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Consulting Civil and
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Cyfarthfa Castle

Roof Surface Water Drainage Strategy

Job Number: 12050

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Suitability Codes as stated within QA data describe documents intended use and are in accordance with BS EN ISO 19650-2-2018.

Code	Description
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Quality Assurance

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Whilst all reasonable care has been taken in this assessment, we cannot guarantee that during the lifetime of this development the flood risk may not exceed that stated in this report. This report has addressed the risk of flooding to the site from surface water runoff, and the conclusions stated in it are based on our best estimate using available data with a precautionary approach taken where possible. We must make it clear that the assessment of weather generated flooding is inexact and that analysis is limited by the accuracy and availability of recorded data. Higher flood risk may occur in the future due to the actions or omissions of third parties, or to poor maintenance, blockage, storm events in excess of the design standard quoted, inaccuracy or unavailability of data. Flooding beyond that estimated in this report may also occur due to climate change.

1.0 Introduction

- 1.1.1 Mann Williams have been appointed to advise on a surface water drainage strategy to inform repairs and replacement drainage infrastructure at Cyfarthfa Castle, Cyfarthfa Park, Brecon Rd, Merthyr Tydfil CF47 8RE, and address local and national policy requirements.
- 1.1.2 Merthyr Tydfil County Borough Council (MTCBC) are proposing sensitive restorations to the historic Grade I listed castle including a temporary roof structure and drainage works. During the proposed work it may be necessary to erect a tented scaffold over Cyfarthfa Castle, covering all areas except the mid-20th-century extensions to the north-east elevation. Once works are complete new above ground rainwater goods, and below ground drainage infrastructure will convey surface water to a dedicated surface water network, to be disposed of, off site via an existing offsite surface water connection.
- 1.1.3 This drainage strategy has been prepared to accompany listed building and planning applications in line with the policies set out in the Merthyr Tydfil County Borough Council Replacement Local Development Plan as listed in the pre-application advice letter. The proposed drainage strategy has been developed to deliver a scheme which addresses both the run-off from the temporary condition and long-term drainage scenarios. This strategy targets the most sustainable disposal techniques identified in the sustainable drainage hierarchy, relevant to this site.

2.0 Site Location & Existing Development

2.1 Site Location & Setting

- 2.1.1 The proposed development is located at Cyfarthfa Castle, Cyfarthfa Park, Brecon Rd, Merthyr Tydfil CF47 8RE at national grid reference SO 04176 07331.
- 2.1.2 The nearest statutory main river to the development site is the River Taff, located approximately 300m West of the castle.
- 2.1.3 A desktop investigation has been undertaken and it has been shown that the site is underlain by impermeable ground conditions.
- 2.1.4 The Castle site and grounds extend over a large area, approximately 50Ha. This largely comprises of woodland and open grassland with a body of water to the South West of the site. The Castle is approximately central to the wider site.
- 2.1.5 A wooded area to the North East is drained by a networks of ditches and water courses. These watercourses enter a below ground drainage network and discharge via a connection to the Welsh Water public surface water drain to the south of the site.
- 2.1.6 The plant nursery, greenhouse & associated building to the north is understood to be drained by a conventional network to Cyfarthfa Park Lake.
- 2.1.7 The grassland to the south drains overground commensurate to its greenfield characteristics.



Figure 1 Approximate extents of Castle grounds highlighted green, to the North West of Merthyr Tydfil town centre. (freemaptools.com)

2.2 Existing Development

- 2.2.1 The roofscape of Cyfarthfa Castle, its courtyards, and surrounding hard paved ground, cover an area of approximately 9000m². An overview of the site with key features identified is illustrated in Figure 3.
- 2.2.2 The existing roofscape of the castle is approximately 4500m² and has been illustrated in Figure 2.
- 2.2.3 Drainage around the perimeter of the castle comprises a combined network, in some locations the drainage is at a significant depth below external ground as it is believed gravity drainage serves the basement storey. Both RWPs and yard gullies connect to combined sewers within the castle courtyards and other areas (for example the forecourt) discharge directly to the surrounding ground.
- 2.2.4 During exceedance events, rainfall follows overland flow routes dictated by the topography of the land.
- 2.2.5 There have been some remediation works to the below ground network which have improved conveyance, but the present-day network remains to be a combined surface and foul water network.

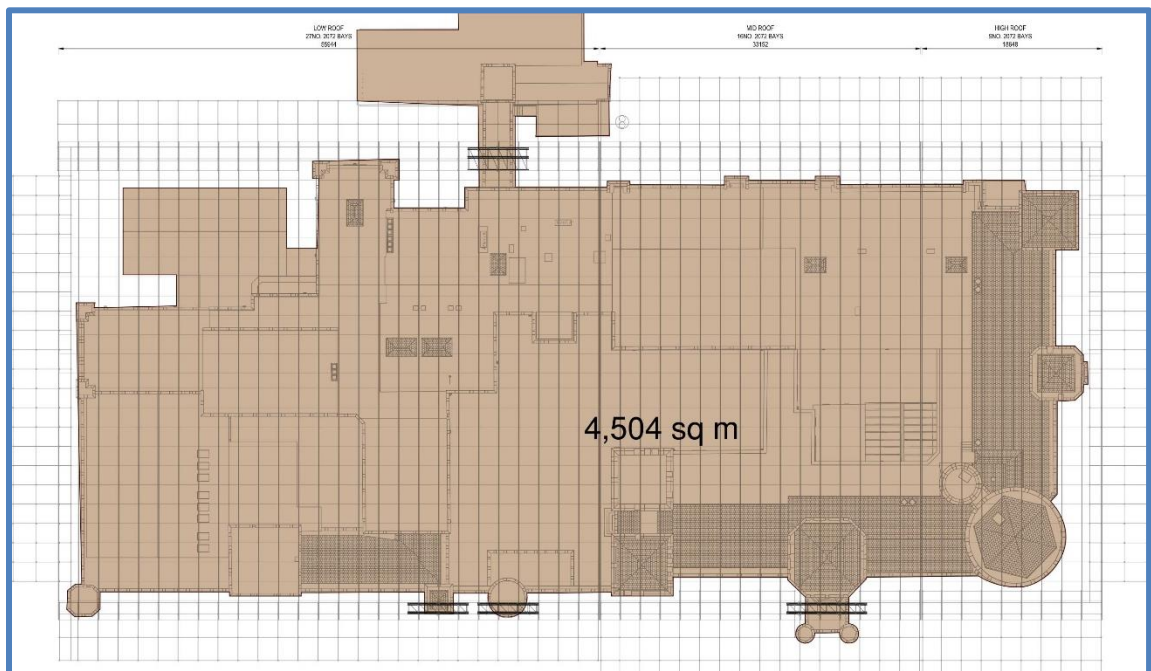


Figure 2 Existing roofscape area of Cyfarthfa Castle, shaded brown with an approximate site area.

- 2.2.6 It has been reported by the client that some of the main drainage runs are in poor conditions, and as expected, are undersized. Occurrences of flooding within the grounds are known to occur. A CCTV survey has been undertaken which has confirmed numerous defects in the drains across the site and that extensive remedial works or replacement drains are required at various points within the network.



Figure 3 Cyfarthfa Castle with key features identified

3.0 Proposed Development

- 3.1.1 The long-term development comprises general repairs to the castle requiring the installation of a temporary scaffold enclosure and temporary over roof.
- 3.1.2 During the installation of the temporary roof enclosure, the rate of run-off will be increased relative to the pre-development scenario due to the large relatively uniform surface of the temporary roof.
- 3.1.3 A drainage strategy is required to address the temporary condition, but also provide the refurbished castle with a sustainable surface water drainage system for the ongoing future.
- 3.1.4 The temporary roof enclosure will cover the existing roofscape including any drainage features, this drainage strategy has been prepared to demonstrate how surface water runoff from the temporary over roof is to be conveyed away from the structure and disposed of at a controlled rate. It also demonstrates the improvements which will result for the future scenario.
- 3.1.5 No increase in impermeable area is to be created as part of the development proposals.

4.0 Surface Water Drainage Strategy

4.1 Drainage Strategy

- 4.1.1 It is proposed to install a new below ground surface water drainage network to convey runoff away from the building to an existing point of discharge within the wider ownership of Cyfarthfa Castle.
- 4.1.2 The new drainage infrastructure will be designed for two scenarios:
 - a) a temporary over roof required during the construction phase
 - b) the refurbished building and roofscape for the long-term future.
- 4.1.3 Defra and the SuDS Manual recommend a sustainable approach to managing runoff from impermeable areas.
- 4.1.4 A surface water management train has been developed to manage the run-off from the site in accordance with the Welsh Governments Sustainable Drainage Developer Guide (WGSDDG).
- 4.1.5 Due to the impermeable ground conditions, it has been agreed with MTCBC that infiltration is not a viable disposal solution.
- 4.1.6 Trial excavations have been carried out to confirm underlying bedrock is at a suitable depth to allow excavations for below ground tanks to be carried out with conventional excavating machinery.
- 4.1.7 The design criteria for the network, attenuation and rate control have been discussed with MTCBC where it was agreed that the 60-minute 1in10yr event would be the design scenario for the temporary condition, otherwise the requirements of the WGSDDG will apply for the permanent scenario.
- 4.1.8 The network for the permanent scenario will be designed for the 1 in 30-year event. With the current principal network collapsed, storm water goes to ground so exceedance is difficult to ascertain but likely to flow down the hill towards the lake and lower parkland.
- 4.1.9 A further constraint is to meet the limiting capacity of the existing below ground network beyond the proposed final site connection into the existing network to the roads and residential estate beyond.
- 4.1.10 As an existing developed site, a betterment target of 30% over existing run-off rates for design storms is to be achieved.

4.2 Proposed Solution

- 4.2.1 The proposed method of surface water disposal is via attenuated, controlled discharge to an existing Welsh Water connection at the South East of the development site. The disposal of storm water will reuse existing rainwater pipes where appropriate with trapped gullies and catch pits to collect debris & silt. An attenuation tank will allow flow control over the two scenarios.
- 4.2.2 The proposal seeks to control the peak rate of surface water run off to a betterment of 30% of the pre-development rate in line with the WGSDDG.
- 4.2.3 The proposed scheme will convey the surface water into a new below ground network comprising new pipework, manholes and attenuation tanks prior to controlled discharge into the existing Dwr Cymru Welsh Water gravity sewer to the south of the development site.

4.3 Temporary Over Roof Scenario

- 4.3.1 The temporary over roof which will collect and discharge surface water to the new below ground network has been calculated as being approximately 5400m² in area and is illustrated in Figure 4.
- 4.3.2 The temporary roof scaffold will discharge surface water runoff to the drainage network via conventional gullies, conveyance will be via a below ground pipe and chamber network, a geocellular below ground attenuation tank will provide storage to allow the rate of run-off will be controlled by a flow control devices.
- 4.3.3 Existing peak surface water runoffs have been calculated in accordance with the Wallingford Procedure for an area of 5400m². There are some limitations to this analysis which does not account for wetting of the building, storage within existing pipes or runoff from flows that may already be disposed of via the poor performing existing network.

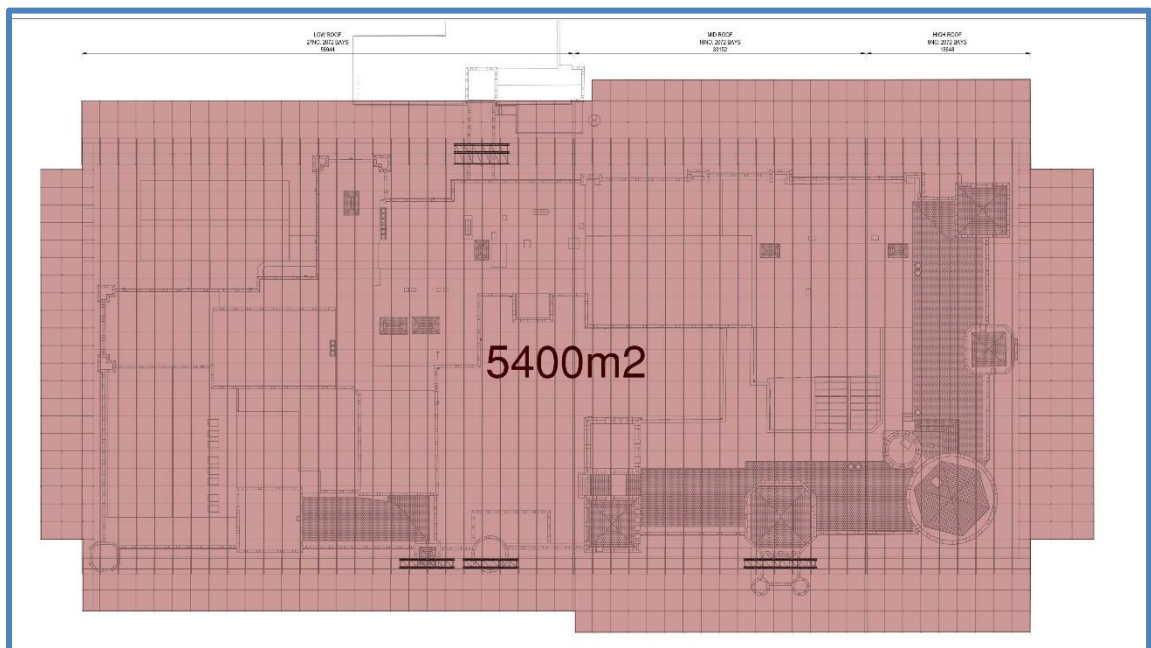


Figure 4 Approximate temporary scaffold roof area

- 4.3.4 Estimated peak surface water runoffs pre and post development have been calculated for the 60-minute duration storm events and have been tabulated below in Table 1. Calculations will be refined at the detailed design stage.

Table 1 Temporary Scenario - Existing surface water runoff and minimum betterment requirement in accordance with gov.wales

Return Period	Existing Maximum surface water runoff (l/s)	30% betterment to existing (l/s)
1 in 1 year	41.0	28.7
1 in 2 year (Qbar)	52.5	36.8
1 in 10 year	77.4	54.2

- 4.3.5 It is proposed to limit the surface water runoff for all events up to a maximum of 20.0 l/s which is the approximate capacity of the existing below ground network (representing a betterment on the pre-development rates).
- 4.3.6 The proposed sewer network has been designed to avoid flooding in the 1in10yr event due to the temporary scenario and 1in30yr event for the permanent design.
- 4.3.7 It has been calculated that an approximate storage volume of 54m³ is required to meet a 20.0 l/s rate control for the over roof with an area of 5400m² for the 1in10yr event.

4.4 Exceedance

In the exceedance events above the 1 in 10-year design event, surface water will flow overground and follow the contours of the landscaped and soft landscaping areas, away from the proposed building and towards the Lake located to the West of the development. This maintains the existing predevelopment exceedance routes.

4.5 Permanent Scenario Allowing for Future Phases of Work.

- 4.5.1 On completion of repairs to the Castle, it is proposed to convey all practical sources of surface water to the new network, via the attenuation tank and to the point of discharge offsite at the south of the site boundary.
- 4.5.2 To achieve this, a new network to convey surface away from the building will be installed, the existing network will remain to serve foul sewage from the building and also any drained basement areas, which are at significant depth below the typical ground level and not practical to collect with the new surface water drainage network.
- 4.5.3 The existing roof catchment area to connect to the below ground network in future phases has been calculated as being approximately 4500m² in area and as illustrated in Figure 5.
- 4.5.4 The permanent solution does not consider incoming runoff from hard landscaping.
- 4.5.5 It is proposed to limit the surface water runoff for all events up to the design event to a maximum of 32.0 l/s (representing a betterment on the pre-development rates).
- 4.5.6 The proposed sewer network has been designed to avoid flooding in the 1in10yr event due to the temporary scenario and 1in30yr event for the permanent design.
- 4.5.7 It has been calculated that an approximate storage volume of 54m³ is required to meet a 32.0 l/s rate control for the roofscape with an area of 4500m² for the 1in30yr event.

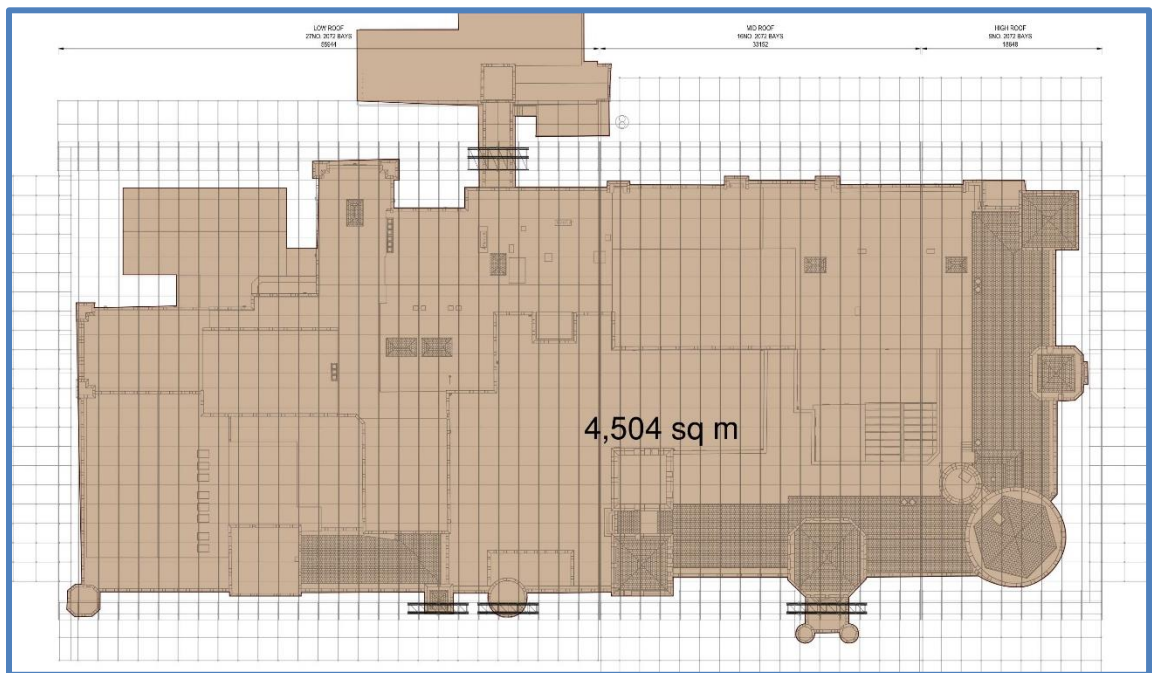


Figure 5 Cyfarthfa Castle's roofscape and catchment areas with Brown shading illustrating areas with the feasibility of connection post temporary over roof.

4.5.8 The layout of drainage around the castle will be as shown in Figure 6.

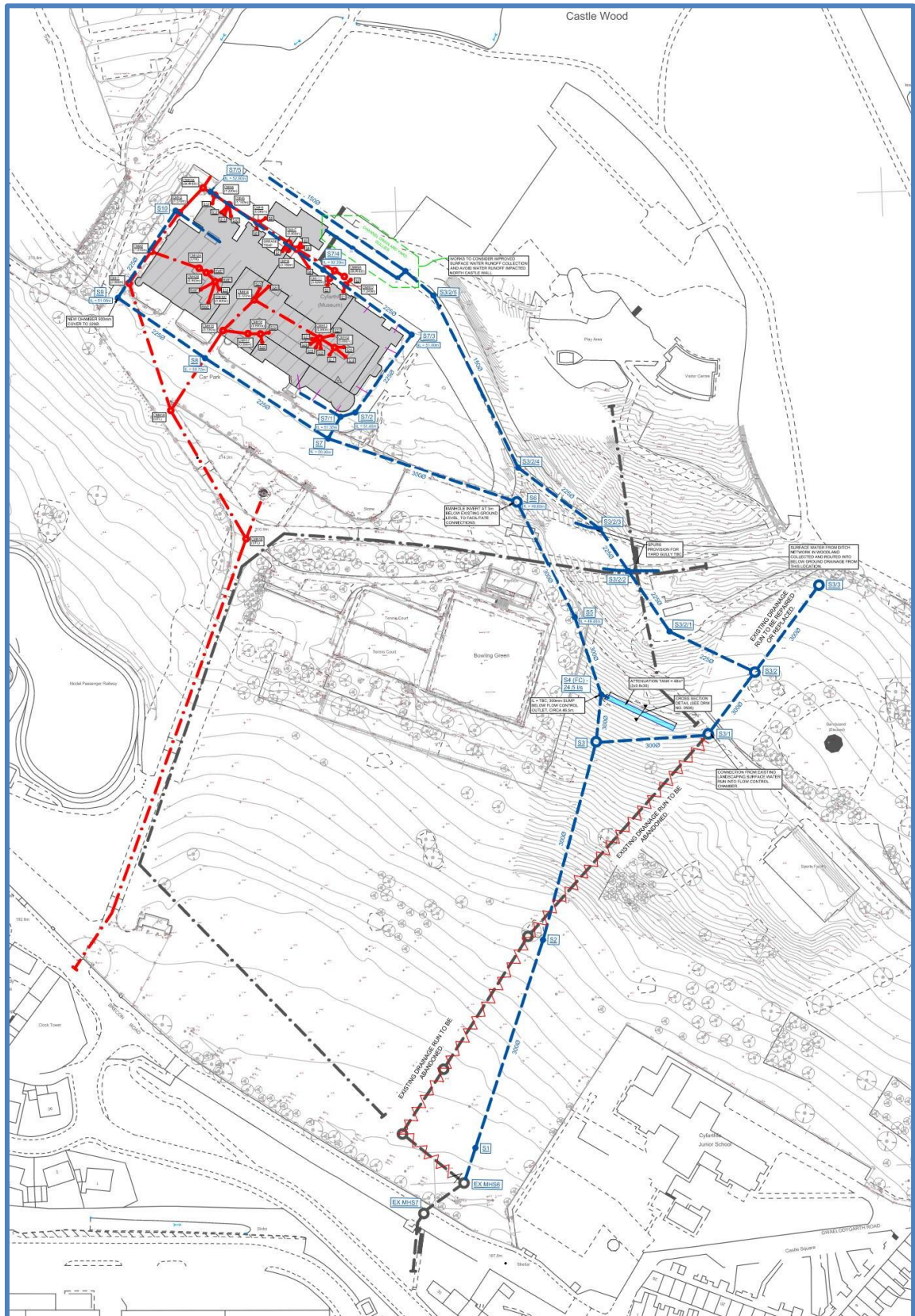


Figure 6 Castle drainage network, existing combined network shown red, new proposed surface water network shown blue.

- 4.5.9 The permanent solution considers utilising the existing attenuation tank installed during the temporary over roof scenario.
- 4.5.10 A new flow control device is proposed for the permanent scenario to be in accordance with the requirements of the WGSDDG. The flow control is proposed to limit rates of runoff for storms up to the 1 in 30-year events to a minimum betterment of 30% of pre-development rates.
- 4.5.11 Estimated peak surface water runoffs and a 30% betterment have been calculated for the 15-minute duration storm events and have been tabulated below in Table 2. Detailed calculations are proposed to be included at the detailed design stage.

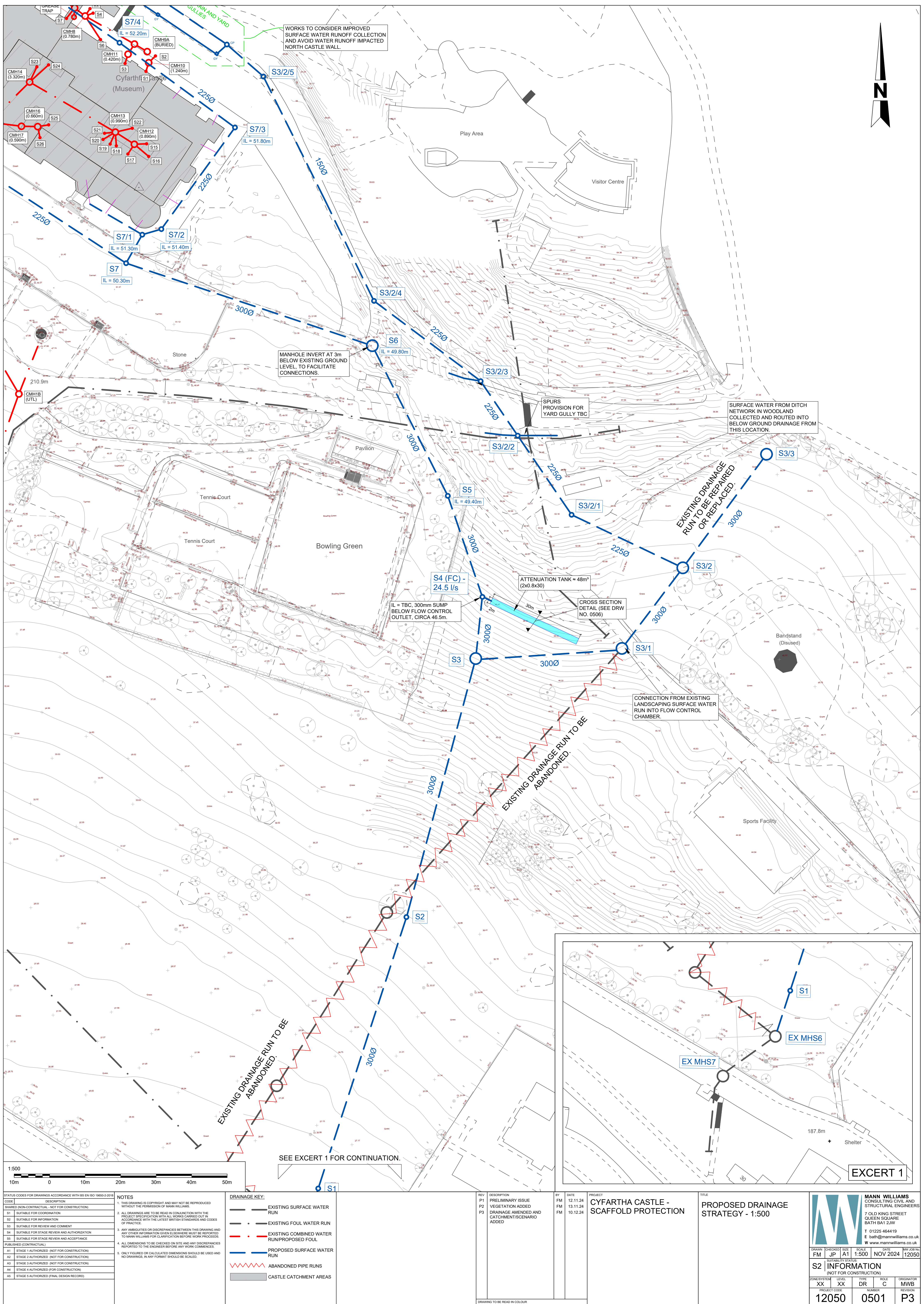
Table 2 Permanent Scenario - Existing surface water runoff and minimum betterment requirement in accordance with gov.wales

rea	Return Period	Existing Maximum surface water runoff (l/s) – 15-min duration	30% Betterment Maximum surface water runoff (l/s) – 15 min duration
Total: 4500m ²	1 in 1 year	54.0	37.8
	1 in 2 year (Qbar)	65.0	45.5
	1 in 10 year	92.0	64.4
	1 in 30 year	104.0	72.8

4.6 Exceedance

In the exceedance events above the 1 in 30-year design event, surface water will flow overground and follow the contours of the landscaped and soft landscaping areas, away from the proposed building and towards the Lake located to the South West of the development. This maintains the existing predevelopment exceedance routes.

Appendix 1 – Proposed Drainage Strategy Drawing



STATUS CODES FOR DRAWINGS ACCORDANCE WITH BS EN ISO 15689-3:2019	
CODE	DESCRIPTION
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	EXISTING FOUL WATER RUN
	EXISTING COMBINED WATER RUN/PROPOSED FOUL
	PROPOSED SURFACE WATER RUN
	ABANDONED PIPE RUNS
	CASTLE CATCHMENT AREAS

REV	DESCRIPTION	BY	DATE
P1	PRELIMINARY ISSUE	FM	12.11.24
P2	VEGETATION ADDED	FM	13.11.24
P3	DRAINAGE AMENDED AND CATCHMENT/SCENARIO ADDED	FM	10.12.24

PROJECT	TITLE
CYFARTHA CASTLE - SCAFFOLD PROTECTION	PROPOSED DRAINAGE STRATEGY - 1:500

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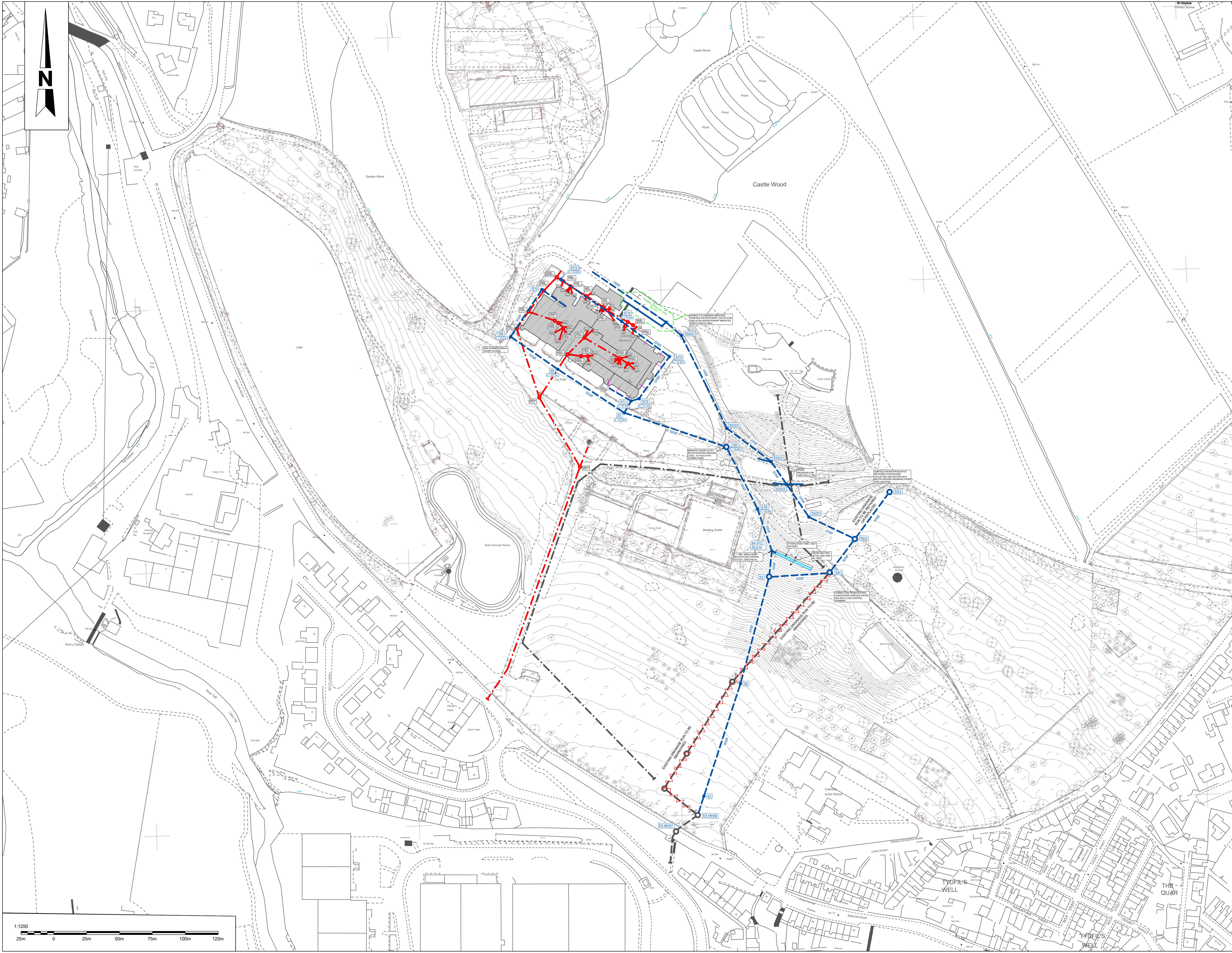
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- CASTLE CATCHMENT AREAS

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PROJECT

CYFARTHA CASTLE - SCAFFOLD PROTECTION

TITLE

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XX	XX	XX	A1	1:1250	NOV 2024	12050

S2 INFORMATION				
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