

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Ysgol Gwenfro

Wynne Construction

Flood Risk and Drainage Report

Prepared by:

Caulmert Limited

Unit 16, St Asaph Business Park, St Asaph, Denbighshire, LL17 0LJ

Tel: 01745 530890

Email: @caulmert.com

Web: www.caulmert.com

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Project Director: Allan Smith
Project Manager: Jonathan Sykes
Caulmert Limited: Unit 16, St Asaph Business Park, St Asaph, Denbighshire, LL17 0LJ
Tel: 01745 530890

Author	J Sykes	Date	16-09-15
Reviewer	J Sykes	Date	16-09-15
Approved	A Smith	Date	18-06-15

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EXECUTIVE SUMMARY

This document describes the assessment of flood risk and drainage of surface water and foul flows from the proposed new primary school development at Gwenfro, Wrexham.

The assessment concludes the development is not at risk of flooding from the nearby Afon Gwenfro or from other potential sources. There is an inherent risk of localised flooding from extreme rainfall and blockage or damage to the drainage system. This can be managed by ground profiling.

Surface water is understood to drain largely to a combined public sewer, and with connections directly to the Afon Gwenfro and also soakaway. The proposed development will eliminate the surface water connected to the sewer and drain via a controlled discharge to the Afon Gwenfro and by infiltration to the ground at shallow depth.

Foul drainage will discharge via the existing outfall into the public sewer.

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YSGOL GWENFRO

Flood Risk and Drainage

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1.0 INTRODUCTION

1.1 Background

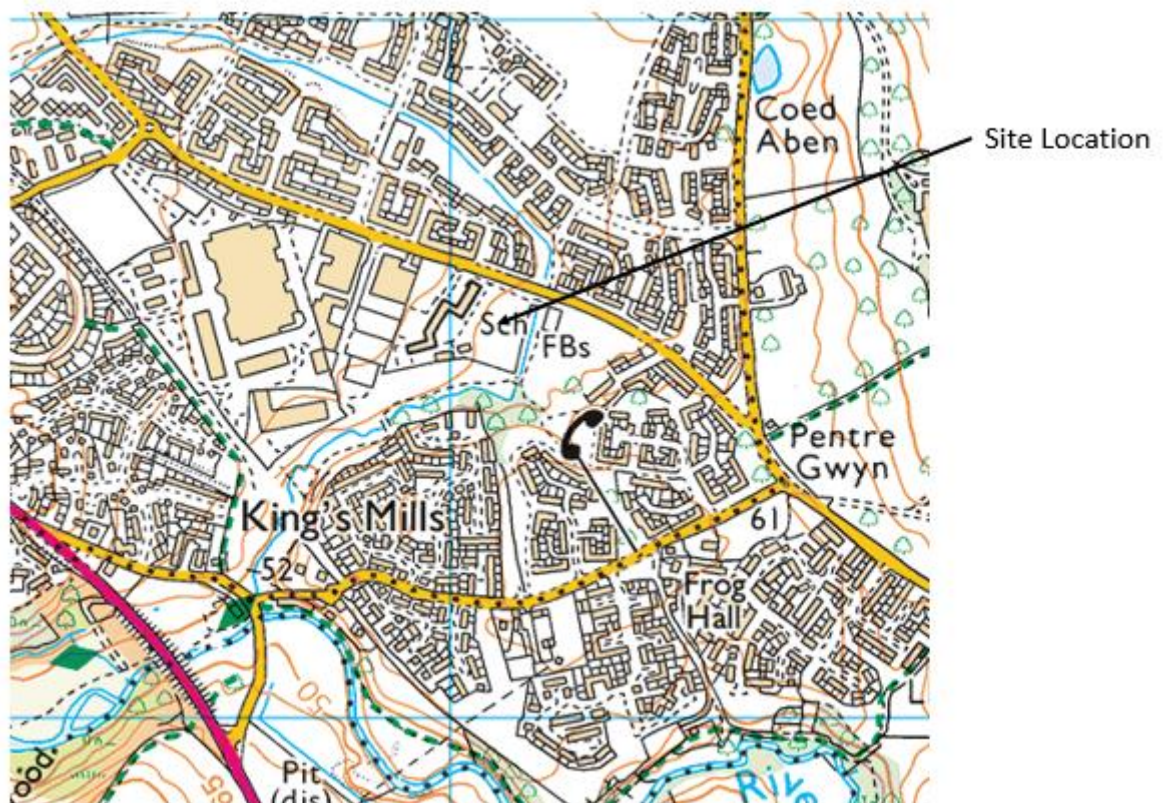
This report is to support a planning application for a new school development on the site of the Gwenfro Primary School. It assesses flood risk surface water drainage and foul drainage, and should be read in conjunction with other planning application documents.

The report sets out how the development can reduce the discharge of surface water from the site and the strategy for managing peak flows. IN developing the strategy reference has been made to Wrexham Borough Council's Draft

The concepts and drainage strategy described in the report are based on initial investigations on the site and will be further developed as the results of further investigations into drainage and ground conditions become available.

1.2 Site Location

The site is located at the east of Wrexham and occupies an area of approximately 2.2ha. It is bounded to the east by the Afon Gwenfro, to the north by Queensway, to the south is a public park area and to the west is an industrial area. See the location plan below:



Site Location

1.3 Site Topography

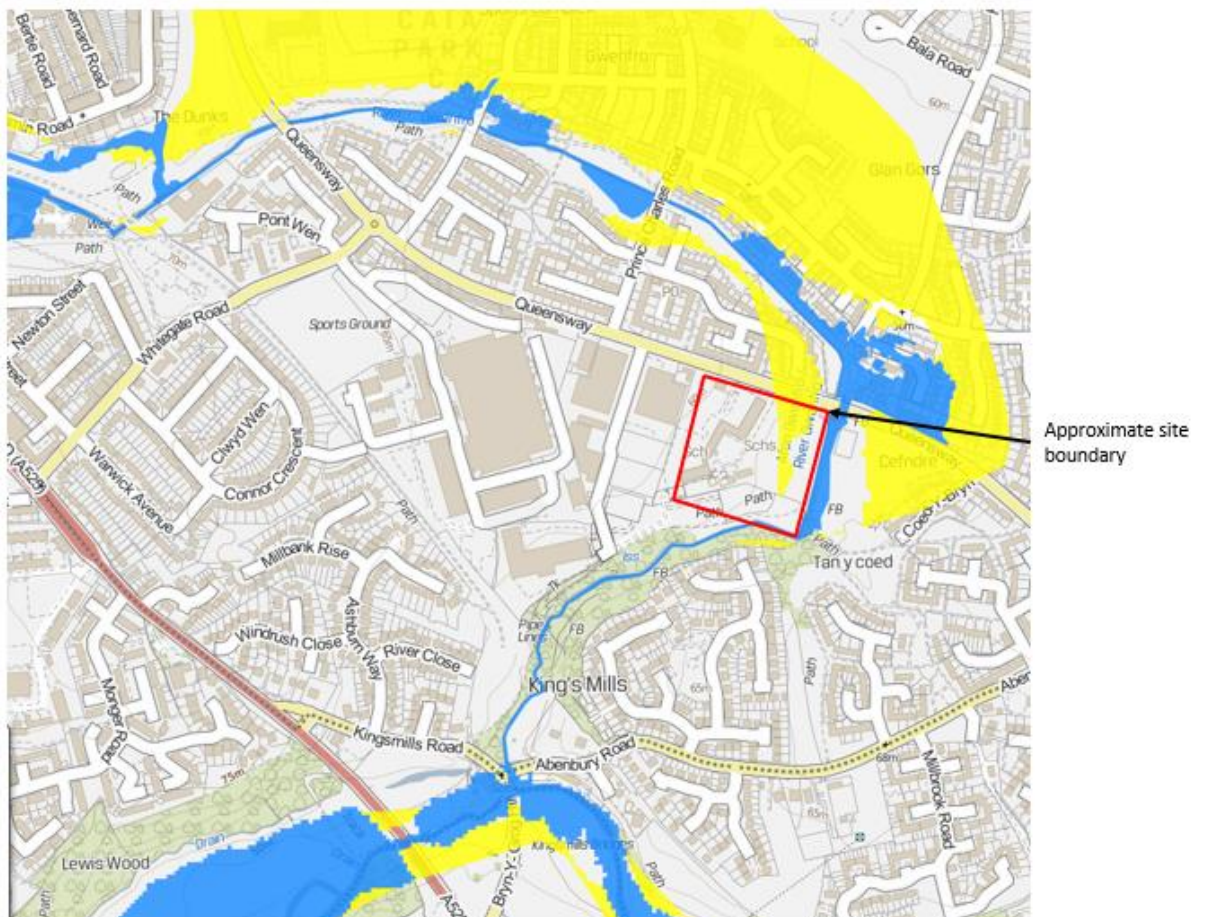
The site is in two distinct levels. The east of the site is a grassed sports area and is generally levels at 54.5m AOD. West of this is a bank sloping at approximately 1:7 to the area where the existing school building are located and the area of the proposed new building. This upper level varies from around 60m AOD to 59m AOD.

2.0 FLOOD CONSEQUENCES ASSESSMENT

2.1 Fluvial Flooding

The site is located to the north and west of the Afon Gwenfro, which is a main river and tributary of the Afon Clywdedog

The Welsh Government's TAN15 flood maps indicate there is an area of yellow Zone B extending into the site. See extract below.



Extract from Welsh Government's TAN15 Development Advice Maps

Zone B is defined as an area which is known to have flooded in the past. This is based on geological draft maps which indicate the presence of river terrace materials.

Inspection of Natural Resources Wales (NRW) flood maps indicates the site is not at risk of flooding from the Afon Gwenfro. Land to the east of the site is lower than the site and in the event of flows exceeding the bank capacity that area would flood in preference to the site. Refer to the extract below.



Extract from NRW Flood Mapping

The buildings on the site are further elevated above the flood risk area and the proposed new building will be set at this elevated level, some 6m above the sports field which forms the lower part of the site.

2.2 Other Sources of Flooding

The upper level of the site is not considered to be at risk from other potential sources of flooding, such as groundwater, drainage and sewerage due to its elevation and the general topography allowing any surface water to flow towards the Afon Gwenfro. A trunk sewer (600mm diameter) passes within the site sports field at a lower elevation than the building, so in the event of flooding from manholes the building area would not be affected.

Localised flooding due to exceedance rainfall or blockages is an inherent risk. Ground levels will be designed so that exceedance rainfall does not affect the buildings.

3.0 SURFACE WATER DRAINAGE

3.1 Existing Site

Camera surveys have been carried out to establish the points of outfall and the areas drained by two surface water pipes. These are shown on the extract below. The surveys have proven that at the east of the site a 225mm diameter drain discharges into the Afon Gwenfro. However the survey has not identified any direct connections into the pipe from the site. A second surface water drain collects flow from the west part of the site and directs it to an adjacent soakaway.

Based on the topographical survey and drainage investigations it appears approximately 650m² of the impermeable area of the site is connected into the soakaway, with the remainder connected to the combined sewer and the Afon Gwenfro.



Plan showing existing permeable and impermeable areas

Based on a flat rate 50mm/hr the discharge rates from impermeable areas are as follows:

Area Description	Existing (l/s)
Impermeable to sewer / Afon Gwenfro	96
Impermeable to soakaway	9

3.2 Proposed development

The proposed development building footprint is reduced compared with the existing, however the external areas are being improved such that the proposed external impermeable area is increased. The plan below indicate the changes (note that north is reversed on this plan as it was produced at a preliminary stage).



Preliminary proposed development for comparison purposes

The change in areas is set out below:

Area Description	Existing (m2)	Proposed (m2)	Change m2 / %
Roof Area	2,184	1,345	-834 m2 / -38%
Impermeable Yard etc.	5,366	6,844	+1478m2 / +27%
Grassed / Landscaped	14,298	13,667	-631m2 / -4%
Total Impermeable	7,550	8,189	+639m2 / +8%

Based on the above, without mitigation peak discharge rates from the site (based on 50mm/hr rainfall) could increase from 102 l/s to 114 l/s. The section below describes the drainage

philosophy which will enable the development to eliminate the discharge of surface water to the public sewer and return towards the equivalent of green-field discharge rates to the Afon Gwenfro.

Based on the HR Wallingford UKSuDS green-field runoff calculations the Qbar for the site is 0.17l/s. However a minimum discharge rate of 5l/s is recommended for any site to mitigate the risk of blockages in flow control devices.

3.3 Drainage Philosophy

The preferred hierarchy of surface water management has been considered as follows:

3.3.1 Drainage via infiltration

Initial ground investigations on site indicates the site is initially underlain by a variable succession of soils including sands, gravels and clays to a depth of between 1m and 1.5m below existing ground levels. These deposits rest on top of a relatively thick stratum of very loose / loose silt extending to between approximately 3m and 4.5m. The sit rests on top of firm / stiff clay presumed to be Glacial Till. Groundwater rose in well installations to around 0.5m and 0.5m below ground level.

Based on the above and that part of the site is understood to presently drain to soakaway, it is anticipated greater use could be made of infiltration in the proposed development. The ground water depth suggests that shallow infiltration would be required, and the likely variability of the sand and gravel layers suggests that an infiltration blanket would be appropriate where feasible. Due account will be taken of the proximity of buildings.

Further investigations are being carried out on site in order to determine permeability parameters for the detailed design of infiltration.

3.3.2 Drainage to Watercourse

CCTV surveys carried out indicate there is an existing 225mm diameter surface water connection to the Afon Gwenfro. It is therefore proposed that, subject to controlling discharge to agreed rates (proposed 5l/s), areas of the school will discharge to the watercourse.

3.3.6 Drainage to Public Sewer

As noted above, it is not proposed to connect any surface water flows from the development site into the public sewer. Dwr Cymru Welsh Water has been consulted and they confirmed their expectation that surface water should only be connected to the public sewer if other alternatives have been exhausted.

3.4 Drainage Strategy

The following strategy is expected to be refined and modified as detailed information following ground investigations becomes available. The strategy will be to discharge the majority of the

new building roof drainage and adjacent paved areas (Phase 1) at controlled rates via the existing outfall into the Afon Gwenfro. Remaining areas of Phase 1 and the majority of Phase 2 will drain via infiltration where ground conditions are suitable, with any residual drainage being controlled and connected into the Phase 1 outfall.

3.4.1 Phase 1

The Phase 1 area is almost entirely impermeable and comprises the new building and yard area. Due to its level the school building and part of the adjacent hard standing will be drained to the north and routed into the existing outfall pipe to the Afon Gwenfro. Discharge into the outfall pipe will be controlled to a peak rate of 5l/s using a vortex flow control device or similar. Due to the anticipated variability of the near surface ground conditions and the need to maintain dry construction conditions in a constrained area it is proposed to positively drain the new building and adjacent areas through the existing outfalls. Attenuation in the form of cellular storage or porous sub base will limit the peak discharge rates from these areas.

Attenuation storage will be provided beneath the external paved areas, and the volume of storage required has been provisionally calculated as follows, using Micro Drainage Quick Storage Estimate:

Approximate Phase 1 areas to Afon Gwenfro @ 5l/s	Area (m²)	1 in 30 year storage (m³)	1 in 100 year plus 30% Climate Change (m³)
Impermeable area	6390	Between 160 to 250	Between 330 and 480

To retain the 1 in 100 year plus climate change volume below ground would require a cellular storage crate of approximately 10m x 40m x 1.2m deep. It is proposed a proportion of the extreme rainfall would be allowed to form standing water on the car park, retained by kerbs. Due to the depth of the drainage it is not anticipated that large scale infiltration will be feasible for this part of the site.

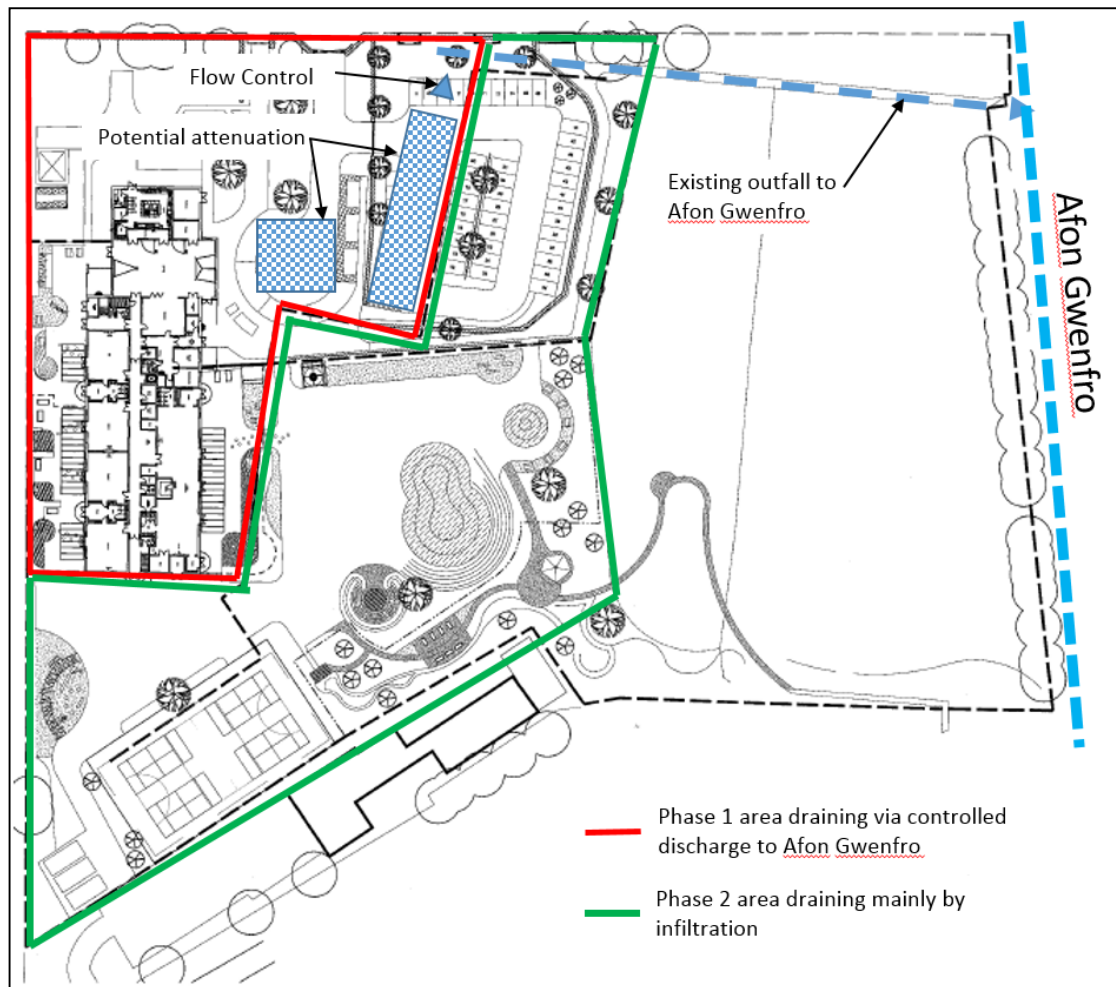
3.4.2 Phase 2

The existing surface water drainage will be largely grubbed out. Where practicable, play areas will be formed from permeable surfacing which will allow rainwater to pass through the structure into the sub strata.

At the south end of the play area it is proposed that shallow under-drained swales are formed which will collect surface runoff from adjacent areas and form a connectivity to infiltrate to the sub strata.

Based on an infiltration rate of 1×10^{-6} (loam) it is estimated a blanket of porous sub base with 30% voids 0.5m deep and occupying 50% of the impermeable area would be able to manage rainfall up to 1 in 100 years plus 30% climate change allowance.

The plan below summarises the drainage strategy



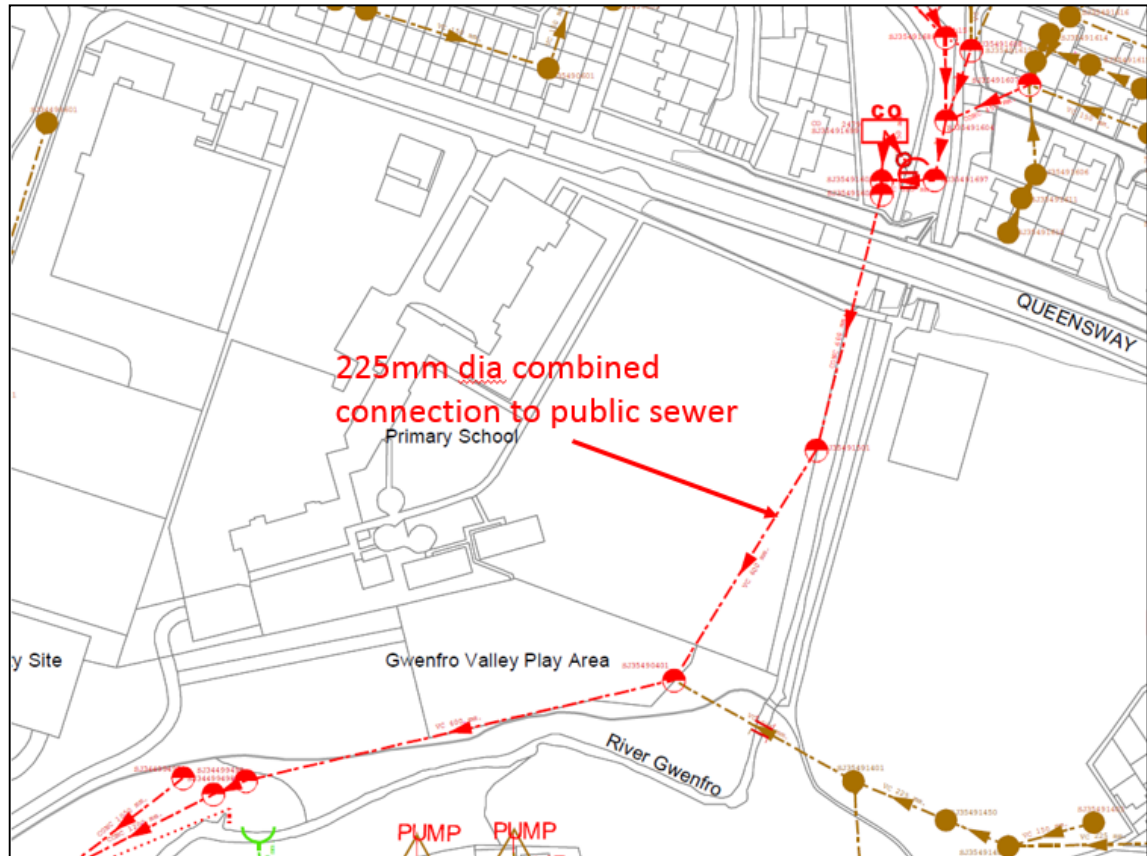
Plan showing indicative surface water drainage strategy

In summary, the development provides an opportunity to significantly reduce the discharge of surface water from the site into the public sewerage system by controlling discharge into the Afon Gwenfro and by infiltration at a shallow depth into the ground. The results of further investigations will allow the strategy to be developed and refined. Details of the final solution will be submitted for approval

4 FOUL DRAINAGE

4.1 Existing Site

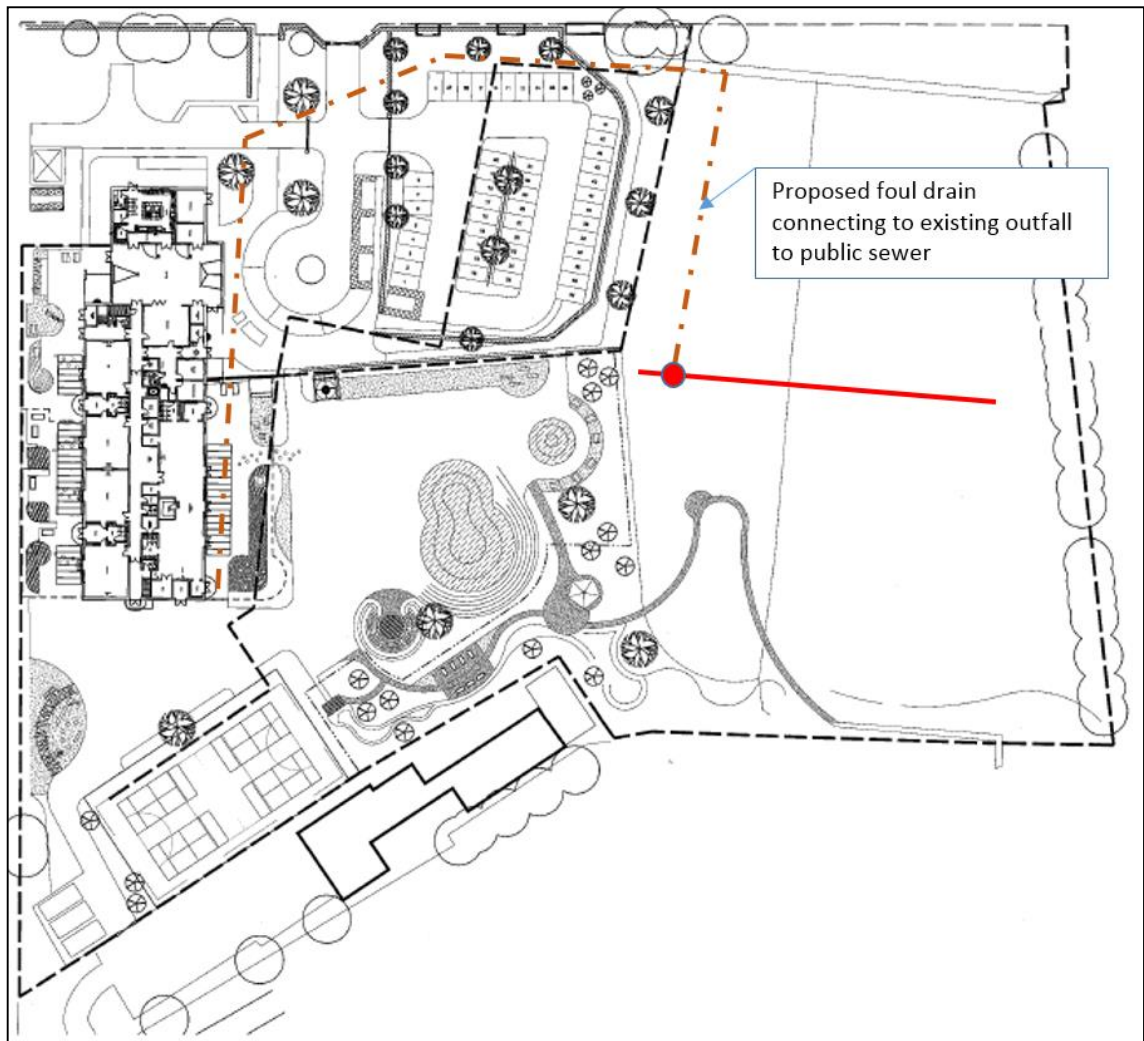
The site has a system of foul drainage, which in places combines with surface water to discharge in a public sewer that traverses the south of the site. The outfall pipe to the sewer is 225mm diameter. See below for an extract from Dwr Cymru's sewer record with the point of connection indicated:



4.2 Proposed Development

4.2.1 Phase 1

The existing foul drainage within Phase 1 area will be abandoned. Foul drainage from the new building will be routed in a new pipe around the east of the school grounds to connect at an existing chamber on the outfall pipe.



Proposed Phase 1 Foul Drainage

4.2.2 Phase 2

The existing drainage for the school will be grubbed out, retaining the foul connections from the Flying Start building, which is outside of the development boundary. This will remove the surface water component of the current school discharge into the public sewer. It is therefore anticipated there will be a significant reduction in peak flows discharging to the public sewer.



Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG

Tel: 01248 672666

Fax: 01248 672601

Email: contact@caulmert.com

Web: www.caulmert.com