Penlanlas Farm, Abergavenny Monmouthshire. Residential Development



Flood Consequences Assessment and Drainage Strategy

June 2025



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Associate Director	Director		Director	

Issue History

Issue	Revision date	Details	Authorized by	Position
1 st	10 Sept 2019			
2 nd	17 Aug 2021	Layout Updated	Tony Owens-Redwood	Associate Director
3 rd	30 May 2025	Updated to the revised TAN 15	Tony Owens-Redwood	Director
4 th	25 June 2025	Discharge rates	Tony Owens-Redwood	Director



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1. Introduction

PHG Consulting Engineers have been commissioned by Edenstone Homes to undertake a Flood Consequences Assessment (FCA) and Drainage Strategy (DS) report to support a planning application for Penlanlas Farm, Abergavenny, referred to from hereon as the site.

The purpose of the report is to identify existing sources of flood risk to the site and ensure that surface and foul water drainage can be discharged from the site without affecting the downstream catchments detrimentally.

The report will also demonstrate how the drainage for the development will be discharged and how flows will be managed to prevent increased flood risk.

Existing Site

The site covers an approximate area of 5.9 ha and is currently greenfield located at National Grid Reference SO303159. The site is bounded by Old Hereford Road to the west, residential development to the east and south and to the north by further greenfield and an existing sub-station. The site boundary is shown on figure 1 below.



Figure 1. Site Boundary



The site is steeply graded with levels falling toward the southernmost corner. Gradients of the existing land range between 1 in 14 and 1 in 5, the average gradient is 1 in 9. The topographical survey and flow routes are shown on Figure 2 which can be seen in Appendix A.



Figure 2. Topographical Survey

Geology and Hydrology

A site investigation has been undertaken by Integral Geotechnique and the findings are outlined in their report reference 12301/JO/18/SI/REV A.

The Environment Agency groundwater vulnerability map and aquifer database classifies the bedrock beneath the site 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 Environment Agency groundwater vulnerability map and aquifer database classifies the superficial deposits beneath the site as Unproductive Strata. Unproductive strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.



Site investigation works found the site to be underlain by clayey sandy gravels. Infiltration testing has also been undertaken within the site, at the locations where testing was undertaken, infiltration was found to be negligible with no drop in water over a 4 hour period.

During on site trail pits undertaken in October 2018, no groundwater was encounter to depths of 3m.

Development Proposals

The proposal comprises the construction of residential dwellings and associated infrastructure. There is provision for affordable homes. The proposed masterplan drawing is included in <u>Appendix B</u>,

2. Flood Consequences Assessment

The assessment will consider all possible sources of flooding pertaining the site and immediate vicinity, determine the risk (flood frequency) and the effects (flood consequences) of flooding. In Wales, planning policy relating to flooding is governed by TAN15:Development and Flood Risk. This assessment has been prepared in accordance with TAN15, March 2025.

Natural Resources Wales (NRW) has updated its flood risk mapping in line with the revised Technical Advice Note 15 (TAN 15), enforced in March 2025. The older Development Advice Maps (DAM) have now been superseded by the more detailed and dynamic Flood Risk Assessment Wales (FRAW) Maps, which provide updated flood risk information across Wales.

According to the FRAW Maps, the site lies within an area classified as having a very low risk of flooding, meaning it has less than a 0.1% annual probability of flooding. This classification applies to all sources of flooding, including rivers, the sea, surface water, and groundwater.



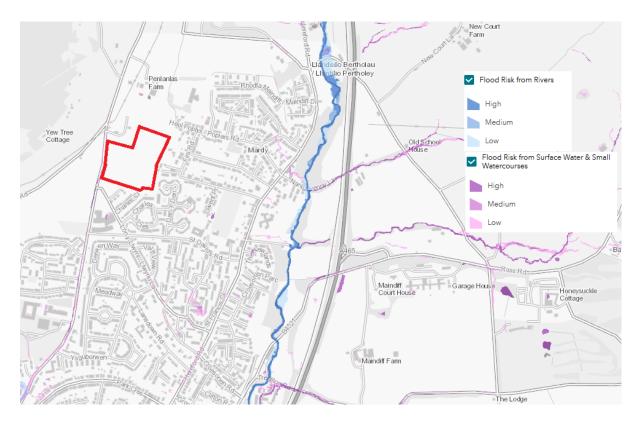


Figure 3. NRW FRAW

The site is topographically elevated with a significant gradient, showing a level difference of approximately 32 metres across its extent. This natural topography further reduces the likelihood of flooding on the site itself.

While the FRAW surface water flood map indicates no risk of surface water flooding within the boundaries of the site, a small area of low surface water flood risk is present along Old Hereford Road, to the west of the site.

Table 1. NRW FRAW - Flood Risk Summary

Source of Flooding	Risk Probability	Remarks
Risk from Rivers	No – Flooding (very low, less than 0.1% annual probability)	The FRAW map in Appendix C demonstrates the site to be flood free (very low, less than 0.1% annual probability). The ordinary watercourse is located at the north boundary of the site.
Risk from Surface Water & Small Watercourses	No – Flooding (very low, less than 0.1% annual probability)	The FRAW map in Appendix C shows the site and the main road (A465) that runs along the west boundary of the site to be at Very Low Risk of Flooding.
Risk from Reservoirs	No risk	There isn't any reservoir in the wider area that can affect the site.



Development Category – Flood Zones Compatibility

The development is classified as Highly Vulnerable Development and its design life is 100 years. As mentioned above the site is located in **Flood Zone 1** and the proposed type of development is allowed in accordance with TAN15.



3. Drainage Strategy

Surface Water Features

There are no existing surface water drainage features within the site, all surface water from the existing site will follow a greenfield surface water drainage regime. However, due to the impermeable nature of the underlying soils, runoff from undeveloped site could present a flood risk to surrounding dwellings.

Existing Drainage

Welsh Water (DCWW) sewer records show an existing surface water and foul sewer within Charles Crescent.

The public (foul) sewer located in Charles Crescent is marked on the DCWW sewer records as a 150mm diameter public sewer and flows southwards.

Next to the public sewer is a 150mm surface water sewer that also flows southwards. This manhole has been surveyed and found to be 1.56m deep giving an invert level of 144.79m AOD.



Figure 4. Welsh Water - Sewer Records



Foul Drainage

A pre-development enquiry had been made to DCWW to provide sewer records for the area and to ascertain whether there is capacity in the existing sewer network. DCWW have confirmed during Pre-Application reference PPA0003321, that up to 200 dwellings within the development can connect to the existing network at manhole SO30153709. A correspondence with DCWW and sewer mapping is included in Appendix C.

Phosphate

As of January 2021, Natural Recourses Wales (NRW) have set new targets regarding phosphate pollution and nutrient neutral development. Where wastewater from a development discharges to a Special Area of Conservation (SAC), discharge must comply with NRW's targets. The development site referred to in this report is within the catchment of the River Usk and discharges to the Llanfoist Wastewater Treatment Works (WwTW), there is no phosphate treatment at this WwTW prior to discharge to the River Usk. Therefore, it is important that all parties develop a range of sustainable solutions to reducing the amount of phosphates entering watercourses and not just rely WwTWs. To provide viable solutions to enable development, all parties including developers, local authorities, Welsh Water, land managers and NRW will need to be involved. A number of options will be considered that will include calculating the net increase in phosphates from the site when comparing the proposed use against the existing use, mitigation through changes to land uses either within the site or wider catchment, and small scale treatment works within the development either site wide or serving individual plots. Solutions will be fully examined and agreed with all relative parties prior to any reserved matters planning application.

We have previously discussed the phosphate issue in Monmouthshire with Dwr Cymru Welsh Water who stated;

We clearly understand the impact that NRW's interim planning guidance is having on development, but there is currently little evidence that the cause of the high phosphorus levels are due to waste water treatment works and we understand NRW agree. It is however worth advising of our capital investment programme - we work closely with our Economic Regulator (Ofwat) in respect to how our customers' money is spent, an important part of which is the planned capital investment in our assets. We are currently in the AMP7 (2020-2025) period following Ofwat's final determination in late 2019 of our business plan for AMP7. As part of our AMP7 business plan submission this would take account of any planned changes to waste water treatment works permit standards (this is classed as enhancement) which Ofwat and our environmental regulators (NRW/EA) agree to in advance of any AMP period. Further, it is not generally the case that waste water treatment works standards are changed within an AMP period without advance agreement. If we voluntarily included investment in our business plan for additional P removal this would have been rejected by Ofwat given that this requirement was not part of the EA/NRW's requirements.



Surface Water Drainage

An outline Drainage Strategy has been prepared in accordance with the SuDS Standards¹. A Full SAB application will have to be submitted for the approval of surface water drainage strategy. The design of the SuDS features and the assessment of their efficiency to satisfy the SuDS Standards is undertaken by following the SuDS Manual².

S1 - Surface Water Destination

Standard S1, regarding the surface water destination has five levels of priority as shown in table 2.

Table 2. S1 Surface Water Runoff Destination

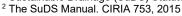
Priority Level	Surface Water Destination	Acceptability / Selection
Level 1	Surface water runoff is collected for use	Collection of water for re-use will be evaluated during the detail design stage, however the use of individual rainwater harvesting systems for residential units is proving uneconomical.
Level 2	Surface water runoff is infiltrated to ground	As discussed above, infiltration testing has been undertaken within the site and found the permeability of the underlying soils to be low. Therefore the sole use of infiltration throughout the development is not possible.
Level 3	Surface water runoff is discharged to a surface water body	There are no watercourses within the vicinity of the site to which the development can connect.
Level 4	Surface water runoff is discharged to a surface water sewer etc.	Surface water runoff from the development will discharge to the existing surface water drain in Charles Crescent. It has been confirmed with DCWW that discharge to the drain should be restricted to approximately 5l/s.
Level 5	Surface water runoff is discharged to a combined sewer	N/A

Surface Water Management Strategy

There are a number of SuDS features proposed across the site that ensure the development surpasses the minimum requirements set out in the Welsh Government's legislation providing water quality management and control of flows. The drainage strategy drawing shows the features across the site, it is proposed all highways and footways drain to a 500mm wide rill along the kerbline, this rill will act as conveyance and treatment with planting to be specified by a landscape architect.

Runoff from private drives and parking areas will either pass through a permeable pavement or drain directly to a swale or rill, each area will pass a minimum of 2 features prior to discharging to the final attenuation area. Clean runoff from roof areas will drain to rainwater gardens that discharge directly to a swale, permeable paving or rill, each dwelling will be fitted with a rainwater butt at the rear elevation.

¹ Sustainable Drainage (SuDS) Statutory Guidance, Welsh Government 2019





The surface water drainage will comply with the principles by keeping all runoff at or near to the surface where practical and conveyed through a suitable treatment train prior to final discharge.

There will be a number of proposed open features in series within the site that allow infiltration and evapotranspiration where possible. Opportunity to harvest rainwater will also be made by installing a water butt on the rear roof downpipes.

Existing greenfield run-off rate for the scheme (developable area) has been calculated as:

- Q1 = 25.3 l/s
- Q30 = 50.7 l/s
- Q100 = 62.7 l/s

The QBAR rate for the scheme is 28.8 l/s, however DCWW have requested that discharge from the site is reduced to 5l/s providing betterment for this site and the surrounding area. This would greatly reduce the risk to properties downstream and existing surface water flood routes would be maintained. Flow of water through the site would be managed at source where possible through the use of controls (orifice / weirs) within attenuation basins and swales.

The final discharge from the development will be controlled by a Hydrobrake flow control with the design flow set at 5l/s, the Hydrobrake will be set immediately downstream of the final attenuation system. To restrict flows throughout the development and manage runoff close to source a number of other flow restrictions will be incorporated across the site, these include orifice plates and pipe restrictions.

Based on the masterplan, there will 2.25ha of impermeable surfacing introduced, to allow for urban creep an additional 10% has been added to roof area, therefore the total impermeable area allowed for within the surface water calculations is 2.33Ha.

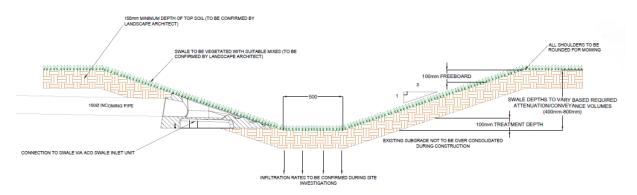
To ensure the development does not have a negative effect on water quality and to comply with standard S3, runoff from impermeable surfaces will be treated by the following methods;

· Porous paving



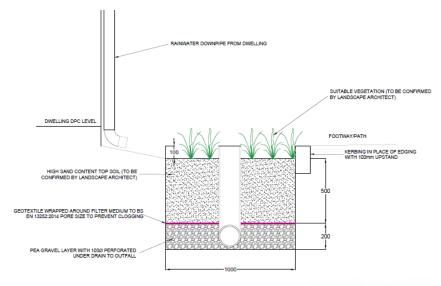


Swales



TYPICAL CONVEYANCE/ATTENUATION SWALE

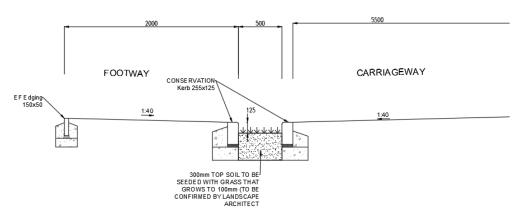
Rain gardens



TYPICAL RAIN GARDEN



Road side Rills



RILL CONSTRUCTION DETAIL

Attenuation ponds



Simple Indices method (as outlined in Section 26 of the SuDS Design Manual) of assessing water quality receptor. The site would be classed as Very Low – Low mostly comprising of roofs and standard estate roads and low use car parking areas. The aim of the table below is to assess the risk and minus the values for treatment to ensure a negative number is achieved:



Risk	TSS	Metals	Hydrocarbons
Hazard Rating	0.3	0.2 (normal concrete roof tiles)	0.05
Mitigation			
Channels, Gullies, Pipework	0	0	0
Grassed Rills	0.4	0.4	0.5
Swale	0.5	0.6	0.6
Pond	0.7 (0.35 as second level treatment)	0.7 (0.35 as second level treatment)	0.5 (0.25 as second level treatment)
Final Mitigation	PASS	PASS	PASS
Scores	-0.45 (Rills to Pond)	-0.55 (Rills to Pond)	-0.7 (Rills to Pond)
	-0.55 (Swales to Pond)	-0.75(Swales to Pond)	-0.8(Swales to Pond)

The scheme passes well within the parameters and with the added secondary treatment of Rain Gardens and permeable paving as initial treatment (permeable paving is only found is some areas) the scheme will achieve enhanced water quality above the requirements set out.

The surface water drainage scheme will include amenity space throughout the with attenuation basins, rills, landscaped rain gardens within the public realm and swales incorporated throughout the site. The basin at the southern corner of the site will be planted to encourage wildlife and be provided with an inform route around the perimeter.

All functions will be designed to encourage community engagement and designed so their functionality is easy for the public to understand. The areas will also be designed to allow for easier maintenance where possible and specifically the ponds will be designed with dry benches to reduce the risk to public of falling into the permanent wet basin. All elements will be designed to the achieve the best design to assist in enhancing the amenity of all SuDS features.

Surface water drainage strategy drawing and the drainage calculations are included in Appendix D.



SuDS approving body (SAB) application

A pre-application submission has been made and a meeting with Monmouthshire SAB Officers took place on 23rd July 2019 with a formal response being provided to Edenstone on the 14th August. The response provided outlines the steps and further information that will be required to accompany a full SAB application including full construction details and details of landscaping. The drainage strategy has been updated to include grassed rills in place of concrete rills, this is following discussion with the SAB officer in relation to S2 part 1 interception. The full response is attached at Appendix E.



4. Conclusions

- The proposed development site is assessed to be of low risk of flooding from all sources of flooding, including rivers, groundwater, surface water, reservoirs, sewers and overland flows.
- The new development is in the low risk Flood Zone A and is therefore justified.
- It is confirmed that that discharging surface water to ground by infiltration is not feasible.
- Searches have shown that there are no watercourses within 20m of the development or any feasible of discharging to.
- The surface water runoff generated during the extreme rainfall events for up to and including the 1 in 100-year event, will be directed away from properties and other vulnerable areas of the development and conveyed into the attenuation structures. The attenuation basin and storage structures will be designed for up to and including the 1 in 100-year storm event with 40% increase in rainfall intensity to allow for climate change.
- The development will provide adequate protection to water quality, providing a number of features in series to remove pollutants.
- The reduction in flows in the post-development scenario will offer significant betterment in higher order rainfall events.
- DCWW have confirmed connection to the existing public sewer is possible.
- It is evident from the report that the development is not at risk of flooding and a sustainable drainage solution is available for the site.

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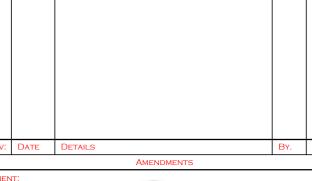


Appendix A Topographical Survey

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Topographical Survey and Existing Flow Routes

TOR SJD Information 1:500 @ A0

Appendix B Masterplan Drawing

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Penlanlas Farm, Abergavenny ILLUSTRATIVE MASTERPLAN







Appendix C DCWW Correspondence and Sewer Records

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Developer Services PO Box 3146 Cardiff CF30 0EH

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Ffôn: +44 (0)800 917 2652 Ffacs: +44 (0)2920 740472

E.bost: developer.services@dwrcymru.com

Date: 23/08/2018 Our Ref: PPA0003321

Mr Stephen Davis PHG Consulting Engineers 62 Albany Road Cardiff CF24 3RR

Dear Mr Davis,

Site Address: Penlanlas Farm, Old Hereford Road, Abergavenny

Development: Residential development – 200 units

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.

SEWERAGE

The foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should be communicated with to the foul/combined sewer between manholes SO30153709 and SO30153610 located in highway (Charles Crescent) to the South of the development site.

Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account.

However, should you wish for an alternative connection point to be considered please provide further information to us in the form of a drainage strategy, preferably in advance of a planning application being submitted.

With reference to the surface water flows from the proposed development you are required to fully exhaust all sustainable drainage systems, we advise the applicant to review the range of sustainable surface water removal methods as set out in "recommended non statutory guidance for sustainable drainage systems (SuDS) Wales". This sets out a sustainable surface water removal hierarchy, each level of the hierarchy should be exhausted prior to moving down to another drainage system. The development site is surrounded by a foul water only sewer network, in no circumstance would we accept surface water into the foul water only sewerage system.

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.

SEWAGE TREATMENT

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



WATER SUPPLY

A water supply can be made available to service this proposed development. Initial indications are that a connection can be made from the 150mm diameter DIEL watermain at grid reference 330167,216098. The cost of providing new on-site watermains can be calculated upon the receipt of detailed site layout plans which should be sent to the above address.

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.

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

Yours faithfully,

Owain George

Planning Liaison Manager

Developer Services

Enc. Sewer Plan

Water Plan

Advice Note

<u>Please Note</u> 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.



Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, a limited company registered in

Nelson, Treharris, Mid Glamorgan CF46 6LY

Wales no 2366777. Registered office: Pentwyn Road,

Tony Owens-Redwood

From: Matthew Lord <Matthew.Lord@dwrcymru.com>

Sent: 13 December 2023 16:39 **To:** Tony Owens-Redwood

Subject: RE: PPA0003321

Hi Tony

I have re-assessed the proposal and content for a connection to the public surface water sewer. I note in the you email you shared that a discharge rate had not yet been agreed. The lowest rate possible will be encouraged with no more than 5 l/s

Many Thanks



Matthew Lord

Lead Development Planning Officer | Developer Services | Dwr Cymru Welsh Water

Linea | Cardiff | CF3 OLT | T: 0800 917 2652 | www.dwrcymru.com

We will respond to your email as soon as possible but you should allow up to 10 working days to receive a response. For most of the services we offer we set out the timescales that we work to on our Developer Services section of our website. Just follow this link http://www.dwrcymru.com/en/Developer-Services.aspx and select the service you require where you will find more information and guidance notes which should assist you. If you cannot find the information you are looking for then please call us on 0800 917 2652 as we can normally deal with any questions you have during the call.

If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our website.

From: Tony Owens-Redwood <tony.owensredwood@phg-consulting.com>

Sent: Tuesday, December 12, 2023 2:31 PM

To: Matthew Lord <Matthew.Lord@dwrcymru.com>

Subject: PPA0003321

****** External Mail ******

Hi Matthew,

We had confirmation from Rhodri previously with regards to discharging surface water sewer as outlined in the attached email. This was a couple of years ago, however, the site is now coming forward, is the connection still suitable?

Kind regards,

Tony Owens-Redwood

Director

T: 029 2030 2521 M: 07568 588861

E: tony.owensredwood@phg-consulting.com

W: www.phg-consulting.com





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committed to water conservation and promoting water effici	ency. Please log on to our website
www.dwrcymru.com/waterefficiency to find out how you cal	n become water wise. Mae Dwr Cymru
Welsh Water wedi ymrwymo i warchod adnoddau dwr a hyrv	vyddo defnydd dwr effeithiol. Mae cyngo
i' ch helpu i ddefnyddio dwr yn ddoeth yn www.dwrcymru.co	m/waterefficiency
****************	******and any file
attached is confidential. If you are not a named recipient or b	pelieve you may have received this email
in error please delete from your system and promptly inform	the sender. Dwr Cymru Cyf (trading as
Welsh Water) is a company registered in England and Wales	, number 02366777, registered office
Linea, Fortran Road, St Mellons, Cardiff CF3 0LT. Mae'r nege	s e-bost yma ac unrhyw ffeil sydd
ynghlwm wrthi'n gyfrinachol. Os nad chi yw'r derbynnydd a e	nwir, neu os ydych chi'n credu eich bod
wedi derbyn y neges yma ar gam, dylech ei dileu o'ch system	n ar unwaith a hysbysu'r anfonwr. Cwmni
sydd wedi ei gofrestru yng Nghymru yw Dŵr Cymru Cyf (yn m	asnachu fel Dŵr Cymru), ei rif
cofrestredig yw 02366777, ,, ac mae ei swyddfa gofrestredig	yn Linea, Heol Fortran, Llaneirwg,
Caerdydd, CF3 0LT. ************************************	********

Tony Owens-Redwood

From: Rhodri Perry <Rhodri.Perry@dwrcymru.com>

Sent: 17 May 2021 14:32 **To:** Tony Owens-Redwood

Subject: RE: PPA0003321 Penlanlas Farm, Abergavenny

Hi Tony,

I hope you had a nice weekend,

The sewer catchment surrounding Penlanlas Farm, Abergavenny drains to LLanfoist waste water treatment works. Llanfoist works does not have a phosphate consent, which means there are currently no phosphate treatment prior to treated effluent being discharged into the River Usk nor is it required for our AMP 7 (2020-2025)

I can provide you with reassurance that we are fully engaged with the relevant stakeholders on the phosphates matter including NRW, Welsh Government and Local Planning Authorities (including Monmouthshire), with the focus on managing the impact on new development and working to establish solutions in order to mitigate the impact of phosphates on the riverine SACs.

It is important that all parties develop a range of sustainable solutions rather than concentrating purely on end of pipe solutions which are expensive to implement and operate. In some catchments end of pipe solutions can play their part, but once the ongoing source apportionment work is completed, we will need to work with developers, local authorities, land managers as well as NRW to deliver a range of solutions. It is our view that investing in catchment solutions such as planting buffer strips alongside rivers, managing nutrient and manure addition to farmland more carefully as well as creating wetlands to better manage runoff into the rivers will have a more beneficial and sustainable impact for everyone.

We clearly understand the impact that NRW's interim planning guidance is having on development, but there is currently little evidence that the cause of the high phosphorus levels are due to waste water treatment works and we understand NRW agree. It is however worth advising of our capital investment programme - we work closely with our Economic Regulator (Ofwat) in respect to how our customers' money is spent, an important part of which is the planned capital investment in our assets. We are currently in the AMP7 (2020-2025) period following Ofwat's final determination in late 2019 of our business plan for AMP7. As part of our AMP7 business plan submission this would take account of any planned changes to waste water treatment works permit standards (this is classed as enhancement) which Ofwat and our environmental regulators (NRW/EA) agree to in advance of any AMP period. Further, it is not generally the case that waste water treatment works standards are changed within an AMP period without advance agreement. If we voluntarily included investment in our business plan for additional P removal this would have been rejected by Ofwat given that this requirement was not part of the EA/NRW's requirements.

Whilst I appreciate this is not the outcome you were hoping for, with the planned River Nutrient Management Boards who will be developing a range of solutions for each of the stretches of failing rivers, we are confident that this issue can be resolved and we will continue to work with all stakeholders to expedite this. The solutions to this problem will require all stakeholders and land managers to develop a range of interventions but working together we can restore these rivers to a position of health whilst still enabling growth and development in Wales.

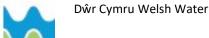
Should you have any further queries relating to Penlanlas Farm site or wider phosphate situation please let me know.

Thank you,

Rhodri

Rhodri Perry

Development Control Officer | Developer Services





W: dwrcymru.com

E: developer.services@dwrcymru.com

T: 0800 917 2652 | M: 07557 849514

A: PO Box 3146, Cardiff, CF30 0EH



If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our website

From: Rhodri Perry

Sent: 14 May 2021 21:50

To: tony.owensredwood@phg-consulting.com

Subject: RE: PPA0003321 Penlanlas Farm, Abergavenny

Hi Tony,

Thank you for your time on call this afternoon,

I will get response over to you early next week regarding our latest phosphate position.

Have a nice weekend

Rhod



Rhodri Perry Development Control Officer | Developer Services

Dŵr Cymru Welsh Water

W: dwrcymru.com

E: developer.services@dwrcymru.com

T: 0800 917 2652 | M: 07557 849514

A: PO Box 3146, Cardiff, CF30 0EH

Before you print please think about the ENVIRONMENT

If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our website

From: Tony Owens-Redwood < tony.owensredwood@phg-consulting.com >

Sent: 14 May 2021 08:34

To: Services Developer <developer.services@dwrcymru.com>

Cc: Stephen Davis < stephen.davis@phg-consulting.com>; James Kathrens < jkathrens@edenstonegroup.com>

Subject: RE: PPA0003321 Penlanlas Farm, Abergavenny

****** External Mail ******

Hi Owain,

Hope you are well,

Can you confirm your WWTW complies with phosphate regulations.

Kind regards,

Tony Owens-Redwood Associate Director T: 029 2030 2521

M: 07568 588861

E:tony.owensredwood@phg-consulting.com

W: www.phg-consulting.com



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From: Tony Owens-Redwood Sent: 10 May 2021 08:50

To: <u>developer.services@dwrcymru.com</u> **Cc:** Stephen Davis ; James Kathrens

Subject: PPA0003321 Penlanlas Farm, Abergavenny

Dear Owain,

This site is being brought forward and will utilise the connections previously confirm in the attached correspondence.

Can you please confirm that the WWTW in Abergavenny has sufficient systems to remove phosphates please?

Kind regards,

Tony Owens-Redwood

Associate Director

T: 029 2030 2521 M: 07568 588861

E:tony.owensredwood@phg-consulting.com

W: www.phg-consulting.com



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water conservation and promoting water efficiency. Please log on to	our website
www.dwrcymru.com/waterefficiency to find out how you can become	ne water wise. Mae Dwr Cymru Welsh Water
wedi ymrwymo i warchod adnoddau dwr a hyrwyddo defnydd dwr ei	ffeithiol. Mae cyngor i' ch helpu i ddefnyddio
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registered in England and Wales, number 02366777, registered office	Linea, Fortran Road, St Mellons, Cardiff CF3
OLT. Mae'r neges e-bost yma ac unrhyw ffeil sydd ynghlwm wrthi'n g	yfrinachol. Os nad chi yw'r derbynnydd a enwir,
neu os ydych chi'n credu eich bod wedi derbyn y neges yma ar gam, o	dylech ei dileu o'ch system ar unwaith a
hysbysu'r anfonwr. Cwmni sydd wedi ei gofrestru yng Nghymru yw D	ŵr Cymru Cyf (yn masnachu fel Dŵr Cymru), ei
rif cofrestredig yw 02366777, " ac mae ei swyddfa gofrestredig yn Lir	nea, Heol Fortran, Llaneirwg, Caerdydd, CF3 OLT.
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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

Date: 23/08/2018 Our Ref: PPA0003321

Mr Stephen Davis PHG Consulting Engineers 62 Albany Road Cardiff CF24 3RR

Dear Mr Davis,

Site Address: Penlanlas Farm, Old Hereford Road, Abergavenny

Development: Residential development – 200 units

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.

SEWERAGE

The foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should be communicated with to the foul/combined sewer between manholes SO30153709 and SO30153610 located in highway (Charles Crescent) to the South of the development site.

Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account.

However, should you wish for an alternative connection point to be considered please provide further information to us in the form of a drainage strategy, preferably in advance of a planning application being submitted.

With reference to the surface water flows from the proposed development you are required to fully exhaust all sustainable drainage systems, we advise the applicant to review the range of sustainable surface water removal methods as set out in "recommended non statutory guidance for sustainable drainage systems (SuDS) Wales". This sets out a sustainable surface water removal hierarchy, each level of the hierarchy should be exhausted prior to moving down to another drainage system. The development site is surrounded by a foul water only sewer network, in no circumstance would we accept surface water into the foul water only sewerage system.

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.

SEWAGE TREATMENT

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



WATER SUPPLY

A water supply can be made available to service this proposed development. Initial indications are that a connection can be made from the 150mm diameter DIEL watermain at grid reference 330167,216098. The cost of providing new on-site watermains can be calculated upon the receipt of detailed site layout plans which should be sent to the above address.

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.

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

Yours faithfully,

Owain George

Planning Liaison Manager

Developer Services

Enc. Sewer Plan

Water Plan

Advice Note

<u>Please Note</u> 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.

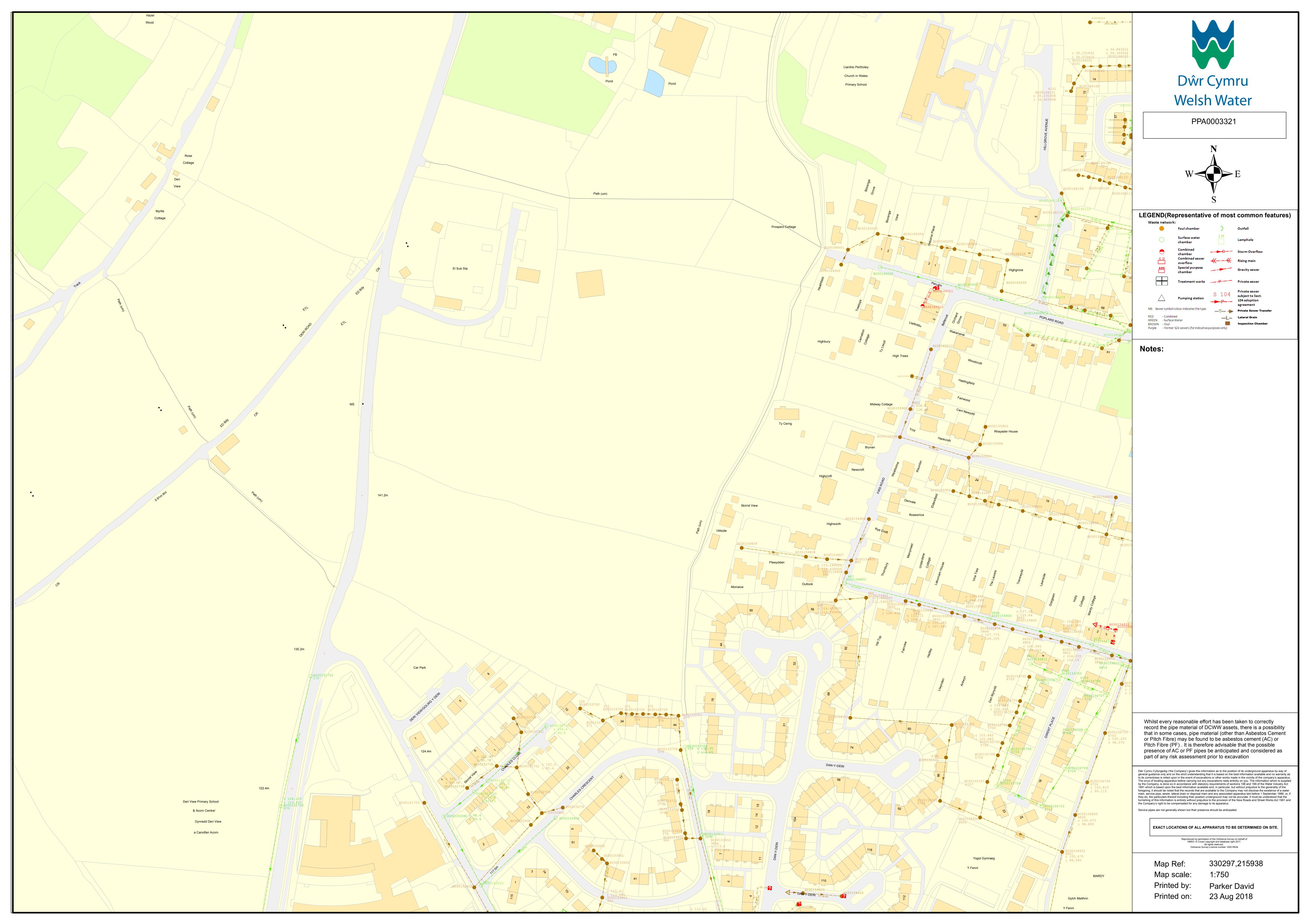


Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, a limited company registered in

Nelson, Treharris, Mid Glamorgan CF46 6LY

Wales no 2366777. Registered office: Pentwyn Road,



Appendix D Drainage Strategy and Calculations

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Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years) 2 PIMP (%) 100

M5-60 (mm) 19.500 Add Flow / Climate Change (%) 0

Ratio R 0.278 Minimum Backdrop Height (m) 0.200

Maximum Rainfall (mm/hr) 50 Maximum Backdrop Height (m) 1.500

Maximum Time of Concentration (mins) 30 Min Design Depth for Optimisation (m) 1.200

Foul Sewage (1/s/ha) 0.000 Min Vel for Auto Design only (m/s) 1.00

Min Slope for Optimisation (1:X)

500

Designed with Level Soffits

Volumetric Runoff Coeff. 0.750

Time Area Diagram for Storm

Time	Area	Time	Area	Time	Area	Time	Area
(mins)	(ha)	(mins)	(ha)	(mins)	(ha)	(mins)	(ha)
		8-12					0.013
4-8	0.411	12-16	0.486	20-24	0.058		

Total Area Contributing (ha) = 2.330

Total Pipe Volume $(m^3) = 430.238$

Network Design Table for Storm

« - Indicates pipe capacity < flow</pre>

PN	Length	Fall	Slope	I.Area	T.E.	Ва	ıse	k	n	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(1/s)	(mm)		SECT	(mm)		Design
	40.507			0.080	8.00			0.600				Pipe/Conduit	_
1.002	30.270	4.500	6.7	0.122	0.00		0.0	0.600		0	100	Pipe/Conduit Pipe/Conduit	ĕ
1.003	34.105	3.250	10.5	0.000	0.00		0.0	0.600		0	100	Pipe/Conduit	0

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)		Σ Base Flow (1/s)				Cap (1/s)	
1.000	46.21	8.27	138.000	0.080	0.0	0.0	0.0	2.48	175.1	10.0
1.001	45.25	8.67	137.000	0.100	0.0	0.0	0.0	2.98	210.5	12.3
1.002	44.85	8.83	134.500	0.222	0.0	0.0	0.0	3.00	23.6«	27.0
1.003	44.31	9.07	130.000	0.222	0.0	0.0	0.0	2.40	18.8«	27.0

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Innovyze	Network 2020.1.3	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (1,		k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	49.055	2.750	17.8	0.031	8.00	(0.0	0.600		0	100	Pipe/Conduit	•
	60.576 60.857				0.00	(0.0		0.350 0.040	→_/→ ○	450	Swale Pipe/Conduit	•
3.000	81.002	2.321	34.9	0.116	8.00	(0.0		0.350	→_/→		Swale	•
4.001	14.544 19.340 25.364	0.508	38.1	0.283	5.00 0.00 0.00	(0.0		0.040	0	300	Pipe/Conduit Pipe/Conduit Pipe/Conduit	•
3.001	44.964	1.673	26.9	0.000	0.00	(Swale	•
	5.000			0.100	5.00							Pipe/Conduit Pipe/Conduit	•
3.002	29.680	1.546	19.2	0.108	0.00	(0.0		0.350	→_/→		Swale	•
	29.277 56.024			0.315 0.100	8.00 0.00			0.600		0		Pipe/Conduit Pipe/Conduit	•
3.003	5.580	0.056	99.6	0.140	0.00	(0.0	0.600		0	225	Pipe/Conduit	•

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)		Σ Base Flow (1/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)
2.000	45.78	8.44	129.500	0.031	0.0	0.0	0.0	1.84	14.4	3.8
1.004 1.005	39.62 38.07		126.750 120.000	0.326 0.326	0.0	0.0	0.0	0.42	582.1 168.0	35.0 35.0
3.000	35.93	13.95	129.440	0.116	0.0	0.0	0.0	0.23	313.1	11.3
4.000	50.00	5.05	134.000	0.100	0.0	0.0	0.0	4.45	78.6	13.5
4.001	50.00	5.50	131.008	0.383	0.0	0.0	0.0	0.72	50.9«	51.9
4.002	50.00	5.61	130.500	0.383	0.0	0.0	0.0	3.92	69.2	51.9
3.001	32.61	16.85	126.719	0.499	0.0	0.0	0.0	0.26	356.8	51.9
5.000	50.00	5.04	128.000	0.100	0.0	0.0	0.0	2.02	35.8	13.5
5.001	50.00	5.14	126.000	0.110	0.0	0.0	0.0	3.38	239.0	14.9
3.002	31.39	18.11	125.046	0.717	0.0	0.0	0.0	0.39	1127.4	61.0
6.000	46.55	8.14	131.479	0.315	0.0	0.0	0.0	3.55	250.9	39.7
6.001	45.67	8.49	130.000	0.415	0.0	0.0	0.0	2.65	20.8«	51.3
3.003	31.32	18.18	123.000	1.272	0.0	0.0	0.0	1.31	52.1«	107.9
				©1982-2	020 Innov	yze				

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Network Design Table for Storm

PN	Length	Fall	Slope	I.Area	T.E.	Ba	ase	k	n	HYD	DIA	Section Type	Auto)
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(1/s)	(mm)		SECT	(mm)		Desig	ŗη
3.004	89.914	5.144	17.5	0.000	0.00		0.0		0.350	$\rightarrow \setminus -/ \rightarrow$		Dry Swale	0	
1.006	15.295	1.000	15.3	0.732	0.00		0.0		0.040	0	150	Pipe/Conduit	0	

Network Results Table

PN	Rain	T.C.	US/IL	Σ I.Area	Σ Base	Foul	Add Flow	Vel	Cap	Flow	
	(mm/hr)	(mins)	(m)	(ha)	Flow (1/s)	(1/s)	(1/s)	(m/s)	(1/s)	(1/s)	
3.004	26.62	24.51	122.944	1.272	0.0	0.0	0.0	0.24	164.1	107.9	
1.006	26.41	24.87	116.300	2.330	0.0	0.0	0.0	0.72	12.7«	166.6	

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Area Summary for Storm

Pipe Number		PIMP Name	PIMP	Gross Area (ha)	Imp.	Pipe Total (ha)
Humber	Type	Hame	(0)	niea (na)	niea (na)	(114)
1.000	_	_	100	0.080	0.080	0.080
1.001	_	_	100	0.020	0.020	0.020
1.002	-	_	100	0.122	0.122	0.122
1.003	-	_	100	0.000	0.000	0.000
2.000	-	_	100	0.031	0.031	0.031
1.004	-	_	100	0.073	0.073	0.073
1.005	-	_	100	0.000	0.000	0.000
3.000	-	_	100	0.116	0.116	0.116
4.000	-	_	100	0.100	0.100	0.100
4.001	-	_	100	0.283	0.283	0.283
4.002	-	-	100	0.000	0.000	0.000
3.001	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.100	0.100	0.100
5.001	-	-	100	0.010	0.010	0.010
3.002	-	-	100	0.108	0.108	0.108
6.000	-	-	100	0.315	0.315	0.315
6.001	-	-	100	0.100	0.100	0.100
3.003	-	_	100	0.140	0.140	0.140
3.004	-	_	100	0.000	0.000	0.000
1.006	-	_	100	0.732	0.732	0.732
				Total	Total	Total
				2.330	2.330	2.330

Simulation Criteria for Storm

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

Number of Input Hydrographs 0 Number of Storage Structures 12 Number of Online Controls 8 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type S	ummer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Storm Duration (mins)	30
Ratio R	0.278		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 3, DS/PN: 1.002, Volume (m³): 6.6

Unit Reference MD-SHE-0038-8000-1500-8000 Design Head (m) 1.500 Design Flow (1/s) 0.8 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 38 134.500 Invert Level (m) Minimum Outlet Pipe Diameter (mm) 75 Suggested Manhole Diameter (mm) 1200

Control Points Head (m) Flow (1/s) Design Point (Calculated) 1.500 0.8 Flush-Flo™ 0.168 0.5 Kick-Flo® 0.337 0.4 Mean Flow over Head Range 0.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (1/s)	Depth (m) F	Flow (1/s)	Depth (m) Flow	(1/s)	Depth (m)	Flow (1/s)
0.100	0.5	1.200	0.7	3.000	1.1	7.000	1.6
0.200	0.5	1.400	0.8	3.500	1.2	7.500	1.7
0.300	0.5	1.600	0.8	4.000	1.2	8.000	1.7
0.400	0.4	1.800	0.9	4.500	1.3	8.500	1.8
0.500	0.5	2.000	0.9	5.000	1.4	9.000	1.8
0.600	0.5	2.200	0.9	5.500	1.4	9.500	1.9
0.800	0.6	2.400	1.0	6.000	1.5		
1.000	0.7	2.600	1.0	6.500	1.6		

Orifice Manhole: 6, DS/PN: 1.004, Volume (m³): 2.4

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 126.750

Hydro-Brake® Optimum Manhole: 11, DS/PN: 4.001, Volume (m³): 2.7

Unit Reference MD-SHE-0186-2000-1850-2000
Design Head (m) 1.850
Design Flow (1/s) 20.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 186

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Innovyze	Network 2020.1.3	

Hydro-Brake® Optimum Manhole: 11, DS/PN: 4.001, Volume (m³): 2.7

Invert Level (m) 131.008
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1800

Control Points Head (m) Flow (1/s) Design Point (Calculated) 1.850 20.0 Flush-Flo™ 0.541 20.0 Kick-Flo® 1.159 16.0 Mean Flow over Head Range 17.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m) Flo	w (1/s) I	Depth (m) Flow	v (1/s)	Depth (m) Flow	(1/s)	Depth (m)	Flow (1/s)
0.100 0.200 0.300	6.5 16.9 18.9	1.200 1.400 1.600	16.3 17.5 18.6	3.000 3.500 4.000	25.2 27.1 28.9	7.000 7.500 8.000	37.8 39.1 40.4
0.400	19.7	1.800	19.7	4.500 5.000	30.6	8.500 9.000	41.6 42.7
0.600 0.800 1.000	20.0 19.5 18.2	2.200 2.400 2.600	21.7 22.6 23.5	5.500 6.000 6.500	33.7 35.1 36.5	9.500	43.9

Orifice Manhole: 13, DS/PN: 4.002, Volume (m³): 3.9

Diameter (m) 0.150 Discharge Coefficient 0.600 Invert Level (m) 130.500

Orifice Manhole: 15, DS/PN: 5.001, Volume (m³): 2.7

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 126.000

Hydro-Brake® Optimum Manhole: 18, DS/PN: 6.001, Volume (m³): 3.7

Unit Reference MD-SHE-0038-8000-1500-8000 Design Head (m) 1.500 Design Flow (1/s) 0.8 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 38 Invert Level (m) 130.000 Minimum Outlet Pipe Diameter (mm) 75 1200 Suggested Manhole Diameter (mm)

Control Points Head (m) Flow (1/s)

Design Point (Calculated) 1.500 0.8

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Innovyze	Network 2020.1.3	

Hydro-Brake® Optimum Manhole: 18, DS/PN: 6.001, Volume (m³): 3.7

Control Points	Head (m)	Flow (1/s)
Flush-Flo [®]	0.168	0.5
Kick-Flo@	0.337	0.4
Mean Flow over Head Range	-	0.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m) Fl	Low (1/s)	Depth (m) Fl	ow (1/s)	Depth (m) Flow	(1/s)	Depth (m)	Flow (1/s)
0.100	0.5	1.200	0.7	3.000	1.1	7.000	1.6
0.200	0.5	1.400	0.8	3.500	1.2	7.500	1.7
0.300	0.5	1.600	0.8	4.000	1.2	8.000	1.7
0.400	0.4	1.800	0.9	4.500	1.3	8.500	1.8
0.500	0.5	2.000	0.9	5.000	1.4	9.000	1.8
0.600	0.5	2.200	0.9	5.500	1.4	9.500	1.9
0.800	0.6	2.400	1.0	6.000	1.5		
1.000	0.7	2.600	1.0	6.500	1.6		

Hydro-Brake® Optimum Manhole: 19, DS/PN: 3.003, Volume (m³): 226.4

MD-SHE-0140-1000-1400-1000	Unit Reference
1.400	Design Head (m)
10.0	Design Flow (1/s)
Calculated	Flush-Flo™
Minimise upstream storage	Objective
Surface	Application
Yes	Sump Available
140	Diameter (mm)
123.500	Invert Level (m)
225	Minimum Outlet Pipe Diameter (mm)
1200	Suggested Manhole Diameter (mm)

Control	Points	Head (m)	Flow	(1/s)
Design Point ((Calculated)	1.400		10.0
	Flush-Flo™	0.410		10.0
	Kick-Flo®	0.879		8.0
Mean Flow over	Head Range	_		8.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m) Flow	(1/s)	Depth (m) Flo	w (1/s)	Depth (m) Fl	low (1/s)	Depth (m)	Flow (1/s)
0.100	5.0	0.400 0.500	10.0	0.800	8.9	1.400	10.0
0.200	9.2	0.500	9.9	1.000	8.5	1.600 1.800	10.6
0.300	9.8	0.600	9.8	1.200	9.3	1.800	11.3

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Hydro-Brake® Optimum Manhole: 19, DS/PN: 3.003, Volume (m³): 226.4

Depth (m)	Flow (1/s)	Depth (m) F	low (1/s)	Depth (m)	Flow (1/s)	Depth (m)	Flow (1/s)
2.000	11.8	3.500	15.4	6.000	20.0	8.500	23.6
2.200	12.4	4.000	16.5	6.500	20.8	9.000	24.3
2.400	12.9	4.500	17.4	7.000	21.5	9.500	24.9
2.600	13.4	5.000	18.3	7.500	22.2		
3.000	14.3	5.500	19.2	8.000	22.9		

Hydro-Brake® Optimum Manhole: 20, DS/PN: 1.006, Volume (m³): 76.5

Unit Reference MD-SHE-0081-5000-3300-5000 Design Head (m) 3.300 Design Flow (1/s) 5.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Diameter (mm) 81 Invert Level (m) 116.300 Minimum Outlet Pipe Diameter (mm) 100 1200 Suggested Manhole Diameter (mm)

Control Points Head (m) Flow (1/s) Design Point (Calculated) 3.300 5.0 Flush-Flo™ 0.349 3.1 Kick-Flo® 0.723 2.5 Mean Flow over Head Range 3.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (1/s)	Depth (m) Flo	w (1/s)	Depth (m) Flow	(1/s)	Depth (m)	Flow (1/s)
0.100	2.4	1.200	3.1	3.000	4.8	7.000	7.1
0.200	3.0	1.400	3.4	3.500	5.1	7.500	7.4
0.300	3.1	1.600	3.6	4.000	5.5	8.000	7.6
0.400	3.1	1.800	3.8	4.500	5.8	8.500	7.8
0.500	3.0	2.000	4.0	5.000	6.1	9.000	8.0
0.600	2.9	2.200	4.1	5.500	6.4	9.500	8.2
0.800	2.6	2.400	4.3	6.000	6.6		
1.000	2.9	2.600	4.5	6.500	6.9		

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Storage Structures for Storm

Tank or Pond Manhole: 3, DS/PN: 1.002

Invert Level (m) 134.500

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 75.5 1.500 333.6

Tank or Pond Manhole: 6, DS/PN: 1.004

Invert Level (m) 126.750

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 23.5 1.000 158.0

Swale Pipe: 1.004

 Manning's N
 0.350
 Base Width (m)
 0.5

 Infiltration Coefficient Base (m/hr)
 0.00200
 Length (m)
 60.6

 Infiltration Coefficient Side (m/hr)
 0.00200
 Side Slope (1:X)
 3.0

 Safety Factor
 2.0
 Slope (1:X)
 10.1

 Porosity
 1.00
 Cap Volume Depth (m)
 0.600

 Invert Level (m)
 126.750
 Cap Infiltration Depth (m)
 0.000

Swale Pipe: 3.000

 Manning's N
 0.350
 Base Width (m)
 0.5

 Infiltration Coefficient Base (m/hr)
 0.00200
 Length (m)
 81.0

 Infiltration Coefficient Side (m/hr)
 0.00200
 Side Slope (1:X)
 3.0

 Safety Factor
 2.0
 Slope (1:X)
 34.9

 Porosity
 1.00
 Cap Volume Depth (m)
 0.000

 Invert Level (m)
 129.440
 Cap Infiltration Depth (m)
 0.000

Complex Manhole: 11, DS/PN: 4.001

Bio-Retention Area

Invert Level (m) 131.208 Infiltration Coefficient Side (m/hr) 0.00200 Porosity 0.30 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00200

Depth (m) Area (m²) Perimeter (m) Depth (m) Area (m²) Perimeter (m) 0.000 50.5 34.000 1.000 50.5 34.000

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Tank or Pond

Invert Level (m) 132.208

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 50.5 1.000 200.0

Swale Pipe: 3.001

Manning's N	0.350	Base Width (m)	0.5
Infiltration Coefficient Base (m/hr)	0.00200	Length (m)	45.0
Infiltration Coefficient Side (m/hr)	0.00200	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	26.9
Porosity	1.00	Cap Volume Depth (m)	0.600
Invert Level (m)	126.719 Ca ₁	ap Infiltration Depth (m)	0.000

Porous Car Park Manhole: 15, DS/PN: 5.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (1/s)	22.2	Slope (1:X)	30.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	126.000	Cap Volume Depth (m)	1.000

Swale Pipe: 3.002

	Manning's N	0.350		Base Width (m)	0.5
Infiltration Coefficient	Base (m/hr)	0.00200		Length (m) 2	29.7
Infiltration Coefficient	Side (m/hr)	0.00200		Side Slope (1:X)	3.0
Sa	fety Factor	2.0		Slope (1:X)	L9.2
	Porosity	1.00		Cap Volume Depth (m) 0	.900
Inver	t Level (m)	125.046	Cap	Infiltration Depth (m) 0	.000

Tank or Pond Manhole: 18, DS/PN: 6.001

Invert Level (m) 130.000

Depth (m) Area (m²) Depth (m) Area (m²) 0.000 240.0 1.500 609.0

Complex Manhole: 19, DS/PN: 3.003

Bio-Retention Area

Invert Level (m) 123.000 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.30 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000

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Bio-Retention Area

Depth (m) Area (m 2) Perimeter (m) Depth (m) Area (m 2) Perimeter (m)

0.000 111.0 46.000 0.500 111.0 46.000

Tank or Pond

Invert Level (m) 123.500

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 111.0 1.500 391.0

Dry Swale Pipe: 3.004

Manning's N 0.350 Trench Length (m) Infiltration Coefficient Base (m/hr) 0.00100 Trench Infiltration Side (m/hr) 0.00100 Infiltration Coefficient Side (m/hr) 0.00100 Trench Porosity 0.30 Safety Factor Side Slope (1:X) 3.0 Slope (1:X) Swale Porosity 1.00 17.5 Cap Volume Depth (m) Invert Level (m) 122.944 0.800 Trench Height (m) 0.500 Cap Infiltration Depth (m) 0.000 0.5 Trench Width (m)

Under Drain Details

Depth above Invert Level (m) 0.100 Number of Pipes 1
Diameter (m) 0.600 Manning's N 0.150

Complex Manhole: 20, DS/PN: 1.006

Bio-Retention Area

Invert Level (m) 116.800 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.30 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000

Depth (m) Area (m²) Perimeter (m) Depth (m) Area (m²) Perimeter (m)

0.000 375.0 97.000 1.200 375.0 97.000

Tank or Pond

Invert Level (m) 117.800

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 380.0 1.800 983.0

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 MADD Factor * 100^3 /ha Storage 2.000 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 12 Number of Online Controls 8 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 330320 216176 SO 30320 16176
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status

DVD Status

ON

Inertia Status

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

	US/MH			Return	Climate	First	(X)	Firs	t (Y)	First (Z)	Overflow
PN	Name	St	orm	Period	Change	Surch	narge	Flo	ood	Overflow	Act.
1.000	1	15	Winter	2	+0%						
1.001	2	15	Winter	2	+0%						
1.002	3	1440	Winter	2	+0%	2/15	Summer				
1.003	4	1440	Winter	2	+0%						
2.000	5	15	Winter	2	+0%						
1.004	6	360	Winter	2	+0%	100/30	Winter				
1.005	7	360	Winter	2	+0%						
3.000	8	15	Winter	2	+0%						
4.000	10	15	Winter	2	+0%						
4.001	11	15	Winter	2	+0%	2/15	Summer				
4.002	13	15	Summer	2	+0%	2/15	Summer				
3.001	14	15	Winter	2	+0%						
5.000	15	15	Winter	2	+0%						
5.001	15	120	Winter	2	+0%	2/15	Summer	100/30	Winter		
3.002	16	30	Winter	2	+0%						
6.000	17	15	Winter	2	+0%						
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$\frac{\text{2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)}}{\text{for Storm}}$

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow /	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (1/s)	Status
1.000	1	138.044	-0.256	0.000	0.05			8.4	OK
1.001		137.044	-0.256	0.000	0.05			10.4	OK
1.002	3	135.064	0.464	0.000	0.02			0.5	SURCHARGED
1.003	4	130.011	-0.089	0.000	0.03			0.5	OK
2.000	5	129.532	-0.068	0.000	0.23			3.2	OK
1.004	6	127.089	-0.679	0.000	0.00		160	1.9	OK
1.005	7	120.024	-0.426	0.000	0.01			1.9	OK
3.000	8	129.575	-0.465	0.000	0.03		7	10.4	OK
4.000	10	134.043	-0.107	0.000	0.18			13.2	OK
4.001	11	131.636	0.328	0.000	0.40		7	19.9	SURCHARGED
4.002	13	130.755	0.105	0.000	0.30			19.9	SURCHARGED
3.001	14	126.917	-0.802	0.000	0.08		11	29.8	OK
5.000	15	128.063	-0.087	0.000	0.37			13.2	OK*
5.001	15	126.392	0.092	0.000	0.02		37	3.2	SURCHARGED
3.002	16	125.242	-0.804	0.000	0.03		12	35.3	OK
6.000	17	131.555	-0.224	0.000	0.15			33.0	OK

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
1.003	4	
2.000	5	
1.004	6	
1.005	7	
3.000	8	
4.000	10	
4.001	11	
4.002	13	
3.001	14	
5.000	15	
5.001	15	7
3.002	16	
6.000	17	

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$\frac{\text{2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)}}{\text{for Storm}}$

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water Level
PN	Name	Storm		Change	Surcharge	Flood	Overflow	Act.	(m)
6.001	18	1440 Winter	2	+0%	2/15 Winter				130.519
3.003	19	480 Winter	2	+0%	2/15 Summer				123.886
3.004	19	960 Summer	2	+0%					123.199
1.006	20	1440 Winter	2	+0%	2/15 Summer				118.427

		Surcharged	Flooded			Half Drain	Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Time	Flow		Level
PN	Name	(m)	(m³)	Cap.	(1/s)	(mins)	(1/s)	Status	Exceeded
6.001	18	0.419	0.000	0.02			0.5	SURCHARGED	
3.003	19	0.661	0.000	0.30		228	9.9	SURCHARGED	
3.004	19	-1.211	0.000	0.06		446	9.9	OK	
1.006	20	1.977	0.000	0.32		1447	4.1	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * $10m^3$ /ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 12 Number of Online Controls 8 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 330320 216176 SO 30320 16176
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status

DVD Status

ON

Inertia Status

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

												Water
	US/MH			Return	Climate	First	t (X)	First	(Y)	First (Z)	Overflow	Level
PN	Name	St	torm	Period	Change	Surch	narge	Floo	od	Overflow	Act.	(m)
1.000	1	15	Winter	30	+0%							138.068
	2											
1.001	_		Winter	30	+0%							137.070
1.002	3	1440	Winter	30	+0%	2/15	Summer					135.354
1.003	4	1440	Winter	30	+0%							130.012
2.000	5	15	Winter	30	+0%							129.552
1.004	6	360	Winter	30	+0%	100/30	Winter					127.291
1.005	7	360	Winter	30	+0%							120.031
3.000	8	15	Winter	30	+0%							129.643
4.000	10	15	Winter	30	+0%							134.068
4.001	11	60	Winter	30	+0%	2/15	Summer					132.520
4.002	13	480	Summer	30	+0%	2/15	Summer					130.755
3.001	14	15	Winter	30	+0%							126.951
5.000	15	15	Winter	30	+0%							128.108
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$\frac{\text{30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)}}{\text{for Storm}}$

PN	US/MH Name	Surcharged Depth (m)			Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (1/s)	Status	Level Exceeded
1.000	1	-0.232	0.000	0.12			19.3	OK	
1.001	2	-0.230	0.000	0.12			24.6	OK	
1.002	3	0.754	0.000	0.03			0.6	SURCHARGED	
1.003	4	-0.088	0.000	0.03			0.6	OK	
2.000	5	-0.048	0.000	0.53			7.5	OK	
1.004	6	-0.477	0.000	0.00		210	2.4	OK	
1.005	7	-0.419	0.000	0.01			2.4	OK	
3.000	8	-0.397	0.000	0.08		7	24.0	OK	
4.000	10	-0.082	0.000	0.42			30.5	OK	
4.001	11	1.212	0.000	0.40		32	19.9	SURCHARGED	
4.002	13	0.105	0.000	0.30			19.9	SURCHARGED	
3.001	14	-0.768	0.000	0.11		7	40.2	OK	
5.000	15	-0.042	0.000	0.85			30.5	OK*	

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$\frac{\text{30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)}}{\text{for Storm}}$

PN	US/MH PN Name		torm		Climate Change	_	t (X) harge	First Flo	t (Y) ood	First (Z) Overflow	Overflow Act.
5.001	15	60	Winter	30	+0%	2/15	Summer	100/30	Winter		
3.002	16	30	Summer	30	+0%						
6.000	17	15	Winter	30	+0%						
6.001	18	1440	Winter	30	+0%	2/15	Winter				
3.003	19	480	Winter	30	+0%	2/15	Summer				
3.004	19	1440	Winter	30	+0%						
1.006	20	1440	Winter	30	+0%	2/15	Summer				

		Water	Surcharged	Flooded			Half Drain	Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Time	Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(1/s)	(mins)	(1/s)	Status
5.001	1 =	126.851	0.551	0 000	0.02		4.6	4.7	CHECHARCER
				0.000			46	4./	SURCHARGED
3.002	16	125.293	-0.753	0.000	0.05		16	57.2	OK
6.000	17	131.598	-0.181	0.000	0.33			76.1	OK
6.001	18	130.790	0.690	0.000	0.03			0.6	SURCHARGED
3.003	19	124.329	1.104	0.000	0.30		360	9.9	SURCHARGED
3.004	19	123.199	-1.211	0.000	0.06		216	9.9	OK
1.006	20	118.944	2.494	0.000	0.36			4.5	SURCHARGED

	US/MH	Level
PN	Name	Exceeded
5.001	15	7
3.002	16	
6.000	17	
6.001	18	
3.003	19	
3.004	19	
1.006	20	

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Innovyze	Network 2020.1.3	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * $10m^3$ /ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 12 Number of Online Controls 8 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 330320 216176 SO 30320 16176
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status

ON

DVD Status

ON

Inertia Status

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

											Water
	US/MH			Return	Climate	First	t (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	St	torm	Period	Change	Surcl	narge	Flood	Overflow	Act.	(m)
1.000	1	15	Winter	100	+40%						138.094
1.001	2	15	Winter	100	+40%						137.096
1.002	3	1440	Winter	100	+40%	2/15	Summer				135.760
1.003	4	1440	Winter	100	+40%						130.013
2.000	5	15	Winter	100	+40%						129.585
1.004	6	360	Winter	100	+40%	100/30	Winter				127.559
1.005	7	360	Winter	100	+40%						120.038
3.000	8	15	Winter	100	+40%						129.709
4.000	10	15	Winter	100	+40%						134.115
4.001	11	60	Winter	100	+40%	2/15	Summer				133.017
4.002	13	60	Winter	100	+40%	2/15	Summer				130.771
3.001	14	30	Winter	100	+40%						127.000
5.000	15	15	Summer	100	+40%						128.150
					©1982	2-2020	Innov	vze			

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107 Cowbridge Road East	Penlanlas Farm	
Cardiff		
Wales, CF11 9AG		Micro
Date 17/08/2021	Designed by KF	Drainage
File SW NETWORK 20191025.MDX	Checked by TOR	Dialilade
Innovyze	Network 2020.1.3	ı

$\frac{\text{100 year Return Period Summary of Critical Results by Maximum Level (Rank}}{\text{1) for Storm}}$

PN	US/MH Name	Surcharged Depth (m)			Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (1/s)	Status	Level Exceeded
1.000	1	-0.206	0.000	0.21			34.9	OK	
1.001	2	-0.204	0.000	0.22			44.6	OK	
1.002	3	1.160	0.000	0.03			0.7	FLOOD RISK	
1.003	4	-0.087	0.000	0.04			0.7	OK	
2.000	5	-0.015	0.000	0.94			13.4	OK	
1.004	6	-0.209	0.000	0.01		296	3.0	FLOOD RISK	
1.005	7	-0.412	0.000	0.02			3.0	OK	
3.000	8	-0.331	0.000	0.14		7	43.2	OK	
4.000	10	-0.035	0.000	0.75			54.3	OK	
4.001	11	1.709	0.000	0.41		53	20.8	FLOOD RISK	
4.002	13	0.121	0.000	0.32			20.8	SURCHARGED	
3.001	14	-0.719	0.000	0.17		10	61.6	OK	
5.000	15	0.000	0.000	1.12			40.2	SURCHARGED*	

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107 Cowbridge Road East	Penlanlas Farm	
Cardiff		
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Innovyze	Network 2020.1.3	

$\frac{\text{100 year Return Period Summary of Critical Results by Maximum Level (Rank}}{\text{1) for Storm}}$

PN	US/MH Name	St	torm		Climate Change		st (X) charge	Firs Flo	t (Y) ood	First (Z) Overflow	Overflow Act.
5.001	15	120	Winter	100	+40%	2/15	Summer	100/30	Winter		
3.002	16	30	Summer	100	+40%						
6.000	17	15	Winter	100	+40%						
6.001	18	1440	Winter	100	+40%	2/15	Winter				
3.003	19	480	Winter	100	+40%	2/15	Summer				
3.004	19	480	Winter	100	+40%						
1.006	20	1440	Winter	100	+40%	2/15	Summer				

		Water	Surcharged	${\tt Flooded}$			Half Drain	Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Time	Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(1/s)	(mins)	(1/s)	Status
5.001	15	128.337	2.037	7.678	0.04		68	7.9	FLOOD
3.002	16	125.348	-0.698	0.000	0.08		11	87.9	OK
6.000	17	131.648	-0.131	0.000	0.61			137.6	OK
6.001	18	131.196	1.096	0.000	0.04			0.7	SURCHARGED
3.003	19	124.951	1.726	0.000	0.30			10.2	FLOOD RISK
3.004	19	123.202	-1.208	0.000	0.06			10.2	OK
1.006	20	119.596	3.146	0.000	0.40			5.0	FLOOD RISK

	US/MH	Level
PN	Name	Exceeded
5.001	15	7
3.002	16	
6.000	17	
6.001	18	
3.003	19	
3.004	19	
1.006	20	

Appendix E SAB Correspondence

Return to text



From: Woodier, James < <u>James Woodier@monmouthshire.gov.uk</u>>

Sent: 13 August 2019 16:57

To: James Kathrens < JKathrens@edenstonegroup.com >

Subject: SAB pre-application advice - Proposed Residential Development at Penlanlas Farm

James,

Further to our SAB pre-application advice meeting of 23rd July the following submission of your drainage layout drawing and street scene visual representations, please find our written advice below.

S1 – Surface water runoff destination

PL1 – Collect for use. Water butts are proposed to provide very basic rainwater harvesting. Welsh Water's offer to provide potable water for the site has been referenced as fulfilling the second exception criteria within G1.4 of the Standards. This is not accepted by the SAB. Reference to DCWW's drought management plans does identify potential stresses on mains water supply. The third exception criteria listed in G1.4 (viability) is likely be acceptable.

PL2 – Infiltrate to ground. The ground investigation report has shown that infiltration at standard soakaway depth (1 m to 3 m below ground level) is not viable due to the low permeability of the soils. No shallow soil permeability tests have been undertaken. Given the sloping nature of the site and the low permeability of the deeper soils we would be wary of accepting shallow infiltration solutions (porous pavements etc.) across the whole site. However, we recommend undertaking shallow permeability tests to assist with meeting interception requirements (Standard S2).

PL3 – Discharge to surface water body. We accept that there is no nearby surface water body suitable to accept discharge from the site.

PL4 – Connection to a surface water sewer. Given the above, discharge at this priority level is considered acceptable for this site, subject to the agreement of DCWW. Correspondence from DCWW provided to date has not confirmed agreement.

<u>S2 – Surface water runoff hydraulic control</u>

Part 1 (interception). No detail of compliance with this requirement has been provided. The current proposals do not meet the interception requirements. Stone or concrete rills as proposed do not provide significant interception benefits. Much of the south-west of the site is drained only through rills and small basin. We recommend that serious consideration is given to Table G2.1 of the Standards and the various area ratios, infiltration rates, and maximum swale gradients required. At present the lack of interception within the proposed SuDS scheme is a significant barrier to SAB approval. Significant re-design of the site layout may be required.

Part 2 (control runoff for 1 in 1 year event). Discharge at QBar is proposed, meaning a higher discharge rate for small events. Justification for this should be provided in the final application. Detail of control mechanisms and storage volumes will be required as part of the final application. As the site will discharge to a DCWW surface water sewer discharge rates will require agreement with DCWW.

Part 3 (control rate and volume for 1 in 100 year event). Discharge at QBar is proposed, meaning a higher discharge rate for small events. Justification for this should be provided in the final

application. Detail of control mechanisms and storage volumes will be required as part of the final application. As the site will discharge to a DCWW surface water sewer discharge rates will require agreement with DCWW.

Part 4 (flooding from the drainage system). The final application should provide evidence that the drainage system provides flood protection in accordance with three principal criteria detail in section G2.34 of the Standards.

Part 5 (consider risks of greater than 1 in 100 events). Exceedance flows must be considered and evidence provided using appropriate scaled plans. Level of footways and gardens need careful consideration, particularly as flows will not be contained within traditional carriageway kerb upstands.

Part 6 (consider structural failure and blockage). Exceedance flows caused by blockage must be considered. Rills should be included in the consideration of blockages.

<u>S3 – Treatment</u>

We recommend using the simple index approach described in Chapter 26 of the CIRIA SuDS Manual to demonstrate compliance with Standard S3. The pre-application form submitted includes a table which compares mitigation indices for swales and ponds with hazard indices for water from residential roofs. Further assessment should be undertaken using hazard indices for low use residential roads, and take into account the lack of swales serving some sections of the site. It should also be noted that ponds are not suitable SuDS components to provide primary treatment for anything other than roof runoff (Standards table G3.3).

The mitigation indices provided to swales should also be given critical consideration with reference to the appropriate chapters of the SuDS Manual. As follows:

SuDS Manual table 26.3, note 1. SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.

SuDS Manual 17.5. Design characteristics to deliver good pollutant removal performance are covered in Section 17.4.1, due to the link with hydraulic performance.

SuDS Manual 17.4.1. For 1:1 year event: depth of flow should be maintained below the height of vegetation; maximum flow velocity should be 0.3 m/s; the residence time of runoff along the swale should be at least 9 minutes (18 minutes if the swale has lateral inflows).

It will be necessary to demonstrate that the swales meet these criteria, particularly as current proposals include only limited SuDS features. The present proposals would fall short of the required treatment requirements for at least some sections of the site.

S4 – Amenity

Three basins and several swales are proposed. The artists impression of the proposed pond in the north-east of the site suggests an enclosed feature with very limited seating, which suggests limited amenity value. Consideration should be given to making this feature more accessible and discussions with MCC's green infrastructure team are advisable. No details of rainwater gardens have been provided.

If a form of rill is to be taken forward as proposed, evidence that the suitability of such a feature within the highway has been considered and that the proposed layout is both safe and practical to vehicles and pedestrians will be required.

S5 – Biodiversity

The final application should detail proposed planting and specify how it will maximise biodiversity for pollinators and other species.

S6 – Design for construction, operation, and maintenance

Full construction details must be submitted as part of the SAB application. These must include associated construction costs for calculation of non-performance bonds and maintenance activities broken down by type, frequency and cost of calculation for commuted sums. Details of the SuDS to be adopted by the SAB should be clearly provided in a written schedule along with a suitable scaled plan. These should be reference in the relevant sections of the construction and maintenance plan.

A suitably detailed construction phase plan must be submitted as part of the full application, clearly setting out how surface water and runoff will be managed during the construction phase.

The general principal of using a rill to convey surface water within a residential development and within the highway boundary is a new concept with limited examples of similar designs available. Evidence should be provided to MCC in its role as SAB as to how such a highway layout will perform, both structurally in terms of impact on highway safety, considering both vehicular and pedestrian traffic.

Summary

At present the proposed system is not compliant with Standards S2, S3, and S4. The SAB has particular concerns about the ability of the current site layout to meet to comply with interception requirements. The use of rills for conveyance precludes the interception and treatment benefits which would be expected from a SuDS component such as a swale. Consideration could possibly be given to removal of one side of the footway to accommodate swales.

Concerns remain regarding the rills in terms of overrunning of vehicles and trip hazards. Wider consultation will be required with planning and highways.

James Woodier (BSc FGS)

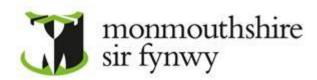
Assistant Engineer (Flood Risk Management)
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Monmouthshire County Council / Cyngor Sir Fynwy
Tel / Ffôn: 01633 644 730

Mobile / Symudol: 07773 573 979

Email / Ebost: <u>jameswoodier@monmouthshire.gov.uk</u> Website / Gwefan: <u>www.monmouthshire.gov.uk</u>

From 7th January 2019 all construction work with an area greater than 100 m², or comprising more than one residential property, will require approval of storm drainage by the SuDS Approval Body (SAB). Details are available at

https://gov.wales/topics/environmentcountryside/epq/flooding/drainage/?lang=en and https://www.monmouthshire.gov.uk/sustainable-drainage-approving-body-sab.



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