SuDS Strategy

Weycock Cross, Barry

Cardiff and Vale College

Prepared by:

SLR Consulting Limited

3rd Floor, Brew House, Jacob Street, Tower Hill, Bristol, BS2 0EQ

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Basis of Report

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Appendices

1.0 Introduction

Authorisation

1.1 SLR has been instructed by Cardiff and Vale College to prepare a Sustainable Drainage Systems (SuDS) Strategy to support an outline planning application and SuDS Approval Body (SAB) application associated with a proposed redevelopment at Weycock Cross, Barry.

Background

1.2 The site currently supports educational and residential development. It is approximately 1,47 hectares (ha) in size and is in northwest Barry.

1.3 According to the Natural Resources Wales (NRW) Flood and Coastal Erosion Risk Maps, the site is not susceptible to flooding from rivers or the sea.

1.4 It is proposed to redevelop the site for residential purposes. The proposed site plans are enclosed in Appendix A.

1.5 This SuDS Strategy has been undertaken in accordance with the guidelines set out in the Statutory National Standards for Sustainable Drainage Systems (SuDS) for Wales.

Aims and Objectives

1.6 The purpose of this report is to coordinate the various technical pieces of information that have been used to support the SAB application.

1.7 This is an interim version of the report, which has been prepared to support the pre-application consultation (PAC) and SAB pre-application. The content is subject to change, once these initial stages are complete.

1.8 It is also intended that this report will be submitted to support the forthcoming planning application, at a later stage.

1.9 The objectives of this SuDS Strategy are to:

- Undertake a desk-based review of the available data for the site to assess flood risk and surface water drainage issues.
- Review the relevant planning policy documents to ensure that the redevelopment is in accordance with these and other relevant regional and local guidance.
- Assess whether the redevelopment will result in an increase of surface water runoff and how this can be mitigated through the application of SuDS.
- Present a summary and justification of the strategy and associated SuDS adopted on site.
- Append key technical drawing, calculations and design.

2.0 Site Description

Site Location and Description

2.1 The site currently supports the mixed use of a residential and educational development. It is approximately 1.47 ha in size and is in northwest Barry.

2.2 The approximate National Grid Reference of the site is ST093691. A site location plan is enclosed in Appendix A.

2.3 Most of the site (approximately 0.5 ha) is impermeable, which consists of either roof or paved surfaces.

2.4 The immediately surrounding area consists of woodland and fields.

Site Topography

2.5 A topographical survey of the site is enclosed in Appendix B. It shows that the ground levels on the site falls from north-east to south-west. The highest point on the site is approximately 59 metres Above Ordnance Datum (m AOD); the lowest point is approximately 36 m AOD.

Geology and Hydrogeology

2.6 The 1 in 50,000 scale British Geological Survey (BGS) online mapping indicates that the site consists of multiple bedrock layers with the south-west part of the site consisting of St Mary's Well bay Member – Limestone and mudstone, the centre (where the majority of the development is to take place) consisting of Lavernock Shales Member – Mudstone and the east part of the site is underlain by Porthkerry Member - Limestone and mudstone. No superficial deposits are indicated to be present on site.

2.7 A Soakaway Investigation Report was completed by TerraFirma in September 2023 (refer to Appendix C). Two infiltration test pits were excavated across the site. Pits were excavated to a maximum depth of 1.5 m. No groundwater was recorded in any of the trial pits.

2.8 The results recorded no infiltration potential on site. Only one test was undertaken in each trial pit.

2.9 The site is not located within a groundwater Source Protection Zone (SPZ).

Hydrology and Existing Drainage

2.10 The topographical survey shows an existing watercourse located to the south-west of the site, beneath the access road. This drains in a north-west direction and eventually into the River Waycock.

3.0 Flood Risk

3.1 According to the NRW Flood and Coastal Erosion Risk Maps, the site is not at risk of flooding from rivers or the sea fluvial. However, the lower lying parts of the site are susceptible to surface water flooding. Refer to Figure 1.

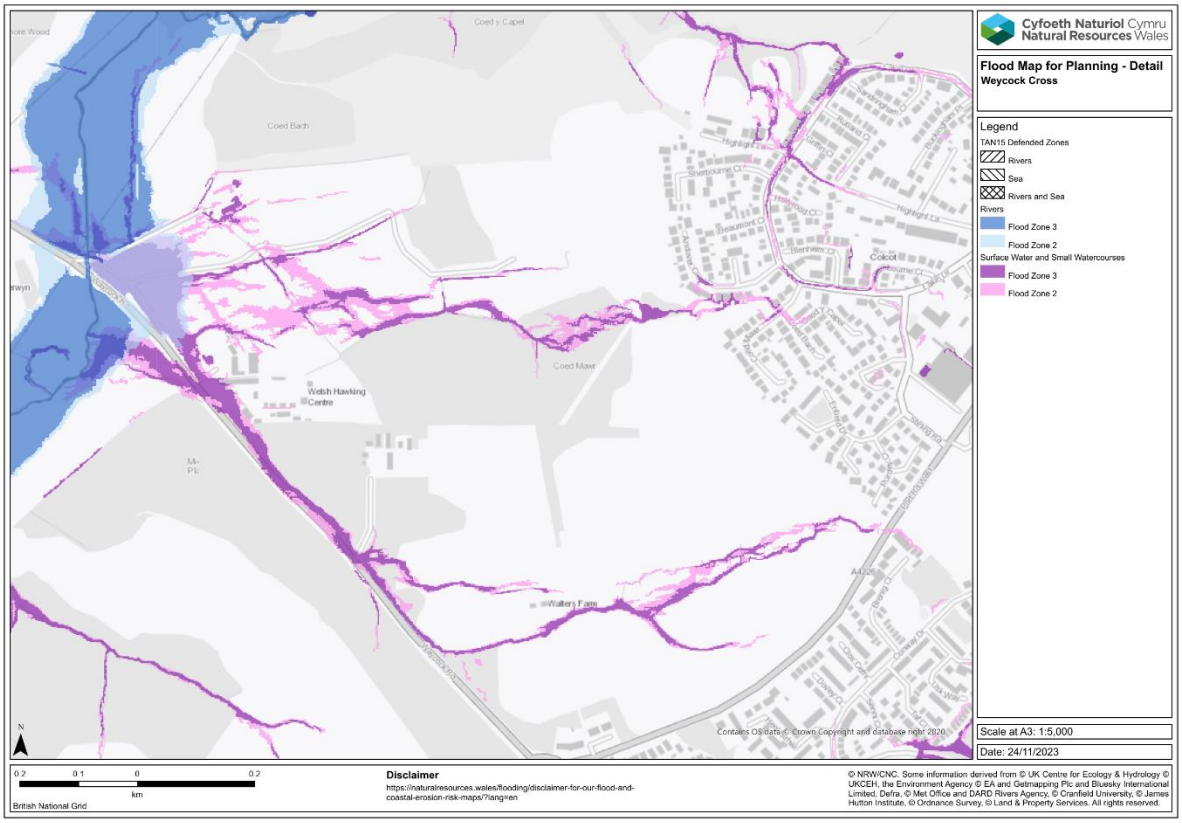


Figure 1: Flood Risk Map

3.2 A surface water flood flow path generated from off site is identified along the southwest boundary of the site at the vehicular access onto Waycock Road. All built development and SuDS have been located outside of this surface water flow path.

Other Sources of Flooding

3.3 A desktop review has not identified any other potential significant sources of flood risk at the site.

Flood Mitigation

3.4 Finished floor levels (FFL) of all dwellings should be elevated above the surrounding ground levels by at least 150 mm in accordance with building regulations. This will protect against the possibility of shallow ponding of water which is inevitable following heavy or prolonged rainfall.

4.0 Surface Water Management

Overview

4.1 It is well understood that one of the effects of development is typically to reduce the permeability of the site and consequently to change its response to rainfall. Therefore, a suitable surface water drainage strategy is required to ensure that the surface water runoff regime is managed appropriately so that there will be no increase flood risk to third parties.

4.2 A fundamental principle of sustainable development is the reduction of surface water runoff. Surface water drainage arrangements for any development site must ensure that volumes and peak discharge rates leaving the site are no greater than those for the site prior to development. Any increase in surface water run-off above the pre-development volumes must also be controlled on site.

4.3 The Statutory National Standards for Sustainable Drainage Systems (SuDS) for Wales outline the key standards that must be met when managing surface water runoff from a new development site. This has informed this SuDS Strategy.

Proposed Surface Water Discharge Receptor

4.4 The drainage hierarchy presented in the Statutory National Standards for Sustainable Drainage Systems (SuDS) for Wales states that the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

- Collected for use,
- into the ground (infiltration),
- to a surface water body,
- to a surface water sewer, highway drain, or another drainage system,
- to a combined sewer.

4.5 The nature of the development (i.e. small private roof surfaces) is not conducive to an economic rainwater harvesting system. Water butts will be used and runoff from roof surfaces and runoff from roof surfaces will be harvested informally to supply water for vegetation in rain gardens.

4.6 As discussed in Chapter 2, the Soakaway Investigation Report completed by TerraFirma presented no infiltration potential. A surface water body is available on site at the access. All surface water runoff from the site will be discharged to this watercourse at a restricted rate.

Greenfield Runoff Rates

4.7 The FEH method has been used to calculate the greenfield runoff rates for the site. The parameters utilised and the calculated rates are provided in Table 1 and 2, respectively. Full results are provided in Appendix E.

Table 1: Calculation Parameters

Parameter	Value	Unit
Area	1	ha
SAAR	980	mm
BFI HOST 19	0.372	-
Region	9	-

Table 2: Greenfield Rates

Return Period	Peak Greenfield Discharge (l/s/ha)
QBAR	9.56
Q1	8.41
Q30	17.01
Q100	20.84

4.8 The QBAR discharge rate of 9.56 l/s/ha has been adopted and all storms up to and including the 1 in 100 year plus climate change event will be restricted to this rate.

Proposed Surface Water Drainage Strategy

4.9 The surface water management strategy proposed for the site has been derived based upon the principles of sustainable drainage as detailed in the CIRIA SuDS Manual (2015) and the Statutory National Standards for Sustainable Drainage Systems (SuDS) for Wales.

4.10 SuDS will be utilised to manage surface water runoff from the site. Roof surfaces will drain to rain gardens, which will subsequently connect into a pipe system. All roads and parking areas will be constructed using permeable surfaces, which will also subsequently connect into the basin. The existing highway will maintain its existing drainage arrangement.

4.11 These various source control SuDS will be located throughout the development and will offer interception of smaller rainfall events.

4.12 Subject to adoption criteria, the new highway will be constructed using permeable surfaces, which will overfall to a detention basin. Most roof surfaces will drain into a rain garden before being collected by a pipe system, which will outfall to the detention basin. One roof surface is flat and has been shown to accommodate a green roof. An existing dwelling is to be retained and downwater pipes from the roof will be connected into the underground pipe network and subsequent detention basin.

4.13 The detention basin will provide attenuation storage and a final water quality treatment. The basin will release runoff into the watercourse at greenfield rates. This will be achieved using a hydrobrake (or similar approved) fitted within a manhole downstream of the detention basin.

4.14 A Preliminary Surface Water Drainage Layout is enclosed in Appendix F, which present the SuDS that are proposed. A MicroDrainage Source Control calculation has been prepared to inform the design of the detention basin. This has been undertaken based on the parameters identified in Table 3. The current impermeable area refers to all paved and roof surfaces. A 10% urban creep allowance has been applied to roof surfaces. A 40% climate change allowance has been adopted, as required by national guidance. The discharge rate was estimated based on current impermeable surface area (i.e. 0.258 x 9.56 = 2.5 l/s).

Table 3 – Detention Basin Storage Parameters

Parameter	Values	Units
Current impermeable surface area	0.258	ha
Urban creep	10	%
Future impermeable surface area	0.265	ha
Discharge rate	2.5	l/s
Climate change allowance	40	%
Basin average side slope	1:4	-

4.15 The calculations are enclosed in Appendix E. Table 4 identifies details of the detention basin, which was found to be required. These details are also shown on the Preliminary Surface Water Drainage Layout (Appendix F).

Table 4: Preliminary Basin Design Details

Total Basin Depth (m)	Basin Area (m^2)	Attenuation Storage Volume (m^3)	Freeboard Depth (m)
1.6	370	173	0.3

4.16 Additional space has also been allocated around the detention basin for earthworks and maintenance access requirements. However, the basin earthworks, along with the wider drainage network, are subject to detailed design.

Exceedance

4.17 Surface water flow paths in extreme events, known as exceedance events (i.e. events in excess of the design criteria i.e. the 1 in 100 year plus climate change event), should be steered away from properties and to provide better protection to people and property. Exceedance routes are shown on the Preliminary Surface Water Drainage Layout enclosed in Appendix F.

Impact on Flood Risk

4.18 The existing runoff rates have been estimated using the Wallingford Procedure and based on an existing impermeable area of 0.51 ha. This shows that a peak flow of 88 l/s is generated in a 1 in 100 year 30 minute storm (see Appendix E). Whilst the Wallingford Procedure is sometimes considered to overestimate runoff rates, it is evident that the restriction to the QBAR rate (2.5 l/s) will result in a significant reduction in runoff discharged from the site and will provide betterment downstream.

Water Quality

4.19 In accordance with the CIRIA SuDS Manual (2015), SuDS components must have a total pollution index that equals or exceeds the pollution hazard index for different land use classifications. It is considered that the SuDS provided as part of the surface water drainage strategy would offer sufficient mitigation for the land use classification.

4.20 This has been undertaken for different land use categories and the SuDS that have been proposed for certain components of the site. Table 5 shows the pollution hazard indices for paved surfaces. All paved surfaces will drain through permeable paving, which provides adequate mitigation (see Table 6). These tables are informed by Table 26.2 and 26.3 of the CIRIA SuDS Manual (2015)).

4.21 In reality, the runoff from paved areas will also be attenuated within the detention basin which will provide further pollution mitigation.

Table 5: Pollution Hazard Indices for Paved Surfaces

Land Use	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change	0.5	0.4	0.40

Table 6: SuDS Mitigation Indices for the Proposed Development

Type of SuDS	Mitigation Indices

	TSS	Metals	Hydrocarbons
Permeable paving	0.7	0.6	0.7

4.22 Table 7 shows the pollution hazard indices for roof surfaces. Almost all roof surfaces will drain through a rain garden, which provides adequate mitigation (see Table 8). These tables are informed by Table 26.2 and 26.3 of the CIRIA SuDS Manual (2015)).

4.23 All roof surfaces will also drain through the detention basin, which will provide further pollution mitigation.

Table 7: Pollution Hazard Indices for Roof Surfaces

Land Use	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roof surfaces	0.2	0.2	0.05

Table 8: SuDS Mitigation Indices for the Proposed Development

Type of SuDS	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Rain garden	0.8	0.8	0.8

5.0 Conclusions

5.1 SLR has been instructed by Cardiff and Vale College to prepare a Sustainable Drainage Systems (SuDS) Strategy to support an outline planning application and SuDS Approval Body (SAB) application associated with a proposed redevelopment at Weycock Cross, Barry.

5.2 This SuDS Strategy has been undertaken in accordance with the guidelines set out in the Statutory National Standards for Sustainable Drainage Systems (SuDS) for Wales.

5.3 A desktop study has concluded that most of the site is not susceptible to flood risk. However, a surface water flow paths impacts the southern site boundary at the access. Development has been steered outside of this part of the site.

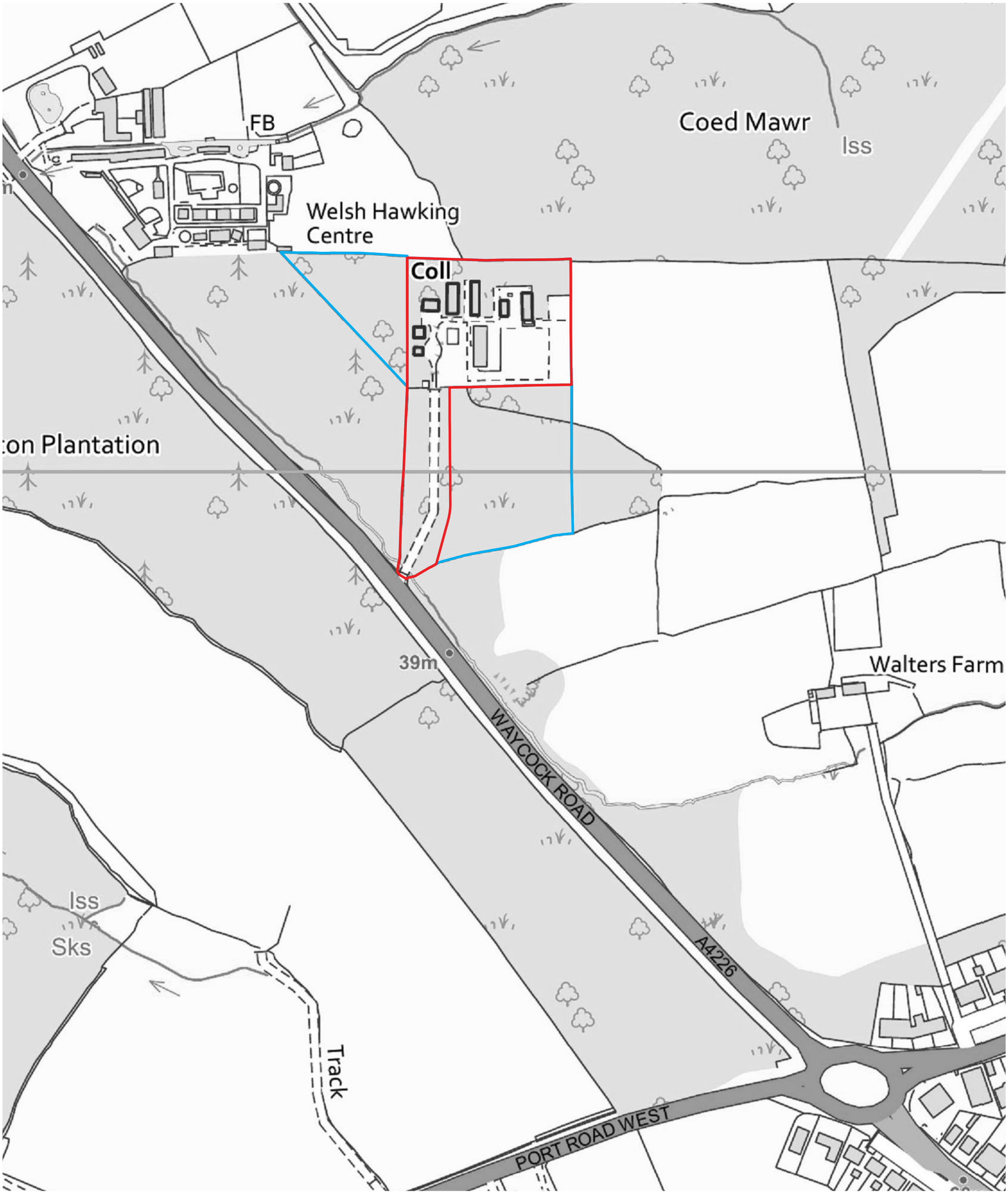
5.4 The surface water drainage strategy includes an extensive network of SuDS, including rain gardens, permeable paving and a detention basin.

5.5 An attenuation-based surface water drainage strategy has been proposed to manage surface water generated from the proposed impermeable surfaces, which will subsequently discharge to the watercourse on site at a controlled rate.

5.6 The SuDS have been designed to also permit the localised interception of rainfall during the smaller storm events.

5.7 The drainage strategy is subject to detailed drainage design and SAB full application, prior to construction.

Appendix A Site Plans



Key

Site Boundary

Additional Land Within Applicant's Ownership

0 50m 100m 150m

Project	Weycock Cross: Barry College Redevelopment
Title	**Site Location Plan**
Client	Cardiff and Vale College
Date	07.12.23
Scale	1:2500 @ A3
Drawn by	SG
Drg. No.	IL60108/01-007RevA

N

LG/LF60108/01

LICHFIELDS

Key

Site Boundary

Vehicular & Pedestrian Access

Notes

Provision is to be made for one vehicular and pedestrian access from Weycock Road at a point between point A and point B - Refer to drawings:

216432_PD05 Rev D - Priority Junction GA

216432_PD06 Rev D - Proposed Carriageway Alignment GA

0 20m 40m 60m

Project	Weycock Cross Campus, Barry
Title	**Parameter Plans** Parameter Plan 1: Access
Client	Cardiff and Vale College
Date	05.12.23
Scale	1:1000 @ A3
Drawn by	SG
Drg. No.	IL60108/03-002 RevB

N

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LICHFIELDS

Key

Site Boundary

Extent of Development (see notes)

Area to Accommodate Access (see notes)

Ancient Semi-Natural Woodland Boundary (within area shown as extent of development)

Notes

The blue shaded area denotes the maximum extent of built development within the site for residential uses, roads, footpaths, cyclepaths, ancillary uses, play space and SuDs. However buildings, SuDS and infrastructure should lie outside the ASNW boundary. Rear gardens of properties or other soft landscaping features would be acceptable within the ASNW boundary.

Within the green shaded area 'development' that may take place can include: landscaping, cycleways, footpaths, lighting, roads/ junctions, infrastructure above/below ground, SuDs and fencing.

0 20m 40m 60m

Project	Weycock Cross Campus, Barry
Title	**Parameter Plans** Parameter Plan 2: Extent of Development (DRAFT)
Client	Cardiff and Vale College
Date	05.12.23
Scale	1:1000 @ A3
Drawn by	SG
Drg. No.	IL60108/03-002 RevB

N

LF/60108/03

LICHFIELDS