Eryri VIP Tunnel

Temporary Accommodation Village at Blaen Cefn Caravan Park

Drainage Strategy

May 2023





Project Information				
Project:	Eryri VIP Tunnel – Temporary Accommodation Village, Blaen Cefn Caravan Park			
Report Title:	Drainage Strategy			
Client:	HOCHTIEF (UK) Construction Ltd			
Instruction:	The instruction to undertake this Drainage Strategy was received from David Grantham of HOCHTIEF (UK) Construction Ltd			
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Approval Record	
Author:	Megan Williams BSc (Hons)
Checker:	Aled Williams BSc (Hons) MCIWEM C.WEM
Approver:	Nigel Jones BEng (Hons) CEng MICE

	Document History				
Revision	Date	Comment			
01	21/04/2023	First issue			
02	03/05/2023	Second issue – Updated foul drainage arrangements			
03	16/05/2023	Third issue – Updated with new site layout			

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This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

Î.



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Introduction

Waterco has been commissioned to undertake a Drainage Strategy in relation to a temporary accommodation village at Blaen Cefn Caravan Park, Penrhyndeudraeth, Gwynedd, LL48 6NA. The accommodation village is associated with the Eryri Visual Impact Provision (VIP) scheme which aims to reduce the visual impact of National Grid's overhead line across the Dwyryd Estuary by removing a section of overhead line and replacing it with electricity cables buried in a tunnel underground.

The aim of the Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment. This report has been prepared in accordance with the Welsh Government 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems' (2018) – herein referred to as 'the Statutory Standards for SuDS'.

Existing Conditions

The site covers an area of approximately 1.1ha and is located at National Grid Reference (NGR): 262023 339713. A location plan and an aerial image are included in Appendix A.

Online mapping (including Google Maps / Google Streetview imagery, accessed May 2023) shows that the site comprises land previously used for caravan pitches and an access track. The site is bordered by an unnamed watercourse and Blaen Cefn Caravan Park to the north, an access road to Blaen Cefn Caravan Park to the east, the A487 to the south and agricultural land to the west. Access to the site is currently provided from the access road to Blaen Cefn Caravan Park to the east.

Local Topography

Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Natural Resources Wales (NRW) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR data shows that the site slopes from approximately 16.98m AOD in the south to approximately 11.48m AOD in the west. The location of the proposed accommodation village generally slopes from 13m AOD in the south to 12m AOD in the north. A LiDAR extract is included in Appendix B.

Ground Conditions

The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by superficial deposits of peat. The superficial deposits are identified as being underlain by the Dol-Cyn-Afon Formation consisting of mudstone 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.

The closest historical BGS borehole record (BGS reference: SH63NW24) is located approximately 175m northwest of the site (NGR: 261639, 339635) and is included in Appendix C. The borehole record indicates that shale is identified from ground level up to 84m below ground level (m.bgl). Groundwater was struck at



12m.bgl, 15m.bgl, 27m.bgl, 41m.bgl and 53m.bgl.

According to NRW's Aquifer Designation data, obtained from the BGS GeoIndex online mapping [accessed May 2023], the Dol-Cyn-Afon 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'. There is no aquifer designation recorded for the superficial deposits.

The NRW 'Source Protection Zones' data, obtained from the Welsh Government 'Data Map Wales' website [accessed May 2023], indicates that the site is not located within a Groundwater Source Protection Zone.

Local Drainage

Public sewer records have been obtained from Welsh Water Dwr Cymru (DCWW) and are included in Appendix D. The DCWW sewer records show that there are no public sewers within the vicinity of the site. The nearest public sewer is a 150mm public foul sewer located in Pool Street approximately 370m west of the location of the proposed accommodation units.

Development Proposals

The proposal is for temporary workers accommodation comprising of 100no. units with associated parking, access road, landscaped areas and a general services building. A proposed development plan is included in Appendix E.

The proposed development will introduce hardstanding areas in the form of buildings, car parking and access roads. Hardstanding will comprise 8,510m² or 77.6% of the total site area. The access roads and car parking will be formed from permeable stone surfacing, however, will be formally drained and as such are considered as 'hardstanding' in this report.

Measurements have been taken from a PDF version of the 'Proposed Sketch Site Plan' and are approximate only.

Planning Policy

The Anglesey and Gwynedd Joint Local Development Plan 2011-2026 (adopted July 2017) contains the following policies relating to drainage:

'STRATEGIC POLICY PS 5: SUSTAINABLE DEVELOPMENT

Development will be supported where it is demonstrated that they are consistent with the principles of sustainable development. All proposals should:



...8. Reduce the amount of water used and wasted; reducing the effect on water resources and quality; managing flood risk and maximizing use of sustainable drainage schemes; and progressing the objectives of the Western Wales River Basin Water Management Plan.

STRATEGIC POLICY PS 6: ALLEVIATING AND ADAPTING TO THE EFFECTS OF CLIMATE CHANGE

...8. Aim for the highest possible standard in terms of water efficiency and implement other measures to withstand drought, maintain the flow of water and maintain or improve the quality of water, including using sustainable drainage systems (in line with Policy PCYFF 6).

POLICY PCYFF 6: WATER CONSERVATION

Proposals should incorporate water conservation measures where practicable, including Sustainable Urban Drainage Systems (SUDS). All proposals should implement flood minimisation or mitigation measures where possible, to reduce surface water run-off and minimise its contribution to flood risk elsewhere.

Proposals greater than 1,000 m² or 10 dwellings should be accompanied by a Water Conservation Statement.

...6.2.17. The use of SUDS to manage waterflows are an important means of minimising flood risk by increasing permeable surfaces in an area which allows water to seep into the ground, thus reducing the risk of flooding. SUDS typically include swales, ponds, infiltration basins and porous surfaces and should be considered in place of conventional drainage methods where practicable. It is important that SUDS are incorporated into the design of a proposal at an early stage so that a range of techniques can be considered in order to maximise efficiency.'

Consultation

A consultation request was submitted to the SAB (Sustainable Drainage Approval Body) in April 2021. In their response (Appendix F) the SAB have stated that:

'Due to the nature of the development, we are generally happy with the proposal. When the full application comes in, we will require the following supporting documents:

- Drainage plan of the site, including the accommodation units.
- Modelling work showing what the surface water will do when under a series of storm events (1 year event, 30 year event and 100 year event)
 - We only require 30% for climate change
- Red line boundary plan
- Infiltration tests, done to BRE365 standards



- Detailed drawings of the permeable paving, including details on the reservoir layer underneath.
- Something that shows us how you established greenfield run-off rates. (calculations, through a website, on a modelling programme etc..)

*we may ask for additional information if we feel we need it, during the full application process.'

Surface Water Management

The site is not currently formally drained and is therefore considered to be 100% permeable. The proposed development will introduce approximately 8,510m² of hardstanding in the form of buildings, car parking and access roads.

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 discharge from the site will be controlled.

The existing greenfield runoff rates have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method. Rainfall data used within the ReFH2 runoff estimation has been derived from the FEH web service. A summary of the greenfield runoff rates for a range of events is provided as Appendix G. The existing 1 in 1 year greenfield runoff rate for the 8,510m² developable area is 4.4 l/s. A discharge rate of 4.4 l/s is therefore proposed for the site.

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, especially when considering the temporary nature of the development. Furthermore, section G1.6 of the Statutory Standards for SuDS 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.

Priority Level 2: Surface water runoff is infiltrated to ground

As described above, the site is underlain by superficial deposits of Peat. As such, infiltration techniques are unlikely to be suitable for the discharge of surface water runoff.

As per SAB requirements, infiltration tests should be undertaken in accordance with the BRE365 specification to determine the suitability of infiltration techniques. Where infiltration techniques are feasible, permeable surfaces will be used throughout and runoff from lodge roofs drained to the sub-grade material of the permeable car park.

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

Where infiltration techniques are not feasible, a connection to watercourse is the next consideration. The nearest watercourse is an unnamed watercourse which is located immediately north of the site. Discharge by gravity to the unnamed watercourse, at a limited discharge rate of 4.4 l/s, appears to be feasible. LiDAR data identifies the watercourse at approximately 10.5m AOD and 1.5m below site levels.

Based on the site layout and topography, discharge to the watercourse will be split. A discharge rate of 3.4 I/s will be applied to the developable area in the east (7,058m²) encompassing the car park, accommodation units and ancillary units. A discharge rate of 1 I/s will be applied to the access road in the western extent of the site (1,452m²). The discharge rate of 3.4 I/s may need to be further split with a separate outfall provided either side of the public water main which crosses the site.

Attenuation Storage & Sustainable Drainage Systems

In order to achieve a limited discharge rate, attenuation storage will be required. Attenuation storage estimates have been provided using MicroDrainage software and are included in Appendix H.

Attenuation storage will be provided in the form of the sub-grade material of porous surfaced access roads and car parking. Runoff from buildings will drain to the sub-grade of the porous surfaced car park.

Western Extent (Permeable Access Road)

Based on a discharge rate of 1 l/s, an estimated storage volume of 147m³ will be required to accommodate the 1 in 100 year plus 30% Climate Change (CC) event. The storage estimate is based on an impermeable drainage area of 1,452m², a design head of 1m and hydro-brake flow control.

Based on a proposed sub-grade area of 856m² (the sub-grade storage will be provided in the lower northern



extent of the access road and excludes the steeply sloping south-western extent) and a void ratio of 30% (applicable to stone aggregate), a sub-grade depth of 575mm will be sufficient to provide the 147m³ of storage required to accommodate the 1 in 100 year plus 30% CC event.

Eastern Extent (Car Park and Buildings)

Based on a discharge rate of 3.4 l/s, an estimated storage volume of 811m³ will be required to accommodate the 1 in 100 year plus 30% CC event. The storage estimate is based on an impermeable drainage area of 7,058m², a design head of 1m and hydro-brake flow control.

Based on a proposed sub-grade area of 4,968m² (excludes sub-grade within the porous surfacing in the easement of the existing water main) and a void ratio of 30% (applicable to stone aggregate), a sub-grade depth of 545mm will be sufficient to provide the 811m³ of storage required to accommodate the 1 in 100 year plus 30% CC event.

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

Exceedance Event

Storage will be provided for the 1 in 100 year plus 30% CC event. Storm events in excess of the 1 in 100 year plus 30% CC event should be permitted to produce temporary shallow depth flooding within the car park, access road and landscaped areas. Finished floor levels should be set above surrounding ground levels ensuring exceedance flooding will not affect the buildings.

Surface Water Treatment

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), residential roofs (applicable to the cabins) have a 'very low' pollution hazard level, with low traffic roads and residential car parking classified as having a 'low' pollution hazard level. Table 1 shows the pollution hazard indices for each land use.

Table 1 – 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	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.

Car parks and roads will be formed from permeable surfacing with runoff from roofs directed to the permeable surfacing. Table 2 demonstrates that permeable surfaces will provide sufficient treatment.



Table 2 – SuDS Mitigation Indices

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

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

Maintenance

Maintenance of the drainage system including the permeable surfacing will be the responsibility of the site owner. A maintenance schedule for permeable surfacing is included in Appendix J.

Foul Drainage

There are no readily accessible public sewers within the immediate vicinity of the site. The nearest public sewer is a 150mm public foul sewer located in Pool Street approximately 370m west of the location of the accommodation units. Given the distance to the nearest public sewer, a new package treatment plant will be required to serve the development. 2no. Biodisc treatment plants (or similar) would be a suitable option and would provide sufficient treatment for domestic foul flows. The package treatment plant(s) should be placed a minimum of 10m from watercourses and any buildings.

Treated effluent could be discharged to the unnamed watercourse located immediately north of the site. Discharge to the watercourse from the package treatment plant(s) will require discharge consent from NRW.



Conclusions

The proposed development is for temporary workers accommodation comprising of 100no. units with associated parking, access road, landscaped areas and a general services building.

The proposed development will introduce impermeable drainage area in the form of buildings, car parking and the access road. This will result in an increase in surface water runoff. In order to ensure the increase in surface water runoff will not increase flood risk elsewhere, flow control will be used and attenuation provided on site to accommodate storm events up to and including the 1 in 100 year plus 30% climate change event.

Infiltration techniques are not considered feasible due to the impermeable nature of the underlying peat. However, evidence to discount infiltration techniques in the form of BRE 365 infiltration testing will be required to support the full SAB application.

Where infiltration is not feasible, surface water runoff will discharge to the unnamed watercourse at the northern boundary of the site at the 1 in 1 year greenfield runoff rate of 4.4 l/s. The discharge rate will be split with 1 l/s applied for the access road in the west and 3 l/s applied for development in the east (comprising the car park, staff accommodation and ancillary buildings). Attenuation storage will be provided within the sub-grade of the permeable surfaced access road and car park.

There are no readily accessible public sewers within the immediate vicinity of the site. Therefore, a new package treatment plant will be required to serve the development. 2no. Biodisc treatment plants (or similar) would be a suitable option and would provide sufficient treatment for domestic foul flows. The package treatment plant(s) should be placed minimum of 10m from watercourses and any buildings. Treated effluent could be discharged to the unnamed watercourse located immediately north 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 K.

Recommendations

- 1. Submit this Drainage Strategy to the Planning Authority in support of the Planning Application.
- 2. Undertake BRE 365 infiltration testing to determine the suitability of infiltration techniques.
- 3. Verify the attenuation volumes included in this report when undertaking detailed drainage design.



Appendix A Location Plan and Aerial Image





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	<u>plot name:</u> 1	.5055_Loc	ation_Pla	n		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



Hochtief (UK) Construction Limited



www.waterco.co.uk

SCHEME:

Eryri VIP Tunnel - Temporary Accommodation Village

Aerial Plan						
PLOT STATUS: DATE:						
FINAL 15-05-2023						
CHECKED:	APPROVED:	PLOT SCA	LE AT	A3:		
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Appendix B LiDAR Extract



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Notes:

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

LEGEND



Site Levels (m AOD)

Ground Elevations (m AOD)

<= 10
10 - 12
12 - 14
14 - 16
16 - 18
> 18



CLIENT:

Hochtief (UK) Construction Limited



www.waterco.co.uk

SCHEME:

Eryri VIP Tunnel - Temporary Accommodation Village

PLOT TITLE:

LiDAR Plan

{ 	PLOT STAT	DAT 15	^{re:} -05-2023			
S	DRAWN: CHECKED: APPROVED PLOT SC MW AW NJ					Ξ ΑΤ Α3: 200
42	PLOT NAME	: 15055_Lil	DAR_Plan			REVISION:

Appendix C Historical BGS Borehole Record



Customer Name	B	rian Le	<u>z</u> ús		anusi dei	unogical SUNAY
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Location of B/Ho	ole <u>By</u>	side d	ne	s ho	use	
Borehole Dia.		200 Dia. fr	om C	to	5	m
		<u>150 Dia. fr</u>	om O	to	84	m
Casing Details	Solid Steel	<u>70 mm f</u>	rom O	to	S Artlich Ger	M
Liner Details	(mdpe - 100m	m) Plain <u>fi</u>	rom 0	to to	39 84	m
Borehole Chan	nber Constructe	ed? Yes	1250			
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0 10° 40° 50°	10' 40' 40' 50' 90' 90'	Broken Broken Damp Shale Prop d Shale 3 g/min	Roc	45		
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O IO^{2}	10 40 40 50 50 90 135 175 175 175 275	Broken Broken Damp Shale Prop of Shale 34 9/min Shale 14 9/min Shale 29/min Shale 1/4 9/min Shale	Rock weter	pleted Drillin	British Geo g6 / 12 /	ological Survey Nogical Survey C3

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Appendix D DCWW Sewer Plan





Appendix E Development Plan





SECURITY FENCE TO BE ERECTED TO ENTIRE — PERIMETER OF SITE AS INDICATED		
PEDESTRIAN GATES PROPOSED, PROVIDING SEPARATION BETWEEN TEMPORARY SITE AND EXISTING CARAVAN SITE WHILST ALLOWING FOR ACCESS TO PUBLIC FOOTPATH CONNECTING — BACK TO PENRHYNDEUDRAETH MAINTAINED		
DROP OFF POINT FOR STAFF/ DELIVERY POINT-		
PROPOSED SECURITY CABIN-		
PROPOSED SECURITY GATE		
	earth	
GENERAL SERVICES BUILDING	\square	



- EXISTING HARDSTANDING (CRUSHED STONE)

- EXISTING ACCESS

EXISTING LANDSCAPING

PROPOSED PLANTING

PROPOSED SOFT LANDSCAPING

PROPOSED BUNDS FOR TOPSOIL STORAGE

PROPOSED SITE PERIMETER FENCING 2400mm HIGH MESH SECURITY FENCING IN GREEN

INDICATIVE POSITIONING OF 2 NO. PACKAGE TREATMENT PLANTS TO DEAL WITH

Menai House Holyhead Road Llanfairpwll Anglesey dewis LL61 5UJ 01248 715006 ARCHITECTURE info@dewis.uk.com www.dewis.uk.com Syrfewyr Siartredig Adeiladu Penseiri Siartredig Chartered Building Surveyors Chartered Architects Project Managers Architectural Consultants **Rheolwyr Prosiect** Ymgynghorwyr PensaerniolArchitectural ConsultantsTechnolegwyr Pensaerniol SiartredigChartered Architectural TechnologistsYmgynghorwyr Adeiladau HanesyddolHistoric Building Consultants Client HOCHTIEF (UK) CONSTRUCTION LTD. Project **Temporary Accommodation Blaencefn** Drawing PROPOSED SITE PLAN File No. D958 - DEW - XX - ZZ - DR - A - 003 DISC. ТҮРЕ ORIGIN ZONE LEVEL DEW ZZ XX A DR Drwg. No. Rev. Scale Drawn by 003 1:1000 RW В. Plot Date Size Issue Status Approved by 12.05.23 DW A1 PAC This drawing must be read in conjunction with all related drawings. All dimensions must be checked and verified on site before commencing The originator should be notified immediately of any discrepancies. Only figured dimensions are to be worked to. This drawing is copyright and remains the property of DEWIS architecture.

Appendix F SAB Correspondence

Megan Williams

From:	Corff Cymeradwyo SDC <corffcymeradwyosdc@gwynedd.llyw.cymru></corffcymeradwyosdc@gwynedd.llyw.cymru>
Sent:	13 April 2023 09:30
То:	Megan Williams
Subject:	RE: 15055 - SAB request

Bore da,

We have reviewed the pre-application, that was submitted on the 05/04/2023, for the site located at Blaen Cefn Leisure Park, Penrhyndeudraeth, Gwynedd.

Due to the nature of the development, we are generally happy with the proposal. When the full application comes in, we will require the following supporting documents:

- Drainage plan of the site, including the accommodation units.
- Modelling work showing what the surface water will do when under a series of storm events (1 year event, 30 year event and 100 year event)
 - \circ $\;$ We only require 30% for climate change $\;$
- Red line boundary plan
- Infiltration tests, done to BRE365 standards
- Detailed drawings of the permeable paving, including details on the reservoir layer underneath.
- Something that shows us how you established greenfield run-off rates. (calculations, through a website, on a modelling programme etc..)

*we may ask for additional information if we feel we need it, during the full application process.

Thank you

Dan Hughes

Uwch Beirianedd Draeinio- Systemau Draenio Cynaliadwy (SDC) / Sustainable Drainage Systems (SuDS) – Senior Drainage Engineer

Swyddfa Penrallt, Ffordd Pafiliwn, Caernarfon, Gwynedd. LL55 1BN

Ffôn/ Phone : 01286 679 355

<u>Gwefan SDC Cyngor Gwynedd</u> | <u>Gwynedd Council SuDS Website</u> | <u>Gwefan YGC</u> | <u>YGC Website</u>

A Ystyriwch yr amgylchedd cyn argraffu / Please consider the environment before printing

Ysgrifennwch ataf yn Gymraeg neu Saesneg Please write to me in Welsh or English

From: Megan Williams <megan.williams@waterco.co.uk>
Sent: 05 April 2023 16:56
To: Corff Cymeradwyo SDC <CorffCymeradwyoSDC@gwynedd.llyw.cymru>
Subject: 15055 - SAB request

Rhybudd / Caution: Mae'r neges hon yn tarddu o du allan i'r sefydliad. Cymerwch bwyll wrth glicio unrhyw ddolen neu atodiad. This message originated outside your organisation. Exercise caution when clicking links or opening attachments.

Blaen Cefn Leisure Park, Penrhyndeudraeth, Gwynedd, LL48 6NA.

Dear Sir/Madam,

We are currently preparing a Drainage Strategy for the site at the above address. Please find attached the SAB preapplication form for review. I have also attached the proposed development plan as supporting information.

The proposal is for temporary workers accommodation, comprising of 100no. units with associated parking and access road, landscaped areas, canteen, first-aid and laundry building for the workers.

Given the impermeable nature of the underlying Peat, it is unlikely that infiltration techniques will be suitable for the site. Infiltration tests will be undertaken in accordance with the BRE365 specification to determine the feasibility of infiltration drainage techniques. Where infiltration is not possible, discharge to the unnamed watercourse immediately north of the site is proposed. Discharge will be restricted to the 1 in 1 year greenfield runoff rate.

Please could you advise on the required climate change allowance to be applied to attenuation storage (i.e 20%/30%/40%).

We look forward to receipt of the pre-app comments.

If you have any questions or require any further information, please do not hesitate to contact me.

Kind regards

Megan Williams BSc (Hons)

Environmental Consultant

01244 668122
megan.williams@waterco.co.uk

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Appendix G ReFH2 Greenfield Runoff Rates

15055 - Snowdonia VIP Tunnel – Temporary

Accommodation Village

DOCUMENT VERIFICATION RECORD				
Project:	15055 - Eryri VIP Tunnel – Temporary Accommodation Village			
Client:	HOCHTIEF (UK) Construction Ltd			
Report Title:	15055-Drainage Strategy-03			
Date:	16/05/2023			

DOCUMENT REVIEW & APPROVAL			
Author:	Megan Williams BSc (Hons)		
Checker:	Aled Williams BSc (Hons) MCIWEM C.WEM		
Approver:	Nigel Jones BEng CEng MICE		

ReFH2 RUNOFF RATES*				
Return Period (Years)	As-rural Peak Flow (I/s)			
1	4.4306			
2	4.9117			
5	6.6746			
10	8.2290			
30	11.6952			
50	13.8549			
75	15.7659			
100	17.2021			
200	20.9406			
1000	30.8783			

*Runoff Rates printed from the ReFH Flood Modelling software package

Name:	FEH_Point_Descriptors_262023	_339713_v5_0_1 (1)
Your Reference:	15055	Area (km ²): 0.5
Easting:	262023	Country
Northing:	339713	England/Wales/Northern Ireland C Scotland
Point Descriptor	s Comments Advanced	
- Key modelli	na descriptors	
SAAR 6	1-90 (mm) : 1444	
PROPW	ET: 0.71	
BFIHOS	T: 0.593	
BFIHOS	T19: 0.526	
		A broke
		Apply

Appendix H MicroDrainage Simulations

Waterco Ltd					Page 1	
Eden Court	15055	- Eryri	VIP Tu	nnel	_	
Lon Parcwr Business Park	Tempo	rarv Acc	ommodat	ion		
Dephighshire II15 1NI	Atten	uation S	torage	(028+)		
	Desis		w	(east)	- MICCO	
Date 16/05/2023	Desig	nea by M	W		Drainage	
File	Check	ed by AW				
XP Solutions	Sourc	e Contro	1 2020.3	1.3		
<u>Summary of Resu</u>	lts for 100	year Re	turn Pe	riod (+30%)		
Storm	Max Max	Max	Max	Status		
Event	Level Dept	h Control	L Volume			
	(m) (m)	(1/s)	(m³)			
15 min Summe	r 9.281 0.28	1 3.4	1 228.5	O K		
30 min Summe	r 9.403 0.40	3 3.4	1 327.4	O K		
60 min Summe	r 9.551 0.55	1 3.4	447.5	0 K		
120 min Summe	r 9.657 0.65	7 3.4	1 533.7	O K		
180 min Summe	r 9.720 0.72	0 3.4	1 584.3	Flood Risk		
240 min Summe	r 9.764 0.76	4 3.4	620.0	Flood Risk		
360 min Summe	r 9.825 0.82	5 3.4	1 669.7	Flood Risk		
480 min Summe	r 9.867 0.86	7 3.4	1 703.7	Flood Risk		
600 min Summe	r 9.897 0.89	7 3.4	1 728.5	Flood Risk		
720 min Summe	r 9.920 0.92	0 3.4	4 747.4	Flood Risk		
960 min Summe	r 9.953 0.95	3 3.4	1 773.6	Flood Risk		
1440 min Summe	r 9.981 0.98	1 3.4	1 /96.5	Flood Risk		
2160 min Summe	r 9.990 0.99	0 3.4	1 803.7	Flood Risk		
2880 min Summe	r 9.993 0.99	3 3.4	1 805.9	Flood Risk		
4320 min Summe	r 9.987 0.98	7 3.4	1 801.7	Flood Risk		
5760 min Summe	r 9.978 0.97	8 3.4	4 /94.Z	Flood Risk		
7200 min Summe	r 9.968 U.96 m 0.056 0.05	8 3.4	± /85.6	Flood Risk		
10080 min Summe	r 9.956 0.95	6 3.4 E 3.4	± //0.0	Flood Risk		
	1 9.945 0.94	5 5		FIODU KISK		
Storm	Rain F	'looded Di	ischarge	Time-Peak		
Event	(mm/hr)	Volume	Volume	(mins)		
		(m³)	(m³)			
15 min Cumm	er 130 640	0 0	206 6	16		
30 min Summ	er 93 958	0 0	273 4	±0 31		
60 min Summ	er 64.645	0.0	439 7	62		
120 min Summ	er 39.021	0.0	513.6	122		
180 min Summ	er 28.825	0.0	534.1	182		
240 min Summ	er 23.211	0.0	532.4	242		
360 min Summ	er 17.101	0.0	524.4	362		
480 min Summ	er 13.774	0.0	517.3	482		
600 min Summ	er 11.653	0.0	511.8	602		
720 min Summ	er 10.170	0.0	507.7	720		
960 min Summ	er 8.217	0.0	502.4	960		
1440 min Summ	er 6.091	0.0	502.6	1440		
2160 min Summ	er 4.547	0.0	1037.3	1884		
2880 min Summ	er 3.711	0.0	1011.7	2280		
4320 min Summ	er 2.800	0.0	953.9	3072		
5760 min Summ	er 2.306	0.0	1559.1	3920		
7200 min Summ	er 1.992	0.0	1679.1	4760		
8640 min Summ	er 1.773	0.0	1776.0	5616		
10080 min Summ	er 1.610	0.0	1751.9	6456		
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Waterco Ltd						Page 2
Eden Court	150)55 - E	Eryri	VIP Tur	nnel	
Lon Parcwr Business Park	Ten	nporary	Acco	mmodati	Lon	
Denbighshire LL15 1NJ	Att	Attenuation Storage (east)				Micco
Date 16/05/2023	Des	Designed by MW				
File	Che	Checked by AW				
XP Solutions	Sou	irce Co	nt.rol	2020.1	.3	
Summary of Results	s for 1	100 vea	ar Ret	urn Pe	riod (+30%)	
<u></u>						
Storm	Max	Max	Max	Max	Status	
Event L	evel D	epth Co	ontrol	Volume		
	(m)	(m)	(l/s)	(m³)		
15 min Minhau O	0.01 0	0.01	2 4	220 F	0.17	
15 min Winter 9	103 0	.281	3.4	228.0	OK	
60 min Winter 9	551 0	.403 551	3.4 3.4	327.3 447 4	0 K	
120 min Winter 9	657 0	.JJI 657	3.4	533 5	0 K	
180 min Winter 9	720 0	720	34	584 2	Flood Risk	
240 min Winter 9	.764 0	.764	3.4	620.0	Flood Risk	
360 min Winter 9	.825 0	.825	3.4	670.0	Flood Risk	
480 min Winter 9	.867 0	.867	3.4	704.4	Flood Risk	
600 min Winter 9	.899 0	.899	3.4	729.7	Flood Risk	
720 min Winter 9	.923 0	.923	3.4	749.1	Flood Risk	
960 min Winter 9	.956 0	.956	3.4	776.5	Flood Risk	
1440 min Winter 9	.988 0	.988	3.4	802.3	Flood Risk	
2160 min Winter 9	.999 0	.999	3.4	811.3	Flood Risk	
2880 min Winter 9	.993 0	.993	3.4	806.6	Flood Risk	
4320 min Winter 9	.977 0	.977	3.4	793.2	Flood Risk	
5760 min Winter 9	.950 0	.950	3.4	771.1	Flood Risk	
7200 min Winter 9	.919 0	.919	3.4	746.5	Flood Risk	
8640 min Winter 9	.888 0	.888	3.4	720.9	Flood Risk	
10080 min Winter 9	.856 0	.856	3.4	695.1	Flood Risk	
Ot a rem	Dain			h	Time Deels	
Storm	Rain (mm/hr	F1000		scharge	(ming)	
Event	(1111) 111) VOIU (m ³	nie v)	(m ³)	(millis)	
		(111	,	()		
15 min Winter	130.64	0 0	0.0	206.6	16	
30 min Winter	93.95	8 (0.0	273.4	31	
60 min Winter	64.64	5 0	0.0	439.7	62	
120 min Winter	39.02	1 (0.0	513.7	120	
180 min Winter	28.82	5 0	0.0	534.3	180	
240 min Winter	23.21	1 (0.0	532.7	240	
360 min Winter	17.10	1 ().0	524.6	356	
480 min Winter	13.77	4 ().0	517.4	474	
600 min Winter	11.65	3 (0.0	511.8	590	
/20 min Winter	1U.1/	0 (7 (.0	507.5	706	
1440 min Winter	6 09	/ (1 () 0	502.1	138/	
2160 min Winter	4 54	- () 0	1036 6	2032	
2880 min Winter	3.71	, (1 ().0	1011 5	2336	
4320 min Winter	2.80	_ (0.0	956.7	3244	
5760 min Winter	2.30	6 (0.0	1559.2	4208	
7200 min Winter	1.99	2 0	0.0	1679.5	5120	
8640 min Winter	1.77	3 (0.0	1779.3	6048	
10080 min Winter	1.61	0 0	0.0	1774.6	6960	
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1						

Waterco Ltd		Page 3
Eden Court	15055 - Eryri VIP Tunnel	
Lon Parcwr Business Park	Temporary Accommodation	
Denbighshire LL15 1NJ	Attenuation Storage (east)	Micco
Date 16/05/2023	Designed by MW	
File	Checked by AW	Urainage
XP Solutions	Source Control 2020.1.3	
Ra	infall Details	
	_	
Rainfall Mode.	L FEH	
FEH Bainfall Version) 100 n 2013	
Site Location	n GB 262023 339713 SH 62023 39713	
Data Type	Point	
Summer Storm	s Yes	
Winter Storm	s Yes	
Cv (Summer)) 1.000	
Cv (Winter)) 1.000	
Shortest Storm (mins)) 15	
Longest Storm (mins)) 10080	
Climate Change	8 +30	
Tim	<u>le Area Diagram</u>	
Tota	l Area (ha) 0.706	
Tir	me (mins) Area	
Fro	m: To: (ha)	
	0 1 0.706	
 @1 98	2-2020 Innovyze	

Waterco Ltd	Page 4					
Eden Court	15055 - Eryri VIP Tunnel					
Lon Parcwr Business Park	Temporary Accommodation					
Denbighshire LL15 1NJ	Attenuation Storage (east)					
Date 16/05/2023	Designed by MW					
File	Checked by AW Didlidy?					
XP Solutions	Source Control 2020.1.3					
<u> </u>	Model Details					
Storage is Onl	line Cover Level (m) 10.000					
Tank	or Pond Structure					
Inver	rt Level (m) 9.000					
Depth (m) Area	a (m²) Depth (m) Area (m²)					
0.000	812 0 1 000 812 0					
0.000	012.0 1.000 012.0					
<u>Hydro-Brake®</u>	Optimum Outflow Control					
ITait	Deference MD CUE 0000 2400 1000 2400					
Design	Head (m) 1 000					
Design F	Flow (1/s) 3.4					
E	Flush-Flo™ Calculated					
	Objective Minimise upstream storage					
Ap	oplication Surface					
Sump	Available Yes					
Diam	leter (mm) 88					
Minimum Outlet Pipe Diam	neter (mm) 100					
Suggested Manhole Diam	neter (mm) 1200					
Control Poi	ints Head (m) Flow (l/s)					
Design Point (Ca	lculated) 1.000 3.4					
E.	$\begin{array}{cccccccccccccccccccccccccccccccccccc$					
Mean Flow over H	ead Range - 3.0					
The hydrological calculations hav	ve been based on the Head/Discharge relationship					
for the Hydro-Brake® Optimum as s	specified. Should another type of control					
device other than a Hydro-Brake C	Optimum® be utilised then these storage routing					
Calculations will be invalidated						
Depth (m) Flow (1/s) Dept	th (m) Flow (l/s) Depth (m) Flow (l/s)					
0.100 2.7	1.600 4.2 5.000 7.2					
0.200 3.3	1.800 4.5 5.500 7.5					
0.300 3.4	2.000 4.7 6.000 7.8					
0.400 3.3	2.200 4.9 6.500 8.2					
0.500 3.2	2.400 5.1 7.000 8.4					
0.600 2.9	2.600 5.3 7.500 8.7 2.000 5.7 8.000 9.0					
	3.000 3.7 8.000 9.0 3.500 6.1 8.500 9.3					
1.200 3.7	4.000 6.5 9.000 9.5					
1.400 4.0	4.500 6.9 9.500 9.8					
	1					
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Waterco Ltd			Page 1
Eden Court	15055 - Ery	ri VIP Tunnel	
Lon Parcwr Business Park	Temporary A		
Denbighshire LL15 1NJ	Attenuation	Storage (west)	Micco
Date 16/05/2023	Designed by	MW	
File	Checked by .	AW	Diamage
XP Solutions	Source Cont	rol 2020.1.3	
<u>Summary of Results f</u>	or 100 year	Return Period (+	<u>30%)</u>
	No No	. Non Oboba	_
Event Leve	. Max Max	x Max Statu rol Volume	S
(m)	(m) (1/s	s) (m^3)	
	() ()	, (<u> </u> ,	
15 min Summer 9.31	8 0.318	0.8 46.8	O K
30 min Summer 9.45	0 0.456	0.8 6/.0	O K
120 min Summer 9.73	5 0.735	0.0 91.3 0.9 108.1 Flood R	isk
180 min Summer 9.80	0 0.800	0.9 117.6 Flood R	isk
240 min Summer 9.84	4 0.844	0.9 124.0 Flood R	isk
360 min Summer 9.90	1 0.901	1.0 132.4 Flood R	isk
480 min Summer 9.93		1.0 137.7 Flood R	isk
720 min Summer 9.96	5 0 975	1.0 141.1 Flood R 1 0 143 3 Flood R	1SK isk
960 min Summer 9.98	9 0.989	1.0 145.3 Flood R	isk
1440 min Summer 9.98	9 0.989	1.0 145.3 Flood R	isk
2160 min Summer 9.98	3 0.983	1.0 144.5 Flood R	isk
2880 min Summer 9.97	3 0.973	1.0 143.1 Flood R	isk
4320 min Summer 9.94	8 0.948	1.0 139.3 Flood R 1 0 135 5 Flood R	isk
7200 min Summer 9.89	6 0.896	1.0 131.7 Flood R	isk
8640 min Summer 9.87	0 0.870	0.9 127.9 Flood R	isk
10080 min Summer 9.84	6 0.846	0.9 124.3 Flood R	isk
Storm R	ain Flooded	Discharge Time-Pe	ak
Event (mm	/hr) Volume	Volume (mins)	
	(m³)	(m³)	
15 min Summer 130	.640 0.0	46.5	16
30 min Summer 93	.958 0.0	63.7	31
60 min Summer 64	.645 0.0	93.5	62
120 min Summer 39	.021 0.0	112.4 1	22
180 min Summer 28 240 min Summer 23	.×25 0.0	123.7 1	8∠ 42
360 min Summer 15	······································	137.8 3	⊐∠ 62
480 min Summer 13	.774 0.0	139.1 4	80
600 min Summer 11	.653 0.0	139.6 6	00
720 min Summer 10	.170 0.0	139.9 7	20
960 min Summer 8	0.0	140.4 9	6U 24
2160 min Summer 4		142.2 IZ 237.1 16	∠ 4 0 4
2880 min Summer	.711 0.0	256.7 20	16
4320 min Summer 2	.800 0.0	254.6 28	56
5760 min Summer 2	.306 0.0	320.9 36	88
7200 min Summer 1	.992 0.0	346.5 45	36
8640 min Summer 1 10080 min Summer 1	610 0.0	37U.L 53 392.2 61	งบ 52
		572.2 01	<u> </u>
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Eden Court	15055 - E	ryri VIP Tur	nel	
Lon Parcwr Business Park	Temporary	Accommodati	on	
Denbighshire LL15 1NJ	Attenuati	on Storage ((west)	Mirro
Date 16/05/2023	Designed 1	oy MW		
File	Checked b	y AW		Diamaye
XP Solutions	Source Co	ntrol 2020.1	3	
Summary of Results f	or 100 vea	r Return Pei	riod (+30%)	
<u></u>	<u>01 100 you</u>		<u> </u>	
Storm Max	K Max	Max Max	Status	
Event Leve	m) (m) (1/s (m ³)		
(,	(, (1/5/ (m /		
15 min Winter 9.3	18 0.318	0.8 46.8	O K	
30 min Winter 9.4	56 0.456	0.8 67.0	O K	
60 min Winter 9.6	ZI U.6ZI 26 0 726	0.8 91.3	U K	
180 min Winter 9.8	01 0.801	0.9 117.7	Flood Risk	
240 min Winter 9.8	45 0.845	0.9 124.3	Flood Risk	
360 min Winter 9.9	04 0.904	1.0 132.9	Flood Risk	
480 min Winter 9.9	41 0.941	1.0 138.3	Flood Risk	
600 min Winter 9.9	65 0.965	1.0 141.9	Flood Risk	
720 min Winter 9.9	82 0.982	1.0 144.4	Flood Risk	
960 min Winter 10.0	00 1.000	1.0 147.0	Flood Risk	
1440 min Winter 10.0 2160 min Winter 9 9	86 0 986	1.0 146.9	Flood Risk	
2880 min Winter 9.9	67 0.967	1.0 144.9	Flood Risk	
4320 min Winter 9.9	16 0.916	1.0 134.6	Flood Risk	
5760 min Winter 9.8	62 0.862	0.9 126.7	Flood Risk	
7200 min Winter 9.8	10 0.810	0.9 119.1	Flood Risk	
8640 min Winter 9.7	61 0.761	0.9 111.8	Flood Risk	
10080 min Winter 9.7	14 0.714	0.9 105.0	Flood Risk	
Storm R	ain Flood	ed Discharge	Time-Peak	
Event (mr	n/hr) Volum	e Volume	(mins)	
	(m³)	(m³)		
15 min Winter 130	640 0	0 46 5	16	
30 min Winter 93	3.958 0	.0 40.3	31	
60 min Winter 64	1.645 0	.0 93.5	62	
120 min Winter 39	9.021 0	.0 112.4	120	
180 min Winter 28	3.825 0	.0 123.7	180	
240 min Winter 23	3.211 0	.0 131.3	238	
360 min Winter 1 480 min Winter 1	7.101 0 2.774 0	.0 13/.6	356	
600 min Winter 1	L 653 0	.0 139.3	584	
720 min Winter 10	0.170 0	.0 139.5	700	
960 min Winter	3.217 0	.0 140.0	922	
1440 min Winter	5.091 0	.0 141.7	1340	
2160 min Winter	4.547 0	.0 237.0	1668	
2880 min Winter	3.711 0	.0 256.7	2136	
4320 min Winter 2 5760 min Winter	2.800 0	.u 255.U	3068 3976	
7200 min Winter	L.992 0	.0 346.5	4832	
8640 min Winter	L.773 0	.0 370.1	5704	
10080 min Winter	L.610 0	.0 392.2	6560	
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Waterco Ltd		Page 3		
Eden Court	15055 - Eryri VIP Tunnel			
Lon Parcwr Business Park	Temporary Accommodation			
Denbighshire LL15 1NJ	Attenuation Storage (west)	Micco		
Date 16/05/2023	Designed by MW			
File	Checked by AW	Drainage		
XP Solutions	Source Control 2020 1 3			
R	ainfall Details			
Rainfall Mode	el FEH			
Return Period (year	s) 100			
FEH Rainfall Versi	on 2013			
Site Location	on GB 262023 339713 SH 62023 39713			
Data Ty	pe Point			
Winter Stor	ms Yes			
Cv (Summe	r) 1.000			
Cv (Winte	r) 1.000			
Shortest Storm (min	s) 15			
Longest Storm (min	s) 10080			
Climate Change	\$ +30			
т. т.	me Area Diagram			
<u></u>	ine med bragram			
Tot	al Area (ha) 0.145			
Т	ime (mins) Area			
Fr	com: To: (ha)			
	0 1 0.145			
	222 2020 Tangerera			
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Waterco Ltd	Pa	age 4	
Eden Court	15055 - Eryri VIP Tunnel		
Lon Parcwr Business Park			
Denbighshire LL15 1NJ	Attenuation Storage (west)	Airm	
Date 16/05/2023	Designed by MW		
File	Checked by AW	Jianiage	
XP Solutions	Source Control 2020.1.3		
<u>1</u>	<u>Model Details</u>		
Storage is Onl	ine Cover Level (m) 10 000		
Tank	<u>or Pond Structure</u>		
Inver	ct Level (m) 9.000		
Depth (m) Are	$a (m^2)$ Denth (m) Area (m ²)		
0.000	147.0 1.000 147.0		
Hydro-Brake®	Optimum Outflow Control		
 IInit	Reference MD-SHE-0047-1000-1000-1000		
Desigr	Head (m) 1.000		
Design	Flow (1/s) 1.0		
I	Flush-Flo™ Calculated		
7~	Objective Minimise upstream storage		
Ar	Available Yes		
Dian	neter (mm) 47		
Invert	Level (m) 8.995		
Minimum Outlet Pipe Dian	neter (mm) 75		
Suggested Manhole Diam	neter (mm) 1200		
Control Poi	nts Head (m) Flow (l/s)		
Design Point (Ca	lculated) 1.000 1.0		
F	lush-Flo™ 0.205 0.8		
Maara Elan anon U	Kick-Flo® 0.415 0.7		
Mean Flow over H	ead Range - 0.8		
The hydrological calculations hav	ve been based on the Head/Discharge rel	lationship	
for the Hydro-Brake® Optimum as s	specified. Should another type of cont	trol	
device other than a Hydro-Brake C	Optimum $^{ m I\!R}$ be utilised then these storage	e routing	
calculations will be invalidated			
Depth (m) Flow (l/s) Dept	th (m) Flow (l/s) Depth (m) Flow (l/s)		
0.100 0.8	1.600 1.2 5.000 2.1		
0.200 0.8	1.800 1.3 5.500 2.2		
0.300 0.8	2.000 1.4 6.000 2.3	5	
0.400 0.7	2.200 1.4 6.500 2.3		
0.500 0.7	2.400 1.5 7.000 2.4		
	2.600 1.5 7.500 2.5		
1.000 1.0	3.500 1.8 8.500 2.7		
1.200 1.1	4.000 1.9 9.000 2.7		
1.400 1.2	4.500 2.0 9.500 2.8		
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Appendix I Concept Drainage Sketch

from t roofs to stone	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 ammendment of the 'Proposed Sketch Site Plan' by 'DEWIS ARCHITECTURE'. This drawing provides a concept only and is not intended for detailed design.					
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Appendix J Maintenance Schedule

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	Stabilise and move contributing and adjacent areas	As required
maintenance	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	:

Appendix K Concept Designers Risk Assessment (cDRA)

CONCEPT DESIGNER'S RISK ASSESSMENT

Project:	Eryri VIP Tunnel- Temporary Accommodat	Project No:	15055		
Report Reference:	Drainage Strategy				
Prepared by:	Megan Williams	Date:	18/04/2023		
Checked by:	Aled Williams	Date:	21/04/2023		
Reviewed by:	Nigel Jones	Date:	21/04/2023		

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	Potential for peat	
2	Hazardous Environment	Unknown	To be confirmed at detail design stage	
3	Existing Working Environment	Unknown	To be confirmed at detail design stage	
4	Existing Services	Unknown	To be confirmed at detail design stage	
5	Proximity to Other Structure(s)	Unknown	Blaen Cefn Caravan Park adjacent	
6	Near Waterbody / flood risk	Yes	Unnamed watercourse immediately north of the site	
7	Proximity to Other Activities	Unknown	Blaen Cefn Caravan Park adjacent	
8	Sequence of Construction	Unknown	To be confirmed at detail design stage	
9	Access	Unknown	To be confirmed at detail design stage	
10	Interfaces	Unknown	To be confirmed at detail design stage	
11	Confined Space Working	Unknown	To be confirmed at detail design stage	
12	Maintenance Considerations	Unknown	To be confirmed at detail design stage	
13	Working at Height	Unknown	To be confirmed at detail design stage	
14	Steep Slopes	Yes	Steep embankment up to the A487 to the south	
15	Demolition / Refurbishment / Repair	Unknown	To be confirmed at detail design stage	
16	Welfare	Unknown	To be confirmed at detail design stage	
17	Occupational Health	Unknown	To be confirmed at detail design stage	
18	Environmental Issues	Unknown	To be confirmed at detail design stage	
19	Other Significant Hazards not Identified Above	Unknown	To be confirmed at detail design stage	
20	Residual Risk to Future Users	Unknown	To be confirmed at detail design stage	