Land South of Heol Martin, Eglwysbach

Flood Consequences Assessment & Drainage Strategy

April 2024

Waterco

Assessment | Modelling | Design

Project Information	
Project:	Heol Martin, Eglwysbach
Report Title:	Flood Consequences Assessment & Drainage Strategy
Client:	Mr Robin Roberts
Instruction:	The instruction to undertake this Flood Consequences Assessment & Drainage Strategy was received from Mr Robin Roberts.
File Ref:	12116-FCA & Drainage Strategy-02

Approval Record	
Authors:	Awel Roberts BSc (Hons) MCIWEM
Checker:	Megan Williams BSc (Hons) MSc MCIWEM
Approver:	Aled Williams BSc (Hons) MCIWEM C.WEM

Document History		
Revision	**Date**	**Comment**
01	31/01/2020	First issue
02	03/04/2024	Second issue – Updated with revised site boundary and layout

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Introduction

Waterco has been instructed to prepare a Flood Consequences Assessment (FCA) and Drainage Strategy in respect of a proposed residential development on the land south of Heol Martin, Eglwysbach, Conwy, LL28 5AJ.

The purpose of this report is to outline the potential flood risk to the site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified flood risk. This report has been prepared in accordance with the guidance contained in Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15): Development and Flood Risk.

This report has also been prepared in accordance with the Welsh Government 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage'.

Existing Conditions

The site covers an area of approximately 3,690m² and is located at National Grid Reference (NGR) 280277, 370405. A location plan and an aerial image are included in Appendix A.

Online mapping (including Google Maps / Google Streetview imagery, accessed April 2024) shows that the site comprises undeveloped agricultural land. The site is bordered by residential properties to the north (Heol Martin), north-east and south-east with agricultural land with the Afon Hiraethlyn beyond to the south-west. Access to the site is provided from Heol Martin.

Local Topography

A topographical survey has been undertaken by CO-Surveys Ltd in May 2018. The topographical survey shows that the site generally slopes from 32.31 metres Above Ordnance Datum (m AOD) in the north-east to 29.5m AOD in the west.

Topographic levels have also been derived from a 1m resolution NRW composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). LiDAR levels generally reflect those on the topographical survey.

Topographical information is provided as Appendix B.

Ground Conditions

The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by superficial River Terrace Deposits generally comprising sand and gravel. The superficial deposits are identified as being underlain by the Denbigh Grits Formation consisting of mudstone, sandstone and siltstone.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

There are no historical borehole records within the close proximity of the site.

According to the Hydrogeology Wales Aquifer Designation data, obtained from the BGS Geo-Index Onshore mapping [accessed April 2024], the River Terrace Deposits and Alluvium are classified as a Secondary A Aquifer. Secondary A Aquifers are 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'.

The underlying Denbigh Grits Formation is classified as a Secondary B Aquifer. Secondary B Aquifers are 'predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers'.

In order to establish the infiltration capacity of the site, infiltration testing has been undertaken by Waterco in December 2019 in general accordance with the BRE 365 specification. Full details of the infiltration testing are provided within the Waterco Infiltration Test Report (reference: 12116-Infiltration Test Report-01).

Trial pits were excavated to a depth of between 1.2 metres below ground level (m.bgl) and 1.4m.bgl. The infiltration testing included 2No. trial pits (TP) within the site. An additional 2no. trial pits were advanced on land immediately west of the site. A trial pit location plan is included in Appendix C.

The excavated material /arisings from TP1 and TP2 (in the location of the proposed development) generally comprised topsoil and small to medium sized fragments of shale. No groundwater was encountered in any of the trial pits.

A summary of the infiltration test results for TP1 and TP2 is included in Table 1. Infiltration testing was completed three times in TP1 and TP2. The infiltration rates in Table 1 are the slowest rates recorded over three consecutive tests.

Table 1 – Infiltration Test Summary

Trial Pit (TP)	Slowest Infiltration Rate (m/s)
1	1.755×10^{-4}
2	2.250×10^{-4}

Infiltration tests conclude that the ground conditions on site are suitable to support infiltration drainage techniques.

Local Drainage

Public sewer records have been obtained from Dwr Cymru Welsh Water (DCWW) and are included in Appendix D. The sewer records show that there is a 225mm public combined sewer crossing the western extent of the site. The 225mm public combined sewer flows north-west into Heol Martin residential estate. No cover or invert levels are provided.

Development Proposals

The proposed development is for 10No. residential units with associated gardens, parking and access. A site layout is included in Appendix E.

The proposed development will introduce hardstanding areas in the form of buildings, parking and access. Hardstanding will comprise 2,160m^2 or 58.5% of the total site area. The remaining permeable, soft landscaped areas will occupy 1,530m^2 or 41.5% of the total site area.

Development proposals place all private property curtilage a minimum of 3m from the 225mm public combined sewer crossing the site. The 225mm combined sewer will be located beneath the proposed access road.

Flood Zone Category and Policy Context

Flood Zone Category

The Welsh Government Development Advice Map, included in Appendix F, shows that the majority of the site is located in Flood Zone A – an area considered to be at little or no risk of fluvial or tidal flooding, with a less than 0.1% (1 in 1000) annual probability of flooding. The south-western boundary of the site is located within Flood Zone B – an area known to have been flooded in the past evidenced by sedimentary deposits.

The NRW 'Flood Map for Planning' (Appendix F), shows that the majority of the site is in an area outside of the extreme flood extent (Flood Zone 1), meaning it has a less than 0.1% annual probability of flooding, including the effects of climate change. A small area confined to the south-western extent of the site falls within Flood Zone 3 – an area considered to be at flood risk with a greater than 1% (1 in 100) annual probability of flooding, including the effects of climate change. The Flood Zone 3 extent is confined to a turning head on the proposed access road. All properties and the access to all properties is located in an area outside of the extreme flood extent (Flood Zone 1).

Development Vulnerability Classification

The proposed residential development is considered to be 'highly vulnerable' development in accordance with Figure 2 of the Welsh Government's Technical Advice Note 15 – Development and Flood Risk (TAN15).

All properties and access will be located within Flood Zone A. TAN15 states that 'highly vulnerable' development is considered appropriate within Flood Zone A.

Local Policy

The Conwy County Borough Council Local Development Plan 2007-2022 (October 2013) contains the following policies relating to flood risk and drainage:

POLICY DP/3 – PROMOTING DESIGN QUALITY AND REDUCING CRIME

All new development will be of high quality, sustainable design which provides usable, safe, durable and

adaptable places, and protects local character and distinctiveness of the Plan Area's built historic and natural environment. The Council will require development to: …

f) Provide sustainable urban drainage systems to limit waste water and water pollution and reduce flood risk in line with national guidance and Policy NTE/8 – 'Sustainable Drainage Systems'….

POLICY NTE/6 – ENERGY EFFICIENCY AND RENEWABLE TECHNOLOGIES IN NEW DEVELOPMENT

The efficient use and conservation of natural resources are essential to the overall quality of life within the Plan Area and to support wider social and economic sustainability objectives. The Council will: …

c) Ensure that all new developments incorporate the principles of sustainable design such as: appropriate layout, massing, orientation, use of materials, rain water harvesting, energy efficiency, sustainable drainage, and waste recycling areas/storage in line with the Development Principle Policies and NTE/8 – 'Sustainable Drainage Systems', NTE/9 – 'Foul Drainage' and NTE/10 – Water Conservation'…

POLICY NTE/8 – SUSTAINABLE DRAINAGE SYSTEMS

1. *The use of Sustainable Drainage Systems will be required wherever reasonably practicable with preference for on-site disposal and where satisfactory arrangements can be put in place for the long-term maintenance of those systems. Where this is not proposed a developer will need to justify that discharge is necessary and is adequately controlled.*

2. *Subsequent preference for surface water drainage will be for:*

   a) Drainage to a surface water body (river, lake etc.) subject to appropriate treatment and attenuation;

   b) Drainage to surface water sewer;

   c) Drainage to combined sewer.

3. *The developer must demonstrate that higher preference drainage options are unfeasible before proposing less sustainable options. …*

4.6.9.3 When the Sustainable Drainage section of the Flood and Water Management Act is commenced, developers will require permission from the SuDS Approval Board (SAB). This will usually be a joint application alongside the planning process. It will therefore be necessary for drainage schemes to be put in place from the start of the design process and detailed in the DAS. Drainage design will be approved by the SAB and details of the required maintenance will also be needed as the SAB will be responsible for adopting SuDS which are constructed in accordance with the approved design (except for SuDS serving a single property). The SAB is the responsibility of the Lead Local Flood Authority but it is possible that a number of authorities will combine (to produce a North Wales SAB for example). National guidance is currently being prepared and will be considered under DP/6. The Water Framework Directive should also be referred to for considering any

development which may have an impact on a river, lake or estuary. This assessment should be included in the DAS or Biodiversity Statement.

POLICY NTE/9 – FOUL DRAINAGE

1. *Foul drainage to an adopted sewer should be provided wherever possible, in compliance with Welsh Ministers Build Standards which are effective from 1 October 2012. The development of sites where drainage to a public sewer is not feasible will only be permitted if proposed alternative facilities are considered adequate and would not pose an unacceptable risk to the quality or quantity of ground or surface water or pollution of local watercourses or sites of biodiversity importance.*

2. *Development proposals which include vehicle parking and other hard surface areas used by vehicles must include measures such as trapped gullies and petrol / oil interceptors or other suitable methods of pollution control to safeguard against pollution of the water environment.*

POLICY NTE/10 – WATER CONSERVATION

All development should incorporate water conservation measures where practicable and conform to BREEAM standards promoting water conservation, efficiency measures and utilize SUDS techniques. Development proposals greater than 1,000 m^2 or 10 dwellings should be accompanied by a Water Conservation Strategy.

Local guidance documents including the Conwy Council Strategic Flood Consequences Assessment (SFCA) (November 2022) and the Conwy Council Preliminary Flood Risk Assessment (PFRA) (June 2011 and its 2017 addendum) have been reviewed and inform this report.

Consultation

A pre-planning opinion request was submitted to NRW in November 2019. In their response (Appendix G), which relates to a previous site layout and larger development area, NRW have stated that:

'We understand the proposal is for highly vulnerable development. Our Flood Risk Map, which is updated on a quarterly basis, confirms the site to be partially within Zone C2 and Zone B of the Development Advice Map (DAM) contained in TAN15. The Afon Hiraethlyn is classed as an ordinary watercourse and we are aware that the Lead Local Flood Authority have historically carried out various flood alleviation measures on it. However due to changes in hydrology and modelling techniques these measures may not provide the necessary standard of protection to meet TAN15 requirements.

We refer you to Section 6 of TAN15 and the Chief Planning Officer letter from Welsh Government, dated 9 January 2014, which affirms that highly vulnerable development should not be permitted in Zone C2 (paragraph 6.2 of TAN15). The justification tests in paragraph 6.2 of TAN15 do not apply to highly vulnerable development in Zone C2.

In consideration of the above, we will not provide any pre-application advice regarding flood risk, unless we receive written confirmation from the Planning Authority that there are overriding reasons for them to

consider the proposals despite the site's location within Zone C2. In such circumstances, we would then review any submitted FCA. If the FCA fails to demonstrate that the consequences of flooding can be acceptably managed over the lifetime of the development, then we would object to the application.

Finally, as you may be aware, under the Town & Country Planning (Notification) (Wales) Direction 2012 and more specifically Category I relating to Flood Risk Area Development, where the Planning Authority is minded to grant permission, there is a requirement to refer applications for emergency services or highly vulnerable development within Zone C2 to Welsh Government'.

A meeting was held with Conwy County Council SAB on 17th December 2019. A summary of the meeting is provided below:

Runoff destination

- Infiltration testing to BRE365 Standards has been carried out at the site. Infiltration test results have concluded that infiltration methods are feasible.
- It is proposed to utilise infiltration methods at the site.

Storm Water Storage

- The access road will be drained via ring manhole soakaways (subject to Highways Department agreement), dwellings will be served via private soakaways in each garden, and / or permeable surfaces on driveways.
- An allowance for urban creep is not local policy however a 10% urban creep allowance should be included for betterment.
- The 1 in 100 year plus 30% climate change event will be used.

SAB correspondence confirming the above is included in Appendix G.

A pre-development enquiry request was submitted to DCWW in November 2019. In their response (Appendix D), DCWW have stated:

*'**ASSET PROTECTION***

The proposed development site is crossed by a 225mm combined public sewer with its approximate position being marked on the attached Statutory Public Sewer Record. Under Section 159 of the Water Industry Act 1991, Dwr Cymru Welsh Water has rights of access to its apparatus at all times, and as such would require an easement of 3m either side of the centreline of this pipe. Should the proposed development be located within the protection zone of the sewer crossing, there would be a requirement to divert the public sewer, which can be applied for under Section 185 of the Water Industry Act 1991.

SEWERAGE

Foul flows only from the proposed development can be accommodated within the public sewerage system.

We advise that the flows should communicate with the 225mm combined sewer crossing the proposed 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. 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.

SURFACE WATER

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'. It is therefore recommended that the developer engage in consultation with Conwy County Borough Council as the determining SuDS Approval Body (SAB), in relation to their proposals for SuDS features. Please note, Dwr Cymru Welsh Water is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation.

Sources Of Flooding and Probability

Fluvial

The nearest watercourse is the Afon Hiraethlyn which is located approximately 30m south-west of the site. The Afon Hiraethlyn flows north-west in this location and joins the Afon Conwy approximately 1.9km north-west of the site. There are no flood defences in the vicinity of the site.

Fluvial flooding could occur if the Afon Hiraethlyn overtopped its banks during or following an extreme rainfall event.

The NRW 'Historical Flood Map' (Appendix F) indicates that there are no records of historical flooding affecting the site.

NRW Modelled Flood Levels

The 'Afon Hiraethlyn 2010' model outputs have been provided by NRW in December 2019. Modelled flood depth mapping for a range of events produced from the NRW model outputs is included in Appendix H. It is acknowledged that the 2010 model is now out of date, however its outputs have been used in absence of updated hydraulic modelling.

A review of the modelled flood mapping shows that no flooding is estimated on site during the 1% Annual Exceedance Probability (AEP) event. Similarly, during the 1% AEP plus 20% Climate Change (CC) event, the site is shown to be flood free. An extract of the 1% AEP plus 20% CC flood extent is shown in Figure 1. The site is also flood free during the 0.1% AEP event.

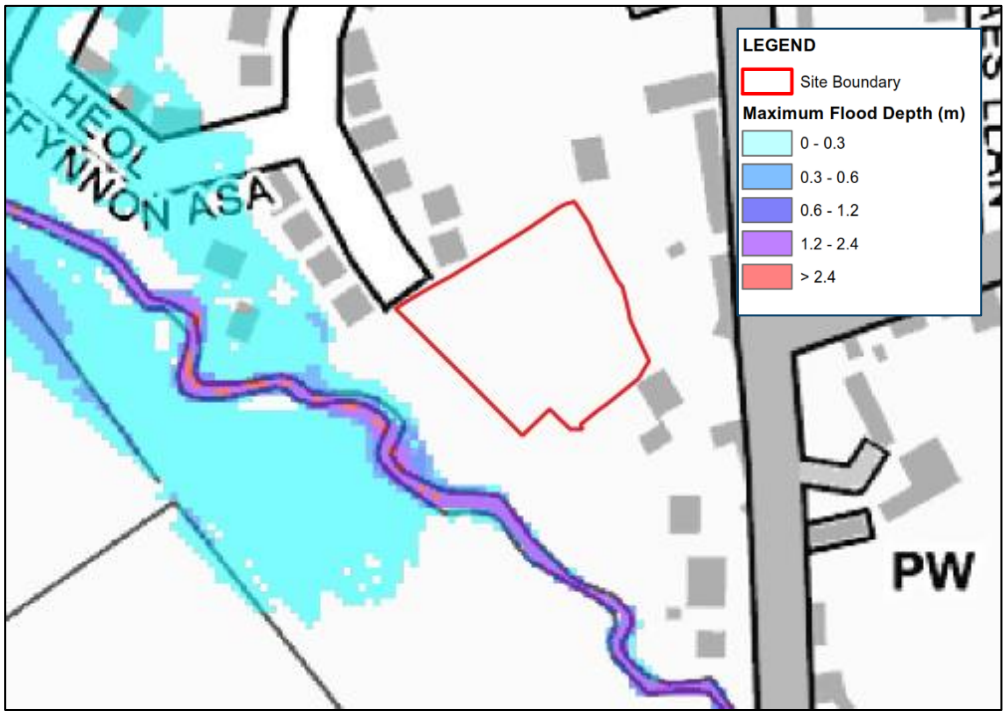


Figure 1 – 1% AEP plus 20% CC – Flood Depths

In absence of updated hydraulic modelling for the Afon Hiraethlyn, the NRW 'Flood Map for Planning' provides a more up to date assessment of flood risk, including the effects of climate change.

The NRW 'Flood Map for Planning' (Appendix F), shows that the majority of the site, including all properties and the access to all properties, is in an area outside of the extreme flood extent (Flood Zone 1), meaning it has a less than 0.1% annual probability of flooding, including the effects of climate change. A small area confined to the south-western extent of the site falls within Flood Zone 3 – an area considered to be at flood risk with a greater than 1% (1 in 100) annual probability of flooding, including the effects of climate change. The Flood Zone 3 extent is confined to a turning head on the proposed access road. The majority of the site access road is flood free and safe access / egress is available to all properties. An indicative overlay of the NRW 'Flood Map for Planning' and site layout plan is included in Appendix F and also reproduced in Figure 2.

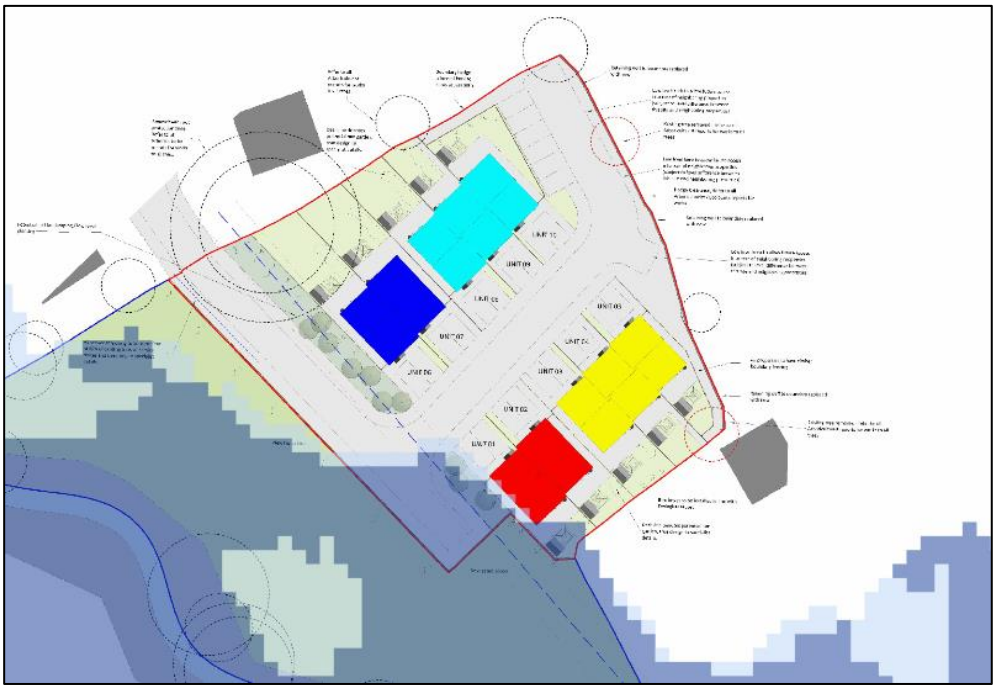


Figure 2 – Flood Map for Planning Overlay

The risk of fluvial flooding to the proposed properties is therefore considered to be very low.

Tidal

The site is situated at a minimum of 29.5m AOD and is significantly above sea level. Therefore, the site is not at risk of tidal flooding.

Surface Water

Surface water flooding occurs when rainwater does not drain away through the normal drainage system or soak into the ground. It is usually associated with high intensity rainfall events but can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen or developed, resulting in overland flow and ponding in depressions in topography. Surface water flooding can occur anywhere without warning. However, flow paths can be determined by consideration of contours and relative levels.

The NRW 'Flood Risk from Surface Water & Small Watercourses' map (Appendix F) shows that the site is at very low risk of surface water flooding, meaning it has a less than 0.1% annual probability of flooding.

Any potential surface water flooding arising at or near to the site would be directed west, away from the site, following the local topography. There are no historical records of surface water flooding at or near to the site.

It can therefore be concluded that the risk of surface water flooding is very low.

Sewer

Flooding from sewers can occur when a sewer is overwhelmed by heavy rainfall, becomes blocked, is damaged, or is of inadequate capacity. Flooding is mostly applicable to combined and surface water sewers.

The DCWW sewer records show that there is a 225mm public combined sewer that flows through the centre of the site.

Any potential flooding arising from the 225mm public combined sewer would be directed west, away from the site, following the local topography. There are no records of sewer flooding at or near to the site.

It can be concluded that the risk of sewer flooding is very low.

Groundwater

Groundwater flooding occurs when water levels underneath the ground rise above normal levels. Prolonged heavy rainfall soaks into the ground and can cause the ground to become saturated. This results in rising groundwater levels which leads to flooding above ground.

The Conwy County Council Local Flood Risk Management Strategy states that:

'*In Conwy County flooding attributed directly to groundwater is extremely difficult to apportion as groundwater flooding usually occurs in combination with pluvial and fluvial flooding. As groundwater flooding occurs in low lying areas, basements of residential housing are usually impacted by this type of flooding'.*

The PFRA and SFCA contain no records of groundwater flooding affecting the site. The site is not located in a low-lying area and furthermore, no basement levels are identified on plans.

It can therefore be concluded that the risk of groundwater flooding is low.

Artificial Sources

There are no canals in the immediate vicinity of the site. The NRW 'Flood Risk from Reservoirs' map (Appendix F) shows that the site is not at risk of flooding from reservoirs.

It can therefore be concluded that the risk of flooding from artificial sources is very low.

Summary of Potential Flooding and Mitigation

It can be concluded that the majority of the site, including the location of all properties, is at very low risk of flooding from all sources. A small area confined to the south-western extent of the site falls within Flood Zone 3 – an area considered to be at flood risk with a greater than 1% (1 in 100) annual probability of flooding, including the effects of climate change. The Flood Zone 3 extent is confined to a turning head on the proposed access road. The majority of the site access road is flood free and safe access / egress is available to all properties.

The proposed ground floor levels should be set at a minimum of 30m AOD, approximately 300mm above the ground level at the Flood Zone 3 extent.

All proposed properties will be located outside of the 1% AEP plus climate change (Flood Zone 3) and 0.1% AEP plus climate change (Flood Zone 2) flood extents. Safe access / egress to all properties is also available during all considered flood events. As such, the development complies with the requirements of TAN15.

Flood Warnings and Evacuation

Flood Warnings and Alerts do not cover this area. It is considered acceptable for site users to remain on site during a flood event as all properties will be flood free. Safe access / egress in the event of a flood is provided from the proposed site access road and Heol Martin which is shown to be outside of the 0.1% AEP plus climate change flood extent.

Impact on Flood Risk Elsewhere

No ground raising is proposed within the flood extent. The development will therefore not remove flood storage space from the floodplain and will not result in an increase in flood risk elsewhere. The impact of surface water runoff generated by the development is discussed in the following section.

Surface Water Management

The site is not formally drained and is therefore considered to be 100% permeable. The proposed development will introduce hardstanding areas in the form of buildings, parking and access. Hardstanding will comprise 2,160m^2 or 58.5% of the total site area.

In accordance with TAN15, new development should not create additional runoff when compared with the undeveloped situation.

The introduction of hardstanding area will result in an increase in surface water runoff rates and volumes. In order to ensure the proposed development will not increase flood risk elsewhere, surface water runoff will be managed using sustainable drainage systems.

Discharge Method

Standard S1 of the Statutory Standards for SuDS sets out the following hierarchy of drainage options:

Priority Level 1: Surface water runoff is collected for use;

Priority Level 2: Surface water runoff is infiltrated to ground;

Priority Level 3: Surface water runoff is discharged to a surface water body;

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority Level 5: Surface water runoff is discharged to a combined sewer.

Priority Level 1: Surface water runoff collected for use

In line with section G1.4 of the Statutory Standards for SuDS, rainwater harvesting is not proposed for this site as:

1. There is no foreseeable need to harvest water at the site as DCWW water resources and drought management plans do not identify potential stresses on mains water supplies;

2. 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.

With regards to the second point above, the costs associated with rainwater harvesting systems (unit costs, installation costs, running costs and maintenance costs) outweigh the water saving costs. Furthermore, section G1.6 of the 'Statutory standards for sustainable drainage systems' states that; '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 runoff destination.' As such, rainwater harvesting systems are not considered a cost-effective solution for managing surface water and a lower priority runoff destination is required.

Water butts will however be installed at each property to encourage external water re-use. A water butt is a small-scale water storage device that collects rainwater from the roof, via the downpipe. A water butt should be connected to an appropriate overflow (lower priority runoff destination).

Priority Level 2: Surface water runoff is infiltrated to ground

As described above, infiltration tests have been carried out by Waterco in December 2019 (report reference: 12116-Infiltration Test Report-01) in general accordance with the BRE365 specification.

The infiltration test results showed that soil permeability is suitable to support infiltration drainage techniques. A summary of the infiltration rates is included in Table 2.

Table 2 – Infiltration Test Summary

Trial Pit Location	Slowest Infiltration Rate (m/s)	Slowest Infiltration Rate (m/hr)
TP1	1.755×10^{-4}	0.6318
TP2	2.250×10^{-4}	0.81

As infiltration techniques are feasible, the following infiltration-based drainage system is proposed:

- Surface water from dwelling roofs will drain to soakaways within individual property gardens, where sufficient space allows. The soakaways, serving individual dwellings, will be within the ownership of future property owners.

- Permeable surfacing will be used for all individual property driveways. The permeable paving will allow for infiltration and will be designed with a suitable sub-grade (drainage layer). In some instances, space constraints or presence of tree root protection zones will prevent the use of soakaways in property gardens (units 6 & 7). In such instances, the sub-grade of the permeable driveways will be designed to accommodate runoff from the roof.

- The proposed access road will be of adoptable standards. At the time of writing, Conwy County Council do not adopt permeable road surfaces. As such, the impermeable access road will be drained using concrete ring soakaways placed within the road.

Infiltration Device Sizing

The infiltration features have been sized using MicroDrainage software. All infiltration features will be sized to accommodate the 1 in 100 year plus 30% CC event. The MicroDrainage outputs are included in Appendix I. A 10% allowance for urban creep has been applied for the individual property soakaways / driveway sub-grade storage.

All soakaways should be located a minimum of 5m from dwellings.

Highway Soakaways (Concrete Ring Soakaways)

The Conwy County Council Roads for Adoption guidance (June 2006) states that:

'14.6.1 Soakaways will only be permitted where it is not possible to install a fully piped system to an adequate outfall. Where it has been agreed with the Highways Development Control Officer that drainage is to be by soakaway(s), the soakaway design shall be as detailed in Fig 8: below unless an alternative design has been approved by the Highways Development Control Officer.

14.6.2 The discharge of highway surface water into soakaways within the development will only be accepted where the results of investigations prove that the ground is sufficiently permeable to dissipate the water. The investigations shall be carried out in accordance with the recommendations of BRE Report 365 and provided to the Highways Development Control Officer before subsequent, formal, approval is given.

Concrete ring soakaways have been sized based on an infiltration rate of 0.6318 m/hr (1.755×10^{-4} m/s) (applicable for TP1).

MicroDrainage outputs (Appendix I) show that for a $100m^2$ section of road (impermeable area), a 2.1m diameter x 1.5m deep (with the water level and infiltration capped at a depth of 0.8m i.e. infiltration will only take place between 1.5m.bgl and 0.7m.bgl) concrete ring soakaway is sufficient to accommodate the 1 in 100 year plus 30% CC event.

The access road covers an area of approximately $1,310m^2$. A total of 13 concrete ring soakaways would therefore be required to accommodate runoff from the access road.

Property Soakaways

Units 1-5

The soakaways for Units 1-5 have been sized with an infiltration rate of 0.6318 m/hr (1.755×10^{-4} m/s), applicable for TP1. An impermeable drainage area of $70m^2$ (including 10% allowance for urban creep) has been applied for each dwelling (Units 1-5 are uniform in size).

MicroDrainage outputs (Appendix I) show that a 3m wide x 1m long x 0.8m deep geo-cellular style soakaway (with a void ratio of 95%) is sufficient to accommodate the 1 in 100 year plus 30% CC event.

Units 8-10

The soakaways for Units 8-10 have been sized with an infiltration rate of 0.81 m/hr (2.250 x 10^{-4} m/s), applicable for TP2. An impermeable drainage area of 70m^2 (including 10% allowance for urban creep) has been applied for each dwelling (Units 8-10 are uniform in size).

MicroDrainage outputs (Appendix I) show that a 3m wide x 1m long x 0.8m deep geo-cellular style soakaway (with a void ratio of 95%) is sufficient to accommodate the 1 in 100 year plus 30% CC event.

Units 6 & 7

Individual property soakaways are not possible in the rear gardens of units 6 & 7 due to the tree root protection zone. As such, surface water runoff from the roofs will drain to the sub-grade of the permeable surfaced driveways. The driveways cover an area of approximately 29m² for each property. An impermeable drainage area of 99m^2 has been applied for each dwelling and includes a 10% allowance for urban creep from the dwelling roof and also includes the driveway area. Units 6 & 7 are uniform in size.

Based on a driveway area of 29m², an infiltration rate of 0.81 m/hr (2.250 x 10^{-4} m/s) and an impermeable area of 99m², a sub-grade depth of 140mm is sufficient to accommodate the 1 in 100 year plus 30% CC event. It is recommended that a minimum sub-grade depth of 200mm is applied for all driveways on site as to provide an element of freeboard.

Concept Surface Water Drainage Scheme

Infiltration techniques including geo-cellular style soakaways for dwellings, permeable paving for driveways and concrete ring soakaways for the adoptable access roads will be used. All infiltration devices will be sized to accommodate the 1 in 100 year + 30% CC event.

The proposed surface water drainage scheme will ensure no increase in runoff over the lifetime of the development. A Concept Drainage Sketch is included in Appendix J.

Exceedance Event

Surface water runoff will be accommodated within soakaways for all events up to and including the 1 in 100 year plus 30% CC event. Storm events in excess of the 1 in 100 year plus 30% CC event will be permitted to produce temporary shallow depth flooding within the landscaped areas and access road. In accordance with building regulations, finished floor levels will be set at a minimum of 150mm above surrounding ground levels ensuring exceedance flooding will not affect the buildings.

Surface Water Treatment

The Statutory Standards for SuDS sets out the following guidance for surface water treatment:

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.

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), residential roofs have a 'very low'

pollution hazard level, with low traffic roads and individual property driveways classified as having a 'low' pollution hazard level. Table 3 shows the pollution hazard indices for each land use.

Table 3 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Low Traffic Roads/ individual property driveways	Low	0.5	0.4	0.4

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2
* Indices values range from 0-1.

Runoff from roofs will be directed to soakaways and the sub-grade of permeable surfaced driveways. Surface water runoff from roads will drain to concrete ring soakaways within the road. Permeable paving will be used for private parking / driveways. Tables 4 demonstrates that soakaways provide sufficient treatment for runoff from roofs and that permeable paving provides sufficient treatment for individual property driveways. Soakaways generally offer sufficient treatment for runoff from roads, however additional treatment will be required for removal of suspended solids.

Table 4 – SuDS Mitigation Indices

	Mitigation Indices		
Type of SuDS	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7
Soakaways	0.4	0.4	0.4

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.3

In order to provide sufficient removal of suspended solids from roads, each road gully will have a silt trap for ease of sediment removal. Silt traps should also be placed on rainwater downpipes to ensure property soakaways do not become silted over time.

Amenity and Biodiversity

The Statutory Standards for SuDS sets out the following standards for amenity and biodiversity:

Standard S4 – *Amenity*

The design of the surface water management system should maximise amenity benefits.

Standard S5 – *Biodiversity*

The design of the surface water management system should maximise biodiversity benefits.

The site is constrained to an access road and private dwellings / gardens. There is therefore limited opportunity for an infiltration-based drainage system to provide amenity and biodiversity value. Small scale bio-retention systems such as raingardens are proposed where practical in property gardens as to enhance the amenity and biodiversity values of the site.

Construction, Operation and Maintenance

Standard S6 of the Statutory Standards for SuDS states;

S6 – Design of drainage for Construction, Operation and Maintenance

1) 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).

2) 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).

3) 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.

All drainage systems will be readily accessible for maintenance access.

Maintenance of communal drainage features such as concrete ring soakaways serving the adoptable highway will be the responsibility of the Local Authority.

Soakaways within individual property gardens and private driveways will be the responsibility of the induvial property owners. Maintenance schedules for soakaways and permeable paving are included in Appendix K.

Foul Drainage

Foul flows should be discharged to the 225mm combined sewer crossing the proposed development site. The invert and cover levels are unknown. However, based on the site layout and the site topography, it is assumed that a gravity connection can be achieved. The cover and invert levels of the receiving manhole on the public combined sewer should be confirmed by survey.

Other Considerations

A 225mm combined public sewer crosses the site. Correspondence from DCWW (Appendix D) states that '*The proposed development site is crossed by a 225mm combined public sewer with its approximate position being marked on the attached Statutory Public Sewer Record. Under Section 159 of the Water Industry Act 1991, Dwr Cymru Welsh Water has rights of access to its apparatus at all times, and as such would require an easement of 3m either side of the centreline of this pipe. Should the proposed development be located within the protection zone of the sewer crossing, there would be a requirement to divert the public sewer, which can be applied for under Section 185 of the Water Industry Act 1991'.*

The proposed development layout makes provision for the existing 225mm public combined sewer. The sewer will be conveyed within the proposed access road.

Conclusions

The proposed development is for 10No. residential units with associated gardens, parking and access.

The Welsh Government Development Advice Map shows that the majority of the site is located in Flood Zone A – an area considered to be at little or no risk of fluvial or tidal flooding, with a less than 0.1% (1 in 1000) annual probability of flooding. The south-western boundary of the site is located within Flood Zone B – an area known to have been flooded in the past evidenced by sedimentary deposits.

The NRW 'Flood Map for Planning' shows that the majority of the site, including all properties and the access to all properties, is in an area outside of the extreme flood extent (Flood Zone 1), meaning it has a less than 0.1% annual probability of flooding, including the effects of climate change. A small area confined to the south-western extent of the site falls within Flood Zone 3 – an area considered to be at flood risk with a greater than 1% (1 in 100) annual probability of flooding, including the effects of climate change. The Flood Zone 3 extent is confined to a turning head on the proposed access road. The majority of the site access road is flood free and safe access / egress is available to all properties.

The risk from all other sources is considered to be very low.

The proposed ground floor levels will be set at a minimum of 30m AOD, approximately 300mm above the ground level at the Flood Zone 3 extent.

The proposed development will introduce impermeable drainage area in the form of buildings, driveways and the access road. This will result in an increase in surface water runoff.

Infiltration testing has been undertaken in general accordance with the BRE Digest 365 specification by Waterco in December 2019. The infiltration test results shown that the site is suitable to support infiltration drainage techniques.

The following infiltration-based drainage system is proposed:

- Surface water from dwelling roofs will drain to soakaways within individual property gardens, where sufficient space allows. The soakaways, serving individual dwellings, will be within the ownership of future property owners.

- Permeable surfacing will be used for all individual property driveways. The permeable paving will allow for infiltration and will be designed with a suitable sub-grade (drainage layer). In some instances, space constraints or presence of tree root protection zones will prevent the use of soakaways in property gardens (units 6 & 7). In such instances, the sub-grade of the permeable driveways will be designed to accommodate runoff from the roof.

- The proposed access road will be of adoptable standards. At the time of writing, Conwy County Council do not adopt permeable road surfaces. As such, the impermeable access road will be drained using concrete ring soakaways placed within the road.

All infiltration devices will be sized to accommodate a 1 in 100 year plus 30% CC event.

DCWW have confirmed that foul flows can discharge to the 225mm public combined sewer located in the centre of the site.

A Concept Designer's Risk Assessment (cDRA) has been prepared to inform future designers of any identified hazards associated with the scheme. The cDRA has been included in Appendix L.

Recommendations

1. Submit this Flood Consequences Assessment and Drainage Strategy to the Planning Authority in support of the Planning Application.

2. Set finished floor levels at a at a minimum of 30m AOD, approximately 300mm above the ground level at the Flood Zone 3 extent.

Appendix A Location Plan and Aerial Image

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Land Under Client's Ownership
- Watercourses
- Waterbodies

CLIENT:
Mr Robin Roberts

waterco
www.waterco.co.uk

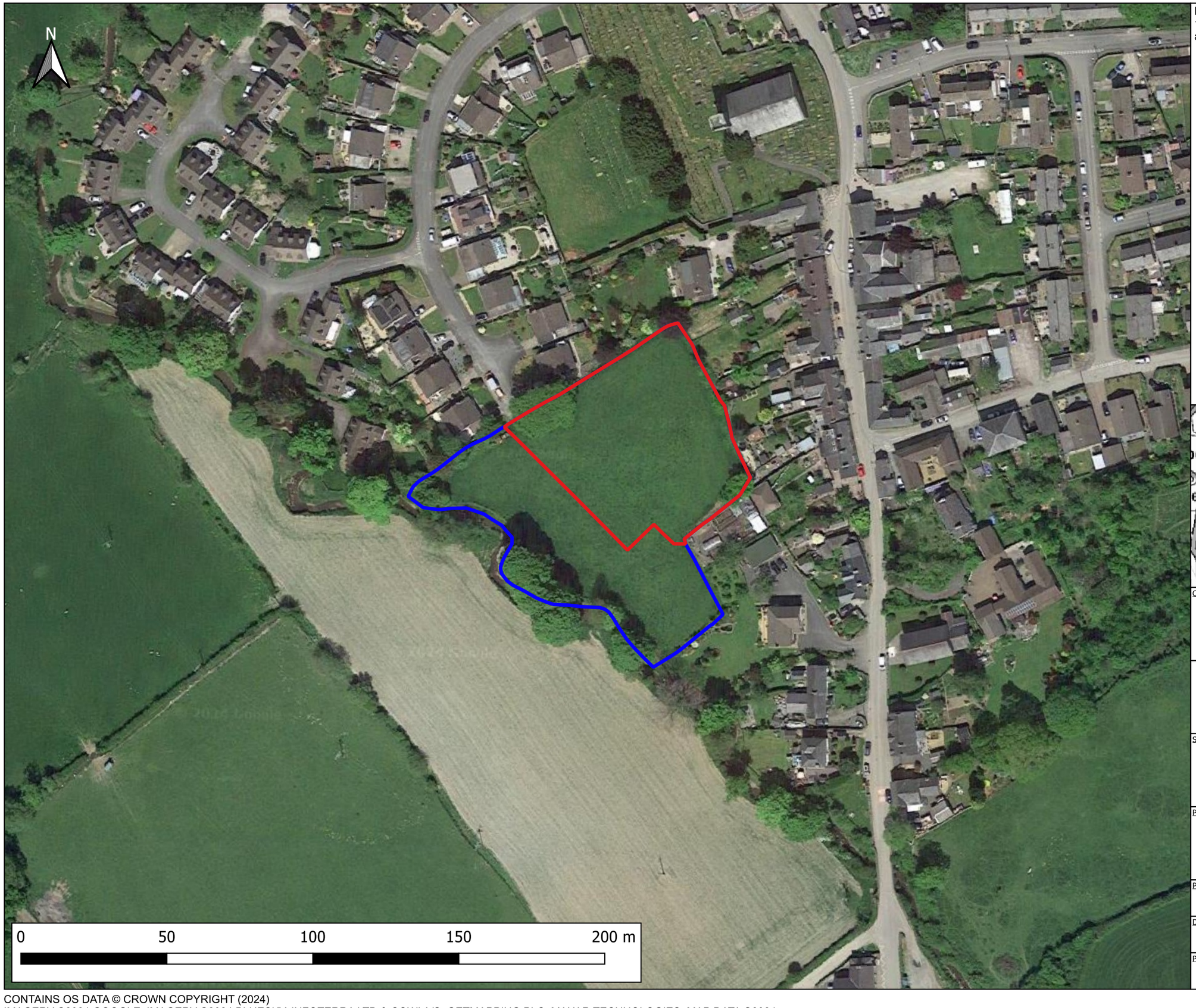
SCHEME:
Heol Martin, Eglwysbach

PLOT TITLE:
Location Plan

PLOT STATUS:	DATE:
FINAL	02-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME:	REVISION:
12116_Location_Plan	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Land Under Client's Ownership

CLIENT:

Mr Robin Roberts

waterco

www.waterco.co.uk

SCHEME:

Heol Martin, Eglwysbach

PLOT TITLE:

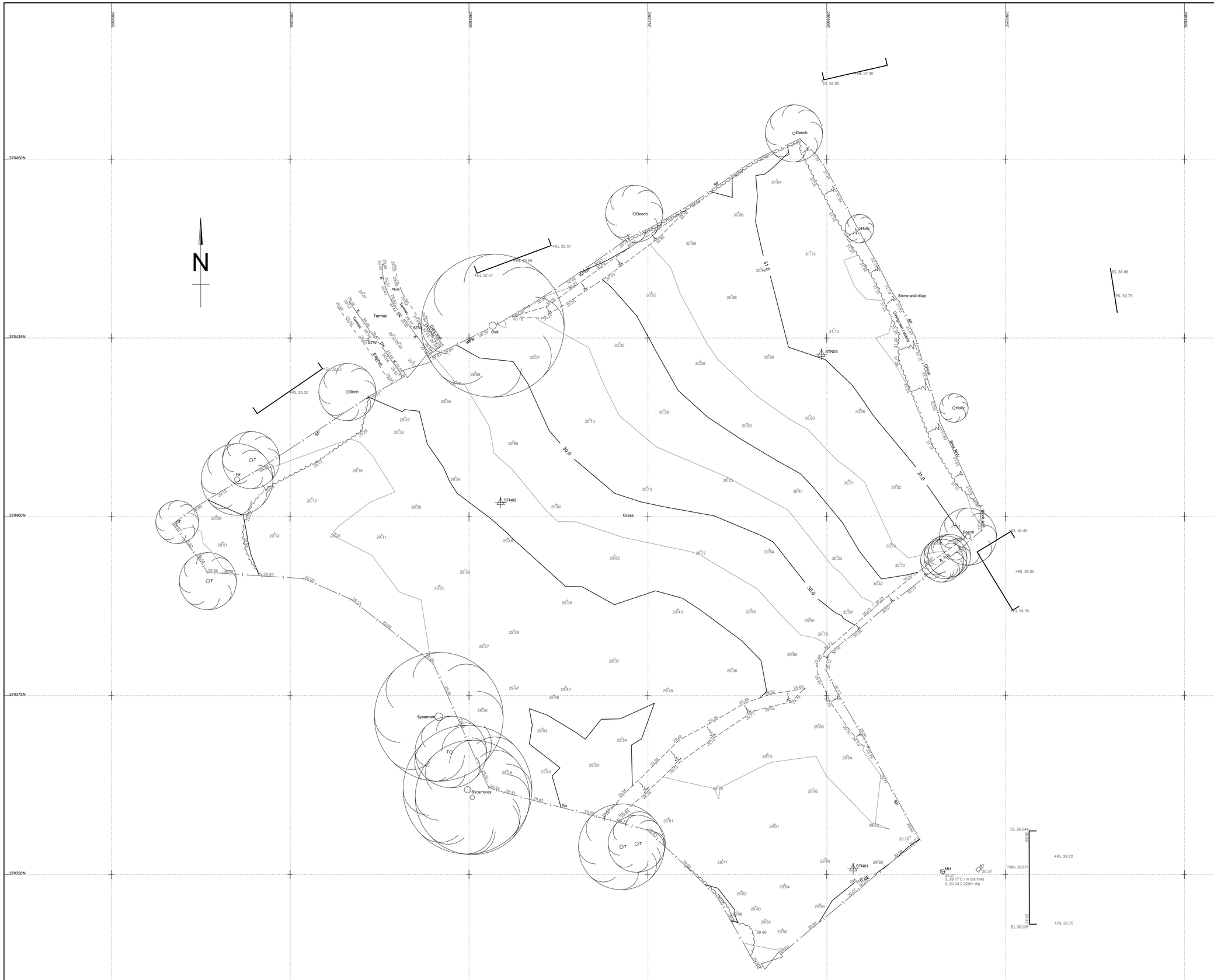
Aerial Plan

PLOT STATUS:	DATE:
FINAL	02-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME:	REVISION:
12116_Aerial_Plan	-

Appendix B Topographical Data



ANNOTATION LEGEND

AV	AIR VALVE
BH	BOREHOLE
Bin	LITTER BIN
Bol	BOLLARD
BS	BUS STOP
BT	BRITISH TELECOM COVER
C/Rack	CABLE RACK
CATV	CABLE TELEVISION
Cab	CABINET
CCTV	CLOSED CIRCUIT TELEVISION
CL	COVER LEVEL
Clawdd	HEDGE/WALL MOUND
Col	COLUMN
Cover	COVER (OTHER)
Conc	CONCRETE
Cul	CULVERT
DC	DRAIN CHANNEL
Dia	DIAMETER
Dis	DISUSED
Dilap	DILAPIDATED
DK	DROP KERB
DP	DRAIN PIPE
DSW	DRY STONE WALL
EK	EDGING KERB
Elec	ELECTRICITY COVER
EL	EAVES LEVEL
EP	ELECTRICITY POLE
ER	EARTHING ROD
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
Flg	FEEDS INTO GROUND
FL	FLOODLIGHT
FP	FOOTPATH
FS	FLAG STAFF
G	GULLY
Grav	GRAVEL
H/C	HARD CORE
IC	INSPECTION COVER
IL	INVERT LEVEL
K	KERB
LB	LETTER BOX
LP	LAMP POST
Mkr	MARKER
Mkrs	MARKERS
MP	MARKER POST
NB	NOTICE BOARD
NP	STREET NAME PLATE
P	POST
Pav	PAVED
PH	POST HOLE
PLP	PEDESTRIAN LAMP POST
RE	RODDING EYE
RL	RIDGE LEVEL
RS	ROAD SIGN
R/W	RETAINING WALL
RWP	RAIN WATER PIPE
Sap	SAPLING
SB	STAGGERED BARRIERS
SP	SIGN POST
Stay	STAY WIRE
St	STUMP
ST	STOP TAP
STG	STOP TAP GAS
STW	STOP TAP WATER
Sub Stn	SUB STATION
SV	STOP VALVE
SVG	STOP VALVE GAS
SVW	STOP VALVE WATER
T	TREE
Tact	TACTILE PAVING
TL	TRAFFIC LIGHT
TL	THRESHOLD LEVEL
TP	TELEPHONE POLE
Trans	TRANSFORMER
UTL	UNABLE TO LIFT
VP	VENT PIPE
W	WATER
WL	WATER LEVEL
WO	WASH-OUT POINT
WM	WATER METER
WP	WASTE PIPE

FENCE TYPES

BW	BARBED WIRE
CB	CRASH BARRIER
CB	CLOSE BOARDED
CI	CORRUGATED IRON
CL	CHAIN LINK
CP	CHESTNUT PALING
CPWM	CONCRETE POST/WIRE MESH
CPCL	CONCRETE POST/CHAIN LINK
CW	CHICKEN WIRE
IR	IRON RAILING
MR	METAL RAILING
Sec	METAL SECURITY FENCE
WPBW	WOODEN POST/BARBED WIRE
WPR	WOODEN POST AND RAIL
WPW	WOODEN POST AND WIRE

All efforts have been made to identify all visible features above ground - it is possible that features may have been obscured at the time of survey due to parked vehicles, debris or vegetation.

No allowance has been made for sub-surface entry into manholes, other chambers or voids below ground level. Therefore, any details relating to depths, pipe sizes, flow directions etc were taken from above ground and as such will be approximate only. The routes of buried services shown on this drawing may be assumed and may require further work to validate their positions.

All critical measurements should be checked on site prior to design and no liability will be taken for this survey if passed on to third parties. If there is any conflict between the detail shown on this drawing and those shown on other drawings, Co-Surveys Ltd should be informed as soon as possible and prior to any design or construction works taking place.

Station	Easting	Northing	Level	Station description
STN01	280303.70	370350.79	29.99	Wooden peg
STN02	280254.43	370402.00	29.67	Wooden peg
STN03	280299.27	370422.73	31.03	Wooden peg

PROJECT

TOPOGRAPHIC SURVEY
HEOL MARTIN
EGLWYSBACH

CLIENT

MR ROBIN ROBERTS
R ROBERTS & SON
260 CONWAY ROAD
MOCHDRE
COLWYN BAY LL28 5DS

ORIGINAL SURVEY BY

CO - Surveys Ltd

Survey House
Unit 7 Parc Caer Seion
CONWY
LL32 8FA
Tel (01492) 593367
mail@co-surv.com

THE SURVEY ASSOCIATION FULL MEMBER

4 May 2018

NOTES

GRID - Related to OSGB36 (UK NG) via GNSS and OSTN15

LEVELS - Related to OS Datum via GNSS and OSGM15

SURVEYED	PROCESSED	APPROVED
AJ	JDL	AJ

SCALES

HORIZONTAL 1:250
VERTICAL N/A

DRAWING REFERENCE

9976 / 1 (sheet 1 of 1)

Sheet reference: 1 Scale 1:250 (when plotted at 1:1 on A1 sheet)

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Land Under Client's Ownership
- Site Levels (m AOD)

Ground Elevations (m AOD)

- <= 28
- 28 - 30
- 30 - 32
- 32 - 34
- 34 - 36
- 36 - 38
- 38 - 40
- > 40

CLIENT:
Mr Robin Roberts

Waterco
www.waterco.co.uk

SCHEME:
Heol Martin, Eglwysbach

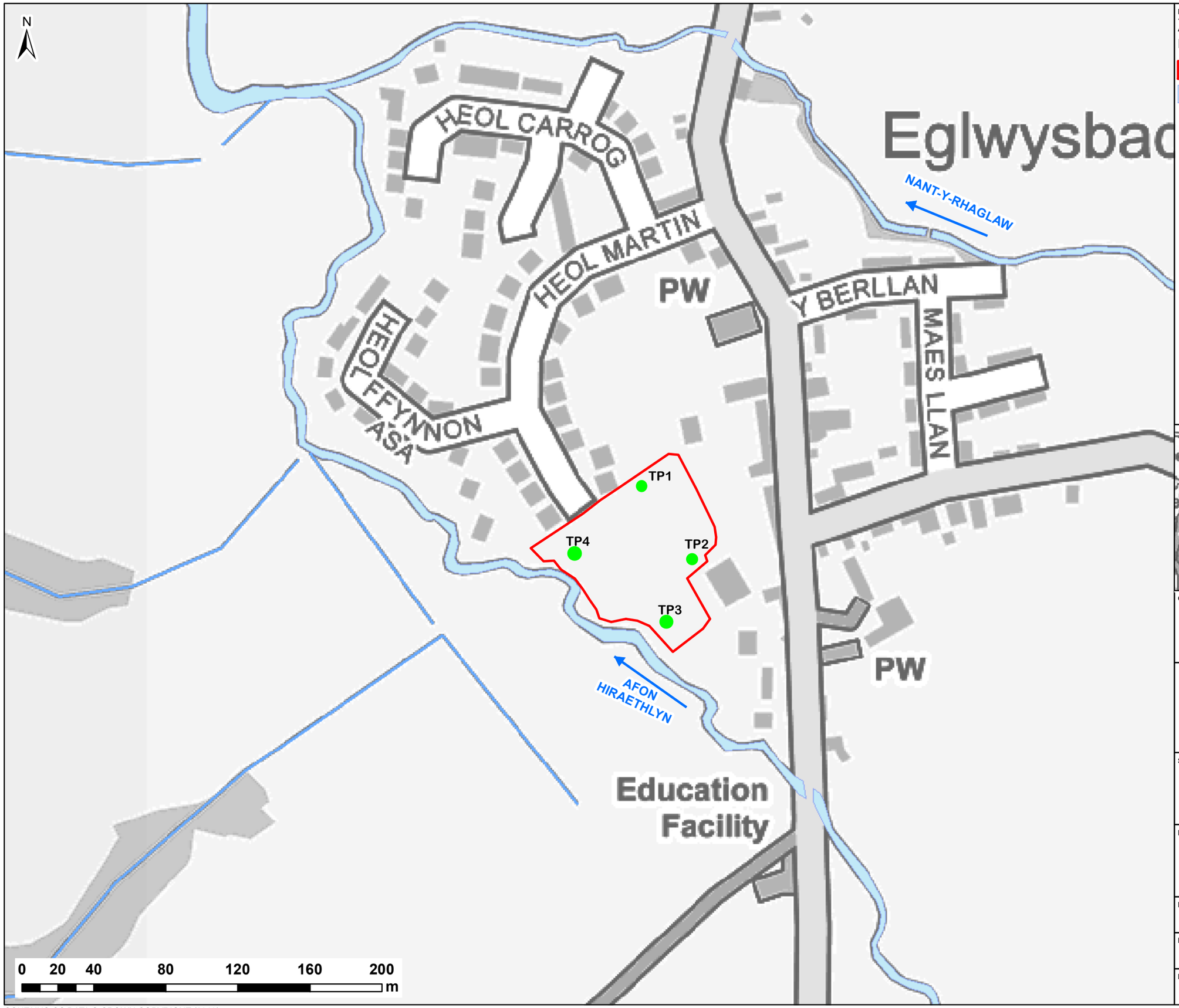
PLOT TITLE:
LiDAR Plan
1m Resolution
Data from Natural Resources Wales

PLOT STATUS:	DATE:
FINAL	02-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME:	REVISION:
12116_LiDAR_Plan	-

Appendix C Trial Pit Location Plan

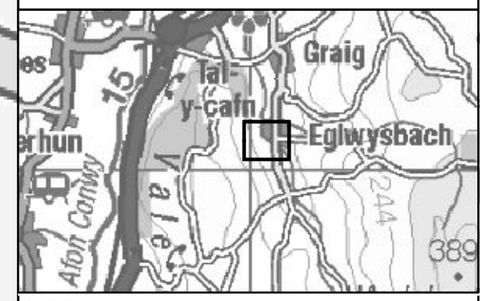


CONTAINS OS DATA © CROWN COPYRIGHT (2019)

NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Watercourses / Water Bodies
- Trial Pit Locations



CLIENT:

MR ROBIN ROBERTS

waterco

www.waterco.co.uk

SCHEME:

HEOL MARTIN, EGLWYSBACH

PLOT TITLE:

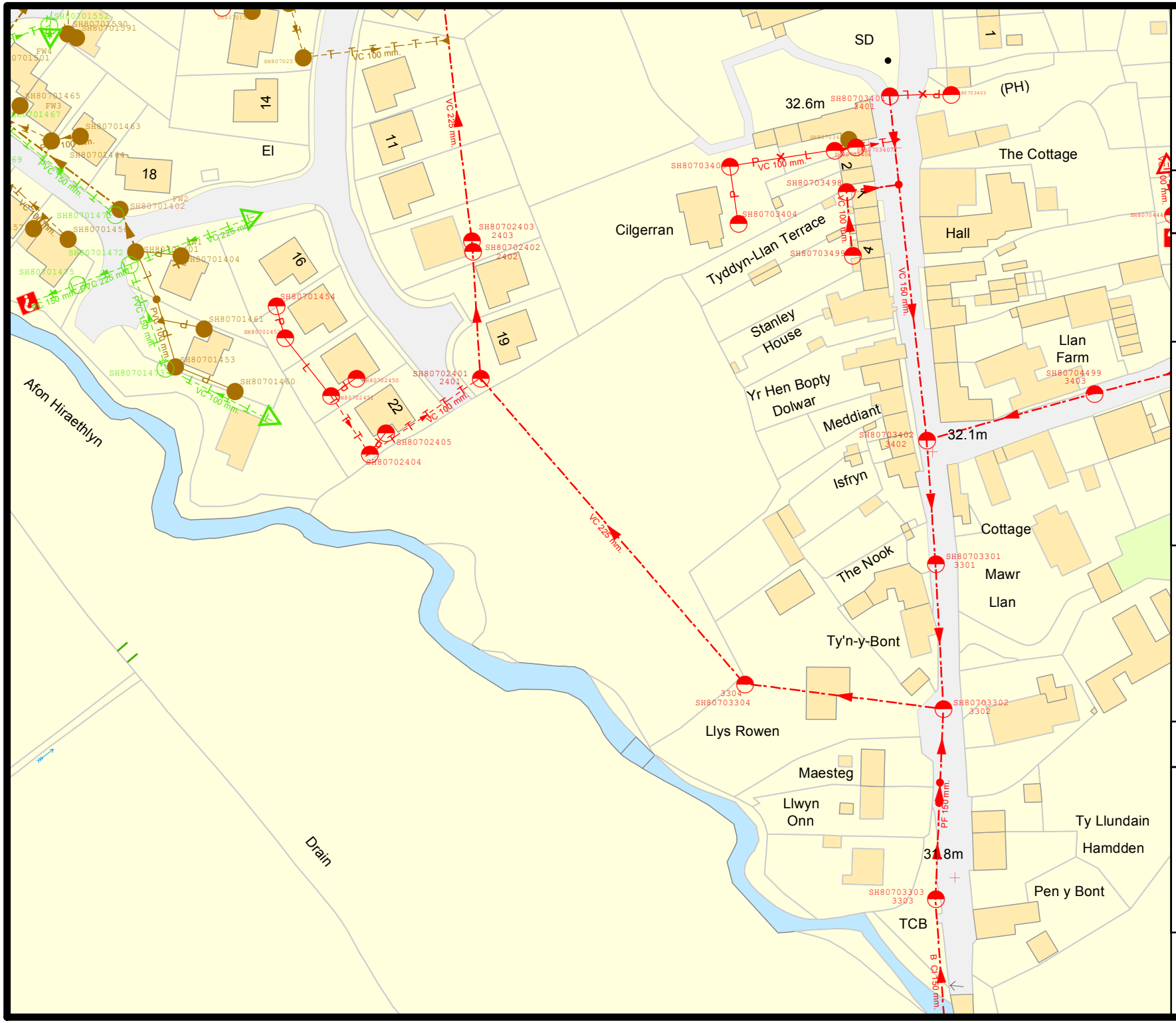
TRIAL PIT LOCATION PLAN

PLOT STATUS:	DATE:
FINAL	28-Nov-19

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
AR	SP	AW	1:2,000 (UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
12116-Location Plan	-

Appendix D Sewer Plans and Correspondence



Dŵr Cymru
Welsh Water

PPA0004491

N
W E
S

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

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	280274,370395
Map scale:	1:1250
Printed by:	Gough Jasmin
Printed on:	05 Dec 2019

Dŵr Cymru
Welsh Water

Land off Heol Martin

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow (CO)
- Special purpose chamber (SPC)
- Treatment works
- Pumping station
- Outfall
- Lamphole (LH)
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- Private sewer subject to Sect. 104 adoption agreement (S 104)
- 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

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	280287,370398
Map scale:	1:2500
Printed by:	Denning Kelly-Ann
Printed on:	20 Nov 2019

Dŵr Cymru
Welsh Water

Developer Services
PO Box 3146
Cardiff
CF30 0EH

Tel: +44 (0)800 917 2652
Fax: +44 (0)2920 740472
E.mail: developer.services@dwrcymru.com

Gwasanaethau Datblygu
Blwch Post 3146
Caerdydd
CF30 0EH

Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

Miss Sally Pettit
Waterco Consultants Ltd
Waterco Lt
Lon Parcwr Business Park
Ruthin
Denbighshire
LL15 1NJ

Date: 04/12/2019
Our Ref: PPA0004491

Dear Miss Pettit,

Grid Ref: 280274 370395
Site Address: Land south of Heol Martin, Colwyn Bay
Development: 12116-Heol Martin, Eglwysbach

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.

ASSET PROTECTION

The proposed development site is crossed by a 225mm combined public sewer with its approximate position being marked on the attached Statutory Public Sewer Record. Under Section 159 of the Water Industry Act 1991, Dwr Cymru Welsh Water has rights of access to its apparatus at all times, and as such would require an easement of 3m either side of the centreline of this pipe. Should the proposed development be located within the protection zone of the sewer crossing, there would be a requirement to divert the public sewer, which can be applied for under Section 185 of the Water Industry Act 1991.

SEWERAGE

Foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should communicate with the 225mm combined sewer crossing the proposed 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.

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.

SURFACE WATER

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'. It is therefore recommended that the developer engage in consultation with Conwy County Borough Council as the determining SuDS Approval Body (SAB), in relation to their proposals for SuDS features. Please note, Dwr Cymru Welsh Water is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation.

ADVISORY NOTES

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.

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.

SEWAGE TREATMENT

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

WATER SUPPLY

A domestic water supply can be made available to service this proposed development. Initial indications are that a connection can be made from the 3 inch diameter uPVC watermain located in Heol Martin.

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

***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.*

APPLICATION GUIDANCE

The Sewer Connection Application Process

Dŵr Cymru
Welsh Water

1

Request an Application Pack

An application pack can be obtained by completing our Expression of Interest form on our website (**dwrcymru.com** – select 'Developer Services').

2

Application Submitted

The completed paperwork & supporting documentation must be submitted to Developer Services along with the relevant fees. Please note that under Section 106 of the Water Industry Act 1991 you must give at least 21 days notice of your intention to connect to the public sewerage system. A dedicated Development Control Officer will then assess the application. The Officer may contact you if further information is required.

3

Application Determined

Developer Services will either refuse (with reasons) or approve the connection application. The Customer and Contractor will receive a copy of this notification. An approval letter will include details of any known site specific risks which we are aware of with the sewer.

4

Completing the Assets to Assets Process

If approved, the nominated contractor must contact our Operations Team to make an Access to Asset Application which must include a Risk Assessment, Method Statement and evidence of the necessary H&S Credentials, as set out on the form AF02. This process should also align with other relevant approvals which are outside our control, such as Highway Opening Notices, approval from third party land owners etc. The Access to Assets form will provide you with more information and relevant contact details.

5

Notify Developer Services

The contractor must contact Developer Services at least 48 hours ahead of the sewer connection works to arrange an inspection of the works. A Site Controller will then visit the site to inspect the connection. Please note any abortive or additional inspections deemed necessary will be re-charged at cost.

Submitting Your Application

Please Note that under Section 106 of the Water Industry Act 1991 you must give at least 21 Days notice of your intention to connect to the public sewerage system. You must therefore complete and provide the following information for our approval. No works should be undertaken before you are in receipt of your Approval letter.

Your application must include:

- Completed 'PROPOSE DRAINAGE COMMUNICATION UNDER SECTION 106 OF THE WATER INDUSTRY ACT 1991' Form
- Inspection Fee of £196.00 made payable to Dŵr Cymru Welsh Water for connections during normal working hours (outside normal working hours – at cost)
- 1 x extract of the public sewer record indicating the proposed point of connection and the route of private drain N.B. Sites with multiple points of connection can be shown;
- 1 x detail of the proposed mode of connection with the public sewer network;
- A copy of your full planning application form and planning permission, including written confirmation from the Local Planning Authority that any relevant drainage conditions have been discharged or satisfied (If permitted development or planning approval/building regulations not required, please state).
- Confirmation that the S104 Adoption Agreement is in place (where applicable)
- Details of your SSIP Health & Safety Assessed Contractor undertaking the connection work

Please ensure that all documents are submitted with your application. If you do not provide all the information requested it will delay your application until all of the information required has been received. You must NOT proceed with any connection until you have entered into a Section 104 adoption agreement (if applicable), and been granted written Section 106 approval to communicate flows from the development, and gained approval from DCWW Waste Operations under the Access to Assets procedure (further information below).

APPLICATION GUIDANCE

The Sewer Connection Application Process

Dŵr Cymru
Welsh Water

Do You Need a S104 Adoption Agreement?

Please note that if your 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 sewer and lateral drain must also conform with the Welsh Ministers Standards for Gravity Foul Sewers and Lateral Drains. In instances where a Sewer Connection involves either lateral drain or sewer, Sewer Connection approval to connect cannot be granted until the adoption agreement is in place.

Please be advised that we will not enter into a sewer adoption agreement for any sewer or lateral drain which is constructed in advance of the adoption agreement being in place.

Further information on whether you will require a Section 104 adoption agreement and the adoption process can be obtained from **dwrcymru.com** (select 'Developer Services') or by contacting Developer Services on **0800 917 2652**.

Your Connection to the Public Sewer (Mode And Location)

The application pack includes a mode of connection plan. The mode of connection refers to the method by which you intend on connecting your drain/sewer with the existing public sewerage apparatus. We require either a connection into a manhole chamber or the formation of a "y" junction. Saddle type connections will not be permitted, other than in exceptional circumstances.

The mode of connection may have already been agreed as part of your section 104 agreement. However, in such instances please resubmit the manhole detail plan for verification.

As well as details of the mode of connection, we also require details of the point of connection with the public sewer. It is important that the exact location of the public sewer is identified and correlates with the mode of connection plan, as this information is needed to support your application. If there is any doubt of the position/location of the public sewer, you should contact our Sewerage Operations Team on **0800 085 3968**. Please note that it could take up to 28 days to visit site and confirm the exact location of the public sewer.

Your nominated contractor must be made aware of the details and method of the physical connection to the public sewer (by you), and they must obtain Access to Asset Approval and provide us with at least 48 hours notice of the intent to make the new connection to the public sewer. To inform us of the 48 hour notice, the approved contractor must contact our Work Allocators on **0800 917 2652**.

Infrastructure Charges

Please note that upon the completion of all new sewer connections, an infrastructure fee of £365.00 will be invoiced (per household). If your development is a new build, this fee will be incorporated in to the infrastructure charges which are payable at the time of the new potable water connection. If your connection follows disconnection from a septic tank/cesspit, you are required to provide the billing reference number on the Applicant's Checklist attached to this document.

SSIP Health & Safety Assessed Contractors

Any work undertaken on the public sewage network needs to take account of a host of hazards including but not limited to, confined spaces, working at depth and the potential presence of toxic / explosive gases. Dŵr Cymru Welsh Water therefore needs to be satisfied that your appointed contractor undertaking the works is both competent and suitably qualified in respect of current Health & Safety Legislation.

We have historically maintained our own Health and Safety Accredited Contractor scheme but this is discontinued and we now utilise more widely used Industry based Health and Safety Assessment Schemes. There are numerous suitable Industry based Health and Safety Accreditation schemes available which will satisfy our requirements registered with Safety Schemes in Procurement (SSIP). SSIP is endorsed by the Health and Safety Executive and acts as an umbrella organisation to facilitate mutual recognition between health and safety pre-qualification schemes wherever it is practicable to do so. Further information is available on the SSIP website: **ssip.org.uk**

We will check the pre qualification status of your chosen contractor with the approving organisation during application process.

In addition to the SSIP requirements your contractor will also have to secure Access to Asset approval ahead of making the physical sewer connection. Further details about this process and the SSIP can be found within the following sections.

APPLICATION GUIDANCE

The Sewer Connection Application Process

Dŵr Cymru
Welsh Water

Access to Asset Process

The contractor who is planning to access our network will be provided with details of known location specific sewer network risks and hazards when connection approval letters are issued. Details of how the contractor plans to address the highlighted and generic risks will need to be addressed when they submit their own risk assessment and method statement for the works which they are undertaking; these must form part of their Access to Asset application.

A copy of Access to Asset Form AF02 is included within this application and includes details of the information which needs to be submitted to secure Access to Asset approval. Contractors will be asked for their Access to Asset Consent reference number when they provide us with 48 hours notice ahead of the connection.

On the day of the planned works, the contractor must contact our Operational Control Centre (02920 740256) ahead of and on completion of their works / access to our network. In the event of an operational issue within the sewage network which we are aware of during the period of the planned works, the contractor will be notified to cease works and leave the sewer network.

Legislative Background

This guidance note makes reference to parts of the Water Industry Act 1991, which govern the sewer connection process, including Section 104 and S106:

Section 104 – Agreement to adopt sewer, drain or sewage disposal works at a future date

This provision relates to the adoption of all new sewers and lateral drains constructed across Dŵr Cymru Welsh Water's operational area. Historically, the sewer adoption process was voluntary, culminating in us becoming responsible for their maintenance at the end of the process. Legislative changes introduced by Welsh Government in 2012 (see S106B below) now mean that entering into an adoption agreement for every new sewer and lateral drain which is intended to connect to the public sewer network is now a mandatory requirement. The changes go further and also address the standards to which the sewers and lateral drains are designed and constructed. Further information and guidance can be found on the Welsh Government website **wales.gov.uk** and search on – The Welsh Ministers Standards for Gravity Foul Sewers and Lateral Drains.

Section 106 – Right to Communicate with public sewers.

Any customer wishing to connect to the public sewer network for the first time must comply with the application and approval process in every instance. The term Communicate is used because connections are not always directly to the existing public sewer network, they can be indirect via an existing private network.

Section 106B – Requirement to enter into agreement before Construction

The introduction of this provision into the Water Industry Act via the enactment of Section 42 Flood and Water Management Act 2010 effectively introduced mandatory adoption and standards for all new sewers and lateral drains, which are intended to connect with the existing public sewer network.

Appendix E Proposed Development Layout

QMS

General Notes

1. Contractor to verify all dimensions and check level datums on site
2. All of the designs are the sole property of TACP Architects Ltd and may not be used without their written agreement
3. All prints, specifications and their copyright are the property of TACP Architects Ltd
4. Do not scale off drawings
5. All dimensions shall be checked on site before commencement of shop drawings, manufacture and all discrepancies must be reported to TACP Architects Ltd

Risk Assessments

Revisions

Rev	Date	Description	By	Check
A	13/07/2020	Red Line amended, boundary walls added		
B	24/09/2020	Site plan amended to suit comments recieved	MR	MG
C	07/05/2021	Note added	MR	MG
D	18/02/2022	Red Line Amended	MR	MG
E	07/06/2022	Riparian Corridor added, Unit 12 amended	MR	MR
F	30/11/2023	5 Bed Properties removed	MR	MR
G	19/12/2023	Boundary Line s amended	MR	MR

Consultants

Client

Mr & Mrs Roberts

Project Title

Land South of Heol Martin, Eglwysbach

Drawing Title

Proposed Site layout

Scale	Date	Drawn By	Checked By	Office
1 : 200@A0	05/06/20	MR	MG	Wrexham

Job Number	Project•Originator•Zone•Level•Type•Role•Number	Revision
18008	EBACH-TACP-XX-ZZ-DR-A-701	G

House Types

- 1 No. 2B 4P Semi Detached (consisting of 2 properties - Units 1 + 2)
- 1 No. 2B 4P Terrace (consisting of 3 properties - Units 3,4 + 5)
- 1 No. 3B 5P Semi Detached (consisting of 2 properties - Units 6 + 7)
- 1 No. 3B 5P Terrace (consisting of 3 properties - Units 8,9 + 10)

Key

- Riparian Corridor
- Red Line Development Area
- Blue Line - Additional land ownership beyond development area
- Approximate Flood Zone - Refer to FCA

Trees

- Existing Tree Retained
- Existing Tree Removed

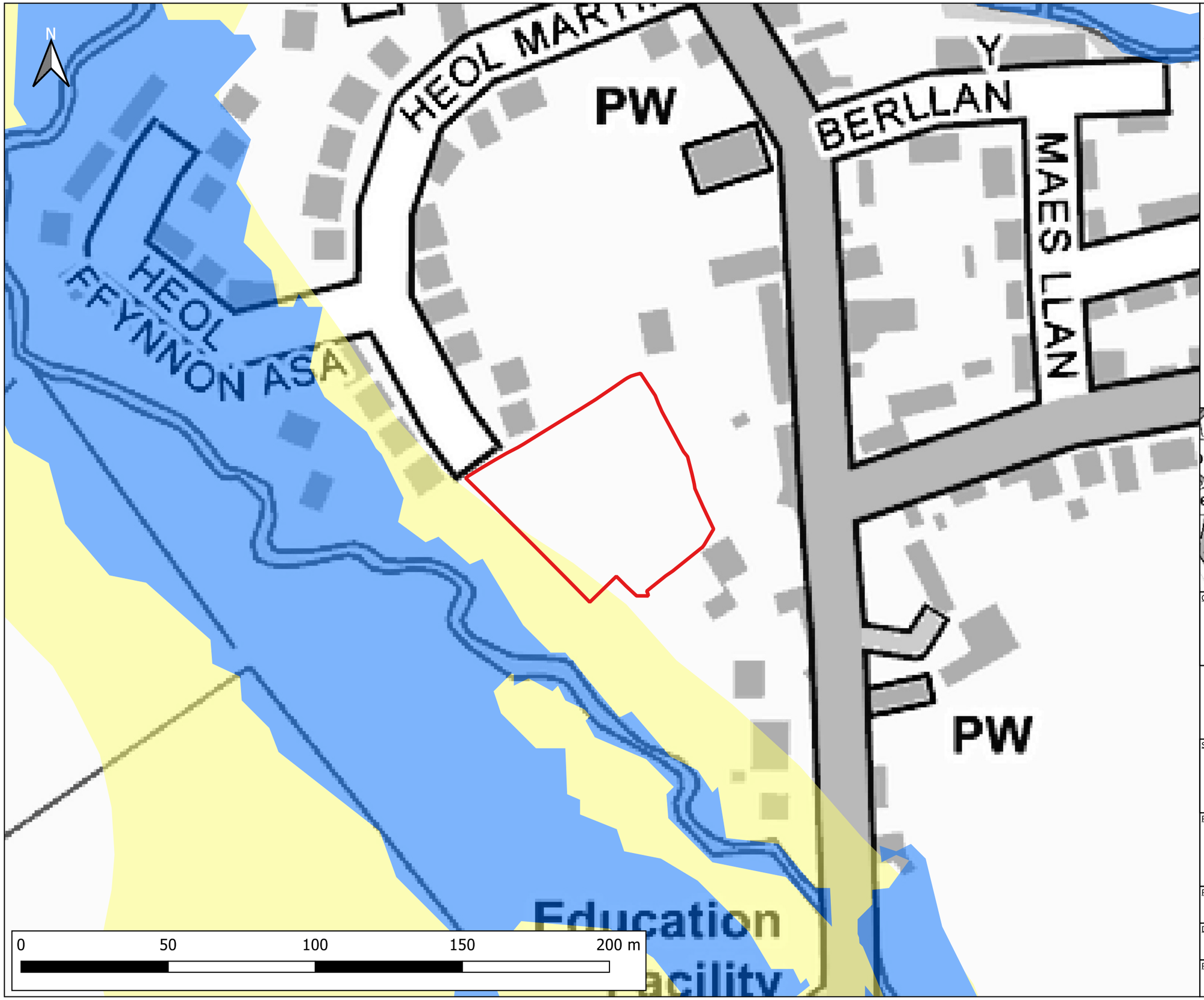
Refer to Arboriculturist reports for works to all trees

Levels

- *00.000* Existing levels
- 00.000 Proposed Levels - *refer to FCA for property finished floor levels*

TACP Architects Ltd
Pembroke House, Ellice Way
Wrexham Technology Park
LL13 7YT
T. 01978 291161
F. 01978 351735
E. admin@tacparchitects.co.uk
www.tacparchitects.co.uk

Appendix F NRW Flood Maps



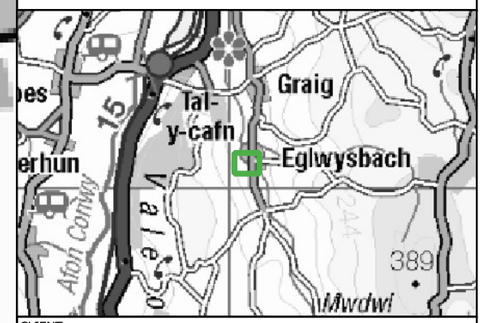
Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary

Development Advice Map (TAN15)

- Zone A
- Zone B
- Zone C1
- Zone C2



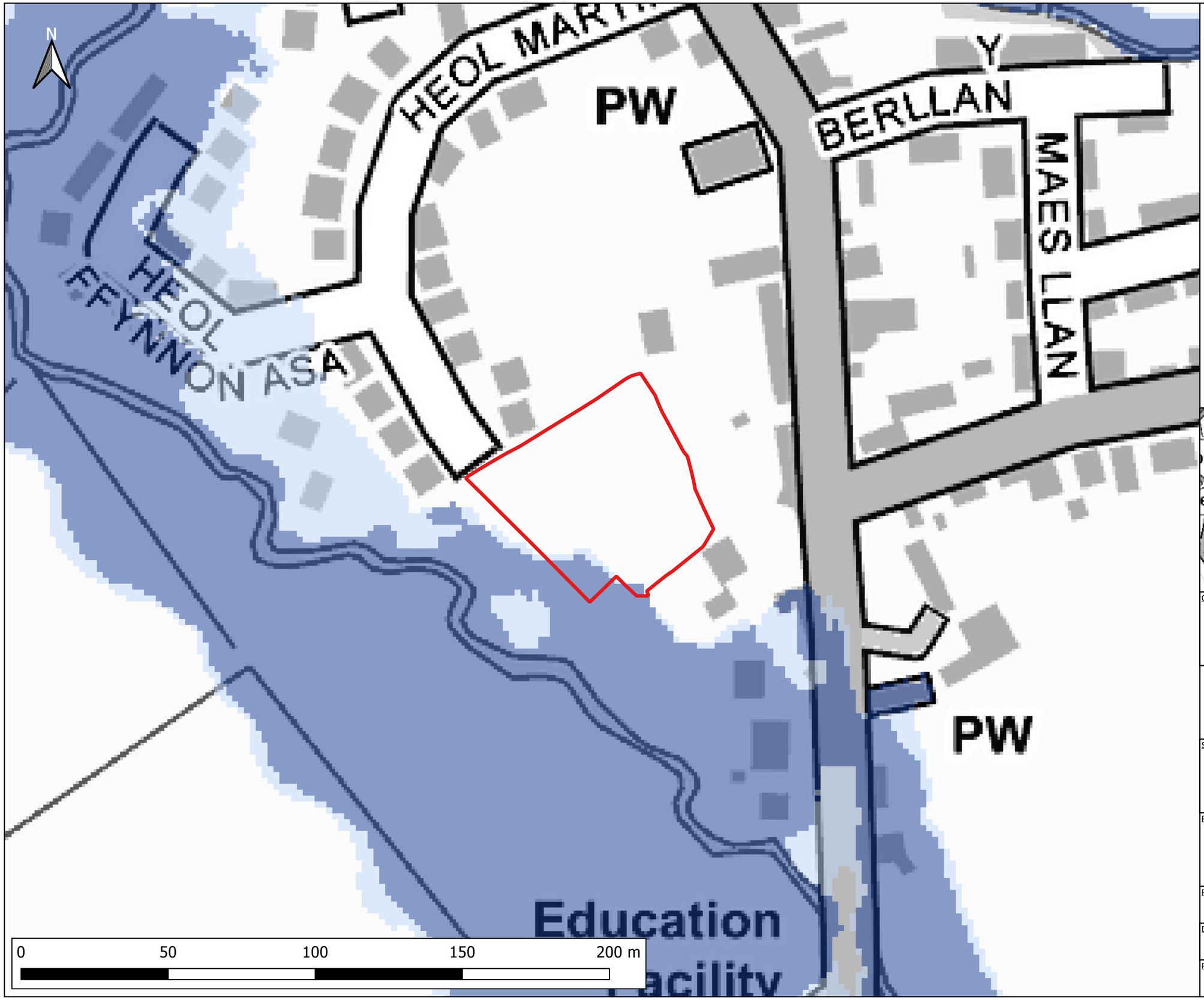
CLIENT:
Mr Robin Roberts

waterco
www.waterco.co.uk

SCHEME:
Heol Martin, Eglwysbach

PLOT TITLE:
NRW Development Advice Map
Data Accessed April 2024
Data from DataMapWales

PLOT STATUS:			DATE:
FINAL			02-04-2024
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250
PLOT NAME:			REVISION:
12116_NRW_DAM_Map			-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary

NRW Flood Map for Planning - Rivers

- Flood Zone 2
- Flood Zone 3

CLIENT:

Mr Robin Roberts

waterco
www.waterco.co.uk

SCHEME:

Heol Martin, Eglwysbach

PLOT TITLE:

NRW Flood Map for Planning - Rivers
Data accessed April 2024
Data from DataMapWales

PLOT STATUS:	DATE:
FINAL	02-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME:	REVISION:
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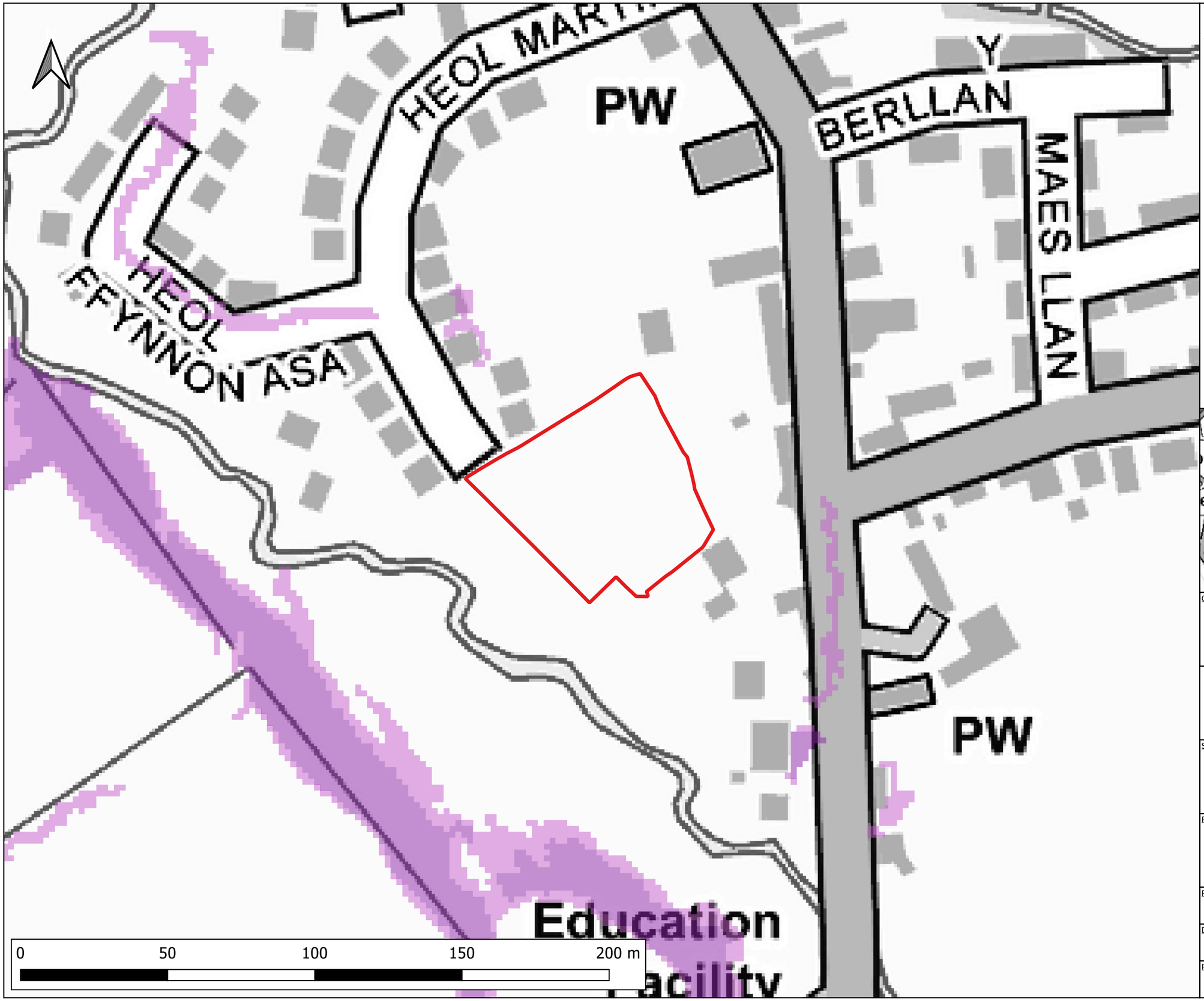


Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

Site Boundary

NRW Flood Map for Planning - Surface Water & Small Watercourses

Flood Zone 2

Flood Zone 3

CLIENT:

Mr Robin Roberts

www.waterco.co.uk

SCHEME:

Heol Martin, Eglwysbach

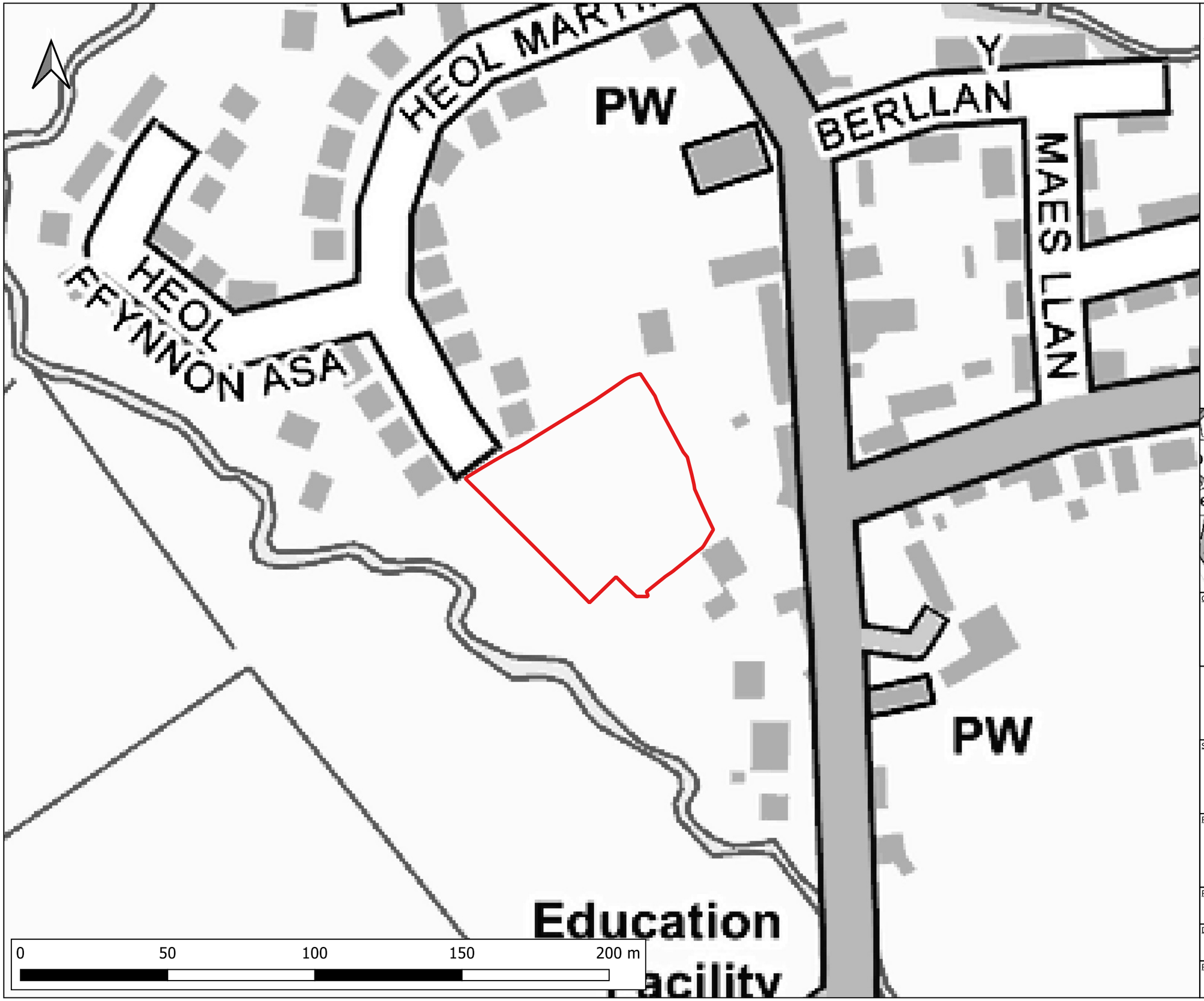
PLOT TITLE:

NRW Flood Map for Planning - Surface Water & Small Watercourses
Data accessed April 2024
Data from DataMapWales

PLOT STATUS:	DATE:
FINAL	02-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME:	REVISION:
12116_NRW_Flood_Risk_from_Surface_Water_&_Small_Watercourses	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary

NRW Flood Map for Planning - Sea

- Flood Zone 2
- Flood Zone 3

CLIENT:

Mr Robin Roberts

waterco
www.waterco.co.uk

SCHEME:

Heol Martin, Eglwysbach

PLOT TITLE:

NRW Flood Map for Planning - Sea
Data accessed April 2024
Data from DataMapWales

PLOT STATUS:			DATE:
FINAL			02-04-2024
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250
PLOT NAME:			REVISION:
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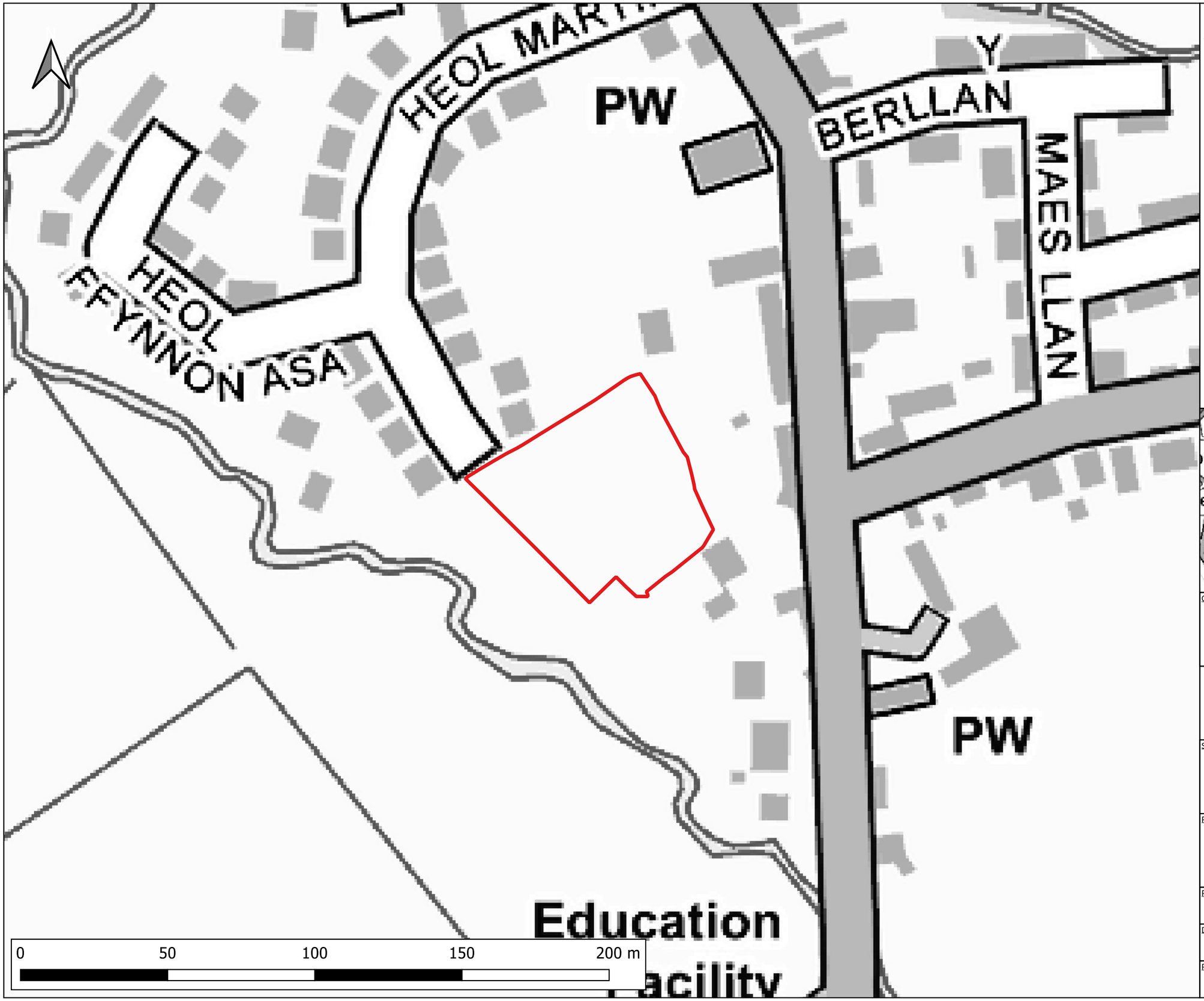


Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Risk of Flooding from Reservoirs - Extent

CLIENT:

Mr Robin Roberts

waterco
www.waterco.co.uk

SCHEME:

Heol Martin, Eglwysbach

PLOT TITLE:

NRW Flood Risk from Reservoirs
Data accessed April 2024
Data from DataMapWales

PLOT STATUS:			DATE:
FINAL			02-04-2024
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME:	REVISION:
12116_NRW_Flood_Risk_from_Reservoirs	-

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- NRW Recorded Flood Extent

CLIENT:

Mr Robin Roberts

www.waterco.co.uk

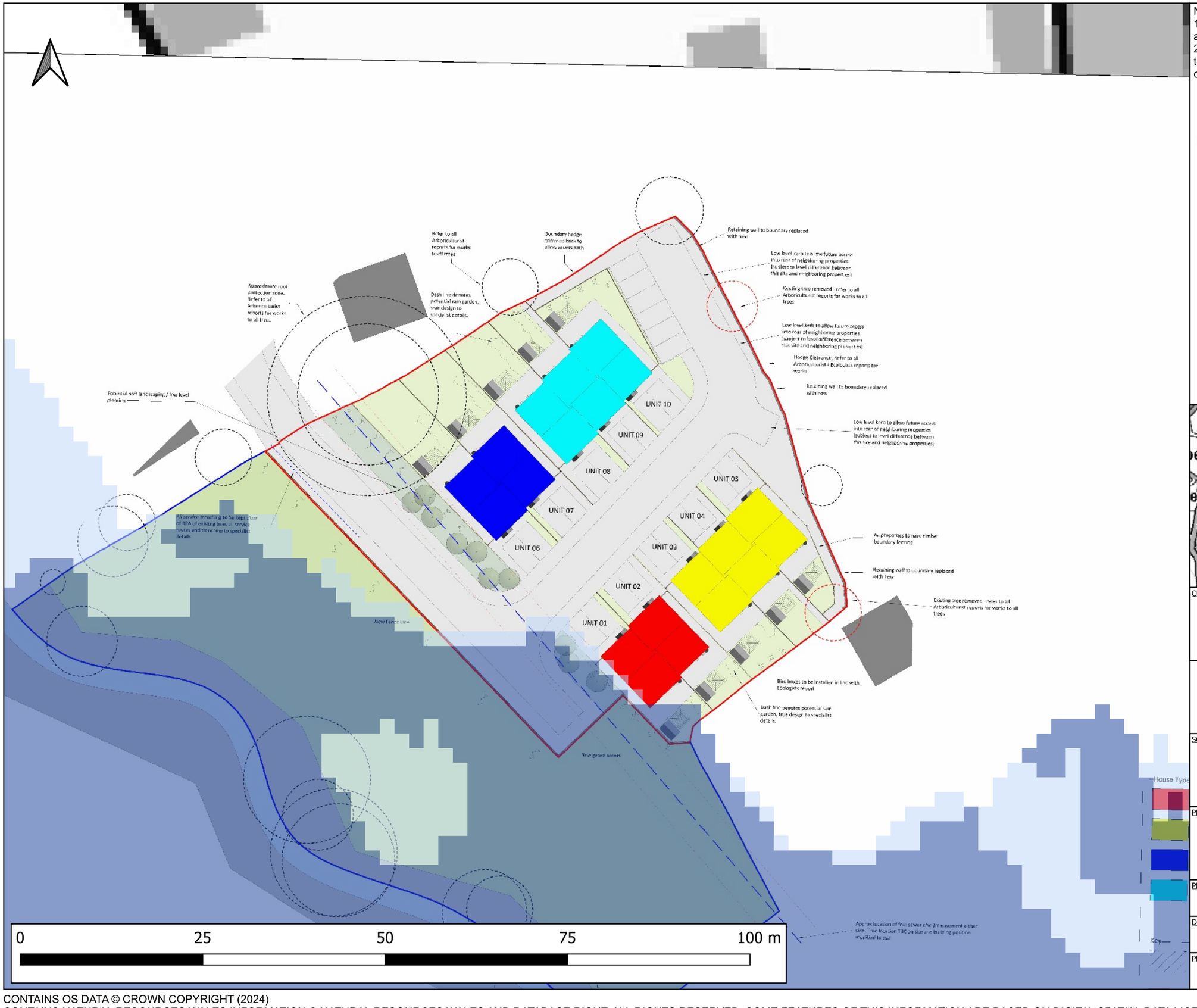
SCHEME:

Heol Martin, Eglwysbach

PLOT TITLE:

NRW Historic Flood Risk
Data accessed April 2024
Data from DataMapWales

PLOT STATUS:			DATE:
FINAL			02-04-2024
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250
PLOT NAME:			REVISION:
12116_NRW_Historic_Flood_Risk			-



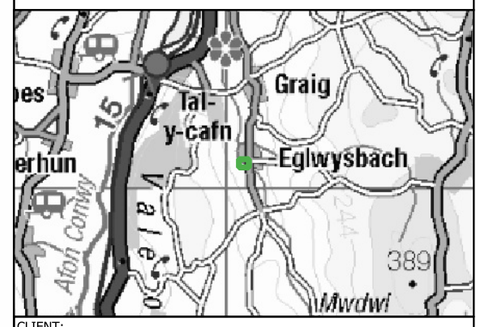
Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise.
2) The location of the proposed buildings in relation to the flood extent is indicatively only and should be confirmed.

LEGEND

- Site Boundary

NRW Flood Map for Planning - Rivers

- Flood Zone 2
- Flood Zone 3



CLIENT:

Mr Robin Roberts

waterco
www.waterco.co.uk

SCHEME:

Heol Martin, Eglwysbach

PLOT TITLE:

NRW Flood Map for Planning - Rivers
With Proposed Development Plan Overlay

PLOT STATUS:	DATE:
FINAL	02-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:500

PLOT NAME:	REVISION:
12116_NRW_FmFP_With_Overlay	-

Appendix G NRW & SAB Correspondence

Cyfoeth Naturiol Cymru
Natural Resources Wales

Ein cyf/Our ref: CAS-104705-N2N0
Eich cyf/Your ref: LL28 5AJ

Maes y Ffynnon,
Penrhosgarnedd,
Bangor,
Gwynedd,
LL57 2DW

Ebost/Email:
northplanning@cyfoethnaturiolcymru.gov.uk
Ffôn/Phone: 03000 65 3787

Conwy County Borough Council
PO Box 1
Conwy
LL30 9GN

3rd December 2019

Dear Madam,

PRELIMINARY PRE-APPLICATION ADVICE

DEVELOPMENT: PROPOSAL FOR 14NO. RESIDENTIAL PROPERTIES, WITH ASSOCIATED ACCESS PARKING AND GARDENS

LOCATION: LAND SOUTH OF HEOL MARTIN, EGLWYSBACH, COLWYN BAY

Thank you for your enquiry dated 19th November 2019.

We have considered your enquiry in relation to our Development Planning Consultations Topics document (September 2018). We advise that the following matters are relevant to your site / proposed development and suggest you consider these further prior to the submission of any planning application:

Flood Risk Management:

We understand the proposal is for highly vulnerable development. Our Flood Risk Map, which is updated on a quarterly basis, confirms the site to be partially within Zone C2 and Zone B of the Development Advice Map (DAM) contained in TAN15. The afon Hiraethlyn is classed as an ordinary watercourse and we are aware that the Lead Local Flood Authority have historically carried out various flood alleviation measures on it. However due to changes in hydrology and modelling techniques these measures may not provide the necessary standard of protection to meet TAN15 requirements.

We refer you to Section 6 of TAN15 and the Chief Planning Officer **letter** from Welsh Government, dated 9 January 2014, which affirms that **highly vulnerable development should not be permitted in Zone C2** (paragraph 6.2 of TAN15). The justification tests in paragraph 6.2 of TAN15 do not apply to highly vulnerable development in Zone C2.

In consideration of the above, we will not provide any pre-application advice regarding flood risk, unless we receive written confirmation from the Planning Authority that there are overriding reasons for them to consider the proposals despite the site's location within Zone C2. In such circumstances, we would then review any submitted FCA. If the FCA fails to demonstrate that the consequences of flooding can be acceptably managed over the lifetime of the development, then we would object to the application.

Finally, as you may be aware, under the Town & Country Planning (Notification) (Wales) Direction 2012 and more specifically Category I relating to Flood Risk Area Development, where the Planning Authority is minded to grant permission, there is a requirement to refer applications for emergency services or highly vulnerable development within Zone C2 to Welsh Government.

European Protected Species (EPS):

Our records show there may be protected species in the vicinity of the site. We advise liaison with the LPA ecologist to discuss and agree the scope of any surveys required.

We refer you to our website for further advice.

Foul Water:

Before deciding a planning application, the LPA needs to be satisfied the foul drainage arrangements for the proposed development are suitable. From the details submitted there is no reference to the foul drainage arrangements for the proposed development. We therefore recommend you provide details regarding foul drainage arrangements with any planning application.

We refer you to WG Circular 008/2018 on private drainage, and specifically paragraphs 2.3-2.5, which stress the first presumption must be to provide a system of foul drainage discharging into a public sewer.

Groundwater protection and land contamination:

Advice on environmental considerations and the assessments needed to support your planning application can be found on our external website.

· For advice on how to deal with possible land contamination on your development visit: http://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/land-contamination/?lang=en

· For advice on how to protect groundwater at your development visit: http://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/protecting-groundwater/?lang=en

Provision of Data:

In addition to the above, please note, we can also provide certain data free of charge, as set out in our Open Data Policy. Customers can access our data via our website.

Please note the view expressed in this letter is a response to a pre-planning enquiry only. We trust these comments will prove helpful, but they should not set a precedent for any future Natural Resources Wales' response to any formal application for planning permission or other legal consent. Such applications shall be assessed on the information submitted and regulations of relevance at that time. The details contained in this letter are based on the information available to date.

As part of our discretionary advice service we can provide further advice relating to land contamination, groundwater and flood risk prior to your planning application being submitted. There is a charge for this service. Further details are available on our website.

If you have any queries on the above please do not hesitate to contact us.

Yours faithfully,

Ruth Prichard
Cynghorydd - Cynllunio Datblygu / Advisor - Development Planning
Cyfoeth Naturiol Cymru / Natural Resources Wales

Jessica Roberts

From: SAB <sab@conwy.gov.uk>
Sent: 23 December 2019 15:26
To: Sally Pettit
Subject: RE: 12116-Heol Martin, Eglwysbach -SAB meeting

Hi Sally,

Can confirm this is what was discussed and acceptable from our meeting.

Thanks,
James

From: Sally Pettit <Sally.Pettit@waterco.co.uk>
Sent: 17 December 2019 14:38
To: SAB <sab@conwy.gov.uk>
Subject: 12116-Heol Martin, Eglwysbach -SAB meeting

Good afternoon James,

Further to our discussions this morning regarding the SAB requirements for the development at Heol Martin, Eglwysbach, I am just confirming the outcomes of the meeting for our records:

Runoff destination

- Infiltration testing to BRE365 Standards has been carried out at the site. Infiltration test results have concluded that infiltration methods are feasible.
- It is proposed to utilise infiltration methods at the site.

Attenuation

- The access road will be drained via ring manhole soakaways (subject to Highways Department agreement), dwellings will be served via private soakaways in each garden, and / or permeable surfaces on driveways.
- An allowance for urban creep is not local policy however a 10% urban creep allowance should be included for betterment.
- The 1 in 100 year plus 30% climate change event will be used.

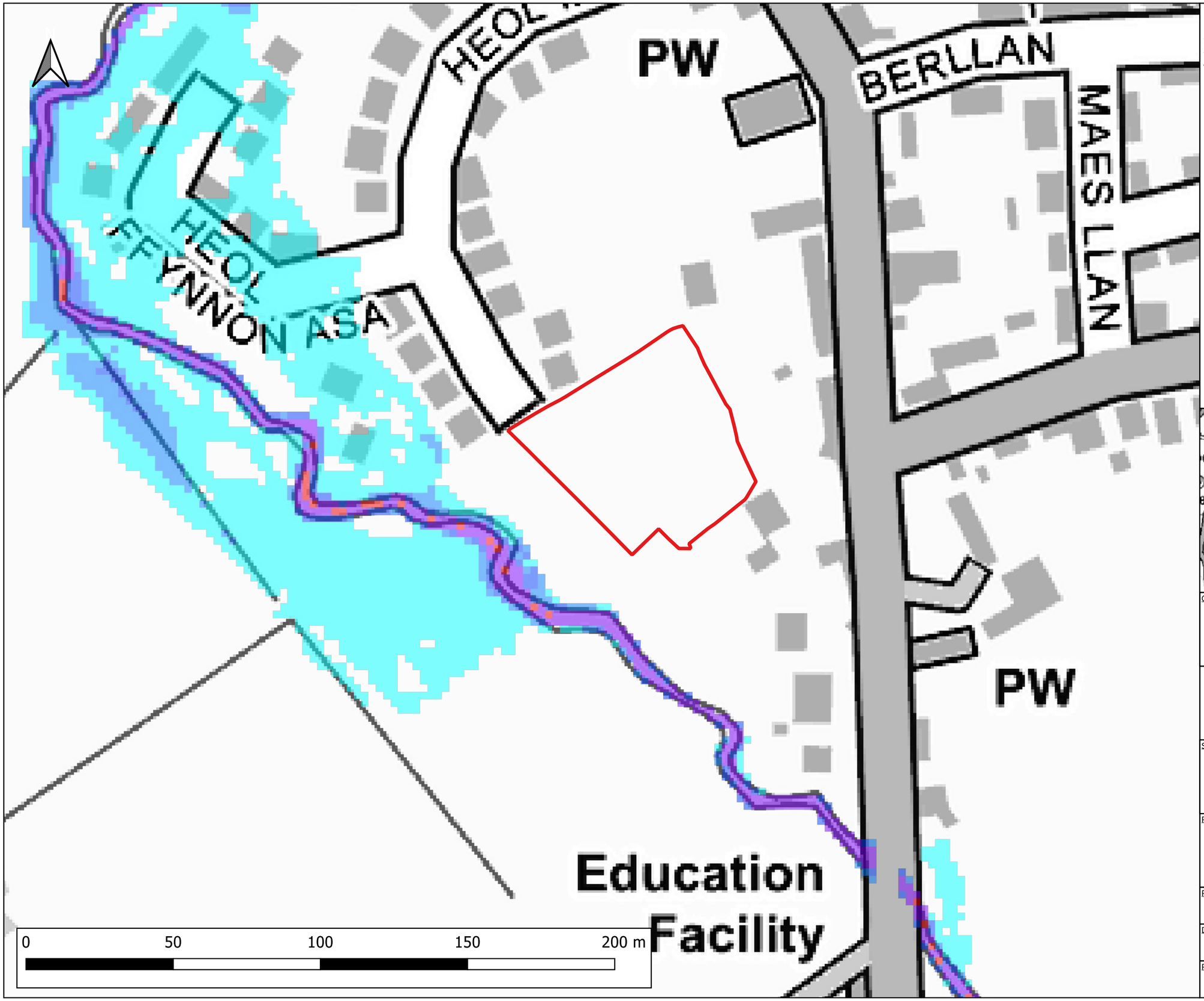
Following on from our conversation today regarding potential flood risk at the site and the possibility that the site layout may change we will contact you in due course to confirm any changes that may arise and how this will affect our drainage proposals. I trust this is acceptable.

Kind Regards,

Sally Pettit BSc (Hons)
Environmental Consultant

Office: 01824 702220
Teams: Sally.Pettit@waterco.co.uk
Over the Christmas period our offices will be closed from 17.00 on Tuesday 24th December and re-open at 9.00am on Thursday 2nd January 2020. We would like to take this opportunity to wish you all a very happy Christmas and a healthy and enjoyable 2020.
Click to complete our survey and be in with a chance of winning a £100 John Lewis voucher!

Appendix H NRW Modelled Data



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise.
2) Modelled Outputs taken from the Environment Agency Wales 'Eglwysbach_5_V1.0_2010' Model.

LEGEND

- Site Boundary

Maximum Flood Depth

- <= 0.3m
- 0.3m - 0.6m
- 0.6m - 1.2m
- 1.2m - 2.4m
- > 2.4m

CLIENT:
Mr Robin Roberts

waterco
www.waterco.co.uk

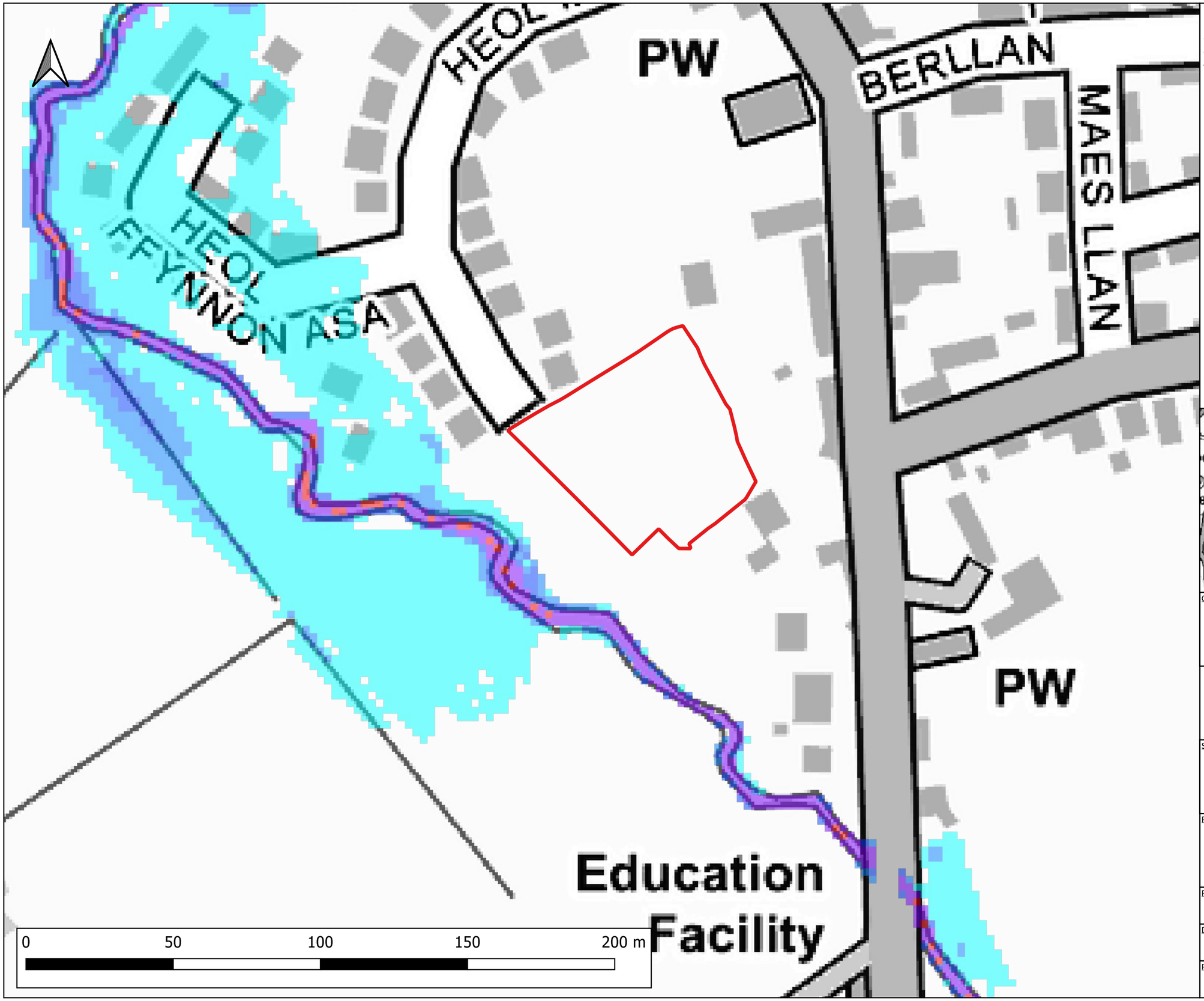
SCHEME:
Heol Martin, Eglwysbach

PLOT TITLE:
AFON HIRAETHLYN & NANT Y RHAGLAW MODEL
MAXIMUM FLOOD DEPTH
1% AEP FLUVIAL EVENT

PLOT STATUS:	DATE:
FINAL	02-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME:	REVISION:
12116_EGLWYSBACH_1%_d_g002.50_Max	-



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise.
2) Modelled Outputs taken from the Environment Agency Wales 'Eglwysbach_5_V1.0_2010' Model.

LEGEND

- Site Boundary

Maximum Flood Depth

- <= 0.3m
- 0.3m - 0.6m
- 0.6m - 1.2m
- 1.2m - 2.4m
- > 2.4m

CLIENT:
Mr Robin Roberts

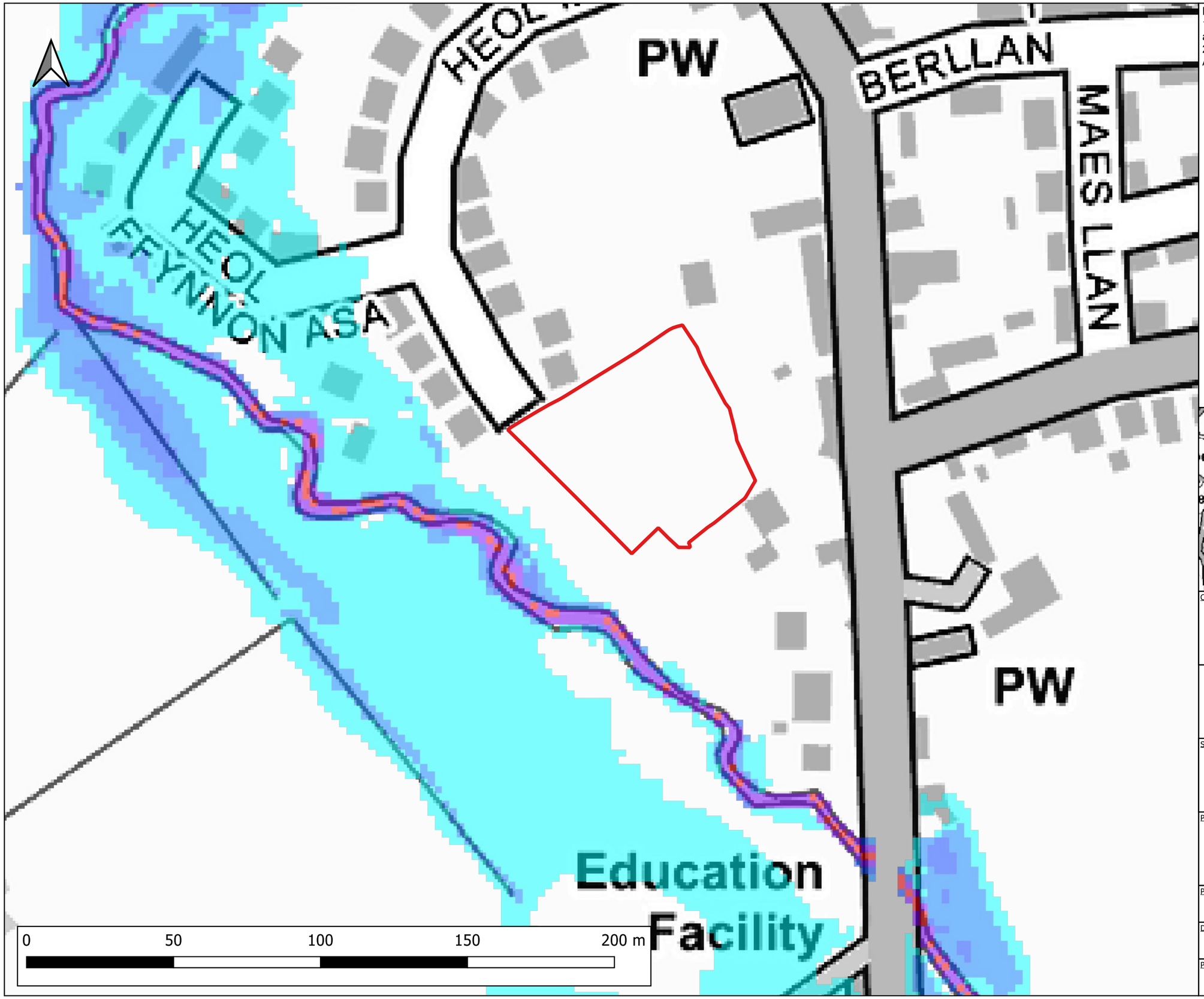
waterco
www.waterco.co.uk

SCHEME:
Heol Martin, Eglwysbach

PLOT TITLE:
AFON HIRAETHLYN & NANT Y RHAGLAW MODEL
MAXIMUM FLOOD DEPTH
1% AEP PLUS 20% CLIMATE CHANGE FLUVIAL EVENT

PLOT STATUS:			DATE:
FINAL			02-04-2024
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME: 12116_EGLWYSBACH_1%+CC_d_g002.50_Max
REVISION: -



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise.
2) Modelled Outputs taken from the Environment Agency Wales 'Eglwysbach_5_V1.0_2010' Model.

LEGEND

- Site Boundary

Maximum Flood Depth

- <= 0.3m
- 0.3m - 0.6m
- 0.6m - 1.2m
- 1.2m - 2.4m
- > 2.4m

CLIENT:
Mr Robin Roberts

waterco
www.waterco.co.uk

SCHEME:
Heol Martin, Eglwysbach

PLOT TITLE:
AFON HIRAETHLYN & NANT Y RHAGLAW MODEL
MAXIMUM FLOOD DEPTH
0.1% AEP FLUVIAL EVENT

PLOT STATUS:	DATE:
FINAL	02-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:1250

PLOT NAME:	REVISION:
12116_EGLWYSBACH_0_1%_d_g002.50_Max	-

Appendix I MicroDrainage Outputs

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 41 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	8.975	0.475	0.8	2.2	O K
30 min Summer	9.076	0.576	0.9	2.7	O K
60 min Summer	9.149	0.649	1.0	3.0	O K
120 min Summer	9.153	0.653	1.0	3.0	O K
180 min Summer	9.124	0.624	1.0	2.9	O K
240 min Summer	9.089	0.589	0.9	2.7	O K
360 min Summer	9.027	0.527	0.8	2.5	O K
480 min Summer	8.976	0.476	0.8	2.2	O K
600 min Summer	8.935	0.435	0.7	2.0	O K
720 min Summer	8.901	0.401	0.6	1.9	O K
960 min Summer	8.848	0.348	0.6	1.6	O K
1440 min Summer	8.777	0.277	0.4	1.3	O K
2160 min Summer	8.715	0.215	0.3	1.0	O K
2880 min Summer	8.679	0.179	0.3	0.8	O K
4320 min Summer	8.634	0.134	0.2	0.6	O K
5760 min Summer	8.609	0.109	0.2	0.5	O K
7200 min Summer	8.592	0.092	0.1	0.4	O K
8640 min Summer	8.581	0.081	0.1	0.4	O K
10080 min Summer	8.572	0.072	0.1	0.3	O K
15 min Winter	9.034	0.534	0.9	2.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	137.821	0.0	15
30 min Summer	94.569	0.0	24
60 min Summer	61.895	0.0	42
120 min Summer	38.439	0.0	76
180 min Summer	28.871	0.0	108
240 min Summer	23.501	0.0	140
360 min Summer	17.527	0.0	204
480 min Summer	14.217	0.0	266
600 min Summer	12.072	0.0	326
720 min Summer	10.553	0.0	390
960 min Summer	8.520	0.0	510
1440 min Summer	6.250	0.0	750
2160 min Summer	4.600	0.0	1108
2880 min Summer	3.698	0.0	1472
4320 min Summer	2.694	0.0	2204
5760 min Summer	2.154	0.0	2936
7200 min Summer	1.817	0.0	3672
8640 min Summer	1.585	0.0	4400
10080 min Summer	1.414	0.0	5136
15 min Winter	137.821	0.0	15

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.146	0.646	1.0	3.0	O K
60 min Winter	9.215	0.715	1.1	3.3	O K
120 min Winter	9.191	0.691	1.1	3.2	O K
180 min Winter	9.137	0.637	1.0	3.0	O K
240 min Winter	9.085	0.585	0.9	2.7	O K
360 min Winter	9.000	0.500	0.8	2.3	O K
480 min Winter	8.936	0.436	0.7	2.0	O K
600 min Winter	8.887	0.387	0.6	1.8	O K
720 min Winter	8.849	0.349	0.6	1.6	O K
960 min Winter	8.792	0.292	0.5	1.4	O K
1440 min Winter	8.722	0.222	0.4	1.0	O K
2160 min Winter	8.666	0.166	0.3	0.8	O K
2880 min Winter	8.635	0.135	0.2	0.6	O K
4320 min Winter	8.599	0.099	0.2	0.5	O K
5760 min Winter	8.579	0.079	0.1	0.4	O K
7200 min Winter	8.567	0.067	0.1	0.3	O K
8640 min Winter	8.559	0.059	0.1	0.3	O K
10080 min Winter	8.552	0.052	0.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	94.569	0.0	25
60 min Winter	61.895	0.0	44
120 min Winter	38.439	0.0	80
180 min Winter	28.871	0.0	114
240 min Winter	23.501	0.0	148
360 min Winter	17.527	0.0	212
480 min Winter	14.217	0.0	276
600 min Winter	12.072	0.0	338
720 min Winter	10.553	0.0	398
960 min Winter	8.520	0.0	520
1440 min Winter	6.250	0.0	764
2160 min Winter	4.600	0.0	1124
2880 min Winter	3.698	0.0	1496
4320 min Winter	2.694	0.0	2204
5760 min Winter	2.154	0.0	2936
7200 min Winter	1.817	0.0	3640
8640 min Winter	1.585	0.0	4368
10080 min Winter	1.414	0.0	5136

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 280276 370395 SH 80276 70395
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.010

Time (mins) From:	To:	Area (ha)
0	1	0.010

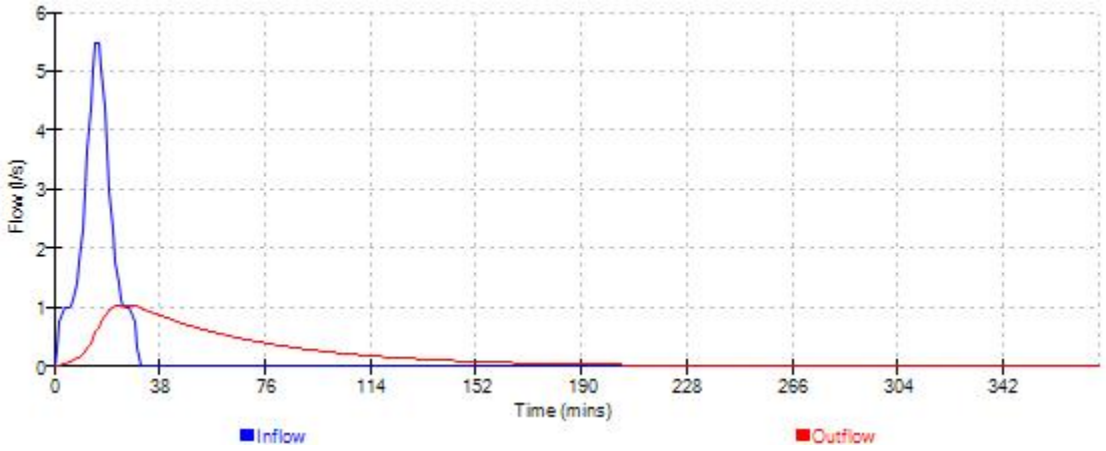
Model Details

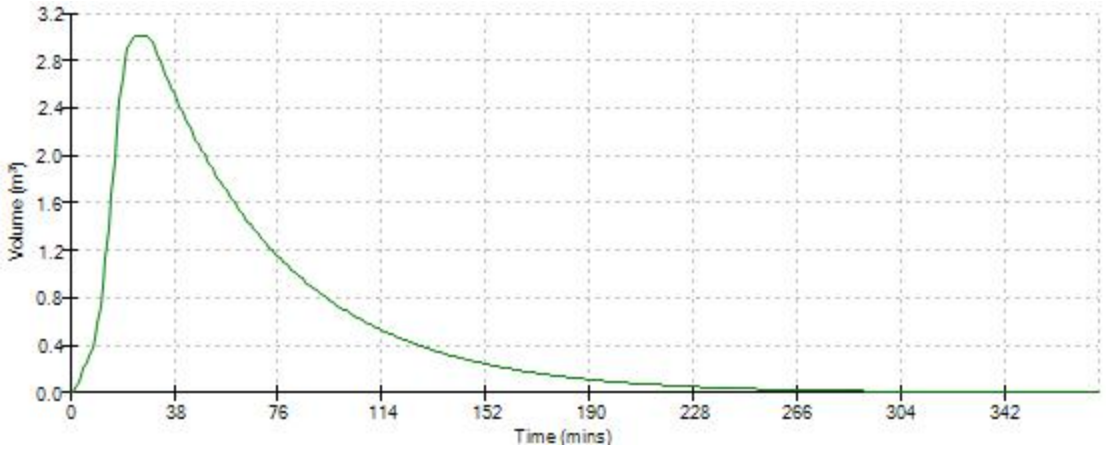
Storage is Online Cover Level (m) 10.000

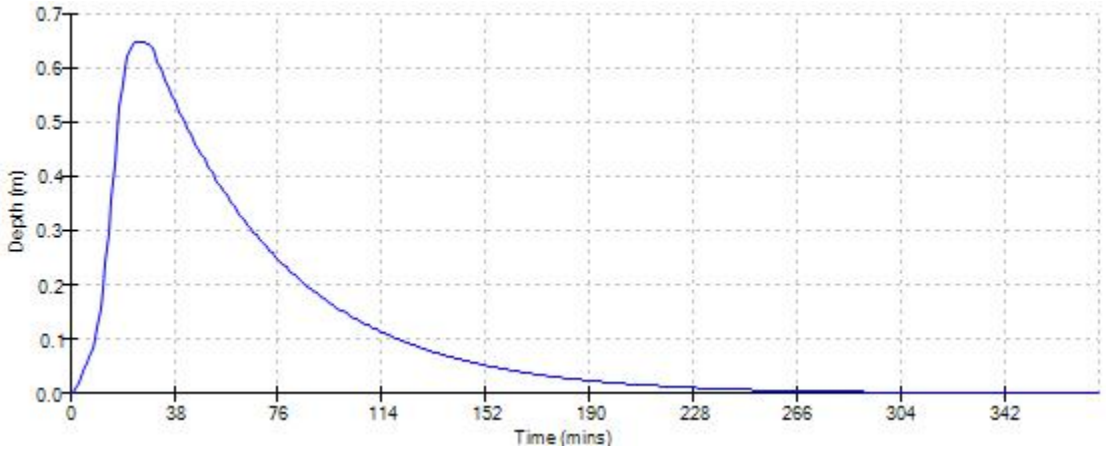
Lined Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.00000	Ring Diameter (m)	2.10
Infiltration Coefficient Side (m/hr)	0.63180	Pit Multiplier	1.3
Safety Factor	1.2	Number Required	1
Porosity	0.30	Cap Volume Depth (m)	0.800
Invert Level (m)	8.500	Cap Infiltration Depth (m)	0.800

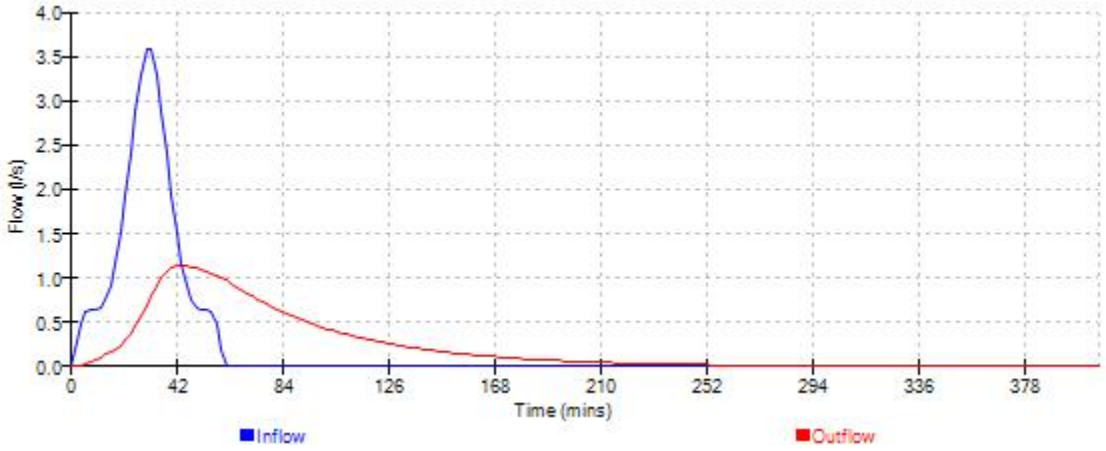
Event: 30 min Winter

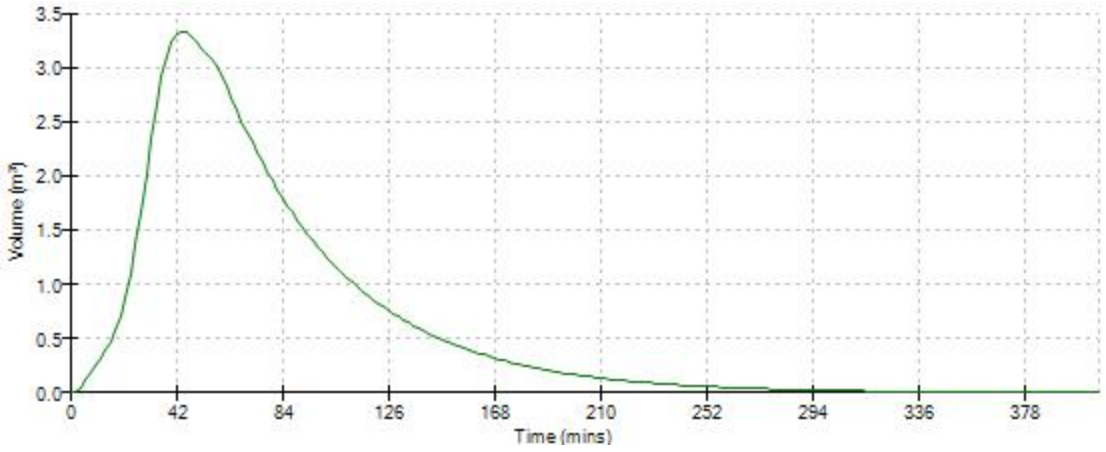


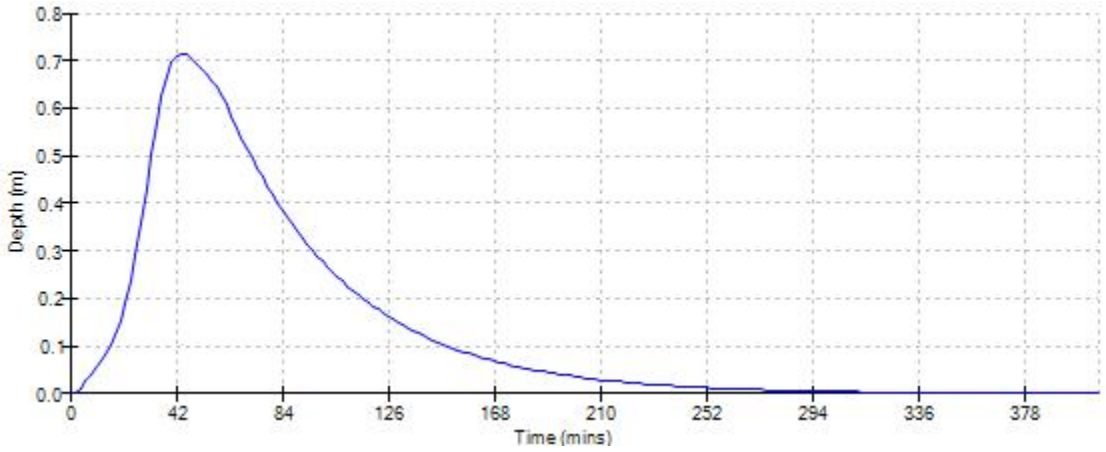




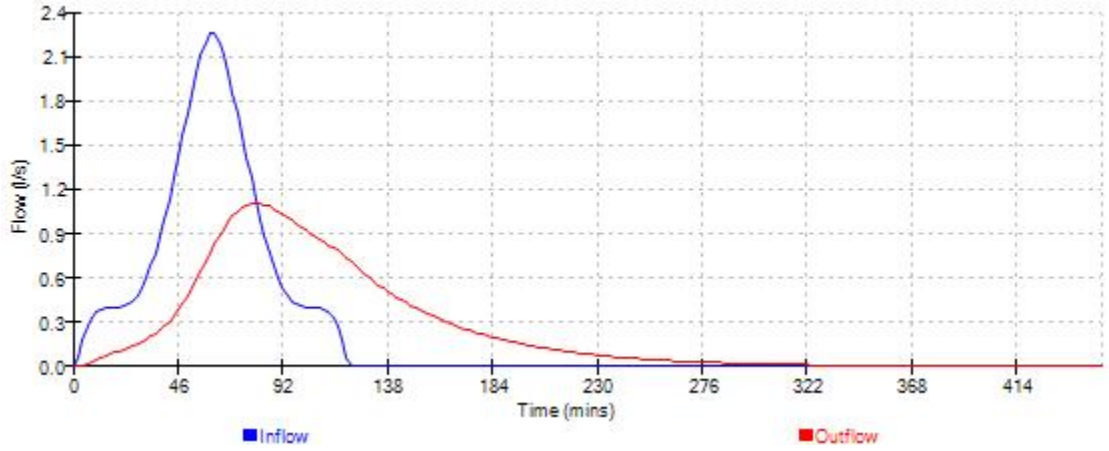
Event: 60 min Winter

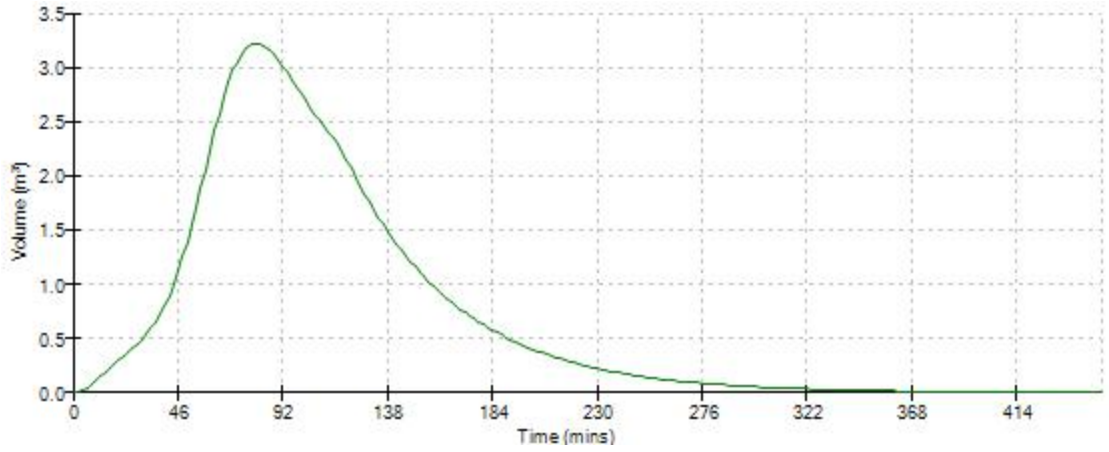


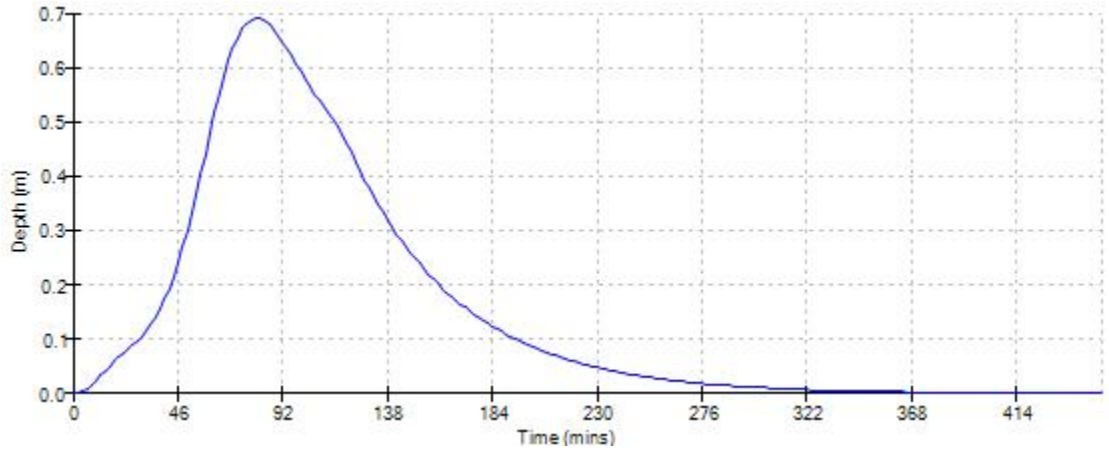




Event: 120 min Winter







Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 33 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	9.729	0.529	0.6	1.5	Flood Risk
30 min Summer	9.837	0.637	0.7	1.8	Flood Risk
60 min Summer	9.909	0.709	0.8	2.0	Flood Risk
120 min Summer	9.898	0.698	0.8	2.0	Flood Risk
180 min Summer	9.856	0.656	0.8	1.9	Flood Risk
240 min Summer	9.813	0.613	0.7	1.7	Flood Risk
360 min Summer	9.740	0.540	0.6	1.5	Flood Risk
480 min Summer	9.683	0.483	0.6	1.4	O K
600 min Summer	9.639	0.439	0.5	1.2	O K
720 min Summer	9.602	0.402	0.5	1.1	O K
960 min Summer	9.546	0.346	0.4	1.0	O K
1440 min Summer	9.472	0.272	0.3	0.8	O K
2160 min Summer	9.410	0.210	0.2	0.6	O K
2880 min Summer	9.374	0.174	0.2	0.5	O K
4320 min Summer	9.330	0.130	0.2	0.4	O K
5760 min Summer	9.305	0.105	0.1	0.3	O K
7200 min Summer	9.289	0.089	0.1	0.3	O K
8640 min Summer	9.278	0.078	0.1	0.2	O K
10080 min Summer	9.270	0.070	0.1	0.2	O K
15 min Winter	9.795	0.595	0.7	1.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	137.821	0.0	15
30 min Summer	94.569	0.0	23
60 min Summer	61.895	0.0	40
120 min Summer	38.439	0.0	74
180 min Summer	28.871	0.0	106
240 min Summer	23.501	0.0	138
360 min Summer	17.527	0.0	202
480 min Summer	14.217	0.0	264
600 min Summer	12.072	0.0	324
720 min Summer	10.553	0.0	384
960 min Summer	8.520	0.0	508
1440 min Summer	6.250	0.0	750
2160 min Summer	4.600	0.0	1104
2880 min Summer	3.698	0.0	1472
4320 min Summer	2.694	0.0	2204
5760 min Summer	2.154	0.0	2936
7200 min Summer	1.817	0.0	3672
8640 min Summer	1.585	0.0	4400
10080 min Summer	1.414	0.0	5104
15 min Winter	137.821	0.0	15

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.913	0.713	0.8	2.0	Flood Risk
60 min Winter	9.974	0.774	0.9	2.2	Flood Risk
120 min Winter	9.927	0.727	0.9	2.1	Flood Risk
180 min Winter	9.859	0.659	0.8	1.9	Flood Risk
240 min Winter	9.798	0.598	0.7	1.7	Flood Risk
360 min Winter	9.702	0.502	0.6	1.4	Flood Risk
480 min Winter	9.633	0.433	0.5	1.2	O K
600 min Winter	9.582	0.382	0.4	1.1	O K
720 min Winter	9.542	0.342	0.4	1.0	O K
960 min Winter	9.485	0.285	0.3	0.8	O K
1440 min Winter	9.414	0.214	0.3	0.6	O K
2160 min Winter	9.360	0.160	0.2	0.5	O K
2880 min Winter	9.330	0.130	0.2	0.4	O K
4320 min Winter	9.295	0.095	0.1	0.3	O K
5760 min Winter	9.276	0.076	0.1	0.2	O K
7200 min Winter	9.265	0.065	0.1	0.2	O K
8640 min Winter	9.257	0.057	0.1	0.2	O K
10080 min Winter	9.251	0.051	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	94.569	0.0	24
60 min Winter	61.895	0.0	44
120 min Winter	38.439	0.0	78
180 min Winter	28.871	0.0	112
240 min Winter	23.501	0.0	146
360 min Winter	17.527	0.0	208
480 min Winter	14.217	0.0	270
600 min Winter	12.072	0.0	332
720 min Winter	10.553	0.0	392
960 min Winter	8.520	0.0	518
1440 min Winter	6.250	0.0	752
2160 min Winter	4.600	0.0	1124
2880 min Winter	3.698	0.0	1472
4320 min Winter	2.694	0.0	2204
5760 min Winter	2.154	0.0	2936
7200 min Winter	1.817	0.0	3648
8640 min Winter	1.585	0.0	4392
10080 min Winter	1.414	0.0	5080

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 280276 370395 SH 80276 70395
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.007

Time (mins) From:	To:	Area (ha)
0	1	0.007

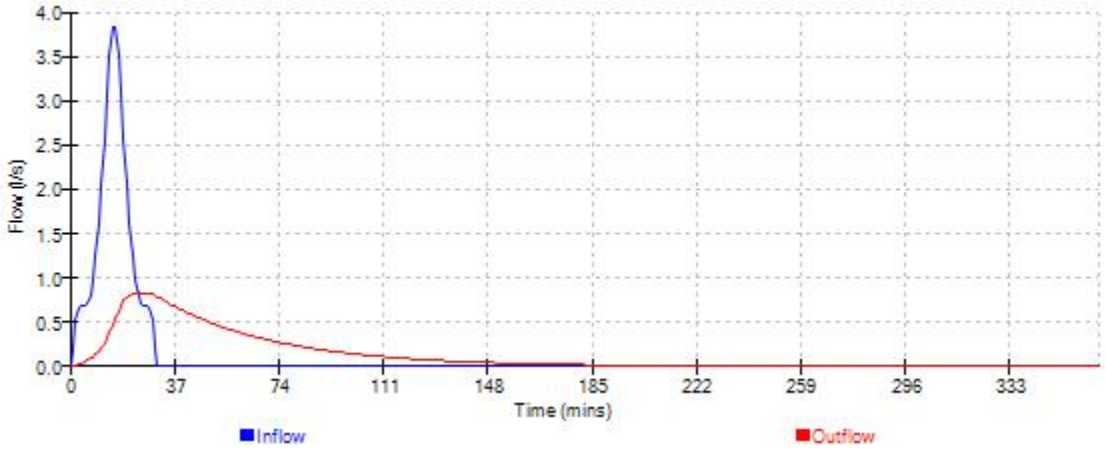
Model Details

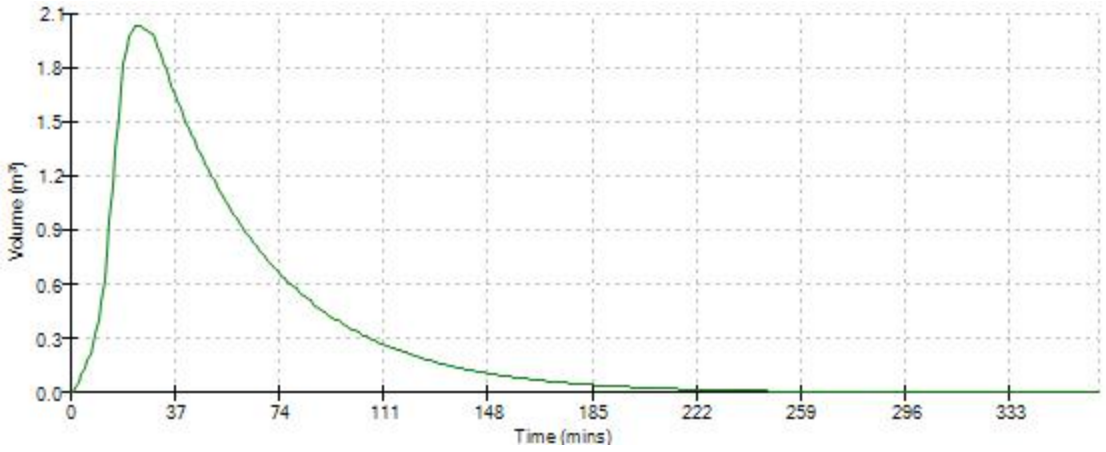
Storage is Online Cover Level (m) 10.000

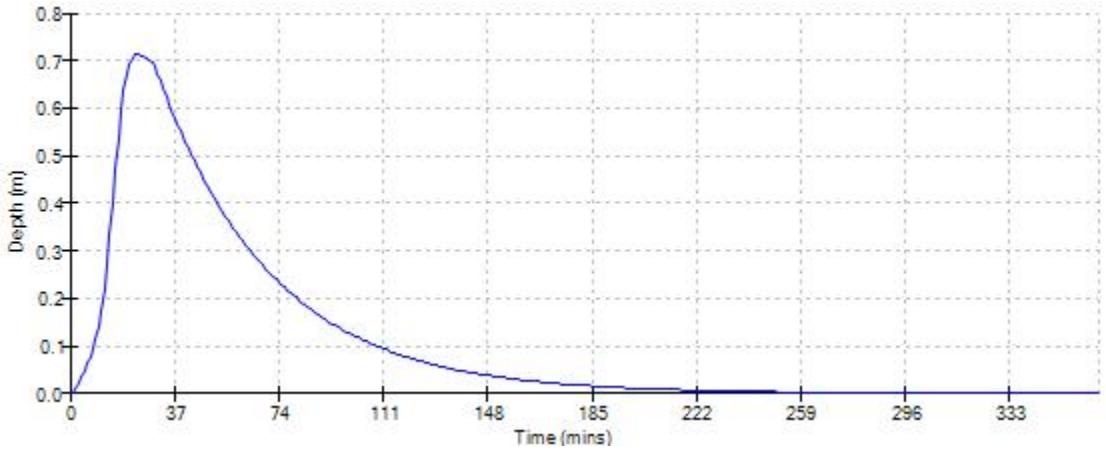
Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.63180	Trench Length (m)	1.0
Safety Factor	1.2	Slope (1:X)	1000.0
Porosity	0.95	Cap Volume Depth (m)	0.000
Invert Level (m)	9.200	Cap Infiltration Depth (m)	0.000

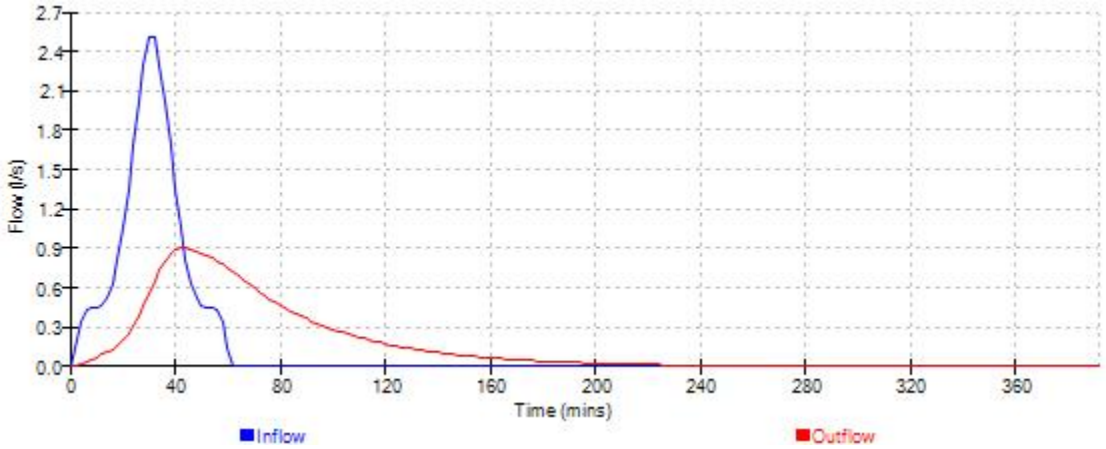
Event: 30 min Winter

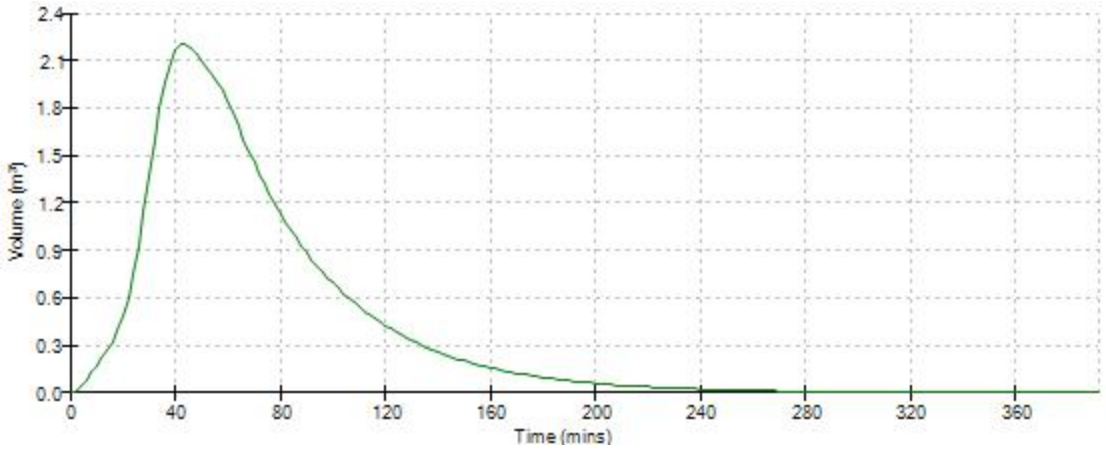


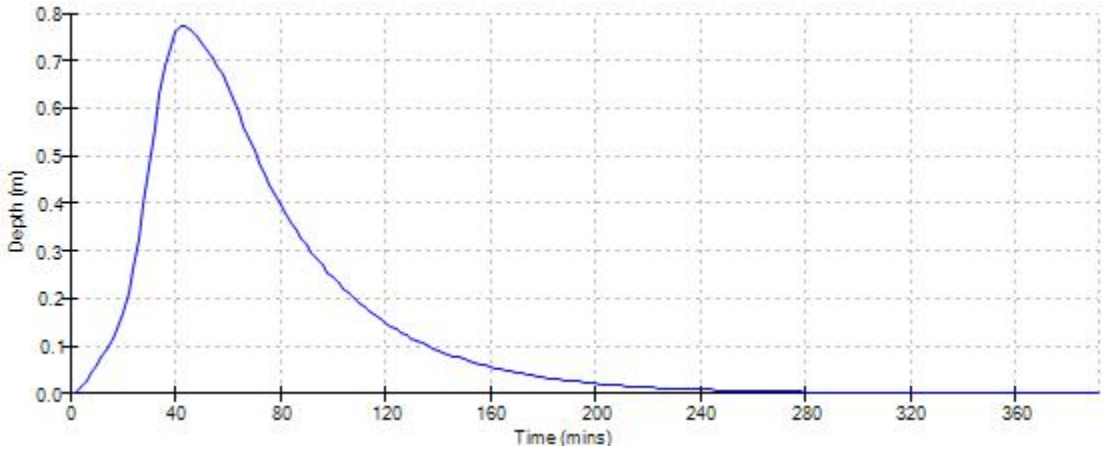




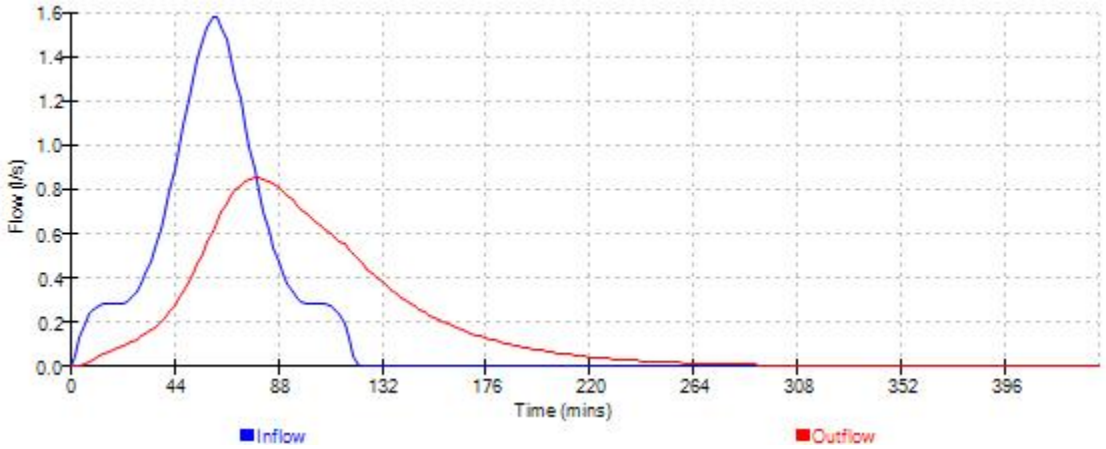
Event: 60 min Winter

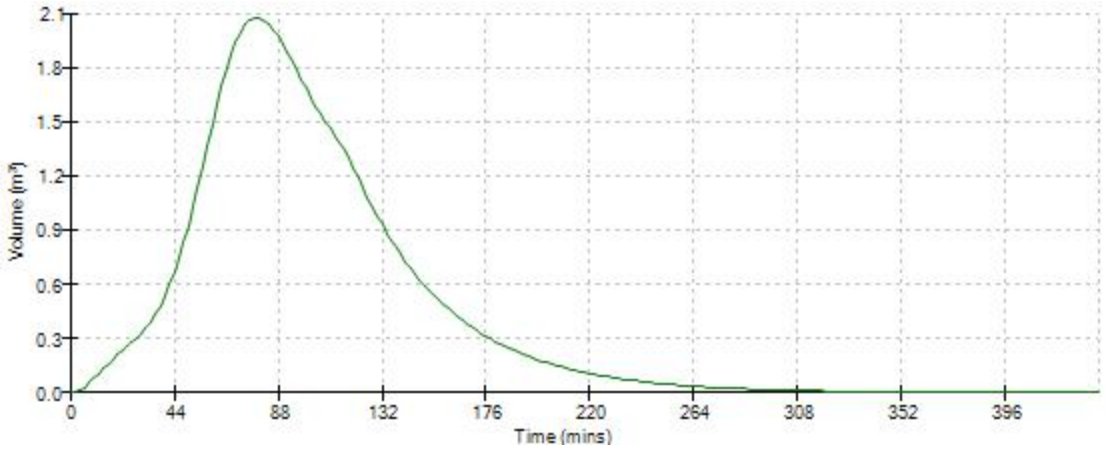


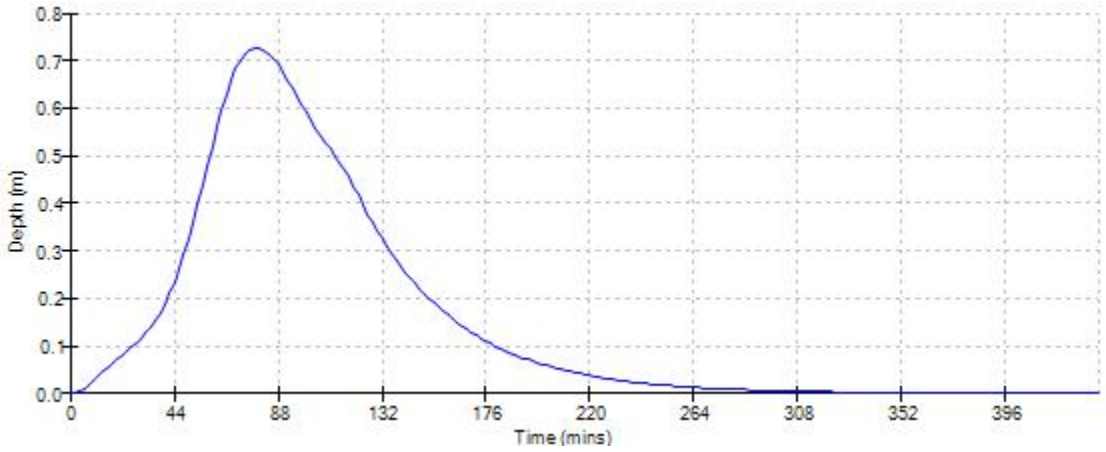




Event: 120 min Winter







Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 4 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	9.926	0.126	3.3	1.1	Flood Risk
30 min Summer	9.920	0.120	3.3	1.0	Flood Risk
60 min Summer	9.881	0.081	3.3	0.7	Flood Risk
120 min Summer	9.844	0.044	2.9	0.4	Flood Risk
180 min Summer	9.835	0.035	2.3	0.3	Flood Risk
240 min Summer	9.829	0.029	1.9	0.2	Flood Risk
360 min Summer	9.822	0.022	1.4	0.2	Flood Risk
480 min Summer	9.818	0.018	1.2	0.2	Flood Risk
600 min Summer	9.815	0.015	1.0	0.1	Flood Risk
720 min Summer	9.813	0.013	0.9	0.1	Flood Risk
960 min Summer	9.811	0.011	0.7	0.1	Flood Risk
1440 min Summer	9.808	0.008	0.5	0.1	Flood Risk
2160 min Summer	9.806	0.006	0.4	0.0	Flood Risk
2880 min Summer	9.805	0.005	0.3	0.0	Flood Risk
4320 min Summer	9.804	0.004	0.2	0.0	Flood Risk
5760 min Summer	9.803	0.003	0.2	0.0	Flood Risk
7200 min Summer	9.802	0.002	0.1	0.0	Flood Risk
8640 min Summer	9.802	0.002	0.1	0.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	137.821	0.0	10
30 min Summer	94.569	0.0	18
60 min Summer	61.895	0.0	34
120 min Summer	38.439	0.0	62
180 min Summer	28.871	0.0	92
240 min Summer	23.501	0.0	122
360 min Summer	17.527	0.0	182
480 min Summer	14.217	0.0	244
600 min Summer	12.072	0.0	302
720 min Summer	10.553	0.0	362
960 min Summer	8.520	0.0	480
1440 min Summer	6.250	0.0	724
2160 min Summer	4.600	0.0	1108
2880 min Summer	3.698	0.0	1448
4320 min Summer	2.694	0.0	2136
5760 min Summer	2.154	0.0	2856
7200 min Summer	1.817	0.0	3480
8640 min Summer	1.585	0.0	4344

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	9.802	0.002	0.1	0.0	Flood Risk
15 min Winter	9.936	0.136	3.3	1.2	Flood Risk
30 min Winter	9.915	0.115	3.3	1.0	Flood Risk
60 min Winter	9.856	0.056	3.3	0.5	Flood Risk
120 min Winter	9.834	0.034	2.2	0.3	Flood Risk
180 min Winter	9.826	0.026	1.7	0.2	Flood Risk
240 min Winter	9.821	0.021	1.4	0.2	Flood Risk
360 min Winter	9.816	0.016	1.0	0.1	Flood Risk
480 min Winter	9.813	0.013	0.8	0.1	Flood Risk
600 min Winter	9.811	0.011	0.7	0.1	Flood Risk
720 min Winter	9.810	0.010	0.6	0.1	Flood Risk
960 min Winter	9.808	0.008	0.5	0.1	Flood Risk
1440 min Winter	9.806	0.006	0.4	0.0	Flood Risk
2160 min Winter	9.804	0.004	0.3	0.0	Flood Risk
2880 min Winter	9.804	0.004	0.2	0.0	Flood Risk
4320 min Winter	9.803	0.003	0.2	0.0	Flood Risk
5760 min Winter	9.802	0.002	0.1	0.0	Flood Risk
7200 min Winter	9.802	0.002	0.1	0.0	Flood Risk
8640 min Winter	9.802	0.002	0.1	0.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
10080 min Summer	1.414	0.0	5216
15 min Winter	137.821	0.0	11
30 min Winter	94.569	0.0	20
60 min Winter	61.895	0.0	34
120 min Winter	38.439	0.0	64
180 min Winter	28.871	0.0	94
240 min Winter	23.501	0.0	124
360 min Winter	17.527	0.0	184
480 min Winter	14.217	0.0	246
600 min Winter	12.072	0.0	306
720 min Winter	10.553	0.0	360
960 min Winter	8.520	0.0	478
1440 min Winter	6.250	0.0	724
2160 min Winter	4.600	0.0	1080
2880 min Winter	3.698	0.0	1420
4320 min Winter	2.694	0.0	1996
5760 min Winter	2.154	0.0	3136
7200 min Winter	1.817	0.0	3640
8640 min Winter	1.585	0.0	4536

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	9.802	0.002	0.1	0.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
10080 min Winter	1.414	0.0	5152

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 280276 370395 SH 80276 70395
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.010

Time (mins) From:	To:	Area (ha)
0	1	0.010

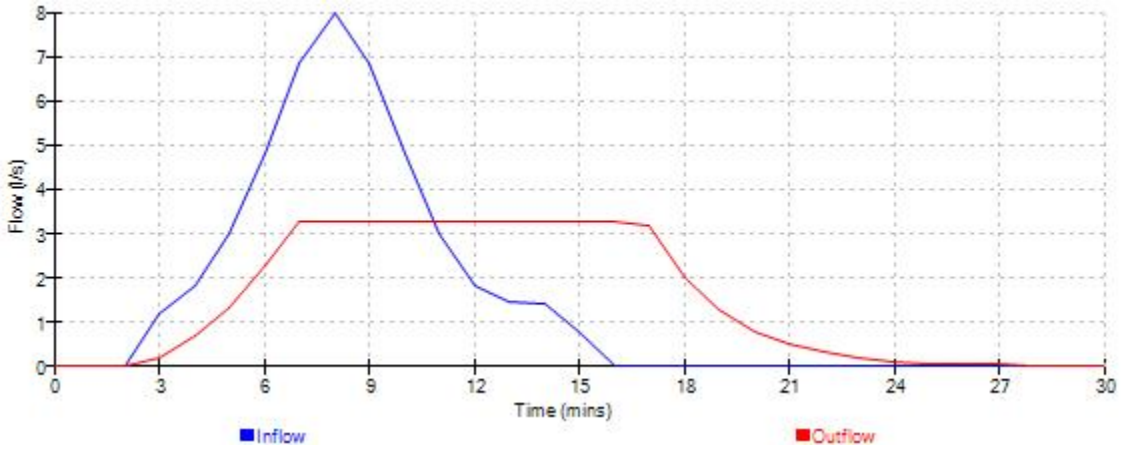
Model Details

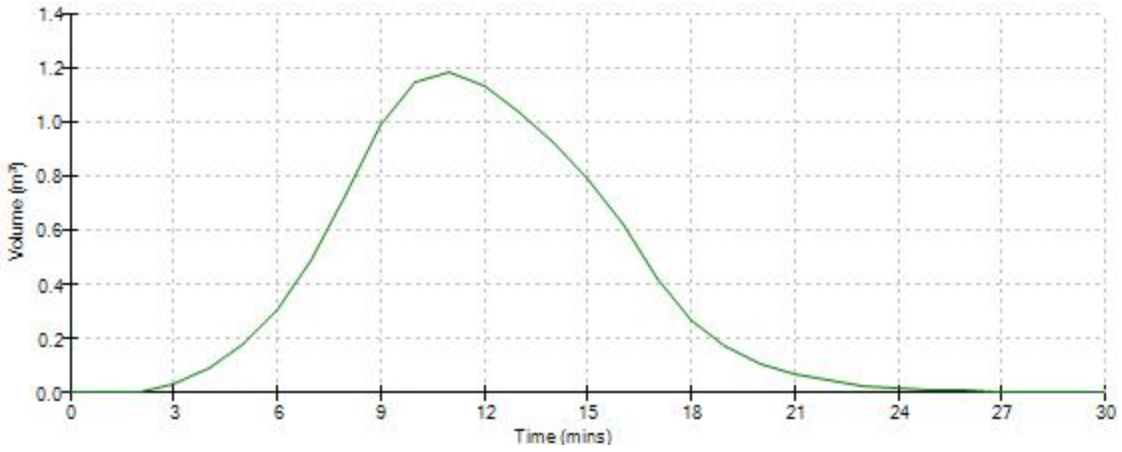
Storage is Online Cover Level (m) 10.000

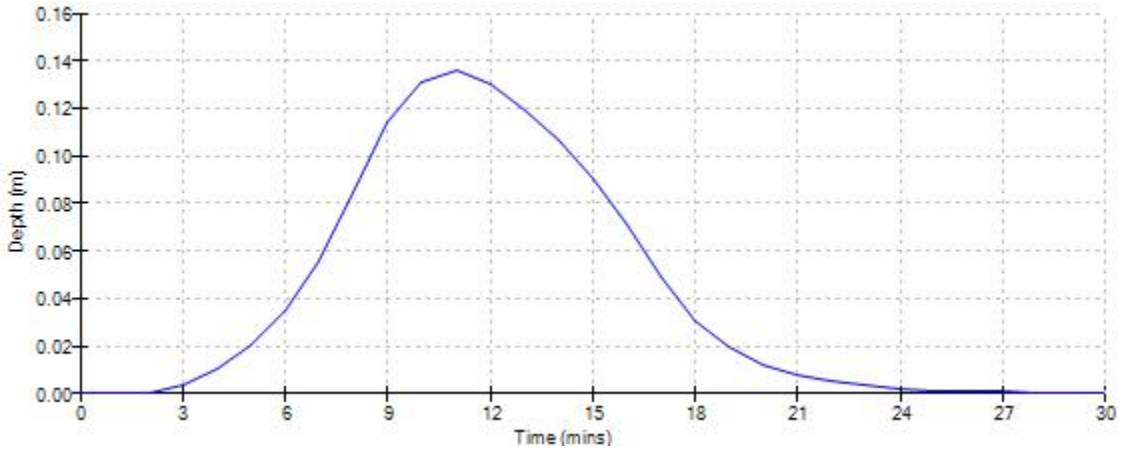
Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.81000
Membrane Percolation (mm/hr)	1000
Max Percolation (l/s)	8.1
Safety Factor	2.0
Porosity	0.30
Invert Level (m)	9.800
Width (m)	5.0
Length (m)	5.8
Slope (1:X)	100000.0
Depression Storage (mm)	5
Evaporation (mm/day)	3
Membrane Depth (m)	0

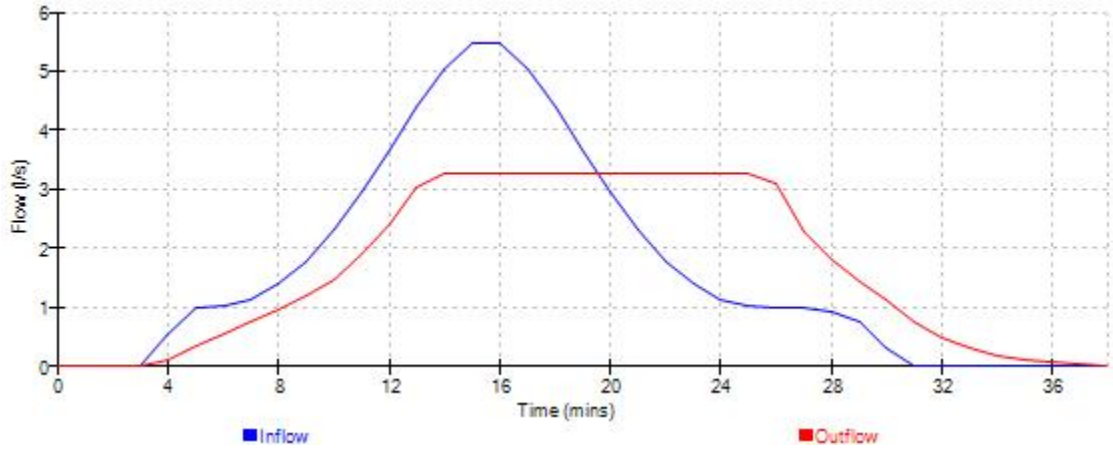
Event: 15 min Winter

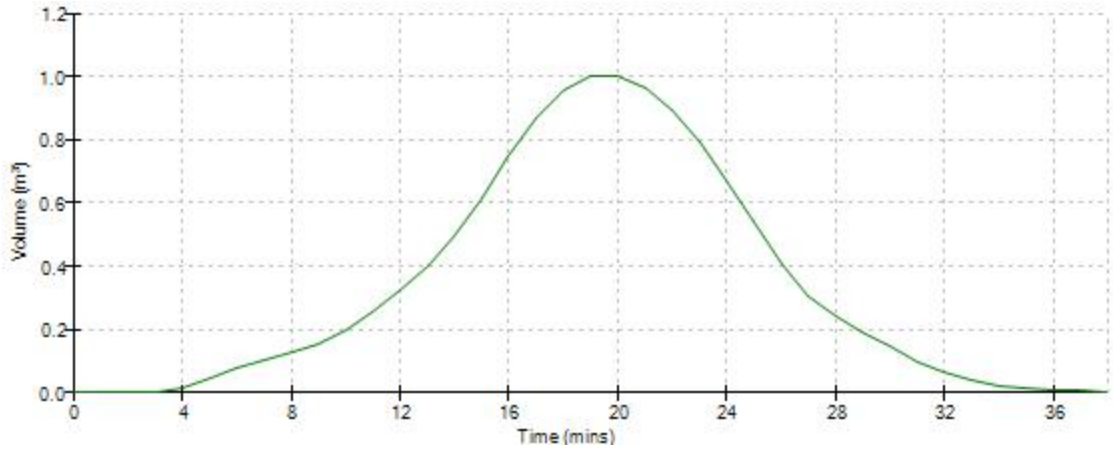


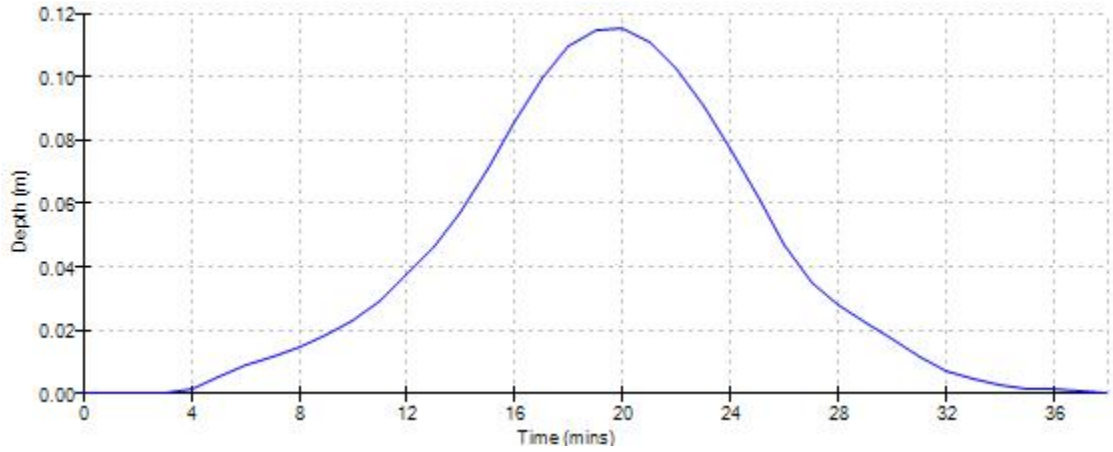




Event: 30 min Winter







Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 25 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	9.706	0.506	0.8	1.4	Flood Risk
30 min Summer	9.805	0.605	0.9	1.7	Flood Risk
60 min Summer	9.859	0.659	1.0	1.9	Flood Risk
120 min Summer	9.828	0.628	0.9	1.8	Flood Risk
180 min Summer	9.778	0.578	0.9	1.6	Flood Risk
240 min Summer	9.733	0.533	0.8	1.5	Flood Risk
360 min Summer	9.660	0.460	0.7	1.3	O K
480 min Summer	9.607	0.407	0.6	1.2	O K
600 min Summer	9.566	0.366	0.5	1.0	O K
720 min Summer	9.533	0.333	0.5	0.9	O K
960 min Summer	9.484	0.284	0.4	0.8	O K
1440 min Summer	9.420	0.220	0.3	0.6	O K
2160 min Summer	9.369	0.169	0.3	0.5	O K
2880 min Summer	9.339	0.139	0.2	0.4	O K
4320 min Summer	9.303	0.103	0.2	0.3	O K
5760 min Summer	9.283	0.083	0.1	0.2	O K
7200 min Summer	9.271	0.071	0.1	0.2	O K
8640 min Summer	9.262	0.062	0.1	0.2	O K
10080 min Summer	9.256	0.056	0.1	0.2	O K
15 min Winter	9.770	0.570	0.9	1.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	137.821	0.0	14
30 min Summer	94.569	0.0	22
60 min Summer	61.895	0.0	40
120 min Summer	38.439	0.0	72
180 min Summer	28.871	0.0	104
240 min Summer	23.501	0.0	136
360 min Summer	17.527	0.0	198
480 min Summer	14.217	0.0	260
600 min Summer	12.072	0.0	320
720 min Summer	10.553	0.0	382
960 min Summer	8.520	0.0	500
1440 min Summer	6.250	0.0	738
2160 min Summer	4.600	0.0	1104
2880 min Summer	3.698	0.0	1468
4320 min Summer	2.694	0.0	2204
5760 min Summer	2.154	0.0	2936
7200 min Summer	1.817	0.0	3672
8640 min Summer	1.585	0.0	4400
10080 min Summer	1.414	0.0	5128
15 min Winter	137.821	0.0	14

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.874	0.674	1.0	1.9	Flood Risk
60 min Winter	9.910	0.710	1.1	2.0	Flood Risk
120 min Winter	9.840	0.640	1.0	1.8	Flood Risk
180 min Winter	9.766	0.566	0.8	1.6	Flood Risk
240 min Winter	9.704	0.504	0.8	1.4	Flood Risk
360 min Winter	9.614	0.414	0.6	1.2	O K
480 min Winter	9.553	0.353	0.5	1.0	O K
600 min Winter	9.509	0.309	0.5	0.9	O K
720 min Winter	9.475	0.275	0.4	0.8	O K
960 min Winter	9.427	0.227	0.3	0.6	O K
1440 min Winter	9.370	0.170	0.3	0.5	O K
2160 min Winter	9.327	0.127	0.2	0.4	O K
2880 min Winter	9.303	0.103	0.2	0.3	O K
4320 min Winter	9.276	0.076	0.1	0.2	O K
5760 min Winter	9.261	0.061	0.1	0.2	O K
7200 min Winter	9.252	0.052	0.1	0.1	O K
8640 min Winter	9.245	0.045	0.1	0.1	O K
10080 min Winter	9.241	0.041	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	94.569	0.0	23
60 min Winter	61.895	0.0	42
120 min Winter	38.439	0.0	76
180 min Winter	28.871	0.0	110
240 min Winter	23.501	0.0	142
360 min Winter	17.527	0.0	204
480 min Winter	14.217	0.0	266
600 min Winter	12.072	0.0	326
720 min Winter	10.553	0.0	388
960 min Winter	8.520	0.0	508
1440 min Winter	6.250	0.0	750
2160 min Winter	4.600	0.0	1108
2880 min Winter	3.698	0.0	1472
4320 min Winter	2.694	0.0	2180
5760 min Winter	2.154	0.0	2936
7200 min Winter	1.817	0.0	3632
8640 min Winter	1.585	0.0	4376
10080 min Winter	1.414	0.0	5120

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 280276 370395 SH 80276 70395
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.007

Time (mins) From:	To:	Area (ha)
0	1	0.007

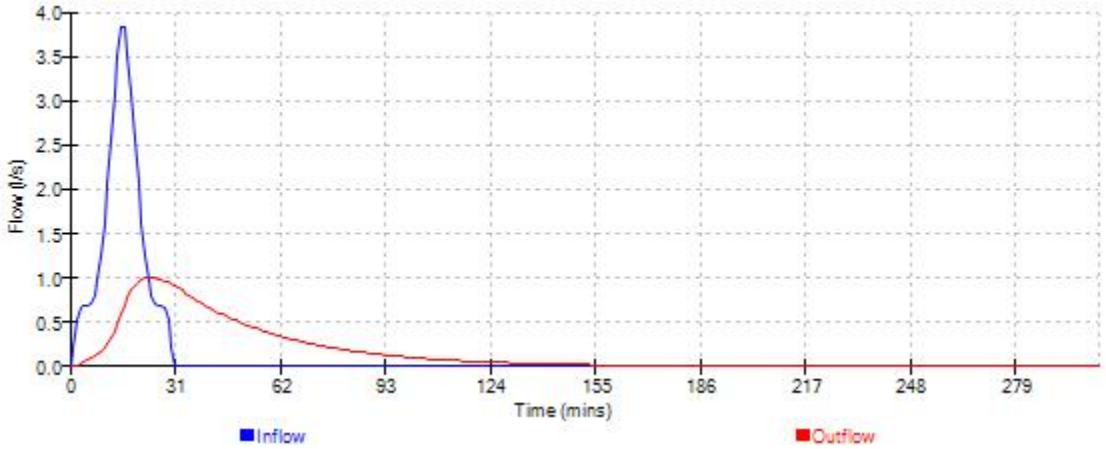
Model Details

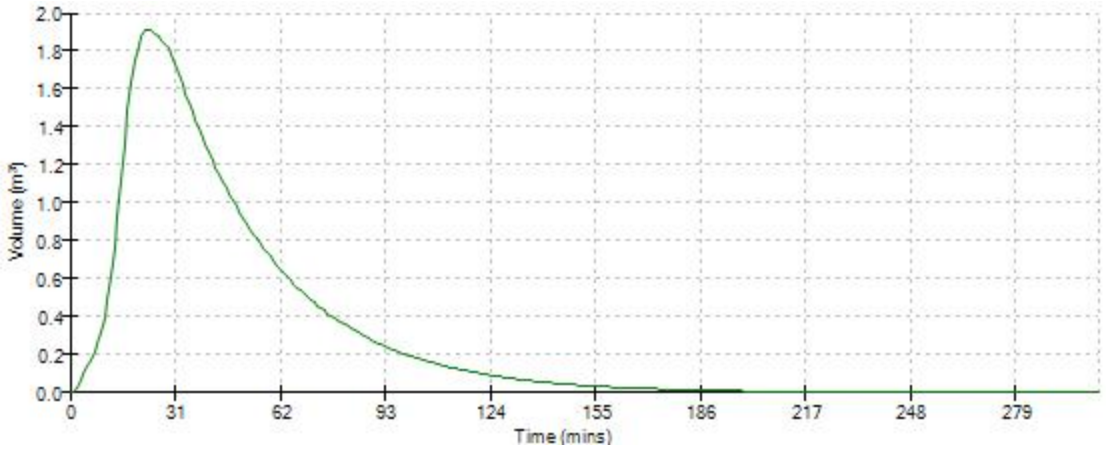
Storage is Online Cover Level (m) 10.000

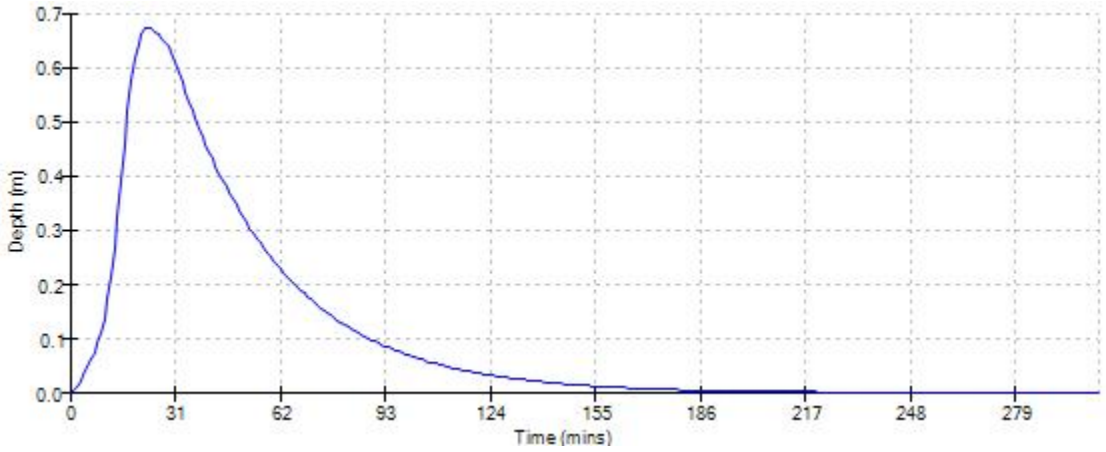
Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	1.0
Infiltration Coefficient Side (m/hr)	0.81000	Trench Length (m)	3.0
Safety Factor	1.2	Slope (1:X)	1000.0
Porosity	0.95	Cap Volume Depth (m)	0.000
Invert Level (m)	9.200	Cap Infiltration Depth (m)	0.000

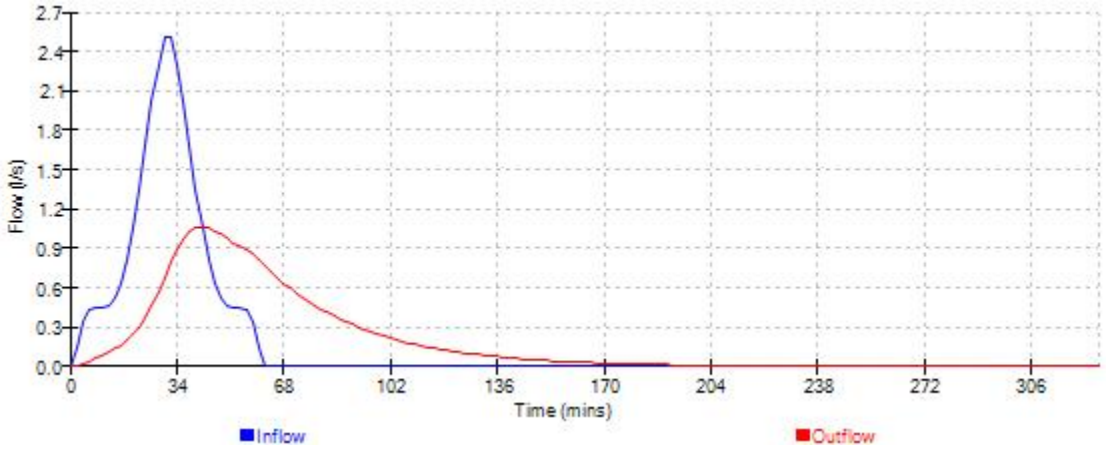
Event: 30 min Winter

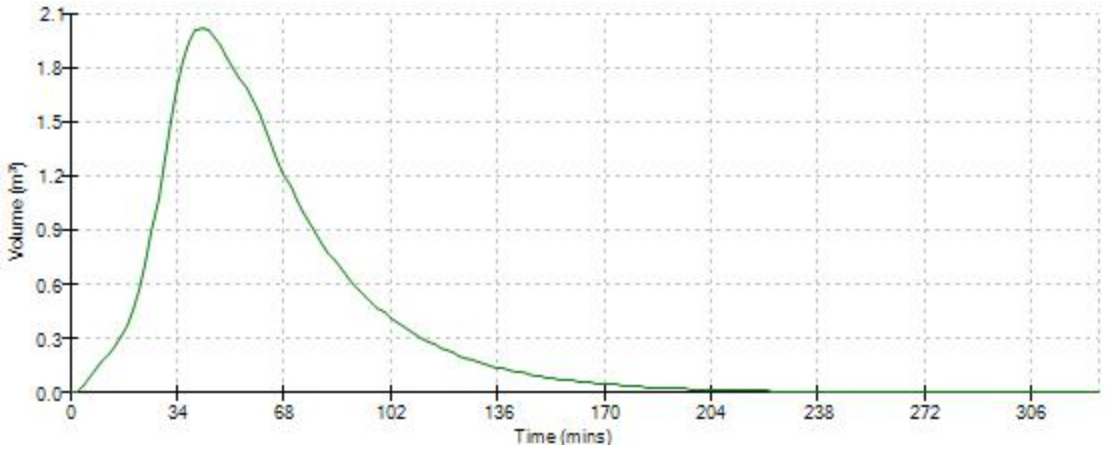


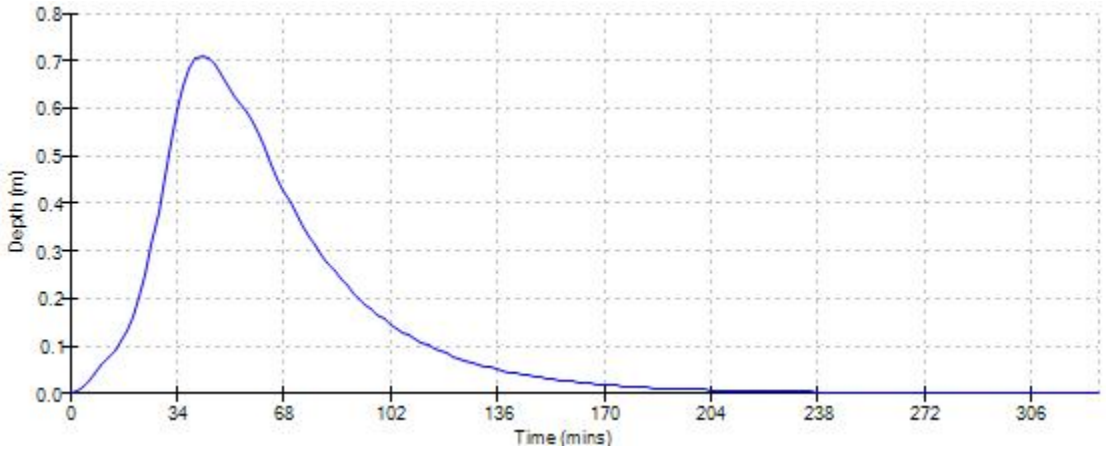




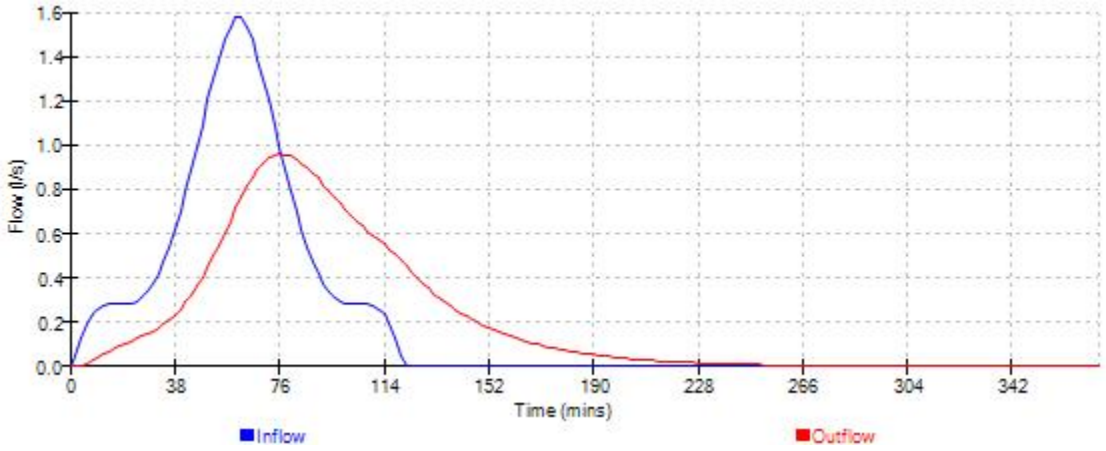
Event: 60 min Winter

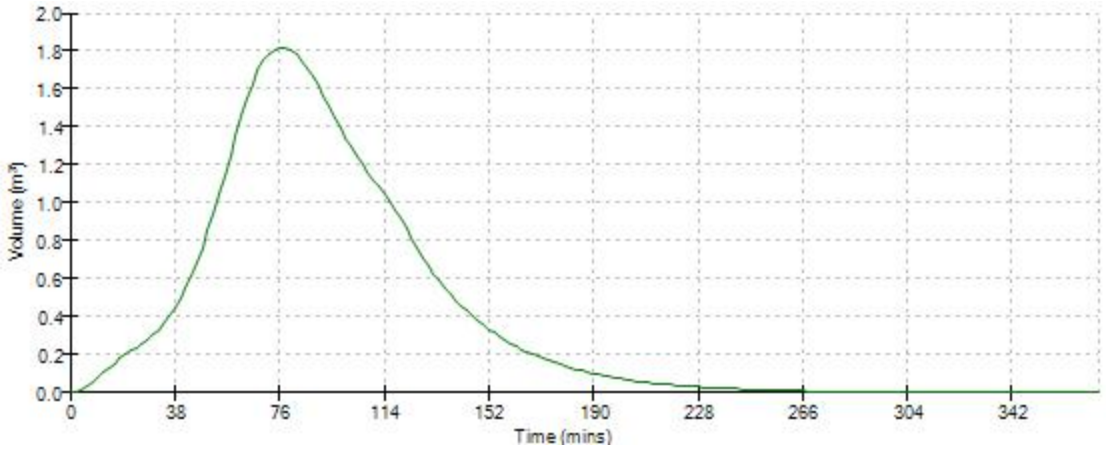


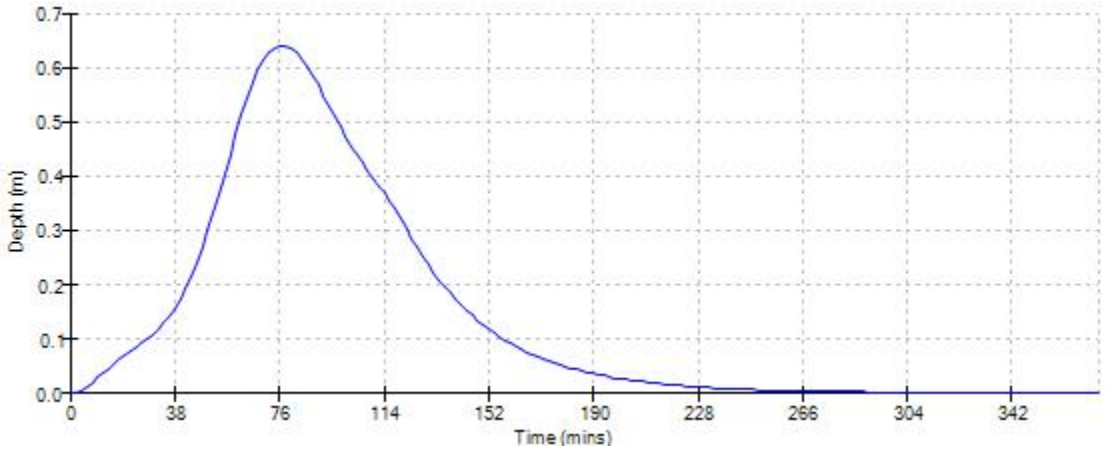




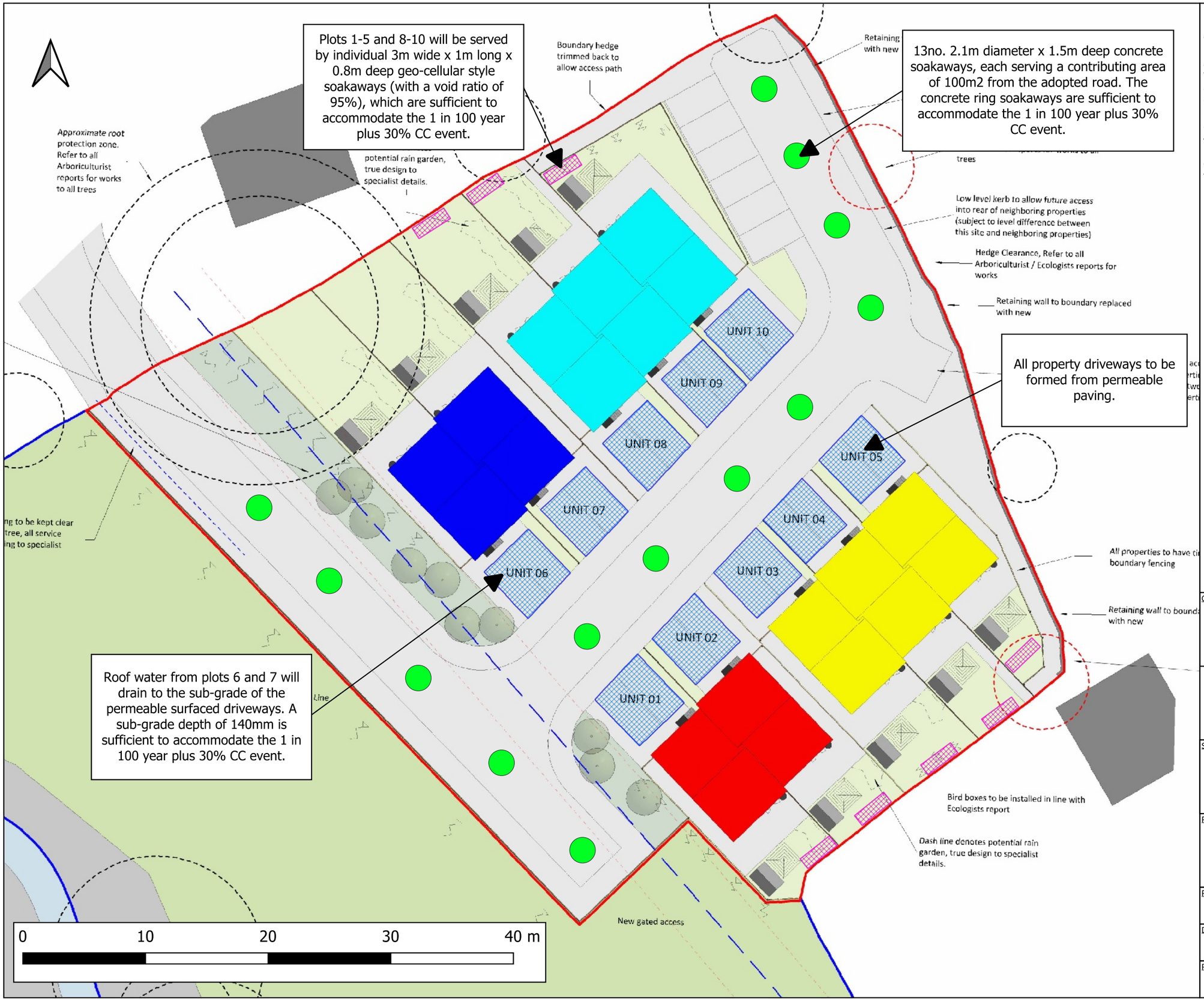
Event: 120 min Winter







Appendix J Concept Drainage Sketch



Notes:
1) This sketch has not been subject to formal checks or approvals. Its validity and use must therefore be limited to discussion and information purposes only.
2) Unless otherwise noted the risks associated with this proposal are not considered to be extra ordinary and within the remit of an experienced and competent contractor.
3) All dimensions in millimetres and all levels in metres above ordnance datum unless shown otherwise.
4) This drawing is an amendment of the 'Proposed Site Layout' (Rev G) by 'TACP Architects Ltd'. This drawing provides a concept only and is not intended for detailed design.

LEGEND

- Site Boundary
- Proposed Geo-Cellular Style Soakaway
- Proposed Permeable Surfaced Driveways
- Proposed Concrete Ring Soakaway

CLIENT:
Mr Robin Roberts

Waterco
www.waterco.co.uk

SCHEME:
Heol Martin, Eglwysbach

PLOT TITLE:
Concept Drainage Sketch

PLOT STATUS:	DATE:
SKETCH	03-04-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	JR	AW	1:300

PLOT NAME:	REVISION:
12116_Concept_Drainage_Sketch	-

Appendix K SuDS Maintenance Schedules

Operation and Maintenance Requirements for Permeable Paving

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and move contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate 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 or the paving	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)
Monitoring	Inspect for evidence of poor operation and / or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Ref. Table 20.15, CIRIA C753 'The SuDS Manual'

The maintenance requirements detailed above are to be undertaken by the site owner.

Name : ----------

Position : ----------

Date : ----------

Signed on behalf of the site owner : ----------

Operation and Maintenance Requirements for Soakaways

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor inspection tube or chamber and inside of concrete manhole rings.	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs.	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation.	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Ref. Table 13.1, CIRIA C753 'The SuDS Manual'

The maintenance requirements detailed above are to be undertaken by the site owner.

Name :

Position :

Date :

Signed on behalf of the site owner :

Appendix L Concept Designers Risk Assessment

CONCEPT DESIGNER'S RISK ASSESSMENT

Project:	Heol Martin, Eglwysbach	**Project No:**	12116
Client:	Mr Robin Roberts		
Report Reference:	12116- Flood Consequence Assessment & Drainage Strategy-01		

Prepared by:	Awel Roberts BSc (Hons) MCIWEM	**Date:**	12/11/2019
Checked by:	Megan Williams BSc (Hons) MCIWEM	**Date:**	02/02/2024
Reviewed by:	Aled Williams BSc (Hons) MCIWEM C.WEM	**Date:**	02/04/2024

Requirement:

The Construction (Design and Management) Regulations 2015 (CDM 2015) place an obligation on the Designer to take all reasonable steps to provide, with the design, sufficient information about the design, construction or maintenance of the structure, to adequately assist the client, other designers and contractors to comply with their duties under CDM. The Designer has undertaken this assessment to identify any extra-ordinary risks, or those that would not be expected on this particular project by an experienced and competent Contractor. The aim is to avoid needless paperwork and bureaucracy and ensure the assessment is project specific, relevant and proportionate to the risk.

DRA Summary

Each of the following risk areas has been considered using the question below. Is a risk present which is considered to be **extra-ordinary or unexpected** in this instance?

If **YES** - A detailed risk assessment is required at design stage
If **UNKNOWN** - Insufficient information has been provided at concept design stage and the risks are unknown. Further consideration must be given at design stage(s)
If **NO** - No further action is required.

Hazard Ref.	Risk Areas	YES, UNKNOWN or NO	Comments
1	Ground Conditions	Unknown	To be confirmed at the detailed design stage
2	Hazardous Environment	Unknown	To be confirmed at the detailed design stage
3	Existing Working Environment	Unknown	To be confirmed at the detailed design stage
4	Existing Services	Yes	225mm public combined sewer crosses the site
5	Proximity to Other Structure(s)	Unknown	To be confirmed at the detailed design stage
6	Near Waterbody / flood risk	Yes	The Afon Hiraethlyn is located 30m from the site
7	Proximity to Other Activities	Unknown	To be confirmed at the detailed design stage
8	Sequence of Construction	Unknown	To be confirmed at the detailed design stage
9	Access	Unknown	From Heol Martin
10	Interfaces	Unknown	To be confirmed at the detailed design stage
11	Confined Space Working	Unknown	To be confirmed at the detailed design stage
12	Maintenance Considerations	Unknown	To be confirmed at the detailed design stage
13	Working at Height	Unknown	To be confirmed at the detailed design stage
14	Steep Slopes	No	Site is gradually sloping
15	Demolition / Refurbishment / Repair	Unknown	To be confirmed at the detailed design stage
16	Welfare	Unknown	To be confirmed at the detailed design stage
17	Occupational Health	Unknown	To be confirmed at the detailed design stage
18	Environmental Issues	Unknown	To be confirmed at the detailed design stage
19	Other Significant Hazards not Identified Above	Unknown	To be confirmed at the detailed design stage
20	Residual Risk to Future Users	Unknown	To be confirmed at the detailed design stage