VYRNWY RESERVE

SURFACE WATER DRAINAGE STRATEGY

APRIL 2025

Vyrnwy Reserve

Surface Water Drainage Strategy

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01	14.01.2025	Alexander Fletcher	Daniel Hadaway	S Davies	S. Davies	First Issue
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1 Introduction

1.1 Overview

This Surface Water Drainage Strategy Report has been prepared by Arcadis Consulting (UK) Ltd. for ‘Canal & River Trust’ as part of the Montgomery Canal Restoration Scheme.

Arcadis are commissioned to undertake a surface water drainage assessment to support the planning application for the proposed new nature reserve at Vyrnwy, adjacent to the Mongomery Channel, herein referred to as the ‘Proposed Development Site’.

2 Existing Site

2.1 Location

The Proposed Development Site is located off Parson's Lane, and the B4393 as a secondary access, approximately 1km west of the village of Four Crosses, post code SY22 6PG (Grid Reference: SJ 26135 19203). The site is bordered by the River Vyrnwy to the north, undeveloped land to the east and west, and a section of the Montgomery Canal and residential property to the south. The Proposed Development Site covers an approximate area of 14.36 ha. The redline boundary and site location can be viewed in Figure 1 below and a proposed site plan is provided within **Appendix A**.

Figure 1 –Vyrnwy Reserve Redline Boundary and Site Location

2.2 Site Topography

Lidar Data from NRW in Figure 2 below and The OS data from Bing Maps in Figure 3 below details the fields east of the canal and indicates that ground levels across the proposed development area range approximately from 66m to 65m above Ordnance Datum (AOD) in the location of the proposed site area.

The prevailing surrounding topography falls roughly from Southwest to Northeast.

Figure 2: Site Topography based on NRW Lidar Data

Figure 3: Bing Maps OS Data

(Background Mapping @ Bing Maps 2024)

A topographical survey for the site was undertaken by Survey Operations in October 2023. A pdf copy of the survey can be found in **Appendix A**.

As with the OS data, levels in the location of the northern and southern backwater channels are between 65 and 66 m AOD. The prevailing surrounding topography falls roughly from West to East in the northern region of the site, and from south to northeast in the southern region of the site.

2.3 Ground Conditions

From a review of the British Geological Survey (BGS) online Geological viewer, the ground conditions comprise Allt-Tair-Ffynnon Formation (Siltstone, Mudstone), overlain by superficial deposits comprising of mainly of ‘Alluvium – Clay, silt, sand and gravel’. Extracts from the BGS mapping of bedrock and superficial geology are shown below in Figure 4 below and Figure 5 below respectively.

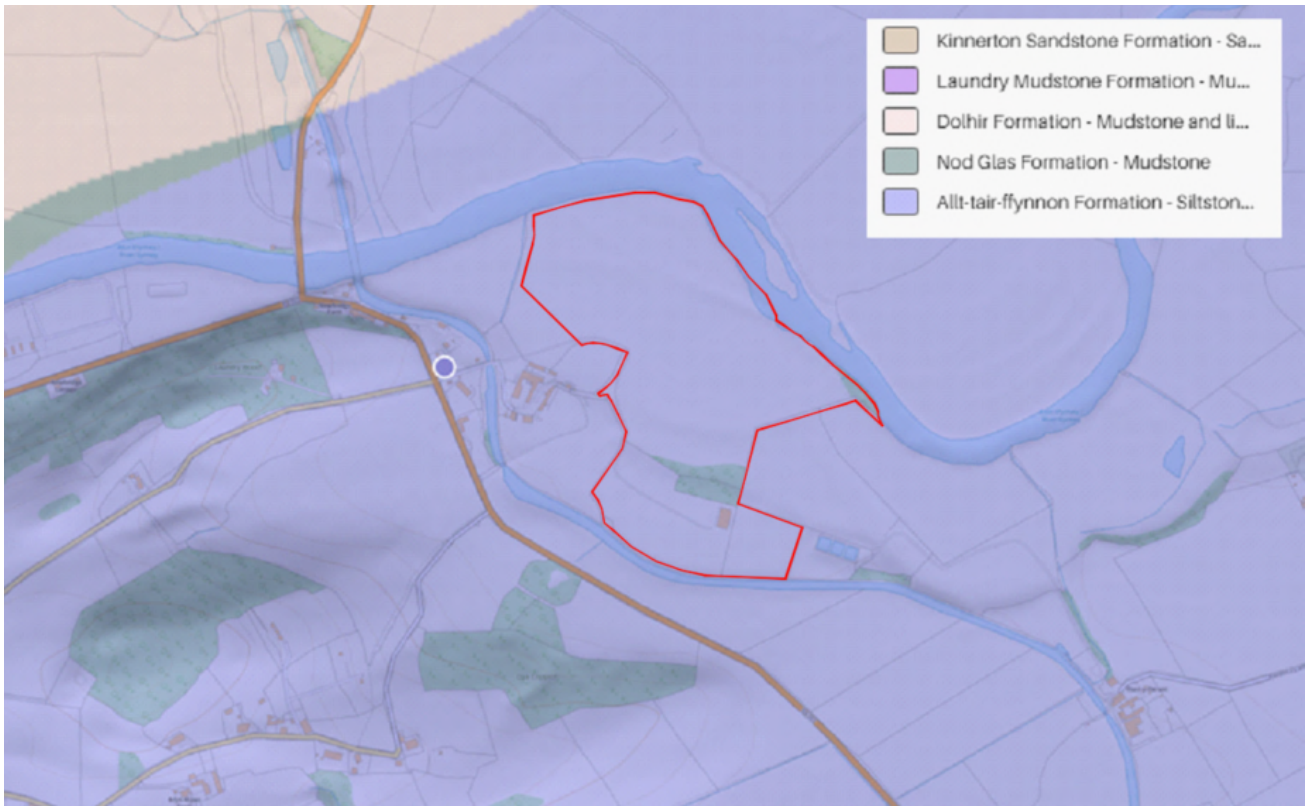


Figure 4. British Geological Survey Mapping (bedrock)

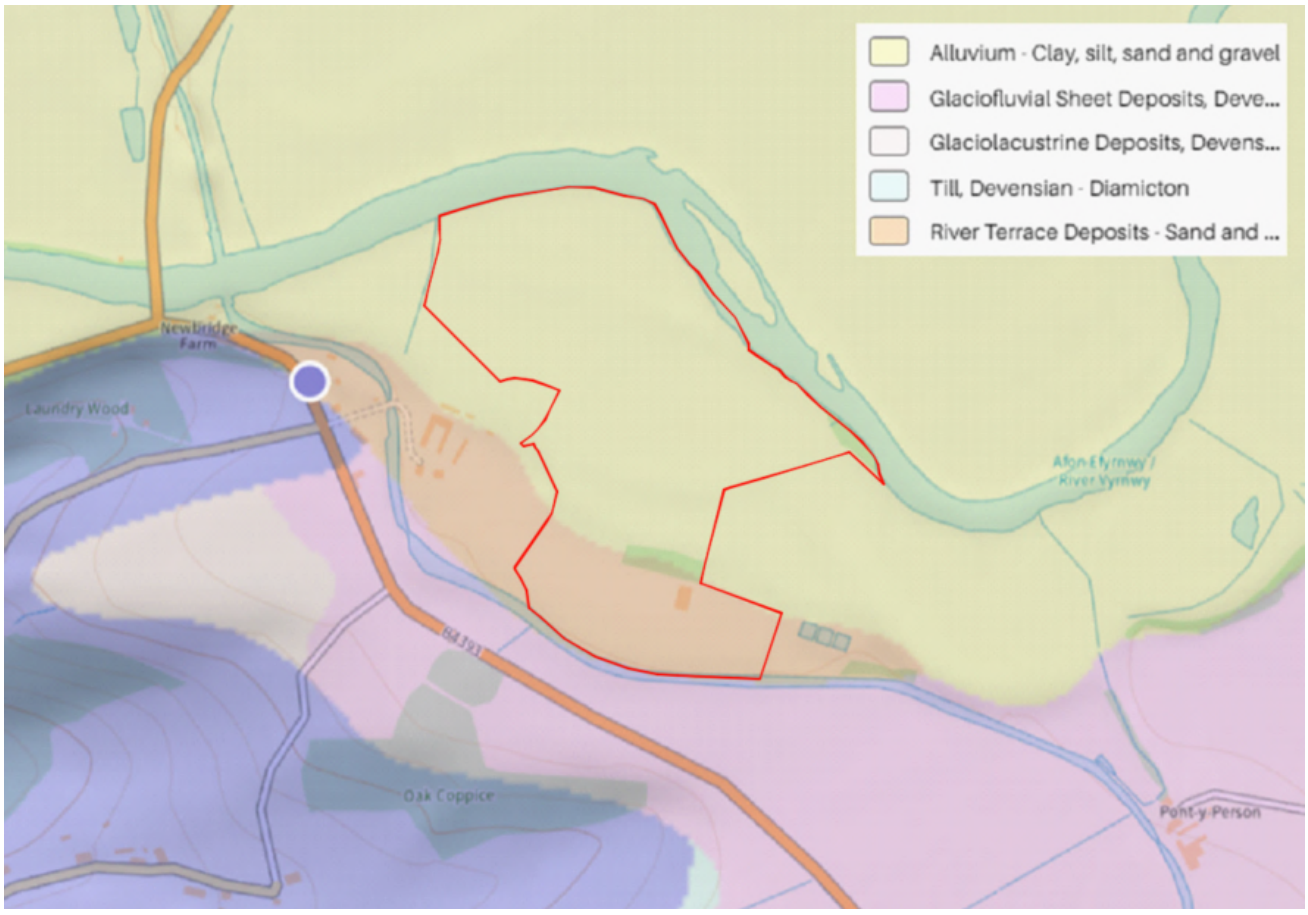


Figure 5 – British Geological Survey Mapping (superficial

2.4 Existing Watercourses

The proposed development sits to the northeast of the Montgomery Canal which is a partially restored canal in eastern Powys and northwest Shropshire. The canal runs 33 miles (53km) from the Llangollen Canal at Frankton Junction to Newtown via Llanymynech and Welshpool and crosses the England–Wales border.

The nearest main river to the site is the River Vyrnwy which is immediately adjacent the proposed site and the Montgomery Canal crosses over this via an aqueduct which can be seen in Figure 3. An extract from the Main Rivers mapping can be seen below in Figure 6 below which identifies the Vyrnwy.

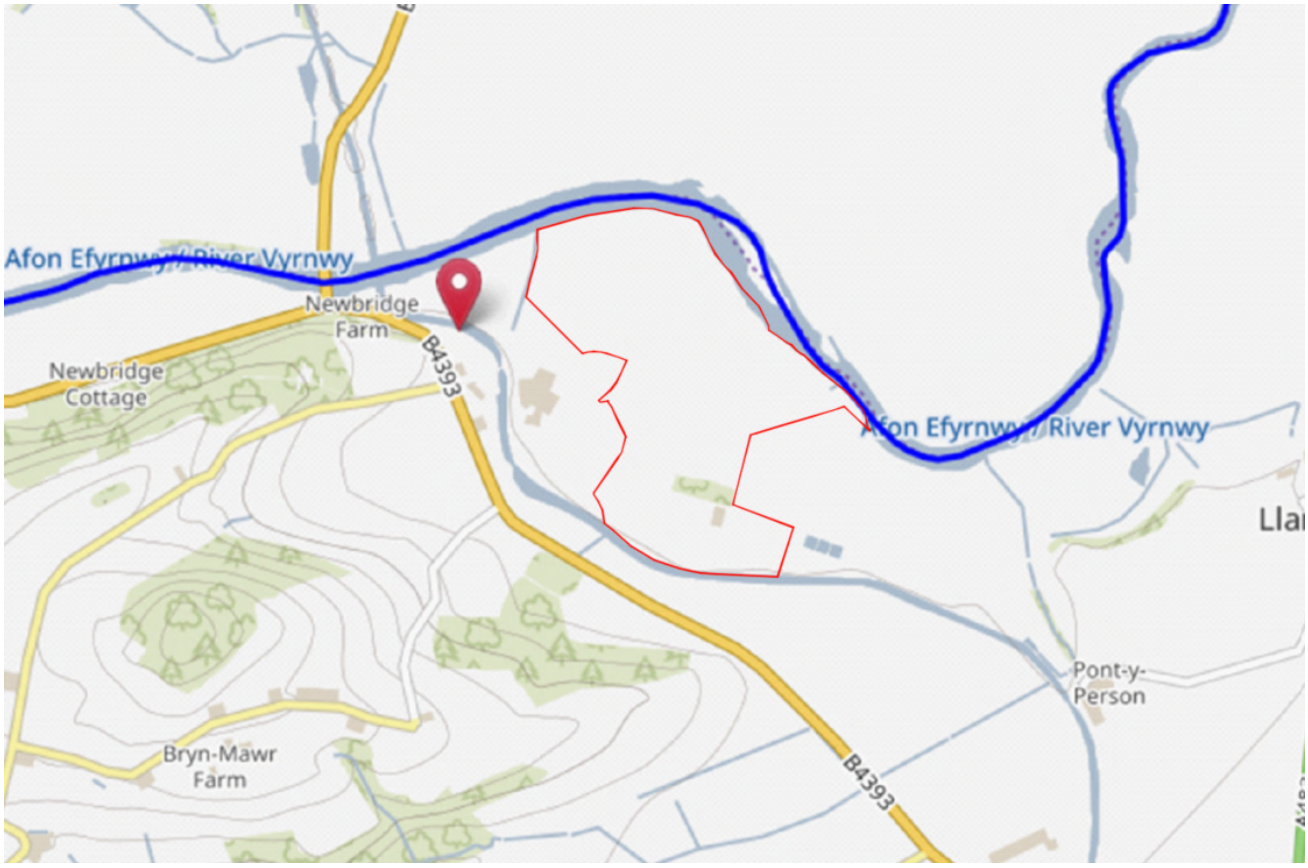


Figure 6 - Main River Datamap Wales

2.5 Existing Site Drainage

The existing site is agricultural land and does not have any formal land drainage, the surface water overland flows follow the fall of site from southwest to east, as such there is no existing formal drainage within the site. The proposed development also does not require any formal drainage, and as this is not a requirement in the design, no further investigation works have been undertaken to confirm the closest public sewer.

2.6 Existing Flood Risk

Natural Resources Wales flood risk search results have concluded that the site was at High Risk of flooding from rivers. The search also considered the risk of flooding from other sources and found no notable other sources of flood risk were identified. Figure 7 below shows an extract that illustrates the results of the search undertaken.

Figure 7: NRW Flood Risk from Rivers Map

Background Mapping © OpenStreetMap contributors. Contains Natural Resources Wales information © Natural Resources Wales and/or database right

3 Proposed Development

The Montgomery Canal Restoration Programme has secured Levelling Up Funding from the UK Government and in partnership with Powys County Council, the Canal & River Trust will deliver a range of significant enhancements along a 7 kilometre (km) stretch of the canal. As part of this scheme, the reserve will provide additional habitat to facilitate the canal restoration.

The Proposed Development involves construction of a wetland's nature reserve adjacent to the Montgomery Canal, comprising the construction of a features forming the new nature reserve including associated landscaping and enabling works. An exact of the site plan is shown in Figure 8 below and provided in **Appendix B**.

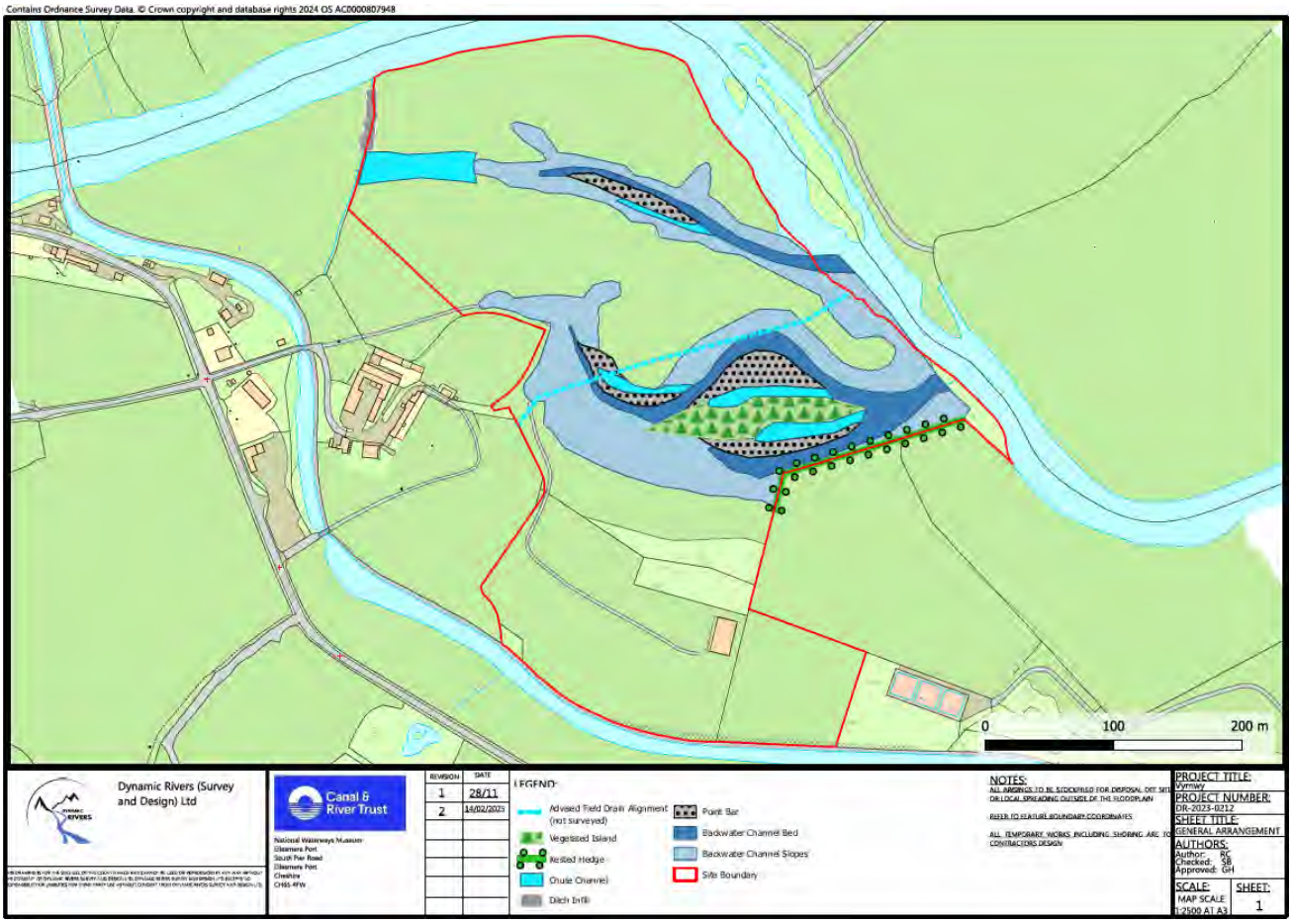


Figure 8: Proposed General Arrangement (Dynamic Rivers Survey & Design Ltd, ref: DR-2023-0212, dated: 14/02/2025)

4 Sustainable Development

The principle of Sustainable development is stated in the Well-being of Future Generations (Wales) Act, and this strategy has also been informed by the following document:

Sustainable Development: Guidance to Risk Management Authorities. Section 27 – Sustainable Development. [November 2011 Published by The Welsh Government].

The supporting principles, and their relevance to sustainable drainage and flood risk management, are:

Low ecological footprint – all flood and coastal erosion risk management should not overuse but seek to work in harmony with natural resources and processes, promote resource efficiency, and minimise waste, so we are clear that flood and coastal erosion risk management will help us reduce Wales's ecological footprint.

Full costs and benefits – Whole system thinking, and whole life costing are key approaches that should be used. Taking account of risks - especially to the economic, social and environmental wellbeing of communities - and uncertainties associated with action and inaction, should also be part of the decision-making process.

Evidence base – An evidenced-based approach to decision-making should be used, but where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to promote sustainable approaches to flood and coastal erosion risk management.

Reflecting distinctiveness – Approaches to sustainable flood and coastal erosion risk management should reflect and respond to the particular needs and issues of communities, and the differing economic, social and environmental circumstances in different parts of Wales.

The drainage design should also:

- Maximise the long-term economic, social and environmental wellbeing of people and communities in Wales, whilst living within environmental limits.
- Safeguard the continued provision of ecosystem services from our natural environment.
- Avoid the exposure of current and future generation to increasing risk.
- Improve the resilience of communities, the economy and the natural, historic, and social environment to current and future risk.

5 Proposed Surface Water Drainage Strategy

The proposed wetlands will not comprise of formal surfaces or hardstanding. The post development site will continue to be greenfield where no impermeable areas are to be introduced, and as such, the site permeable area will remain as existing.

Additionally, the proposed site levels and development arrangement is designed not to impede the existing surface water overland flow routes and flood plain designation, therefore these will remain as existing.

The sites existing levels fall from approximately southwest to northeast and this will be maintained in the proposed design, keeping the proposed surface water overland flows as existing. The landscaped features of the wetlands will help slow and control the egress of the surface water overland flows.

The wetland water level is designed to sit below the existing flood plain level, this will therefore not impact the flood plain designation. The wetlands will provide a contribution to flood compensation for the River Vyrnwy, creating further flood storage and this would provide betterment, lessening the flooding extents from the river.

As summarised above the existing drainage regime will not be changed but betterment to the control of discharge of surface water overland flows will be provided. No formal drainage networks will be required for this proposed scheme

6 SuDS Standards for Wales

The Flood and Water Management Act 2010 (Schedule 3), which came into effect in Wales on 7 January 2019, requires new developments to include Sustainable Drainage Systems (SuDS) features that comply with national standards.

6.1 Compliance with Planning Policy Requirements

As set out in the Statutory standards for sustainable drainage systems sets out criteria which need to be considered.

The criteria are as follows:

- Standard S1 - Surface water runoff destination
- Standard S2 - Surface water runoff hydraulic control
- Standard S3 - Water Quality
- Standard S4 - Amenity
- Standard S5 - Biodiversity
- Standard S6 - Design of drainage for construction, operation and maintenance and structural integrity

6.1.1 Compliance with Standard S1 – Surface Water Runoff Destination

6.1.1.1 The Standard

This Standard addresses the use of surface water by the development and where it should be discharged. The aim is to ensure that runoff is treated as a resource and managed in a way that minimises negative impact of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology. This will ensure that early consideration is given to the use of rainwater harvesting systems to both manage runoff and deliver a source of non-potable water for the site where practical. Where it is not, prioritisation should be given to infiltration. Discharges to sewerage systems must be limited where possible.

There are 5 Priority Levels to be considered, with level 1 being the most preferable option.

The standard requires that the site comply with the highest of the following priority levels:

- **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

6.1.1.2 Site Specific Proposals

Each of the surface water runoff destinations (based on priority) were considered as summarised in Table 1 below.

Table 1.Surface water runoff destinations (based on priority)

Priority Level	Site Specific Proposal
Priority Level 1	The proposed Development Site involves the construction of a wetland's nature reserve, primarily involving landscaping and enabling works. Therefore, there are no facilities proposed in which to utilise collected surface water runoff for use.
Priority Level 2	As noted in **Section 2.3**, the site sits over Alluvium, infiltration would be equivalent to the existing pre-development state.
Priority Level 3	The proposed development sits adjacent the River Vyrnwy from which existing natural overland surface water flows currently discharge to.
Priority Level 4	N/A
Priority Level 5	N/A

The proposal is to discharge surface water drainage to The River Vyrnwy which existing natural overland flows currently discharge to and would therefore comply with **Priority Level 3** (Surface water runoff is discharged to a surface water body) for all areas of the site.

6.1.2 Compliance with Standard S2 – Surface Water Runoff Hydraulic Control

6.1.2.1 The Standard

This Standard addresses the use of surface water by the development and where it should be discharged. The aim is to ensure that runoff is treated as a resource and managed in a way that minimises negative impact of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology. This will ensure that early consideration is given to the use of rainwater harvesting systems to both manage runoff and deliver a source of non-potable water for the site where practical. Where it is not, prioritisation should be given to infiltration. Discharges to sewerage systems must be limited where possible.

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.

The allowable flow from a development site is to be informed by the regulatory requirements of the site.

When rainfall takes place on greenfield sites there is, for the majority of rainfall events during the year, no discernible surface water runoff to receiving water bodies. The rainwater normally evapotranspires, or in winter it can result in river base flow replenishment and/or groundwater recharge. However, impermeable surfaces generate runoff from virtually all rainfall events, and this change in runoff characteristics can have a negative impact on the morphology and ecology of receiving water bodies. Interception aims to mimic greenfield runoff conditions.

- Flood protection for the site
  - Flood protection to a suitable level of service should be provided to people and property on (or adjacent to) the site. There are three principal criteria which would normally be applied to the drainage design:
    - Protection against surface flooding for roads and other access areas for the 1:30 year return period rainfall event. Lower levels of service may be used for certain locations depending on the impact on site users.
    - Protection against internal flooding of properties for the 1:100-year return period (or greater). Critical infrastructure and roads where access is essential may also be protected to the same level of service (or greater).
    - Freeboard against flooding of any structure should be appropriate to the uncertainty in providing the level of protection required and the consequence of the flooding occurring.

- Extreme event exceedance management of surface water runoff
  - Extreme events exceeding the design event (usually the 1% - 1 in 100-year return period) could occur and may result in overland flows within the site, onto the site and from the site to adjacent areas. The duration of flooding, maximum depth, maximum velocity and the route of flood flows should be established and managed so as to mitigate the flood impact to people and property. The impact of exceedance flows from and on adjacent land should also be considered. The return period of this assessment will be related to the potential consequences associated with its impact.
  - Conveyance routes should be selected such that likely future changes on site will not prevent the safe routing of flood flows in the future.

6.1.2.2 Site Specific Proposal

Both national and local planning policies state that for any proposed development, peak rates of surface water discharge to either a watercourse or a sewer should be restricted to as close as is reasonably practicable to the equivalent greenfield rates of runoff from impermeable areas introduced to the site from the proposed development, especially if the existing site is a greenfield site.

If impermeable areas are introduced runoff rate should be limited post development peak rates of runoff from all storm events up to and including 1 in 100-year storm events (with a 45% allowance for climate change if required) to no greater than the greenfield peak flow rate (QBAR).

QBAR Greenfield runoff rates have been calculated using the Wallingford runoff calculation for reference only as the post development site will continue to be greenfield with no introduction of impermeable surfaces and the QBAR is therefore maintained. These calculations are summarised below in Table 2 below, and can be found in full in **Appendix C**.

Table 2: QBAR Rates (See Appendix C)

Drained Area	QBAR Greenfield Runoff Rate
34.97 ha	68.44 l/s

6.1.3 Compliance with Standard S3 – Water Quality

6.1.3.1 The Standard

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

The effectiveness of components in improving water quality is strongly linked to the reduction in the volume of runoff. Well-designed SuDS, designing for water quality management, should maximise volume reduction when designing conveyance and attenuation measures, preferably using vegetated, surface-based systems.

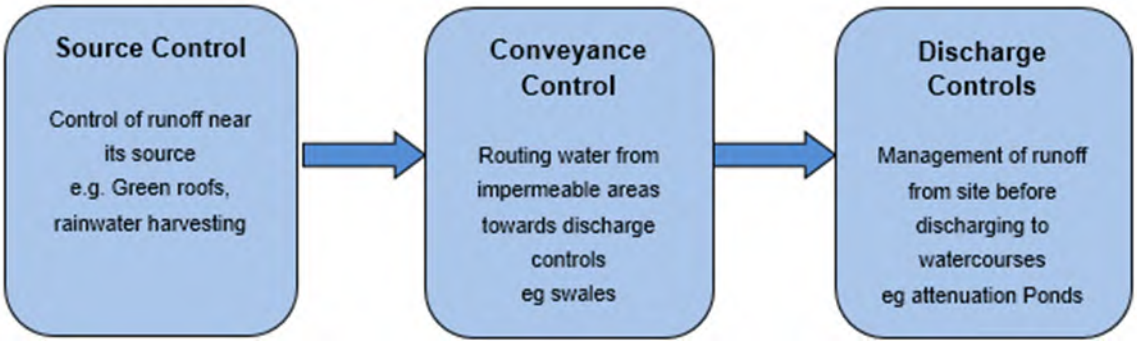
Where possible, surface water runoff should be managed using Interception, sedimentation, and treatment components close to its source. This will help to prevent sediment and other pollutants from being conveyed to, and building up in, downstream components and causing:

- Increased risk of system blockage,
- Increased maintenance requirements,
- Lower amenity and biodiversity potential for downstream drainage components,
- Increased risk of contaminant re-mobilisation and discharge.

Pollution prevention strategies are detailed in the SuDS Manual. Interception, the primary defence against pollution, is detailed in Standard S2.

To comply with current best practice, the drainage system is to:

- Manage runoff at or close to its source;
- Manage runoff at the surface;
- Integrated with public open space areas and contribute towards meeting the objectives of the urban plan (not applicable for this development);
- Be cost-effective to operate and maintain.



The drainage system ensures that:

- Natural hydrological processes are protected through maintaining interception of an initial depth of rainfall and prioritising infiltration.
- Flood risk is managed through the control of infiltration rates and storage volumes on the site.
- Storm water runoff is treated to prevent detrimental impacts to the receiving subsurface because of urban contaminants

6.1.3.2 Site Specific Proposals

To ensure proposed developments and drainage design meets the water quality design criteria and good practice design standards, the simple index approach as defined in Section 26 in the CIRIA SuDS Manual C753 should be considered.

Table 26.2 of the CIRIA SuDS Manual provides the pollution hazard indices for different land use classifications. The proposed site does not fall under any of the categories listed within Table 26.2 and as such the proposed wetlands will not have any implication on water quality and pollution entering the existing River Vyrnwy.

It is therefore determined that no further pollution control measures will be required. For reference the pollution mitigation indices of a wetland have been outlined below in Table 3 below.

Table 3. Pollution Mitigation Indices for the Wetlands.

Type of SuDS Component	Mitigation Indices		
	Total Suspended Solids (TTS)	Metals	Hydrocarbons
Wetlands	0.7	0.7	0.5

6.1.4 Compliance with Standard S4 – Amenity

6.1.4.1 The Standard

Standard S4 addresses the design of SuDS components to ensure that, where possible, they enhance the provision of high quality, attractive public space which can help provide health and wellbeing benefits, they improve liveability for local communities, and they contribute to improving the climate resilience of new developments.

Standard S4 addresses the design of SuDS components to ensure that, where possible, they enhance the provision of high quality, attractive public space which can help provide health and wellbeing benefits, they improve liveability for local communities, and they contribute to improving the climate resilience of new developments.

A key aim for sustainable drainage is to provide an improved local environment which integrates the surface water drainage function with open space, providing amenity and recreation opportunities where possible.

This section shows how SuDS can add amenity value by contributing towards:

- Making sites pleasant places to live or work.
- Reducing hazards from climate change.
- Creating amenity space - contributing to green space accessibility standards.
- Promoting the well-being of site users.

Detailed guidance on these aspects is set out in the SuDS Manual

6.1.4.2 Site Specific Proposals

Incorporating a wetland nature reserve to the site, which has previously been utilised for agricultural purposes, can provide amenity in the following ways:

- The presence of a wetland nature reserve can enhance the visual appeal of the area, providing peaceful and natural scenery, create a more pleasant environment for nearby residents and visitors.

- Wetland nature reserves can offer recreational activities such as birdwatching, nature walks on the existing canal tow path being retained, and photography. These activities can bring people closer to nature and provide opportunities for relaxation and enjoyment.
- Although the site is not anticipated to contribute to any pollutants, wetlands act as natural filters, improving water quality by trapping sediment and pollutants before they reach larger bodies of water. This can have a positive impact on the surrounding environment and contribute to overall ecosystem health.
- Wetlands can also provide opportunity for an educational tool as information boards can provide details of flora and fauna of the area.

6.1.5 Compliance with Standard S5 – Biodiversity

6.1.5.1 The Standard

Standard S5 addresses the design of SuDS to ensure, where possible, they create ecologically rich green and blue corridors in developments and enrich biodiversity value by linking networks of habitats and ecosystems together. Biodiversity should be considered at the early design stage of a development to ensure the potential benefits are maximised.

The aim of standard S5 is to ensure that, wherever possible, and having regard to the need to prioritise infiltration drainage and rainwater harvesting, the SuDS scheme makes the best use of a site to maximise benefits for biodiversity, as well as for amenity, water quantity and quality. Biodiversity benefits will usually be best achieved by drainage systems which are on the surface and visible with vegetated components, forming part of the local green infrastructure and local ecosystem structure. It is important to ensure that the SuDS design does not damage existing sensitive habitats. Amenity is addressed by Standard S4.

A key aim for sustainable drainage is to provide an improved local environment which integrates the surface water drainage function with open space providing habitat opportunities where possible. This Standard and Standard 4 (Amenity) provide guidance on how to ensure that SuDS can work for people and nature. SuDS can add biodiversity value by:

- Supporting and promoting natural local habitat and species,
- Contributing to the delivery of local biodiversity objectives,
- Contributing to habitat connectivity, delivering wider biodiversity benefits,
- Creating diverse, self-sustaining, resilient local ecosystems.

SuDS should be designed (where appropriate) to benefit priority habitats (defined as those most threatened and requiring conservation action) and help deliver strategic objectives set out in national and local biodiversity strategies, frameworks, and action plans.

6.1.5.2 Site Specific Proposals

Incorporating a wetland nature reserve to the site, which has previously been utilised for agricultural purposes, can provide biodiversity in the following ways:

- The proposed wetland will create a significant biodiversity betterment to the existing agricultural field creating a diverse natural habitat adjacent the Montgomery canal. Introducing a wetland nature reserve can provide a habitat for different species not previously supported on the site by providing food source, breeding ground and migration stopover for species.
- Providing a wetland ensures that as much of the open space and existing features as possible is retained which will minimise the impacts on the existing local vegetation and wildlife.

6.1.6 Compliance with Standard S6 – Design of Drainage for Construction, Operation and Maintenance and Structural Integrity

6.1.6.1 The Standard

Standard S6 deals with designing robust surface water drainage systems so they can be easily and safely constructed, maintained, and operated, taking account of the need to minimise negative impacts on the environment and natural resources.

- All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
- All elements of the surface water drainage system should be designed to ensure maintenance and operation can be undertaken (by the relevant responsible body) easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
- The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, considering the requirement for reasonable levels of maintenance.

6.1.6.2 Site Specific Proposals

Construction Environmental Management Plan:

The Montgomery canal is a Special Area of Conservation (SAC), as such a Habitats Regulation Assessment (HRA) has been produced for the work, this includes a section on 'Measures to Control Pollution Risk and Biosecurity' to ensure that there is no risk from pollution during the construction phase, a Construction Environment Management Plan (CEMP) will be prepared and implemented. The CEMP will incorporate best practice in relation to construction activities within or near the water environment and will typically include (but not be limited to):

• Toolbox talks to Contractor, including INNS issues.

• Ecological supervision and monitoring during construction.

• Clear demarcation of working areas and use of temporary protective fencing and signage, as necessary.

• Buffer zones around retained habitats.

• Use of sediment traps, e.g. straw bales, regularly checked and replaced as needed.

• Contractors to arrive and leave site with clean footwear and machinery and wheel wash facilities to be provided.

• Fuel storage and re-fuelling to take place in designated areas away from the canal.

• All vehicles and plant to be stored in a secure site compound overnight.

• Plant nappies and spill kits to be carried as standard; and

• Emergency pollution incident protocols in place.

Operation and Maintenance Schedule:

The Vyrnwy reserve will become a Canal & River Trust asset and will fall into the Trust's asset management system. The Trust's principal assets are subject to a hierarchy of inspections, which will provide information on the condition, serviceability, and details of any defects. Assets are maintained under the Trust's Planned Preventative Maintenance standard, which sets out the requirements and responsibilities of PPM for the Trust's structures. Day to day operation of the reserve will be managed by the local Waterway team.

The reserve will also be added to the Montgomery canal reserves management plan which is written and delivered by the Trust's ecologists.

7 SAB Pre-application

A pre-application was submitted to the SUDs Approval Body and the response has been provided in **Appendix C**. A summary of the points raised have been outlined below:

- Noted no hardstanding areas are introduced.
- Existing levels maintained and overland flow routes maintained.
- The proposed wetlands will offer a benefit to water quality, biodiversity, and amenity compared to pre-existing conditions.
- SAB response notes that if hardstanding areas are introduced attenuation to control 1 in 100-year storm plus climate change will be required. In the instance of this site no hard standing areas are being introduced.
- Noted that exceedance flows be reduced or slowed.
- Noted that the construction management proposals were pleasing, and that the CEMP will be provided within the full application.
- Detail of required maintenance indicated as being required, Section 6.1.6.2 above outlining the operation and maintenance schedule added to this report.

8 Conclusions

This report has set out the principles of why the sites existing surface water drainage regime will remain and formal drainage will not be required for the site. Surface water overland flows from the proposed development will discharge existing.

The key principles are:

- The site is within a high flood risk area.
- The proposed scheme is designed to not impact the existing flood plain and as such will not have implication on further risk to flooding.
- The wetlands will provide a contribution to flood compensation for the River Vyrnwy, creating further flood storage and this would provide betterment, lessening the flooding extents from the river.
- There are no impermeable areas or sources of containments being introduced as part of the proposed scheme.
- The proposed site levels will not alter existing surface water overland flow routes.
- The wetlands landscaping will help to control and slow the egress of surface water overland flows.
- The wetlands pond will significantly increase amenity and biodiversity compared to pre-existing conditions.

Surface Water Drainage for the proposed development will continue as per the existing overland flows and drainage regime, therefore achieving the aims and objectives of both local and national policies.

Appendix A

Topographical Survey

Site Location Plan

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Note:

The survey is plotted on a plane local Grid. Orientation to National Grid.
All levels relate to Ordnance Datum, achieved using the
OS National GPS Network.

Survey Control Markers established for Mapping purposes only and should not be used for Construction without the written approval of Survey Operations Ltd.

Area within bold dashed line surveyed October 2023 and added to Survey Operations drawing number 22C171.

SURVEY STATIONS

Name	Easting	Northing	Height
CA1	325412.45	319913.22	66.55
CA2	325360.29	319757.74	71.40
CA3	325392.74	319666.24	71.04
CA4	325414.90	319594.56	70.98
CA5	325425.73	319576.85	70.96
CA6	325449.37	319563.54	70.97
CA7	325494.72	319550.90	71.00
CA8	325537.50	319509.80	71.00
CA9	325607.32	319479.13	72.60
CA10	325727.38	319586.74	66.03
CA11	326105.61	319419.21	65.01
CA12	326144.49	319363.33	65.76
CA13	325604.86	319470.29	72.81
KM1	325607.06	319431.99	71.07
KM2	325612.59	319379.87	70.97
KM4	325615.79	319329.32	70.79
KM5	325648.59	319299.76	70.97
KM6	325713.25	319263.36	70.97
KM7	325768.48	319223.87	71.14
KM8	325810.69	319191.23	71.00
KM9	325843.48	319176.36	70.95
KM10	325897.05	319141.95	70.93
KM11	325931.05	319041.89	65.93
MF1	325375.33	319671.20	65.55
MF2	325391.47	319656.01	65.96
MF3	325413.63	319659.54	66.09
MF4	325431.44	319692.22	66.05
MF5	326037.42	319153.09	71.09
MF6	326037.42	319153.09	71.09
MF7	325818.85	319162.62	71.11
MF8	325869.40	319169.43	71.12
MF10	325920.78	319183.86	68.41
MF11	325851.12	319287.14	68.09
SO1	325420.41	319827.43	66.09
SO2	325392.41	319843.16	70.53
SO3	325392.41	319843.16	70.53
SO4	325366.42	319843.91	71.77
SO5	325331.90	319772.49	67.74
SO6	325335.04	319719.46	66.99
SO7	325325.81	319671.36	67.93
SO8	325332.19	319628.65	68.42
SO9	325337.19	319578.65	69.42
SO10	325327.77	319608.24	69.59
SO11	325411.72	319611.56	66.49
SO12	325394.70	319956.51	65.44
SO13	325447.40	320015.13	66.91
SO14	325502.36	320137.58	68.80
SO15	325511.66	320138.27	68.99

Sheet Layout

1	2	3	4	
	5	6	7	8
	9	10	11	12
		13	14	15

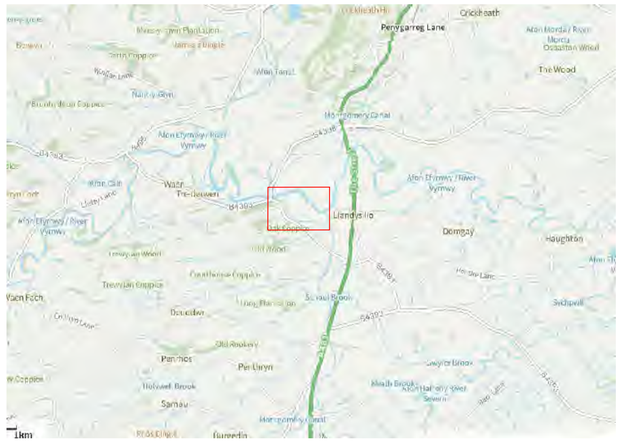
SurveY OPERATIONS
Smith Street, Skelmersdale, Lancs. WN8 8LN
Tel: 01695 725862 Fax: 01695 51816
Email: mail@survops.co.uk – www.survops.co.uk

Client
Canal & River Trust

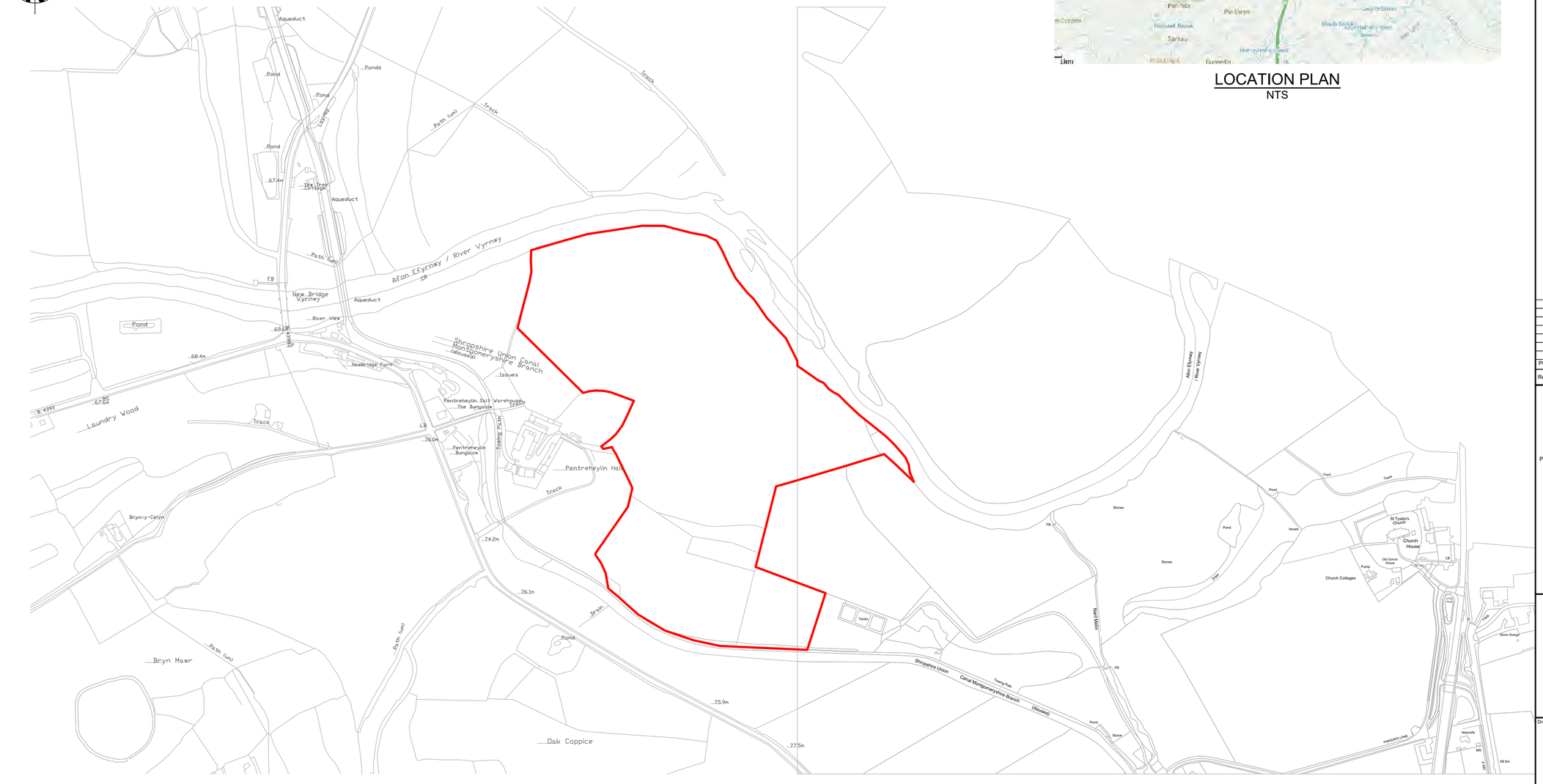
Drawing Title
Topographical Survey of Land at:
2323-22 Vrynwy Land Investigation
Llandysilio
Sheet 1 of 15

Scale(s)	1:200	Surveyor	KM/CA
Date	OCT 23	Drawn	CD
Job Number	23I096	Checked	SO

Sheet Size & Drg Number & Revision
A0 23I096/001



LOCATION PLAN
NTS



VYRNWY RESERVE - SITE PLAN
1 : 1250

NOTES:

1. DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING WAS PRODUCED AT THE REQUEST OF THE TRUST BASED ON MARKUPS PROVIDED BY THE TRUST ON 14.11.24 and 10.12.24.

RED LINE BOUNDARY

Rev	Date	Description	Prod.	Chk.	Rev.	App.
P01	20/12/24	For information	JM	EF	AH	AH

Project:
Montgomery Canal Restoration
Vyrnwy Reserve

Site
Grid Reference SJ 25813 19569

Client
Canal & River Trust
National Waterways Museum
Ellesmere Port
Cheshire CH65 4FW

ARCADIS
Registered office:
80 Fenchurch Street
London
EC3M 4BY

Coordinating office:
1st Floor, 12 King St.
Leeds, LS1 2HL
Tel: 44 (0)113 284 5300

www.arcadis.com

Drawing Title:
Vyrnwy Reserve
Red Line Boundary

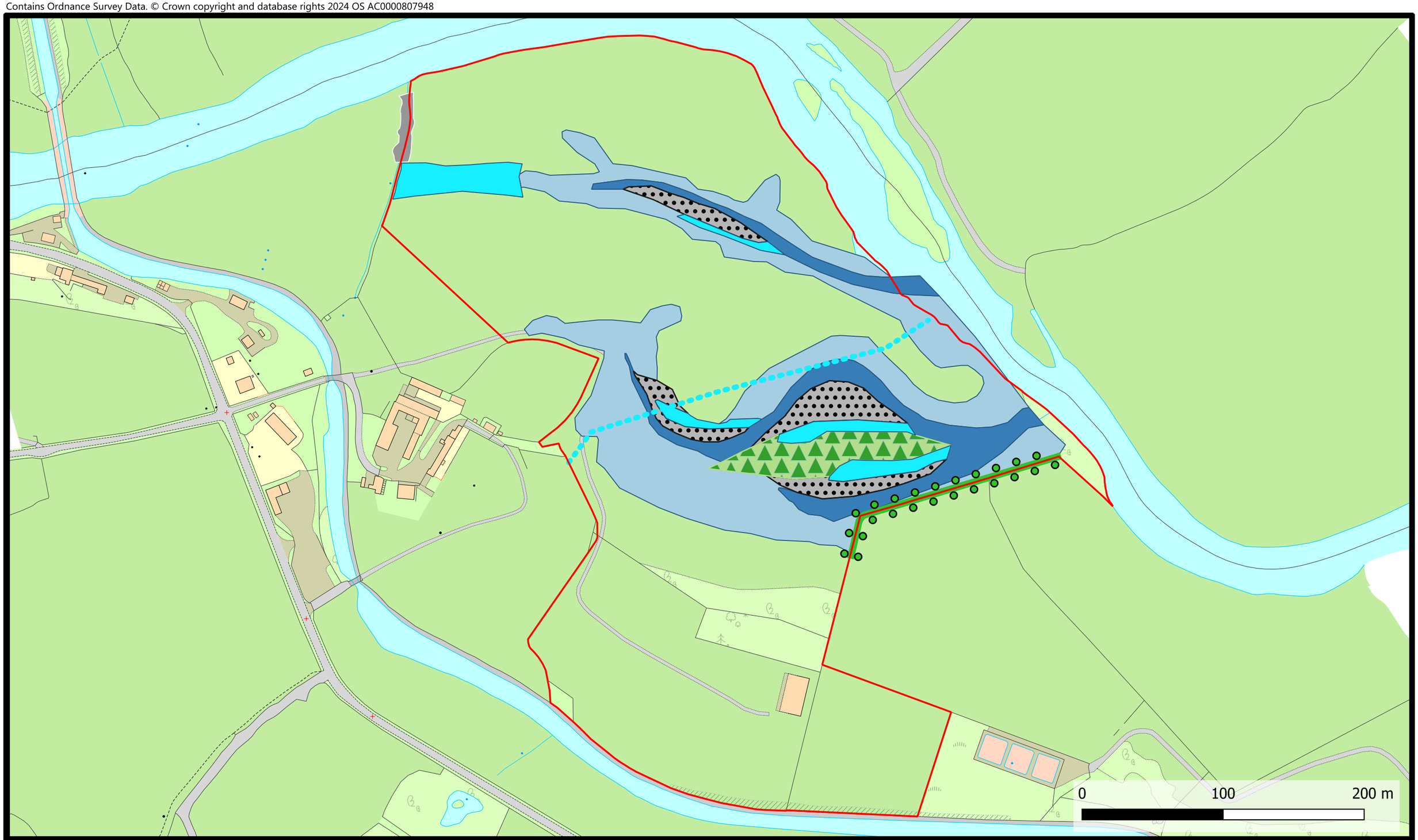
Designed: J. Marshall	Signed J.M	Date 20/12/24
Produced: J. Marshall	Signed J.M	Date 20/12/24
Checked: E. Flynn	Signed E.F	Date 20/12/24
Reviewed: A. Holt	Signed A.H	Date 20/12/24
Approved: A. Holt	Signed A.H	Date 20/12/24
Design Stage: Preliminary Design		
Original Size: A1	Grid: OS	Datum: AOD
Suitability Code: S2	Scale: As shown	Project Number: 10048826
Suitability Description: FOR INFORMATION		

Drawing Number:
10048826 - ARC - EWE
R1 - DR - CE - 00301

Revision:
P01

Appendix B

Proposed Development Plan



Dynamic Rivers (Survey and Design) Ltd

Canal & River Trust

National Waterways Museum
Ellesmere Port
South Pier Road
Ellesmere Port
Cheshire
CH65 4FW

REVISION	DATE
1	28/11
2	14/02/2025

LEGEND:

- Advised Field Drain Alignment (not surveyed)
- Vegetated Island
- Kested Hedge
- Chute Channel
- Ditch Infill
- Point Bar
- Backwater Channel Bed
- Backwater Channel Slopes
- Site Boundary

NOTES:

ALL ARISINGS TO BE STOCKPILED FOR DISPOSAL OFF SITE OR LOCAL SPREADING OUTSIDE OF THE FLOODPLAIN

REFER TO FEATURE BOUNDARY COORDINATES

ALL TEMPORARY WORKS INCLUDING SHORING ARE TO CONTRACTORS DESIGN

PROJECT TITLE:
Vyrnwy

PROJECT NUMBER:
DR-2023-0212

SHEET TITLE:
GENERAL ARRANGEMENT

AUTHORS:
Author: RC
Checked: SB
Approved: GH

SCALE:
MAP SCALE 1:2500 AT A3

SHEET:
1

Appendix C

Greenfield Runoff Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Daniel Hadaway
Site name:	Vyrnwy Reserve
Site location:	Vyrnwy

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.76821° N
Longitude:	3.10081° W
Reference:	1149054718
Date:	May 02 2024 14:28

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	34.97

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	744	744
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 30 years:	2	2
Growth curve factor 100 years:	2.57	2.57
Growth curve factor 200 years:	3.04	3.04

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	68.44	68.44
1 in 1 year (l/s):	56.81	56.81
1 in 30 years (l/s):	136.89	136.89
1 in 100 year (l/s):	175.9	175.9
1 in 200 years (l/s):	208.07	208.07

Appendix D

SAB Pre-app Response

2500091- CRT Vyrnwy Reserve, Llandysilio

SAB Pre-App Response

Introduction

Please find below the SAB pre application response for **CRT Nature Reserve, Llandysilio**.

In response to your pre application form submission together with accompanying documents **(Surface Water Drainage Strategy Report Ref: 0048826-ARC-XX-ZZ-RP-CE-0003)** the SAB make the following comments.

All relevant information for consideration as part of a full and / or pre SAB Application should be included within the appropriate application form. This can be as a summary, with accompanying documents used to provide elaboration and further information such as calculations and drawings. However, details on each Standard should be included in the first Standard box on the application form with supporting documents referenced in the second half of each Standard box.

Standard S1 – Surface Water Runoff Destination

Priority Level 1

The SAB note that within the Surface Water Drainage Strategy Report in Section 6.1.1.1 it states that "There is potential to collect and re use surface water. The flows through stilling/attenuation tank required for the siphonic drainage system serving the new building could also partly re-used for on-site applications." There is mention of a new building and stilling/attenuation tanks, however these are not shown on any of the plans or referenced elsewhere. These points are then contradicted in table 6.1.1.2 where it says that "The proposed development site involves the construction of a wetland's nature reserve, primarily involving landscaping and enabling works. Therefore, there are no facilities proposed in which to utilise collected surface water runoff for use."

Priority Level 2

The SAB are pleased to see that the remaining surface water will be dealt with through infiltration which is Priority Level 2 on the surface water discharge hierarchy. The British Geological Survey Mapping (Superficial deposits) shows the site is mostly comprised of alluvium, with the southern part made up of river terrace deposits meaning that therefore infiltration is likely. The soils are shown to be freely draining on the Cranfield University Soilscapes Viewer website – http://www.landis.org.uk/soilscapes/.

For Priority Level 3 it states that "There is no surface water body available for discharge and therefore cannot be utilised as an outfall." Again, this is contradicted in table 6.1.1.2 where

you correctly state that the site is adjacent to the River Vyrnwy where existing natural overland flows currently discharge to.

There are two contradicting methods of surface water discharge in section 6.1.1. Under 6.1.1.1 it states that surface water will be infiltrated to ground and won't be discharged not a surface water body, whereas under section 6.1.1.2 you state that the proposal is to discharge surface water drainage to the River Vyrnwy as is existing. The SAB would like to seek clarification on which method would be used in the full application.

Infiltration is acceptable where there is 1m clearance above groundwater levels. Given the presence of the flood extent onsite as shown in figure 7, basins will not always be effective. However, considering scale and nature of development and subject to appropriate arguments within the full app, we would likely consider this to be acceptable.

Standard S2 – Surface Water Runoff Hydraulic Control

The SAB understand that the existing greenfield runoff scenario is being maintained. However, where possible, this should be limited to the 1 in 1 year or QBAR runoff rate in all situations. We note that ponds and wetlands are being proposed, and therefore exceedance flow may be reduced or slowed, but where possible, a restricted flow should be introduced. We are pleased to see that where proposals change to introduce hardstanding areas, that attenuation will be designed to accommodate the 1 in 100-year event plus climate change. We would be satisfied with a 40% allowance for climate change, though 45% would be pleasing, and would request the associated calculations with the full application.

Standard S3 – Water Quality

The use of wetlands can help to provide significant water quality benefits. As you state under section 6.1.3.2 the proposed site does not fall under any of the categories and therefore it is difficult to classify. The SAB also note in this section that you mention the proposed wetlands will not have any implication on the water quality and pollution entering the existing canal, however it was understood that the surface water was proposed to enter the River Vyrnwy. This should be clarified within a full SAB Application.

Standard S4 / S5 – Amenity/Biodiversity

The proposed wetland can provide significant amenity benefits. They can enhance the local scenery and visual appeal of the area. Wetlands can also provide the opportunity for an educational tool as information boards can provide details of the flora and fauna of the area, encouraging people to go bird watching, photography, or just enjoy being in nature. Similarly, there are many biodiversity benefits to wetlands. For a start the existing agricultural field would have poor ecological value, so the construction of wetlands will significantly improve this providing a habitat for numerous different species which would have not been supported by an agricultural field.

Standard S6 – Design of Drainage for Construction and Maintenance and Structural Integrity

The SAB are pleased to see how the construction process has been detailed including methods on how to control pollution risk. You also mention that a Construction Environment Management Plan (CEMP) will be prepared and implemented, the SAB would expect to see this submitted for the full application. Greater detail would be welcomed on how the wetlands will be maintained for the lifetime of the development – e.g. vegetation management and the frequency at which this may be undertaken.

Summary

Overall, the SAB are satisfied with the proposals put forward the construction of a wetland can only benefit the local area. Construction should take flood risk into consideration as not to affect the flood risk elsewhere. However, there are some contradictory points made in parts of the Surface Water Drainage Strategy Report that we would like to see addressed for clarity in the full application.
We look forward to receiving your full SAB application in due course.

Documents Reviewed

Document Name	Revision	Date
SAB Pre-Application Form		24/01/2025
Surface Water Drainage Strategy Report Ref: 0048826-ARC-XX-ZZ-RP-CE-0003	01	14/01/2025

Signed

Carwyn Price

Arcadis (UK) Limited

80 Fenchurch St
London
EC3M 4BY

T: +44 (0)207 812 2000

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