DRAINAGE STRATEGY

Tredegar Welsh Medium Primary School

Report Reference: DS_MTD_2103

December 2021

Hannah Collis

Drainage Design Engineer MTCBC

MERTHYR TYDFIL
County Borough Council
Cyngor Bwrdeistref Sirol
MERTHYR TUDFUL

CONTENTS

DOCUMENT CONTROL

Project	Tredegar Welsh Medium Primary School
Client	Blaenau Gwent County Borough Council
Reference	MTD_2103

Rev.	Issue	Author	Checked	Date
-	PAC	HC	HW	08/12/2021

1.0 INTRODUCTION

Merthyr Tydfil County Borough Council Engineering have been commissioned by Blaenau Gwent County Borough Council to produce a preliminary surface water drainage strategy for a new Welsh Medium Primary School in Sirhowy, Tredegar. The preliminary drainage strategy is to support a pre-application submission to the SuDS Approving Body (SAB). Detailed design and full SAB application will be completed as part of a design and build contract.

POLICY CONTEXT

The drainage strategy will be based on the principles of sustainable drainage systems (SuDS) in order to meet the Welsh Government Statutory Standards for Sustainable Drainage Systems and the requirements of the SAB under Schedule 3 to the Flood and Water Management Act 2010.

The strategy has taken account of the Blaenau Gwent County Borough Council Local Flood Risk Management Strategy (2013) and the Blaenau Gwent Local Development Plan 2013-2021. This drainage strategy contributes to the following LFRMS measures:

- *increasing approaches that utilise the natural environment, like adopting soft engineering in place of traditional solutions, managing of the land to reduce storm runoff, creating more wetlands to store water*
- *encourage the sustainable drainage systems (SuDS) approach for surface water management for both new and existing developments*
- *incorporating greater resilience into the design of development (houses, buildings, roads and paved areas)*

The strategy meets the following LPD policy:

> *SP7 Climate Change*
>
> *2c. Managing flood risk through incorporating measures in design and construction to reduce the effects of flooding.*

DEVELOPMENT PROPOSALS

The proposed development is a new 210 pupil Welsh medium primary school complex. The development will consist of a single storey school building, hard play areas, bus drop off area, parking, service yard, MUGA and landscaped areas including 'play on the way' and SuDS features. Access to the site will be created from the existing highway to the east (Chartist Way).

A development plateau to site the school building will be created by lowering ground levels in the east and using this material as fill to raise ground levels in the west. Relative ground levels can be inferred, however specific proposed site levels are not available from the client at this time.

2.0 Baseline Conditions

Site Location

The site is located on a disused area of land along Chartist Way in Sirhowy, Tredegar. The grid reference for the central point of the proposed site is (SO) 314380E, 210215N. Figure 1 below shows a site location plan.

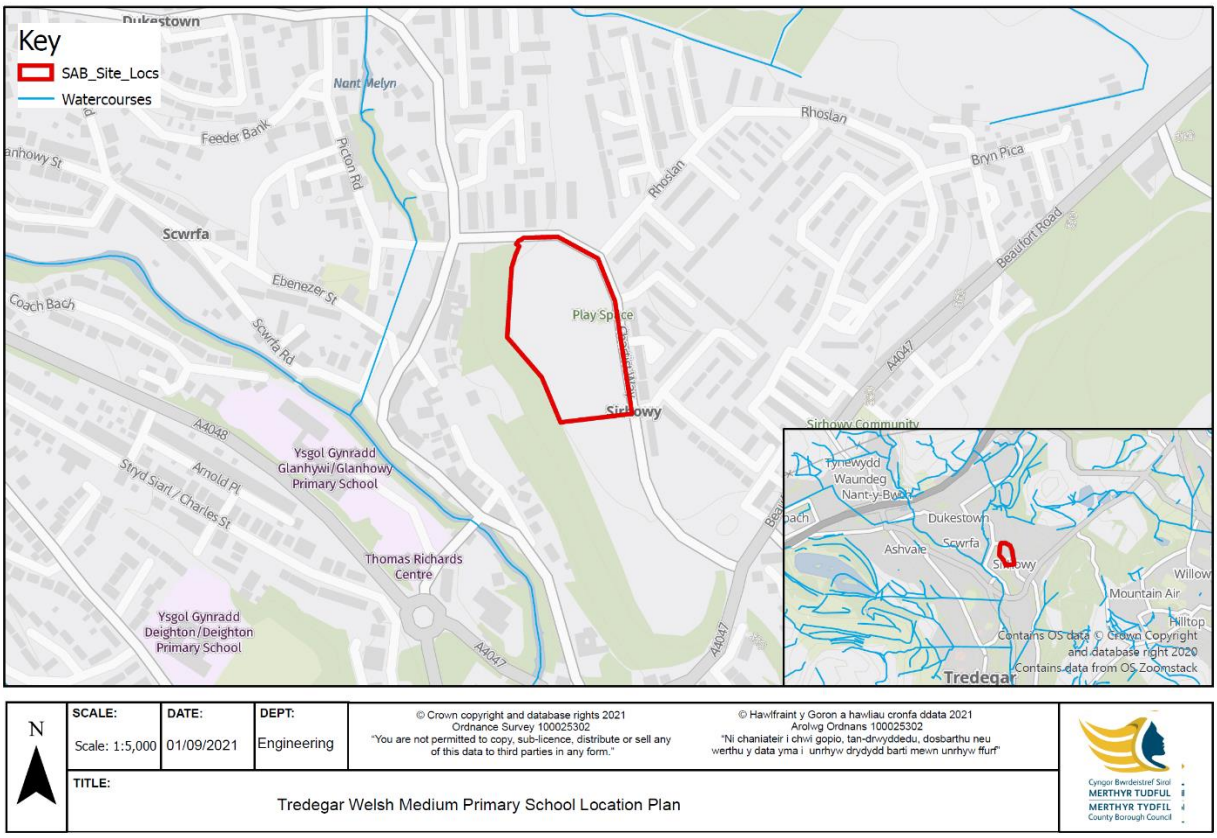

Figure 1: Site location map with inset.

Site Description

The site comprises an area of mainly marshy grassed fields used for grazing and a small playground in the north east area. The site has an irregular shape; it is approximately 220m long and varies from approximately 80-120m wide. The site is bordered to the west by a very steep, wooded embankment extending down to the historic iron works and Dukestown Road. Along the northern and eastern boundary is Chartist Way public highway. Further grassed fields extend to the south of the site; the most southerly extent of the site lies approximately opposite the Chartist Way-Green Meadow junction. There is currently no vehicular access to the site except for farm vehicles which can gain access from Chartist Way.

The topography of the site slopes from east to west towards the embankment leading to Afon Sirhywi (200m west of the site). There is approximately 6m decrease in elevation from east boundary to the west boundary from 349m AOD to 343m AOD.

In the late 1800s the site was heavily industrialised, with building and infrastructure associated with the Sirhowy Ironworks. In the early 1980s, a level plateau was created from the spoil on site with an embankment on the west boundary and Chartist Way on the east.

Existing Hydrology & Drainage

From a desktop survey using available mapping it has been determined that the closest watercourse to the site is Nant Melyn stream located 200m NW of the central point of the site. The Sirhowy River is located approximately 250m SSW of the central point of the site. There are a number of small tributaries of Nant Melyn from 500m northwards.

There is currently no active surface water drainage for the majority of the site. In the south of the site along the western boundary there is a gravel drain measuring 500mm x 52m which is likely to be linked to similar gravel drains running down the western boundary of the fields to the south of the site.

Dŵr Cymru Welsh Water (DCWW) mapping (Figure 2) indicates that a 225mm surface water sewer crosses the site within the small embankment adjacent to Chartist Way along the northern boundary. The sewer skirts the western boundary of the site for approximately 40m travelling further west down the embankment eventually outfalling to Afon Sirhywi. There are no other DCWW assets within the site boundary. A larger 18IN surface water sewer is located within the footway of Chartist Way public highway adjacent to the site's northern boundary. This sewer outfalls to Nant Melyn to the west.

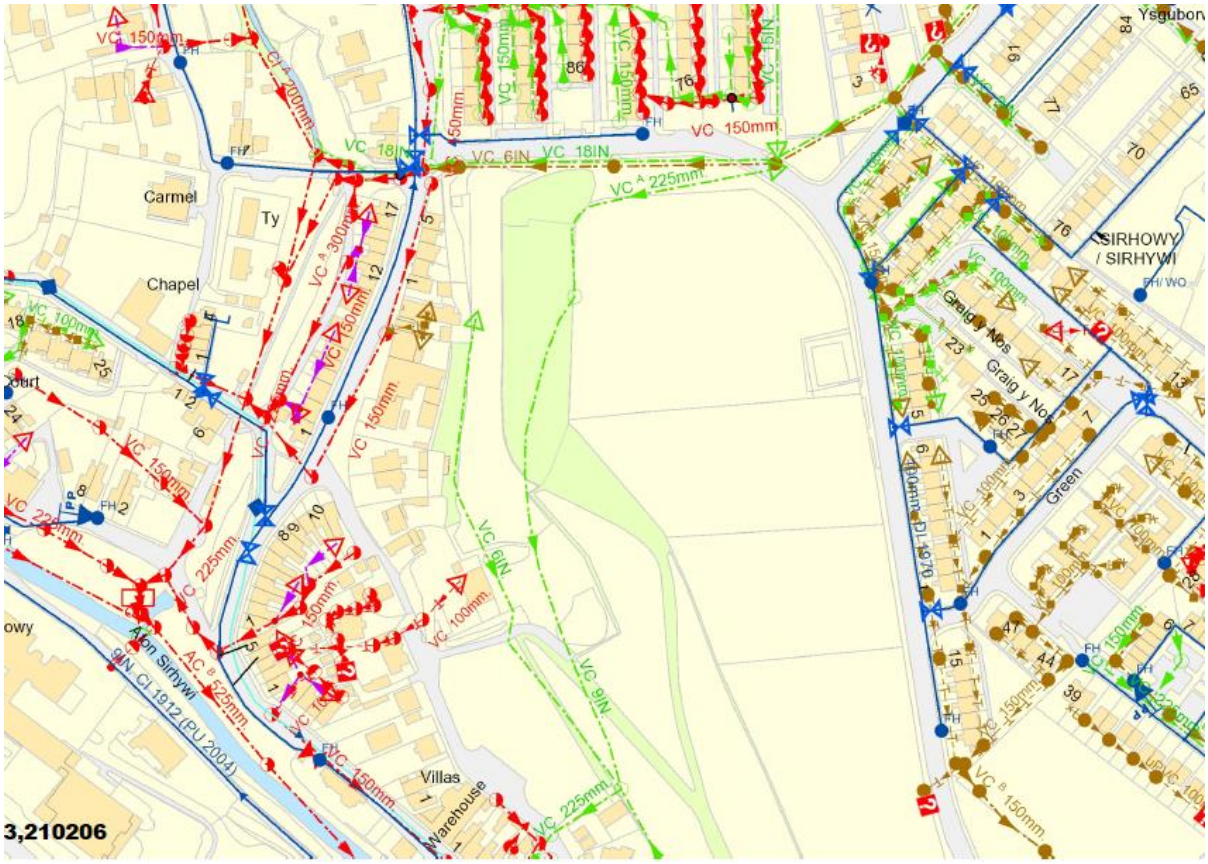

Figure 2: Dŵr Cymru Welsh Water Asset map

Existing Surface Water Discharge Rates

The proposed development has a site area circa 2.158ha which consists mostly of grassy fields aside from a small hard surfaced playground area (~550m^2). Therefore the existing run-off rates are assumed to be equivalent to greenfield rates.

The greenfield run-off rates for the existing site were determined through rural runoff calculations using ICP SuDS methodology and using uksuds greenfield runoff estimation tool (IH124 method). The greenfield runoff rates for the site are listed in table 1 below.

Method	QBAR	Q (1 year)	Q (30 year)	Q (100 year)
ICP SuDS (2.158ha)	17.4	15.4	30.8	38.0
IH124 (2.158ha)	33.01	29.05	58.76	71.96
Average	**25.21**	**22.23**	**44.78**	**54.98**

Table 1: Greenfield runoff rates in l/s

Flood Risk

The site is not shown to be at risk of flooding from rivers according to the 'Flood Map for Planning' (recently released as 'best available information') and is located in Zone A of the 'Development Advice Map' indicating the area is considered to be at little or no risk of fluvial or coastal/tidal flooding. The site is not shown to be at risk of flooding from surface water and small watercourses.

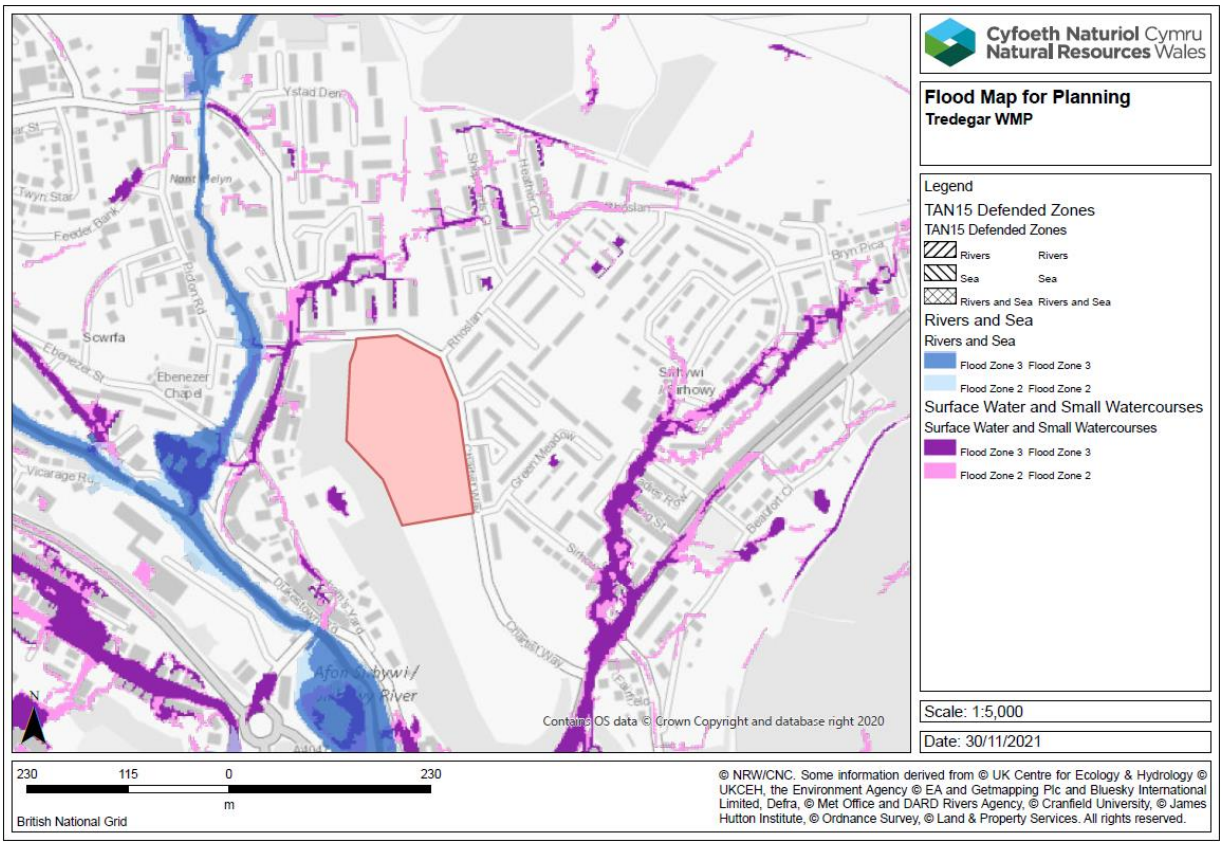

Figure 3: Flood risk according to Flood Map for Planning (NRW, 2021)

3.0 SuDS Strategy

Design Rational

Surface water runoff from the development will be managed in line with the Sustainable Drainage Systems Standards for Wales. How these standards will be met will be outlined in the following sections of this drainage strategy.

The SuDS strategy for the site has a strong focus on vegetated, source control SuDS. Having a SuDS scheme that is integrated with the school and its surrounding landscape has been an integral part of the design development and has resulted in a harmonious incorporation of SuDS in the landscape. This integrated approach has created great potential for using the SuDS around the site for educational purposes, providing excellent amenity benefit. The use of source control SuDS allows storage volumes to be dispersed across the site and therefore helps to keep the SuDS shallow and avoids the use of a site control with deep water which would not be appropriate for a school site.

Precedent Images

Figure 4: Clockwise from top left- Rednock School wetland, Illman Young Design; Bewdley School Science Block flowering swale, Robert Bray Associates; Play-on-the-way Raingarden, Designer unknown; Grey to Green Sheffield Raingarden, Sheffield City Council, RBA & Nigel Dunnett.

Description

Runoff from the proposed school building will be managed at source by a green roof. Oufalls from the roof in the form of rain water pipes (RWPs) will discharge to the closest raingarden or conveyed to a raingarden by an adjacent swale. Runoff from the RWPs will cross hard surfaced areas using dish channels to provide visual interest and an interactive feature. Hard surface play areas around the building will fall away from the building, allowing water to be collected and conveyed by swales running along the edge. These swales will be constructed to be 'dry' swales and will outfall from the underdrain to either the subbase of the piazza raingarden or the attenuation basin depending on their location.

A bus turning circle and drop-off is proposed for the southernmost area of the site. Runoff from this area will be managed by a central raingarden with the bus circle falling towards the centre similar to a roundabout. Surface water leaving the bus turning circle raingarden will be conveyed to the wetland via swales and an attenuation basin. The adjacent Piazza will be managed by a central raingarden and a bioretention strip to the west, allowing excess runoff to be conveyed to the wetland through the same route as runoff from the bus turning circle.

All car parking bays proposed for the site will be surfaced in permeable block paving. Adjacent driveways will fall towards the parking bays in order to utilise the treatment and storage potential of the permeable paving for these areas. Outfalls from the parking bays will deliver runoff to adjacent bioretention areas and swales for it to be conveyed to the wetland. A linear raingarden will be provided alongside the access road to the service yard to provide storage and treatment for this runoff. The service yard itself with fall to the west in line with falls across the site. A bioretention strip will catch and treat the runoff before it is transported and treated further in a 'wet' swale to reach the wetland.

Due to the large area of hardstanding required for the MUGA it is considered most appropriate to manage surface water from this area using permeable asphalt with an open graded subbase to provide attenuation. Outfalls and exceedance from the MUGA will be conveyed to the wetland using swales.

S1- Surface Water Runoff Destination

Standard S1 of the Sustainable Drainage Standards for Wales is a hierarchy standard and discharge from a site must make use of the highest possible priority level before moving down the list. Exception criteria need to be demonstrated if higher priority levels cannot be met. The levels are detailed in figure 5.

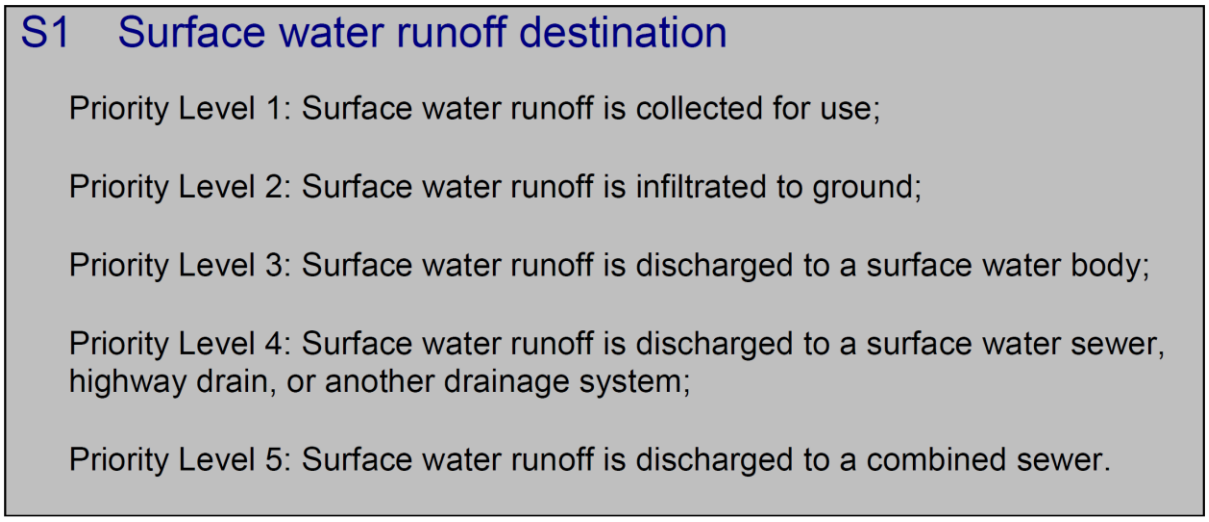

Figure 5: Standard 1 Priority Levels, Sustainable Drainage Standards for Wales

The suitability of rainwater harvesting for a development depends on the greywater demand of the site as well as how much rain water can be harvested from the roof area. As the proposed school building is single storey it has a substantial roof area (2000m^2+) which would lead to large volumes of harvested water. Compared to the potential volumes harvested, the demand of the school complex is relatively low. In addition, there will be extended periods of very low demand which could lead to legionella issues. These conditions would require complex management systems for the rainwater harvesting and extensive downstream management for exceedance due to supply outstripping demand. This results in rainwater harvesting not being an appropriate solution for managing surface water runoff on the site. Raingardens proposed for areas of the site will provide a small amount of direct rainwater collection for use by the plants in the raingarden and reduce the demand on potable water supply for watering the plants. Priority Level 1 unsuitable, move to Level 2.

A ground investigation has been undertaken for the site in March 2021 by Earth Science Partnership (report ref.: ESP.7777b.3543). The site is underlain by Made Ground and a number of mine workings and adits which poses a number of risks with regard to infiltration. “A very high subsidence risk is posed to the proposed development” by the mine workings and the addition of water through infiltration in these areas is not recommended. The Made Ground across the site is very variable, with some areas prone to subsidence, the presence of localised perched ground water bodies, diffuse pollution and large variability in the percentage of fines present; all of which make infiltration challenging or not appropriate. The CBR value of the colliery spoil present within the made ground is particularly sensitive to changes in moisture content and therefore water should not be introduced to the soils close to hardstanding areas. Given the ground conditions of the site infiltration drainage is not deemed practicable. Priority Level 2 unsuitable, move to Level 3.

The closest surface water body to the site is approximately 200m from the site centre. Due to the fact that the surface water sewer immediately adjacent to the site discharges to the closest surface water body it would be significantly more expensive and a duplication of pipe networks and extensive works to pipe the site outfall to this point instead of discharging to the sewer. Priority Level 3 unsuitable, move to Level 4.

An 18in surface water sewer is present in the footway along the northern boundary of the site. Initial discussions are in progress with the asset owner (DCWW). Section 104 and Section 106 agreements will be sought for the full application. Priority Level 4 met.

S2- Surface Water Runoff Hydraulic Control

The aim of Standard S2 is to manage the surface water runoff from and on a site to protect people on the site from flooding from the drainage system for events up to a suitable return period, to mitigate any increased flood risk to people and property downstream of the site as a result of the development, and to protect the receiving water body from morphological damage.

To prevent as far as possible any discharge from the development for rainfall events of less than 5mm the design incorporates surface level green SuDS including bioretention, a green roof and permeable paving. These features will provide interception losses evapotranspiration and infiltration within the soils and sub-base as well as effectively reducing the pollution load from the site.

The surface water drainage strategy will aim to restrict all run off from the development site for all return periods up to the 1 in 100 year even +30% climate change allowance to Qbar, as outlined in the simple approach in the statutory standards. These rates should be should be agreed with the SAB prior to detailed design. Due to the surface level SuDS approach to the drainage strategy and the provision of many green features that lead to losses, the 1 in 1 year return period event will be controlled by design and be naturally reduced compared with larger events. A series of flow controls across the sub catchments will maximise storage and losses within the SuDS features and reduce run off rates compared with a single control at the site outfall.

All rainfall events up to the 1 in 100 year + 30% climate change allowance will be managed on the site to ensure no increased downstream flood risk.

Storage will be provided in the form of wetlands, raingardens, detention basins and permeable paving. At this stage storage volumes have been estimated using the MicroDrainage Quick Storage Estimate function (Table 2).

Impermeable area	Discharge rate	1 in 100 year + 30% event
8966m^2	25 l/s	476-819 m3

Table 2: Quick Storage estimate for runoff from impermeable site areas

The upper limit of the required volume has been divided across the impermeable development area of the site in order to give m^3 storage required per m^2 of development (CIRIA Susdrain Attenuation Fact Sheet). This approach allows storage to be allocated more easily on a subcatchment basis which lends itself to a surface water drainage strategy designed around source control features.

Outfall and Exceedance

The site will outfall to a DCWW 18IN surface water sewer located within the footway of Chartist Way public highway adjacent to the site's northern boundary. This sewer discharges to 'Nant Melyn' surface water body approximately 100m to the west.

All rainfall events up to the 1 in 100 year + 30% climate change allowance will be managed on the site to ensure no increased downstream flood risk. Exceedance events will be mapped to accompany the full SAB application.

4.0 WATER QUALITY

S3- WATER QUALITY

Standard S3 addresses the drainage design requirements to minimise the potential pollution risk posed by the surface water runoff to the receiving water body.

All areas of the school site will be subject to multiple levels of treatment to create a SuDS 'Management train'. A focus on vegetated source control SuDS to reduce runoff volume across the site will provide effective pollution treatment due to the direct link between reducing volume and improving water quality. Managing runoff at the surface allows a number of beneficial processes for water quality to take place. Vegetated source control SuDS encourage sedimentation and provide filtration through substrates and filter media in addition to allowing the breakdown of hydrocarbons through exposure to UV light.

The majority of the site has a 'low' pollution hazard level as determined by Table 26.2 of The SuDS Manual C753 (CIRIA, 2015). Hard surfaced play areas, footpaths, pedestrian only areas and the school roof make up the majority of the impermeable catchment areas. All of these areas will be subject to at least two levels of treatment and therefore receive adequate mitigation as outlined in Table 26.3 of The SuDS Manual C753 (CIRIA, 2015). Car parking areas, the bus drop off and the service yard and associated access drive will be the areas of the site with higher pollution hazard levels. Raingardens and permeable paving have been selected as source control features for these areas due to the efficacy of these components to treat runoff polluted with hydrocarbons and suspended solids. The higher pollution hazard level areas will be subject to a three stage SuDS management train in order to provide ample pollution reduction and to protect the amenity value of the downstream wetland component. Having multistage management trains allows spills to be contained in upstream components and facilitates easier remediation if the situation were to arise.

5.0 LANDSCAPE PLAN

S4 – AMENITY

The SuDS strategy for the school site was developed in tandem with the landscaping strategy. This early engagement has led to well integrated, multifunctional SuDS that offer a wealth of educational benefit. The primary attenuation storage on the site in the form of a wetland is a key area to be utilised by teachers and pupils for recreation and teaching. Being the final element in the SuDS treatment train will ensure that surface water in the wetland is clean and that the amenity value is not compromised.

A wider soft play area is provide to the back of the school, along with a growing area of raised planters and orchard trees, to provide informal learning and skills development. Forest play/schools, are located to the south of the MUGA and north of the Piazza. These will be an informal setting of natural play elements, with flexibility to be developed further by the teachers and pupils to suit their needs. A network of trails will link pupils to these spaces and allow them to explore the surroundings of wetlands, swales and wildflower meadows to further enhance their learning.

S5 – Biodiversity

The planting proposal reflects the function and use for each particular area. The selection of species are to be non-toxic, non-defensive and hardy to suit the climatic conditions of the landscape. Where possible, native and local species have been selected to reflect the existing landscape character. A diverse planting palette has been collated to suit different habitats, whilst creating seasonal interest and increasing amenity value of the site.

The landscape strategy has been informed by this drainage strategy, which is a cohesive system of soft and hard solutions. The planting palette has been carefully considered to ensure species are suited to each of these solutions, and become valuable ecological assets. A wetland is proposed for the site, which will provide water storage and control run off, whilst creating a new wetland habitat within the landscape. Planting species have been selected to provide suitable shelter and food for wildlife in this area. Bug hotels and butterfly houses are placed within the vicinity of the forest play/schools, to form part of the pupil's learning experience.

6.0 S6- Design of Drainage for Construction, Operation and Maintenance

Management

The SuDS will not be offered for adoption by the SAB as the system controls a site which has single ownership. The site will be managed by the client's maintenance team for its lifetime. Sufficient documentation will be provided as part of the operation and maintenance details to ensure that the SuDS are managed and maintained to a level that allows them to continue to operate as designed.

Maintenance

The SuDS will be maintained in accordance with guidance in the CIRIA SuDS Manual and current best practice. Appendix I provides details of the maintenance requirements for each SuDS element and the frequency of the maintenance activity. Further maintenance details will be developed with the client's team as the design progresses and costing will provided to support a full SAB application.

Construction Management

SuDS proposed for the development have been designed to be simply constructed with minimal reliance on proprietary solutions. A construction management plan for the SuDS will be developed as part of the full SAB application to ensure that the SuDS are constructed at appropriate phases of the construction and that they are protected from damage and polluted runoff during construction.

APPENDIX I – SUDS MAINTENANCE REQUIREMENTS

TABLES REPRODUCED FROM C753 THE SUDS MANUAL (CIRIA, 2015)

Green Roof Maintenance

TABLE 12.5 Operation and maintenance requirements for green roofs

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Bioretention Areas/Raingarden Maintenance

TABLE 18.3 Operation and maintenance requirements for bioretention systems

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

Swale Maintenance

TABLE 17.1 Operation and maintenance requirements for swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Permeable Paving Maintenance

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	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	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Detention Basin Maintenance

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Wetland Maintenance

TABLE 23.1 Operation and maintenance requirements for ponds and wetlands

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay.	Every 1–5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25–50 years
Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows.	As required