

DRAINAGE STRATEGY REPORT

**EXPANSION OF BIKE PARK WALES
GETHIN WOODLAND CENTRE
ABERCANAID
MERTHYR TYDFIL
CF48 1YZ**

Project Reference
6655

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Client
BIKE PARK WALES

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REPORT CONTROL SHEET

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This document is intended to be a working document for further development and discussion with all concerned including Bike Park Wales, Project Design Team Members, The SuDs Approval Body and Natural Resources Wales together with all appropriate regulators.

This document has been prepared exclusively for the use of Bike Park Wales for the purposes of consultation with and approval by the regulators in connection with the specific subject scheme and should not be transferred to any other parties without the express consent of Bingham Hall Partnership Limited. The document's contents, views, conclusions and recommendations should not be used or relied upon by any third parties without the express consent of Bingham Hall Partnership Limited.

1 INTRODUCTION

Bingham Hall Partnership Limited has been commissioned by Bike Park Wales to undertake the Civil and Structural Engineering aspects of the expansion of their facility at Gethin Wood Centre, Abercanaid, Merthyr Tydfil. An activity of the commission is to prepare a Drainage Strategy Report in support of the Planning Application and The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018.

The Clients proposals will provide the following facilities:

- New parking areas for 141 vehicles;
- Overflow parking area with space for 85 vehicles;
- New area for motorhomes with separate foul drainage facilities;
- 21 camping pods, 3 shepherds huts and 5 lodges;
- Shower and toilet blocks;
- Changing village;
- Workshop storage and shed;
- 2 linen pods;
- Relocated trail maintenance yard;
- Play and picnic area;
- New highway access routes;
- New and remodelled footpath network;
- Remodelled bike tracks;
- Ground profile works;
- New foul drainage infrastructure to accommodate the above development;
- New SuDs infrastructure to accommodate the above development;
- Landscape works.

As a result of the enactment of Schedule 3 of the Flood Water Management Act 2010 by Welsh Government, the development will be subject to The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018 as well as planning approval in order to be constructed. This report has been produced to satisfy both approval processes.

This Drainage Strategy Report explains the initial design process that has been undertaken by Bingham Hall Partnership Limited in advance of the Planning and Sustainable Drainage (SuDS) Regulations applications, and is intended to explain the design process undertaken to date, together with the design intent for the proposed foul and surface water drainage systems serving the proposed development.

The objectives of this report are to;

- Outline both the surface water and foul water proposals for the development and also identify the requirements for suitable outfall locations for the Surface Water and Foul Drainage from the development as it has been proven by on site testing that infiltration techniques are not appropriate for this site.
- Provide a vehicle for consultation with the Lead Local Flood Authority, SuDS Approving Body (SAB) and Natural Resources Wales (NRW) regarding the proposals.
- Provide a schematic layout of the proposed foul and surface water drainage proposals.

- Demonstrate compliance with the new National SuDs design standards, specifically standards S1-S6.

2 SITE LOCATION

The site is currently operated as the Bike Park Wales mountain bike park, the proposed works are associated with the expansion of the facility to provide the additional facilities noted at section 1 of this strategy report.

The site is located in Gethin Woods approximately 0.5km west of Abercanaid, at a National Grid Reference of 305160, 203410. The site is irregular in shape and occupies an area of approximately 5 hectares. The boundaries of the site are defined by existing undeveloped and wooded areas to the north, east and west and an extensive network of bike trails and tracks utilised by the bike park to the south and southwest. The areas surrounding the site comprise woodland areas associated with the Bike Park Wales.

The site location is shown in Figure 1.1 below;



Figure 1.1 – Location Plan

3 EXISTING TOPOGRAPHY

A topographical survey of the site has been undertaken by John Vincent Surveys Limited in February 2018; a copy of the survey drawing is included in Appendix A of this report.

The site is on sloping ground towards the base of the valley and falls in a north easterly direction towards the River Taff from an approximate maximum elevation of 260m AOD to an approximate minimum elevation of 220m AOD. Offsite the ground rises more sharply to the southwest to reach a maximum elevation of 471m AOD.

Within the areas of proposed development around the existing building and car park areas the ground level has been reprofiled to form a series of plateaus.

4 SUMMARY OF SITE GROUND CONDITIONS

The 1:10,560 scale geological map of the area (SO 00 SE) indicates the site to be underlain by southerly dipping strata of the South Wales Middle Coal Measures Formation of the Carboniferous Period. The dip of strata in the vicinity of the site is indicated to be 6°-10° to the south.

These rocks typically comprise grey productive coal-bearing mudstones/siltstones, with seatearths and minor sandstones.

The conjectural outcrop of the Lower Cwmgorse Marine Band is indicated traversing approximately through the centre of the site on a northwest to southeast trend, while the conjectural outcrop of the underlying Foraminifera and Upper Cwmgorse Marine Bands are indicated just to the north and the south respectively of the site.

A number of conjectural outcrops of various coal seams are indicated in the vicinity of the site.

The known and conjectured outcrops of the Pentre Rider, the Pentre and the Lower Pentre are indicated to the north of the site. Due to the southerly strata dips these seams would be expected to underlie the northern and central parts of the site at shallow depths, deepening in a southerly direction. Former adits and shafts are recorded along these seam outcrops indicating that these seams have been mined underground in the area. The nearest of these adits are less than 200m to the north of the site.

The Graig and Abergorky seams are shown to outcrop (or conjectured to outcrop) approximately through the centre of the site just below the Lower Cwmgorse Marine Band.

Given the southerly dip of the strata, these seams would underlie the southern half of the site at shallow depths. An adit is shown on the Graig/Abergorky outcrop, approximately 150m to the northwest of the site, again indicating that these seams have been mined underground in the area.

The conjectural outcrop of the Hafod seam is indicated to pass beneath the site, running approximately parallel to the south western edge and therefore this seam could also be shallow beneath these parts of the site.

The solid strata are indicated to be overlain by superficial deposits of Devensian Till of the Quaternary Period. These deposits generally comprise a poorly sorted and variable composition of clays, sands and gravel, with some cobbles and occasional boulders. Superficial deposits are not indicated to overly the bedrock along the southwest edge of the site.

Ground investigation works have been carried out on the site and are documented in the following Integral Geotechnique Site Investigation Reports: -

- Reference 12329/LP/18/DS – Desk Top Study Report dated November 2018
- Reference 12329/LP/18/CMRA – Coal Mining Risk Assessment dated November 2018
- Reference 12329/LW/19/S – Desk Top Study Report dated February 2019

The results of the ground investigation works referenced above were consistent with the anticipated geology. Generally, the ground conditions encountered in the exploratory holes comprised topsoil or made/reworked natural ground over superficial deposits consisting of glacial till deposits.

The glacial till comprised of a vertically and laterally variable sequence of medium dense brown to brown grey silty clayey sandy gravel and firm silty sandy gravelly clay. The gravel consisted of siltstone, mudstone and sandstone with cobbles and boulders encountered. The glacial till was encountered at depths of between 0.2m and 1.4m below existing ground level.

An indicative soakaway test was undertaken in one trial pit which recorded no infiltration. More extensive, proposed location and depth specific further testing has been subsequently undertaken in order to confirm the specific design parameters to inform the final drainage design.

The results of the supplementary specific soil infiltration testing are documented in Messrs Integral Geotechnique (Wales) Limited letter report referenced 12329/LW dated 26th September 2019.

To summarise three additional BRE 365 compliant soil infiltration tests and three BS 6297:2007 (Design and Installation of Drainage Fields for Use in Watercourse Treatment) compliant percolation tests were undertaken on 9th September 2019. The tests were strategically located and undertaken at depths which replicated the proposed soakaways in service.

In conclusion the above report documents that the results of the soil infiltration testing indicated that the superficial deposits consisting of glacial till at shallow depth are unsuitable for the use of sustainable drainage systems. The high clay content of the glacial till deposits prohibits and/or limits the infiltration rates within the soils. Further the results of the drainage field percolation testing indicate that the use of a drainage field for the disposal of effluent from a foul water treatment plant is unsuitable. The high clay content of the glacial till deposits is considered to prohibit the infiltration rates within the soils.

5 FLOOD RISK

Bingham Hall Partnership Limited has consulted the website of Natural Resources Wales. The Development Advice Map (as updated 2017) indicates that the subject site is completely located within Zone A, which in accordance with Technical Advice Note 15, defines an area to be at little or no risk of fluvial or tidal/coastal flooding. Refer to Figure 5.1 below.

Further the Natural Resources Wales Surface Water Flood Map has been consulted, refer to Figure 5.2, also below. The map indicates that the site is essentially outside the surface water flood risk zone, however relatively small local areas of low flood risk are indicated within the site boundary.

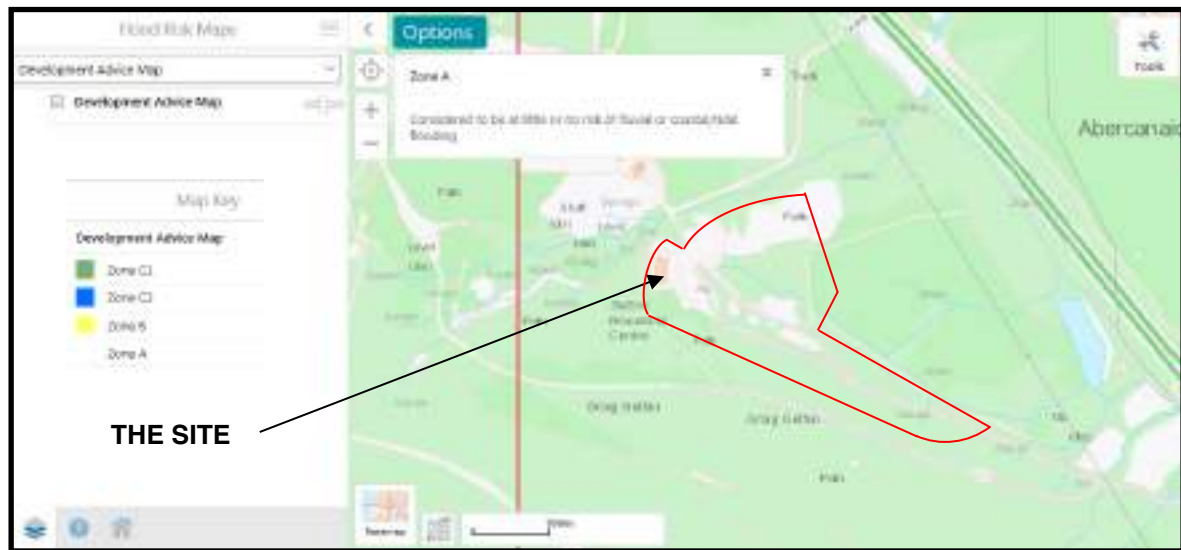


Figure 5.1 – Extract of Development Advice Map (DAM)

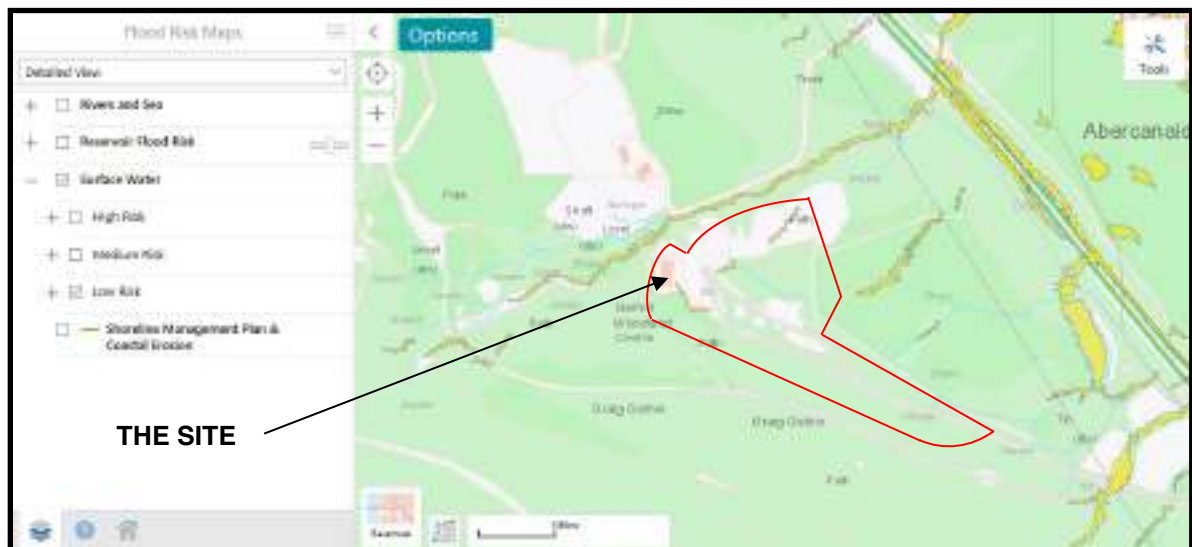


Figure 5.2 – Extract of Natural Resources Wales Surface Water Flood Map

6 DEVELOPMENT PROPOSALS

The proposed landscape masterplan drawing numbered 18/461/011 produced by Peter Quinn Associates is included in Appendix B of this report.

It is proposed that the existing Bike Park Wales facility is expanded to include the following:

- New parking areas for 141 vehicles;
- Overflow parking area with space for 85 vehicles;
- New area for motorhomes with separate foul drainage facilities;
- 21 camping pods, 3 shepherds huts and 5 lodges;
- Shower and toilet blocks;
- Changing village;

- Workshop storage and shed;
- 2 linen pods;
- Relocated trail maintenance yard;
- Play and picnic area;
- New highway access routes;
- New and remodelled footpath network;
- Remodelled bike tracks;
- Ground profile works;
- New foul drainage infrastructure to accommodate the above development;
- New SuDs infrastructure to accommodate the above development;
- Landscape works.

A planning application was previously made to Merthyr Tydfil County Borough Council by The Urbanists on behalf of Bike Park Wales. Merthyr Tydfil County Borough Council allocated the previous Planning Application Number of P/19/0073.

7 FOUL DRAINAGE

There are no DCWW public foul or combined sewer networks within relatively close proximity to the development.

We understand that the foul water drainage from the existing site is routed through a local site network to a packaged treatment plant located to the north west of the site. Natural Resources Wales has advised that the treated effluent discharged from the existing treatment plant outfalls to a receiving watercourse named the Nant Graig. The Client has provided us with the Emissions and Monitoring Schedule of the current discharge permit, a copy of this schedule, reference Schedule 3, is included in Appendix C of this report.

We understand that flows from the existing bike wash areas are routed through a local site network to a reed bed also located to the north west of the site. The Client has advised that the reed bed has been specifically designed to accommodate foul flows from the bike wash. The Client has also provided us with information relating to the existing reed bed which indicates that following treatment the effluent flows, by gravity, from the reed bed to the reed bed level control chamber and onto a manhole connection downstream of the existing foul water treatment facility prior to exiting to the outfall to the above noted watercourse.

Our foul water drainage proposals are indicated on our proposed site wide external works scheme drawing referenced 6655-BHP-ZZ-XX-DR-S-(60)P01S, a copy of which is included in Appendix D of this report.

The effluent from both bike washes and the trail maintenance yard will be routed to the existing reed bed which has been appropriately designed to accommodate such effluent. The Client has advised that the proposed bike wash and trail maintenance installations will be subject to no more uses, the additional facilities merely reducing the demand on the existing.

The Client has advised that there will be no drainage provision required for the workshop and storage shed.

Generally, the proposed development foul water will be routed through a local site network to a proposed new foul water treatment facility located to the north east of the site. Appropriate measures for the trapping of grease prior to effluent entry into the treatment facility will be incorporated into the system as any fat and/or grease passing through the proposed foul drainage system into the final discharge off site to the watercourse would be detrimental. Further the final design of the foul water treatment facility will include a provision to counter fluctuating loads.

The breakdown of foul effluent proposed for discharge to the new foul water treatment facility is as noted below: -

- 5 number Cabins/Lodges
- 1 number Camping Pod converted to a Toilet Pod and 1 number Camping Pod converted to a Shower Pod
- 3 number Shepherd Huts
- 21 number camping pods
- Changing village

The proposed area with provision for 7 motorhomes will have a facility for discharge of foul waste. In consideration that such waste is likely to contain chemicals, this provision will discharge to a separate sealed cesspool which will be used to store the waste until it is pumped clean to a tanker and appropriately disposed at an off-site facility. The Client has advised that this area will be used infrequently, mainly for event days and as such it is proposed to provide an above ground storage system, the details of such a system are included in Appendix E of this report.

The 21 number camping pods do not have any water or drainage connection and will utilise the proposed shower and toilet pods and changing village.

Considering the results of the BS 6297:2007 Percolation Compliant Testing, in accordance with Approved Document H, Part H1 of the Building Regulations (for use in Wales), we would propose one of the following two options for the disposal of foul water, as the results of the above percolation testing precludes option (C)(i).

Option (C) (ii) Either a septic tank or packaged treatment plant with an outfall to a watercourse, effluent treated to 20 (BOD)/30 (Suspended Solids) 20 (NH3) quality. This option is to be approved and consented by Natural Resources Wales.

Option (D) A cesspool with a capacity of 45 days foul effluent inflow. This option is to be approved and consented by Natural Resource Wales.

In accordance with the hierarchy as set out in Part H1, Option (C) (ii) packaged treatment plant alternative is currently the preferred option and is indicated on our strategy drawing.

The design team will engage with the NRW Permitting Team at the earliest opportunity, at a stage when the design is sufficiently developed in order to obtain both a new permit for the proposed foul water treatment facility and, if necessary, an appropriate variation to any existing permit with respect to the existing packaged treatment plant.

Bike Park Wales has provided the maximum anticipated usage data and using British Water Flows and Loads 4 guidance we have estimated the following loads.

PROPOSED TREATMENT FACILITY

21 Camping Pods

240 toilet uses per day, say 180 uses at 10l/use	1800l
and 60 uses at 5l/use	300l
240 shower uses per day at 40l/use	9600l

3 Shepherds Huts

200l/day per hut	600l
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5 Cabins (3 bedrooms)

5 x 3 x 150l/day per cabin	2250l
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New Changing Village

100 toilet uses per day, say 75 uses at 10l/use	750l
and 25 uses at 5l/use	125l

Foul Load at Maximum Usage for 1 day 15425 litres (Say 15.5m³)

Bike Park Wales has confirmed that over a one week operating cycle the percentage of maximum usage is as follows: -

Saturday/Sunday	-	maximum usage
Monday	-	70% maximum usage
Tuesday/Wednesday/Thursday	-	50% of maximum usage
Friday	-	80% maximum usage

Total weekly anticipated usage expressed as a proportion of 700% equates to 77.8m³ per week, that is, $\frac{500}{700}$ or 0.72 maximum daily discharge for a seven day cycle.

FOUL DISCHARGE PROVISION FOR 7 NUMBER MOTORHOMES (2 person occupancy)

7 x 2 x 100 l/day per motorhome	=	1400l
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As noted in the foregoing this facility will be infrequently provided for event days and therefore foul waste is proposed to be stored above ground and tankered away as and when necessary.

8 SURFACE WATER DRAINAGE

The sustainable drainage system proposed for the site is to manage water on or as close to the surface and as close to the source of the runoff as possible. All pathways, parking and access roads are proposed to be constructed using dry bound macadam, a material which has the potential to be locally sourced, including residual hydrocarbon capture membranes where appropriate. Such surfacing facilitates a degree of permeability enabling infiltration into it to a degree, however given the permeability of the in-situ soils below full infiltration is unlikely to occur. Further, gravel porous surfacing is very effective at removing pollution from run-off. The pollutants may remain on the surface (at areas with low gradients) or may be flushed into the granular layer itself where many of the pollutants are filtered and trapped or degrade over time. Further, filter geotextiles are proposed to be incorporated into the construction make-up which will also enhance the final water quality. Aqua swirl units positioned immediately downstream of the car parking areas will also enhance the quality of the offsite flows.

Given the underlying ground conditions most of the rainfall on the paved surfaces will generate sheet flow run off which is proposed to be directed to local swales / filter drains / infiltration strips which will have flow capabilities.

Vegetation growth promoted in the swales together with the incorporation of sacrificial geotextile wrapped layers within the filter drains will be effective in trapping any silt transported off the pavement surfaces via sheet flow. At the proposed parking area to the north of the site, swales and infiltration structures have been arranged within the terrain such that excess runoff will be cascaded down to the lower structure. Across the site it is proposed to link the various SuDS structures by below ground pipework to the vicinity of the outfalls off site as noted below.

The camping pods, showers and toilet blocks have relatively small plan areas and therefore roof run-off will be to adjacent ground. Given the poor infiltration properties of the insitu soils an element of greenfield run off from these areas will migrate to the filter drains located adjacent to the proposed access road and at the car park respectively. The roof run-off from the lodges will be collected via a local network and routed towards the north west of the site prior to being discharged off site at a rate to be agreed into the Nant Graig watercourse.

It is proposed to discharge any excess runoff from the overflow parking area to the south east together with the immediately adjacent length of road, to the existing local drainage ditches at a rate to be agreed. It is proposed to route any excess runoff from the remaining drained areas to the north west of the site where it is proposed to be discharged off site at a rate to be agreed into the Nant Graig watercourse.

Given the poor infiltration properties of the insitu soils, with exception of the overflow car parking area, it will be necessary to include below ground attenuation structures within close proximity to the offsite outfalls to facilitate the limited offsite controlled discharges.

All discharges off site are subject to agreement with the SuDs Approval Body, Natural Resources Wales and other appropriate regulators.

Exceedance storage is proposed to be facilitated by the partial flooding of the lower area of the northern parking.

Statutory Standards for Sustainable Drainage Systems – Designing, Constructing, Operating and Maintaining Surface Water Drainage Systems

In October 2018, the Welsh Government published the ‘Statutory Standards for Sustainable Drainage Systems – Designing, Constructing, Operating and Maintaining Surface Water Drainage Systems’. This standard is now mandatory for new developments with either a construction area greater than 100m² or more than 1 dwelling.

The principles which underpin the design of surface water management schemes to meet the Standards are as follows;

SuDS schemes should aim to;

- Manage water on or close to the surface and as close to the source of the runoff as possible;
- Treat rainfall as a valuable natural resource;
- Ensure pollution is prevented at source, rather than relying on the drainage system to treat or intercept it;
- Manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by the development;
- Take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep;
- Use the SuDS Management Train, using drainage components in series across a site to achieve a robust surface water management system (rather than using a single “end of pipe” feature, such as a pond, to serve the whole development);
- Maximise the delivery of benefits for amenity and biodiversity;
- Seek to make the best use of available land through multifunctional usage of public spaces and the public realm;
- Perform safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance;
- Avoid the need for pumping where possible; and
- Be affordable, taking into account both construction and long term maintenance costs and the additional environmental and social benefits afforded by the system

There are six mandatory standards to be achieved within the National SuDS standards, S1 to S6. The following sections demonstrate compliance with each of these standards.

Standard S1 – Surface Water Run-off Destination

This standard reviews the disposal routes for surface water run-off. The destinations are split into 5 levels with level 1 being the most preferential and level 5 being the least preferred and only used in exceptional circumstances.

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

The feasibility of utilising a rainwater harvesting or recovery system for the expansion of Bike Park Wales has been reviewed and currently cannot be included within the budgeted works. Currently fresh water is being abstracted from an on-site borehole and we understand that the proposed expansion is unlikely to take abstraction requirements beyond the parameters of the current licence. There is also obviously no demand on the mains water supply.

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

Integral Geotechnique (Wales) Limited has undertaken an intrusive site investigation on the site which included BRE Digest 365 compliant infiltration testing and BS 6297:2007 Percolation Compliant Testing. No groundwater infiltration was recorded within the subject test pits and therefore no infiltration rate could therefore be calculated. The reports concluded that the site is unsuitable for any form of infiltration drainage.

The writer is referred to section 4 of this report and Messrs Integral Geotechnique (Wales) Limited site investigation reports as noted below:

- Reference 12329/LP/18/DS - Desk Top Study Report dated November 2018
- Reference 12329/LP/18/CMRA - Coal Mining Risk Assessment dated November 2018
- Reference 12329/LW/19/S - Desk Top Study Report dated February 2019
- Reference 12329/LW - Letter Report dated 26th September 2019.

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

Surface water features cross the site, however the nearest watercourse to the development is the Ordinary Watercourse to the north east known as Nant Graig.

We understand that existing discharges from the existing reed bed, foul treatment plant and surface water sewer network currently outfall to the Nant Graig under restricted flow rates which have been agreed with the relevant regulators.

It is proposed to similarly discharge the majority of flows into the surface water features that cross the site, and, also, the Nant Graig Ordinary Watercourse at greenfield or controlled runoff rates, subject to agreement with the SuDs Approval Body, Natural Resources Wales and other relevant regulators.

Standard S2 – Surface Water runoff hydraulic control

Greenfield Run-off Rates

The Greenfield Runoff rate for the proposed development site has been calculated using the IH124 method. The calculations undertaken for the development have been divided into its two isolated networks.

Network 1 depicted in the surface water calculations considers the car park to the north of the site along with the link road between the north and south car park. Indirectly, Network 1 also caters for a large greenfield area, central to the site; equating to 7940m². The proposed surface water network allows for 50% of this area; assuming the remaining 50% is intercepted by the vegetation, ground and via evaporation.

Network 1 has been divided into three various isolated networks to accommodate the phased construction of the area; consequently, three individual Hydrobrakes have been proposed along with 3 individual attenuation facilities; all of which accommodate, all storm durations for the 1:100 return, along with a 30% allowance for climate change.

The surface water network diagram & impermeable areas diagram, found in Appendix G of this report, outlines the distinction between the three parts of the network. Below, the restricted discharges of the three Hydrobrakes have been calculated using the Q100 Greenfield Runoff Rates and the impermeable area associated with that part of the network; reference should be made to Appendix F for the Greenfield Runoff Rates.

Network 1a;	Total Impermeable Area	= 1,970m ²
Network 1a;	Restricted Flow	= 0.197 / 50 ha x 477 l/s = 1.87 l/s (Say 2.0 l/s)
Network 1b;	Total Impermeable Area	= 7,940m ² + 530m ²
Network 1b;	Restricted Flow	= 0.847 / 50 ha x 477 l/s = 8.1 l/s
Network 1c;	Total Impermeable Area	= 2,440m ²
Network 1c;	Restricted Flow	= 0.244 / 50 ha x 477 l/s = 2.3 l/s

Network 2 depicted in the surface water calculations serves the five timber lodges located to the east of the development and considers the roof areas only; equating to 630m². The Greenfield runoff rate for this part of the development has been calculated below and stipulates the flow restriction for Network 2. Given the low Greenfield rate, a minimum discharge rate of 2.0 l/s has been adopted.

Network 2;	Total Impermeable Area	= 630m ²
Network 2;	Restricted Flow	= 0.063/ 50 ha x 477 l/s = 0.60 l/s (Say 2.0 l/s)

A summary of the catchment areas and the combined discharge rates for the two networks have been shown in Table 8.1 below:

Attenuation Volumes

In line with SUDS manual and CIRIA document C753, the attenuation volumes for the proposed networks, described above, have been calculated, based on all storm durations for the 1 in 100 return period along with a 30% allowance for climate change.

Table 8.1 – Peak Surface Water Discharge Restrictions

Network	Proposed Catchment Area (Ha)	Discharge Restriction (l/s)	Attenuation Volume (m ³)
Network 1a:	0.197	2.0	128.0
Network 1b:	0.847	8.10	240.0
Network 1c:	0.244	2.3	144.0
Network 2:	0.063	2.0	20.0

The above calculations represent the worst case scenario of zero infiltration. On this basis approximately 532m³ of below ground attenuation storage is required. The storage is proposed to be delivered by a series of SuDS features together with supplementary underground storage distributed around the site, final details will be agreed with the appropriate regulators. Given the site topography it is not possible to provide all attenuation storage above ground.

The initial surface water drainage and arrangement of SuDS features on the site are shown on drawing number 6655-BHP-ZZ-XX-DR-S-(60)001, a copy of which is included within Appendix D.

Interception of run-off

Interception mechanisms will be required to ensure compliance with the requirement of zero runoff for the first 5mm rainfall for 80% of storm events during the summer and 50% in winter.

With reference to Table G2.1 'Interception Mechanisms with Assumed Compliance' of the National SuDS Standard which are applicable for small sites, the following table 8.3 demonstrates how the proposed drainage scheme complies with this specific requirement;

Table 8.2 – Proposed Interception Mechanisms

Source of Run-off	Interception Mechanism
External paths and footways	All new external areas are to be constructed with permeable construction and will not be taking additional catchments. The permeable surfaces are therefore compliant with zero runoff for the first 5mm of rainfall.
Parking areas and new highway access routes	All new external areas are to be constructed with permeable construction and will not be taking additional catchments. The permeable surfaces are therefore compliant with zero runoff for the first 5mm of rainfall.
Roof areas	The roof areas are relatively small in comparison to the above areas. Interception mechanisms will need to be addressed during the detailed design process and SuDS application.

Standard S3 – Water Quality

A SuDS treatment train will be required to satisfy Standard S3 of the new SuDs design standards. This is necessary to prevent negative impacts on the water quality of the downstream receiving watercourses and/or drainage systems.

The number of treatment levels within the train will be dependent on the type of land use proposed and the discharge point.

The roof catchment areas would be classified as a low pollution hazard level and therefore one treatment level should be sufficient prior to discharge. All rainwater down pipes will pass through silt traps prior to entering infiltration features.

All external footpaths and roads are proposed to comprise porous construction including filtration membranes, any sheet flow from significant areas of these surfaces is proposed to be discharged to swales or filter drains which incorporate silt traps, filter materials and wraps. Also, along conveyance features silt trap manholes have been included. Car parking areas will additionally be protected by aqua swirl units.

Considering the above measures, the risk of passage of pollutants, silt and debris off site is minimised.

Standard S4 – Amenity

The purpose of Standard S4 is to ensure the design of SuDs components enhance the provision of high quality, attractive public spaces which can provide health and wellbeing benefits.

The general civil engineering design including the SuDs features has been carefully considered and integrated into the landscape architecture from the inception of the scheme.

A landscape architect has been appointed for the scheme and will be providing significant input into the overall development of the scheme from inception to completion.

Further, given that the nature of the development is leisure and sport, amenity has been given careful consideration as it renders the site more attractive to both existing and future customers.

Standard S5 – Biodiversity

Standard S5 requires the design of the surface water management system to maximise the biodiversity benefits.

The general civil engineering design including the SuDs features have been carefully considered and integrated into the landscape architecture. The seeding mixes within the SuDS features have been carefully considered by both the landscape architects and ecologist to add species diversity. The management of the features will include leaving tussocky / longer sward to facilitate reptile and amphibian cover, and to allow a full invert lifecycle (including grub / pupae in litter or tussock layer in winter).

For details and biodiversity benefits refer to landscape architects documentation and ecologists specification and statements. The surface water management system has been fully considered by both the developments landscape architect and ecologist and maximises the biodiversity benefits.

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

The SuDs solution has been designed in accordance with the SuDS Manual and is generally served by shallow SuDs features. No inherent safety issues have currently been identified with the proposed scheme and any issues which arise will be addressed via designer's risk assessments during the remainder of the design process.

All areas of the proposed SuDS infrastructure are in accessible areas for ease of maintenance.

Maintenance responsibilities of the various Suds features on site need to be clearly defined. Technically mandatory adoption by the Suds Approval Body only applies where the SuDs feature serves more than 1 property. An overland flow route plan is included in Appendix H. This demonstrates that the proposed levels design ensures that if any exceedance events occur, flows are directed to follow pre- development flood flow routes.

9 CONCLUSIONS

The foul drainage from the proposed motorhome area will discharge to a sealed cesspool which will be periodically pumped out and tankered off site for appropriate disposal.

The flows from the existing bike wash areas are routed to a reed bed which has been specifically designed to accommodate such flows. The effluent from both bike washes and the trail maintenance area will be routed to the existing reed bed. The client has advised that the proposed bike wash and trail maintenance installations will be subject to no more use, the additional facilities merely reducing the demand on the existing.

The foul drainage from the balance of the serviced development will be routed via a below ground network to a proposed on-site packaged treatment plant. The treated effluent from the treatment plant will be conveyed off site to a watercourse. Alternatively, if Natural Resources Wales / lead local flood authority object to discharge to the local ordinary watercourse a sealed cesspool will be provided to take the flow, the cesspool will be periodically pumped out and tankered off site for appropriate disposal.

All foul drainage routed to the packaged treatment plant will be passed through appropriate grease traps.

As determined in Standard S2 above, the proposed surface water for networks 1 and 2 will discharge off site with restricted flows of 5.0 l/s and 2.0 l/s respectively. A sum attenuation storage volume of 520m³ will be required for the development, designed to accommodate all storm durations for the 1 in 100 return period with a 30% allowance for climate change; this attenuation has been based on zero infiltration to the ground below.

Permeable paving will be used at the proposed parking areas, highway access routes, external paths and footways. It is likely that only minimal infiltration will be achieved with excess sheet flows which will be directed to adjacent infiltration/conveyance structures. These structures are interlinked and direct excess runoff to the lower areas of the site. Controlled outfalls to the existing offsite ordinary watercourse and site features will be required with associated below ground crated storage.

All paved areas are to comprise porous construction incorporating geotextile filters. Sheet flows from significant areas of such surfaces are proposed to be directed to swale or filter drain infiltration/conveyance structures which incorporate silt traps, filter materials and wraps. Also, along conveyance features silt trap manholes have been included. Immediately downstream of car parking areas aqua swirl units have been incorporated into the systems.

Considering the above measures, the risk of passage of pollutants, silt and debris off site will be minimised.

The overall surface water drainage strategy for all phases of this project has obtained the consent of the SuDS Approval Body (SAB). Merthyr Tydfil County Borough Council has issued a Compliance Certificate, SAB Plan Number SAB/20/0011.

All appropriate permits and consents will be obtained from the regulators, particularly Natural Resources Wales, prior to the drainage systems being put into beneficial use.

APPENDIX A

TOPOGRAPHICAL SURVEY DRAWING

