Fords Wastewater Treatment Works (WwTW).

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011.

The presence of such assets may affect the proposal.

In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site. Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

Surface Water Drainage

As of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy which states that discharge to a combined sewer shall only be made as a last resort. Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to a surface water drainage body in liaison with the Land Drainage Authority and/or Natural Resources Wales.

It is therefore recommended that the developer consult with Wrexham County Council, as the determining SuDS Approval Body (SAB), in relation to their proposals for SuDS features. Please note, DCWW is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation. Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note.

In addition, please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

Foul Water Drainage – Sewerage Network

We have considered the impact of foul flows generated by the proposed development and concluded that flows can be accommodated within the public sewerage system. We advise that the flows should be connected to the combined sewer at manhole SJ33504198 located to the east of the development site. Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account. However, should you wish for an alternative connection point to be considered please provide further information to us in the form of a drainage strategy, preferably in advance of a planning application being submitted.



You may need to apply to Dwr Cymru Welsh Water for any connection to the public sewer under Section 106 of the Water industry Act 1991. However, if the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com.

Foul Water Drainage – Sewage Treatment

Please note that the Natural Resources Wales have recently released Planning Advice relating to increased phosphate levels in several river Special Areas of Conservation (SAC). Applications for new development in these areas need to consider the requirements set out in the planning advice and should form part of the local planning authority's decision making when determining planning applications. The flows from this development would eventually drain to our Five Fords Wastewater Treatment Works which has a phosphate consent. Notwithstanding this no problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at developer.services@dwrcymru.com

Please quote our reference number in all communications and correspondence.

Yours faithfully,



Owain George
Planning Liaison Manager
Developer Services



Glas Cymru Cyfyngedig

Welsh Water is owned by Glas Cymru – a 'not-for-profit' company.
Mae Dŵr Cymru yn eiddo i Glas Cymru – cwmni 'nid-er-elw'.

We welcome correspondence in
Welsh and English

Dŵr Cymru Cyf, a limited company registered in
Wales no 2366777. Registered office: Pentwyn Road,
Nelson, Treharris, Mid Glamorgan CF46 6LY

Rydym yn croesawu gohebiaeth yn y
Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng
Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn
Nelson, Treharris, Morgannwg Ganol CF46 6LY.

Please Note that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.

**ENC. SEWER PLAN
PRE PLANNING NOTES**



Welsh Water is owned by Glas Cymru – a 'not-for-profit' company.
Mae Dŵr Cymru yn eiddo i Glas Cymru – cwmni 'nid-er-elw'.

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Rydym yn croesawu gohebiaeth yn y
Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng
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