BURO HAPPOLD

Wrexham FC Darland Training Ground

Drainage Strategy

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Revision P02

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Glossary

Term	Definition
SuDS	Sustainable Urban Drainage Strategy
SAB	Sustainable Urban Drainage Approving Body
GA	General Arrangement
TAN15	Technical Advice Note 15; Provides technical guidance in relation to development, flooding & coastal erosion.
AEP	Annual Exceedance Probability (AEP); the probability that a given flood event will be equalled or exceeded in any single year.
Return Period	A statistical average used to describe the average time between flood events. A 1 in 100-year return period has a 1% chance of occurring in any given year. This is directly related to AEP.

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1 Introduction

1.1 Executive Summary

This report has been prepared to present the surface water drainage design for new pitches proposed at Wrexham AFC's Darland Training Ground. The report presents the information for planning approval. The scope of the planning application covers the elements of the site that require planning approval, namely the swales, and areas of proposed structures. The site is considered as a whole for the purpose of the site drainage design.

The scheme consists of grass football pitches and school games area. Where viable, surface water is disposed of to ground through the pitch buildup and via two interlinked swales. An outfall is provided from the swales to an unnamed watercourse present to the north of the site, referred to as the beck. Surface water flows into the beck once the infiltration potential of the pitches and swales is exceeded. Peak flow rates are restricted to equivalent greenfield rates by the use of orifice plate flow controls. Water quality is addressed by provision of swales.

Infiltration testing has been completed via trial pits both at the depth of the proposed pitch formation and in the location of the proposed swales. Trial pits in the swales were excavated to a depth of 1m below the proposed base level of the swales to identify the depth to groundwater.

The drainage system will remain in the ownership of Wrexham AFC and maintained by them.

1.2 Local Stakeholder Consultation

A meeting with the SuDs Approving Body (SAB) occurred in May 2025. During this meeting, the surface water drainage strategy and hydraulic modelling methodology was presented. The SAB team raised no concerns and noted the nature of the project is favourable to surface water management.

The SAB team did note the requirement of attenuation to allow the controlled discharge of runoff at a flow rate to provide betterment, in comparison to the existing runoff rates. The importance of a SuDS train was also noted, to ensure a suitable level of treatment is provided to runoff, prior to its discharge.

These points have been considered during the design of the surface water drainage strategy.

1.3 Site Context

The site is situated to the south-east of Darland High School. Access from the school is provided via a footbridge crossing over the beck. The north-east boundary of the site is defined by Gamford Lane, which also serves as a vehicular access point. To the south-east, the site adjoins agricultural land, while to the south-west it borders a still under construction housing development. The entire site is enclosed by established hedgerows.

1.4 Site Boundary & Area

See Figure 1—1 for the boundary of the Darland Training Grounds site. The planning application is defined by the red line and covers an area of 0.97Ha. The wider site catchment considered in the hydraulic design is 3.68Ha (see Figure 5—1).

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Figure 1—1 Darland Training Grounds Existing Site Condition, Planning Application Boundary in Red

1.5 Topography

The existing site is undulating but generally slopes gently from the south-east corner towards the beck along the north-west boundary. Levels range from a maximum of 12.5m to minimum of 11.3m AOD, the average slope is approximately 1 in 180. A topographic survey is contained in Appendix A.

1.6 Geology, Infiltration Rates & Groundwater

The general geology of the wider area is shown in Figure 1—2 below, extracted from the British Geological Survey website. The site is shown to be River Terrace Deposits (sands and gravels) over Mudstone and Sandstone.

A site-specific ground investigation was conducted in August 2025 to establish the shallow geology below the proposed pitches and the attenuation swales. Trial pits were dug to the proposed formation depth for each of the new pitches, and a shallow soak-away test undertaken to understand the capacity of each pitch to infiltrate surface water to ground. Deeper trial pits were dug at the location of each swale to a depth of approximately 1m below the proposed base level of each swale.

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Soak-away tests were conducted in both of the deeper pits to understand each swales capacity to infiltrate surface water to ground.

The shallow geology at the site was found to vary. Sand and gravel were encountered below the topsoil in some locations and clay was encountered in others. The infiltration rates varied accordingly, with the tests failing in the clay areas. Groundwater was encountered within a gravel layer within TP02 at a depth of 1.6m. All other pits were found to be dry. The results are summarised in Table 1—1 below, the full GI report is contained in Appendix B.

The site is greenfield with no history of prior development; hence a geo-environmental investigation is not considered necessary.

Table 1—1 Geological Summary.

Pit Reference	Depth	Geology Encountered (below topsoil)	Infiltration Rate	Depth to Groundwater
TP01	1.75m	Slightly silty fine to medium SAND to 0.75m depth, over Firm to stiff dark reddish brown slightly sandy slightly gravelly CLAY.	Test failed. Infiltration assumed to be zero.	Dry
TP02	1.90m	Firm to stiff light brown slightly sandy slightly gravelly CLAY to 0.5m depth, over Soft to firm orangish brown slightly gravelly sandy CLAY, to 0.9m depth, over Sandy slightly silty subrounded to rounded fine to coarse GRAVEL	5.36E-05 m/sec (19.3 mm/hour)	1.6m
TP03	0.75m	Gravelly slightly clayey fine to medium SAND to 0.75m depth.	3.00E-05 m/sec (10.8 mm/hour)	Dry
TP04	0.80m	Soft to firm light brown slightly gravelly sandy clay to 0.45m depth, over Firm to stiff greyish brown slightly sandy slightly gravelly CLAY.	Test failed. Infiltration assumed to be zero.	Dry
TP05	0.81m	Gravelly slightly silty fine to medium SAND to 0.62m depth, over Gravelly slightly clayey fine to coarse SAND.	8.31E-05 m/sec (29.9 mm/hour)	Dry

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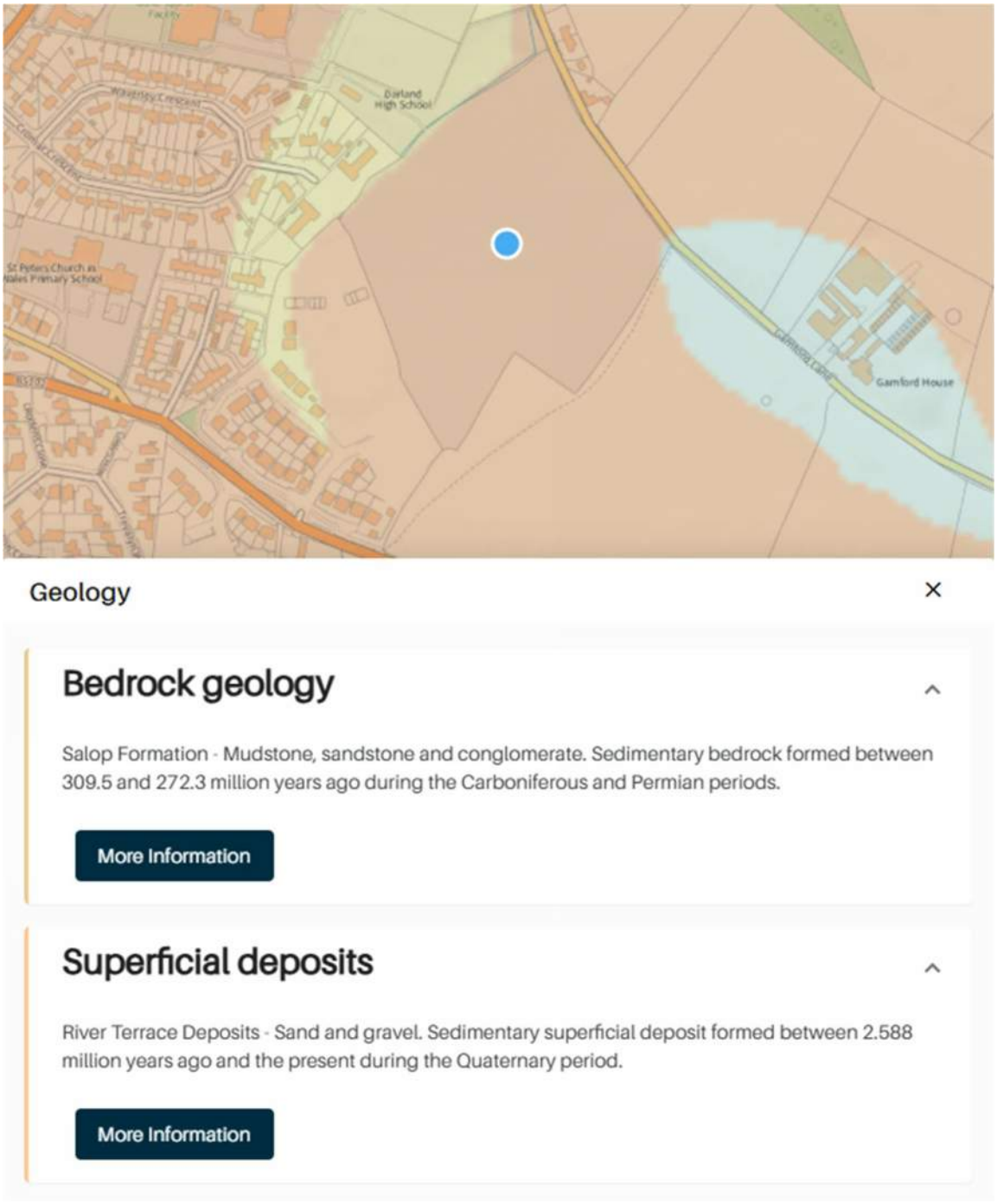


Figure 1—2 Geology from BGS Website

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2 Existing Hydrology

2.1 Existing Drainage

The existing site is served by a land drainage system, formed of a herringbone network of perforated pipes laid in gravel trenches. The layout of the pipework was evident during dry weather in May 2025, where the pipe routes are clearly identified as parched marks in the grass. The parch marks were surveyed to be at approximately 6m centres, and trial pitting recoded the pipe trench to consist of 100 mm topsoil overlying 650mm gravel with a 110mm perforated pipe at the base. A number of outfalls were found to discharge directly to the beck on the north-western boundary of the site.

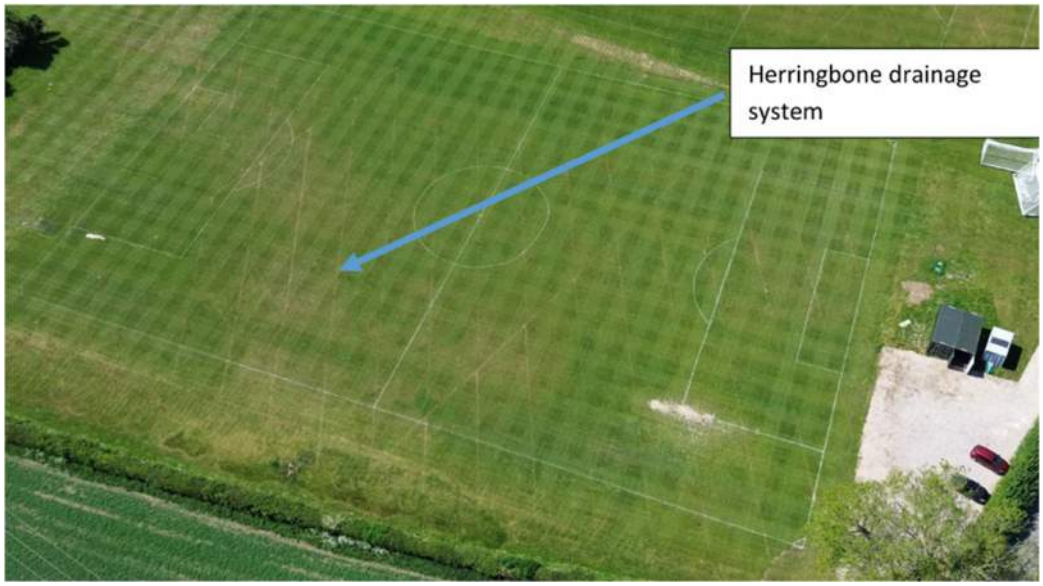


Figure 2—1 Parch march showing layout of existing land drainage system at the site.

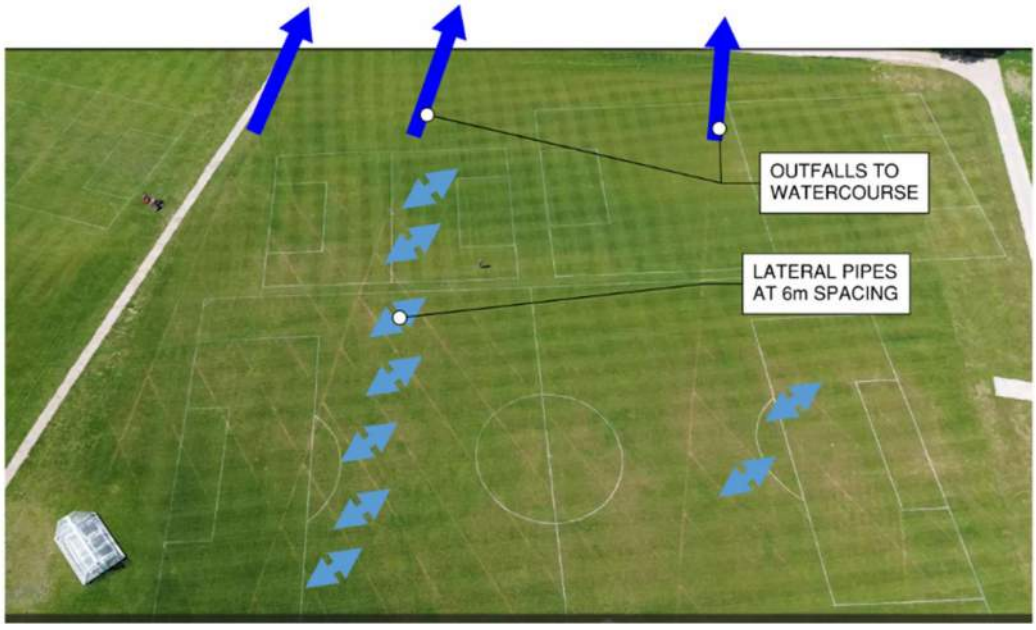


Figure 2—2 Parch march showing layout of existing land drainage system at the site.

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Figure 2—3 Existing Land Drainage Pipe Trench and Example of Outfall to Beck





2.2 Greenfield-Run Off Rates

Discharge rates from the site, in an undeveloped, greenfield state have been calculated for the site using the UK SuDs tool based on a drainage catchment area of 3.68Ha, see Appendix C. WRAP soil type mapping indicated the site to be type 4, which reflects the GI information that shows the site being predominantly underlain with clay in the GI. Soil type 4 has therefore been retained for the calculation.

Table 2—1 Greenfield Discharge Rates

Return Period	Greenfield Rate (L/s)
2	16.3
10	24.9
30	31.3
100	38.3

2.3 Pre-Development Run Off Rates

The existing land drainage system present will alter the response of the site to rainfall and increase the speed and rate at which rainfall is conveyed to the beck. The pipes also provide a pathway to allow sub-soil drainage to flow into the watercourse and reduce the overall volume soaking to ground.

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The land drainage pipe system is likely to be inundated during extreme events, meaning water would enter by a combination of pipe flow from the system and overland flow across the existing ground.

Whilst the land drainage system will increase flows into the watercourse, the It not considered possible to accurately estimate the run-off rates from the existing site with the information currently available. The drainage design for the new development will therefore be engineered to meet the greenfield rates noted above, which will provide a betterment to the current drainage system, albeit not accurately quantified.

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3 Proposed Development

Proposed Development

Full planning permission is sought for a development with the following description:

"Full planning application for the undertaking of drainage engineering works, in addition to the erection of shipping containers, landscaping and other associated works."

The proposed works are summarised as follows:

- Installation of permanent irrigation tanks and pump housing;
- Provision of shipping container storage buildings;
- Construction of two swales (attenuation ponds) to attenuate surface water run-off from the site; and
- Hard and soft landscaping works involving reinforced hedgerows, low management grassland, permeable maintenance access routes, and stock fencing.

Note: This application seeks planning permission for the proposed works which are located within the red line boundary, to help facilitate the wider improvement works to the land drainage systems below the football pitches. A separate SuDS (Sustainable Drainage Systems) Approval Body (SAB) application is being submitted to deliver these wider works. Therefore, whilst the works to the football pitches are not technically being assessed as part of this application, they have been demonstrated on the site plan and the supporting documentation to show how the planning application relates to the wider improvement works.

The proposed site layout is shown in Appendix D, and in Figure 3—1 below. The site proposals include:

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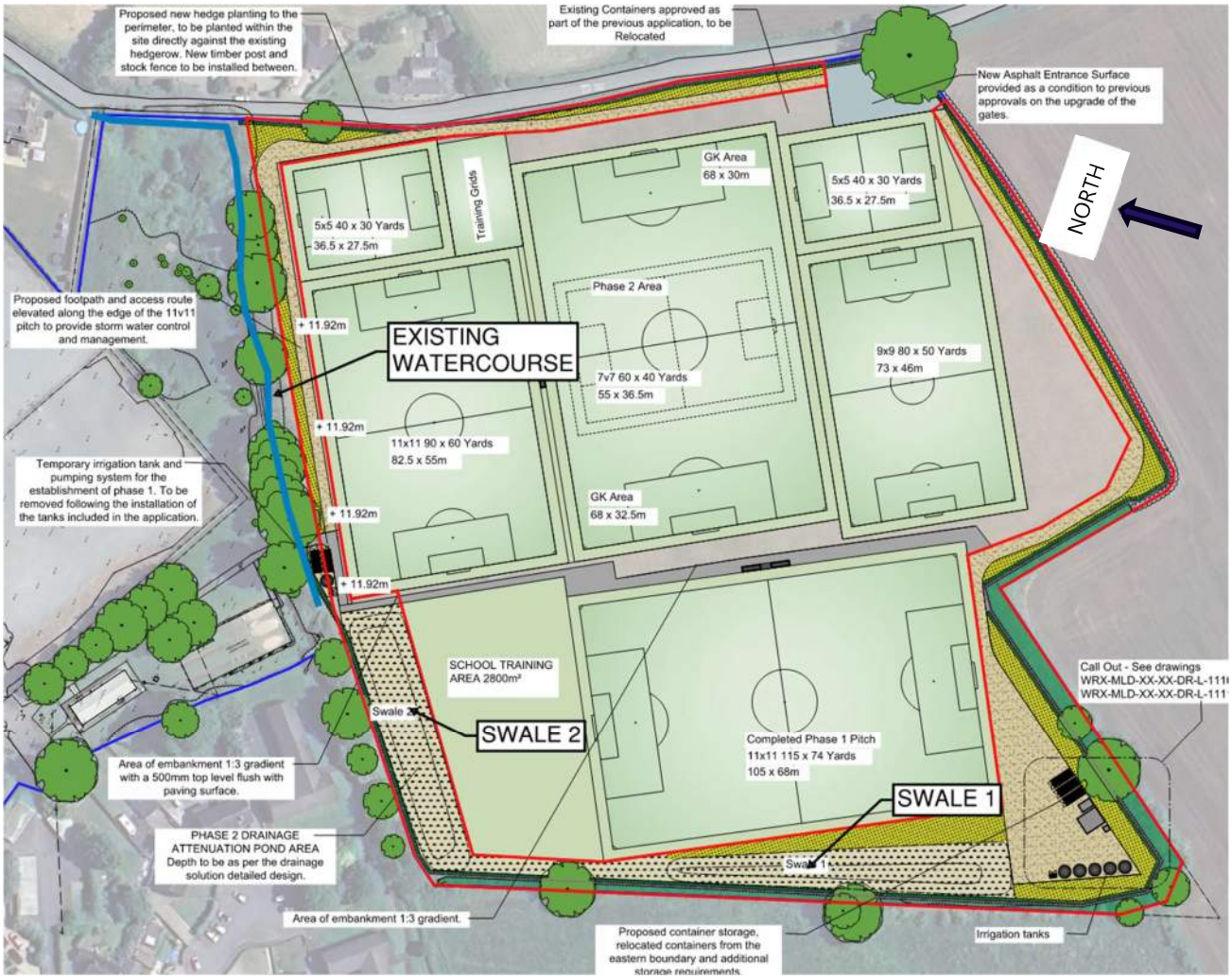
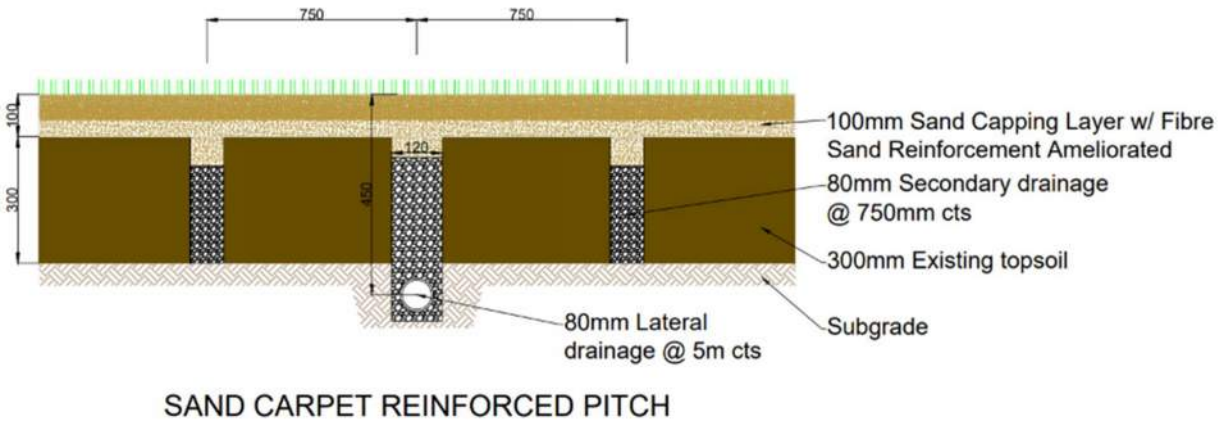


Figure 3—1 Proposed Site Layout

The new pitches are to be constructed using a Reinforced Sand Carpet arrangement, a detailed in Figure 3—2 below. The pitches include a 100mm top layer of fibre reinforced sand over the existing topsoil. Perforated land drainage pipes are provided at 5m centres running across each pitch, which connect to a carrier drain at the pitch edge. Secondary drainage is provided by 80mm wide slit drains at 750mm centres, which promote infiltration from the surface to the topsoil and sub-soil.



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Figure 3—2 Pitch Construction Detail

The site proposals do not include any significant areas of impermeable surfacing. Local impermeable catchments will be created by the structures constructed for the new pitch irrigation system, these are considered negligible in the wider context of the site, and will be allowed to drain locally onto the surrounding permeable surfaces.

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4 Surface Water Drainage Strategy

4.1 Aims & Objectives

The aims and objectives of the proposed surface water drainage strategy are as follows:

- Protect against flooding,
- Improve the drainage characteristics of the football pitches to provide a high quality playing surface,
- Maximise the volume of water able to drain by infiltration,
- Collect and convey surface water away from the pitch areas in a safe and controlled way,
- Provide measures to improve the quality of runoff prior to discharge,
- Be sustainable and maintainable,
- Be appropriate for and compliment a natural turf football training ground area used by a school, and
- Ensure structural integrity over the duration of the development design life.

4.2 Proposed Discharge Limit

National and local planning policy require the peak discharge from site to provide a minimum of 30% betterment, compared to existing runoff rates, or equal to greenfield rates for all return periods.

It is proposed to limit the maximum discharge flow rate to the equivalent greenfield rates, as noted in Table 2—1. The maximum permitted discharge will be 38.3/sec for the 1 in 100 year event.

4.3 Surface Water Discharge Destination

The proposed surface water drainage strategy for the site has followed the design guidelines set out by CIRIA SuDS manual, particularly the hierarchy for surface water runoff destination. The hierarchy is as follows:

1. **Surface water runoff is collected for use**

Reuse of surface water runoff for irrigation was considered, however deemed not feasible. The pitches will allow water to infiltrate naturally and will only generate runoff in more extreme events, which might occur only a handful of times a year. Pitch run-off would also typically only occur in the wetter months of the year when the topsoil is already saturated, and when irrigation is not required.

There would therefore be no reliable nor frequent rechange of a rainwater harvesting system based on pitch run-off.

2. **Surface water runoff is infiltrated to the ground**

It is known that the soil underlying the site has a variable but generally poor infiltration rate, discharge to the ground via infiltration as the primary method of discharge is not considered feasible. However, the proposed surface water management strategy has been designed to allow infiltration to continue to occur as it currently does, thereby maintaining existing flow paths and mimicking the site's natural hydrological behaviour. As there is no material change in the site's use, the drainage approach remains simple and proportionate, avoiding unnecessary complexity while ensuring compliance with sustainable drainage principles.

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3. Surface water runoff is discharged to a surface water body

Discharge to the watercourse located on the north-eastern boundary of the site is proposed as the primary method of discharge. This is in line with the existing drainage regime. The existing multiple outfalls to the beck will be removed and replaced with a single point of discharge with a flow control.

4. Surface water runoff is discharged to a surface water sewer

Unnecessary; a higher priority discharge destination can be achieved.

5. Surface water runoff is discharged to a combined sewer

Unnecessary; a higher priority discharge destination can be achieved.

4.4 SuDS Assessment

An assessment of SuDS typology has been made to inform the drainage design and is summarised below:

Table 4—1 SuDS Assessment

SuDS Feature	Suitable on Site?	Comments
Permeable Pavement	Yes	Permeable pavement is viable for all bound surfaces.
Infiltration Trench	Yes	Land drainage systems across football pitches are to be comprised of gravel trenches with turf and a top-soil layer at the surface. These trenches will allow infiltration to ground as well as conveyance.
Infiltration Basin	No	Infiltration is not considered viable.
Soakaway	No	Infiltration is not considered viable.
Bio-Retention/Filter Strips	No	No areas of soft landscaping on site suitable for use.
Filter Trench	Yes	Land drainage system across football pitches are to be comprised of filter trenches with turf and a top-soil layer at the surface.
Swale	Yes	Areas on site outside of the pitch area, to be designated as dry swales to attenuate and convey surface water runoff.
Wetland	No	Wetlands & permanent ponds are not considered appropriate for the proposed location next to a school and football training academy. Safety concerns and practicalities of retrieving wayward balls from the features.
Retention Pond	No	Wetlands & permanent ponds are not considered appropriate for the proposed location next to a school and football training academy. Safety concerns and practicalities of retrieving wayward balls from the features.
Detention Pond	No	Wetlands & permanent ponds are not considered appropriate for the proposed location next to a school and football training academy. Safety concerns and practicalities of retrieving wayward balls from the features.
Sub-Surface Storage	Maybe	Viable, however surface storage is preferred.
Rainwater Harvesting	No	Rainwater harvesting is not viable due to limited opportunity for reuse of runoff.
Green/Brown Roof	No	No roof area available.

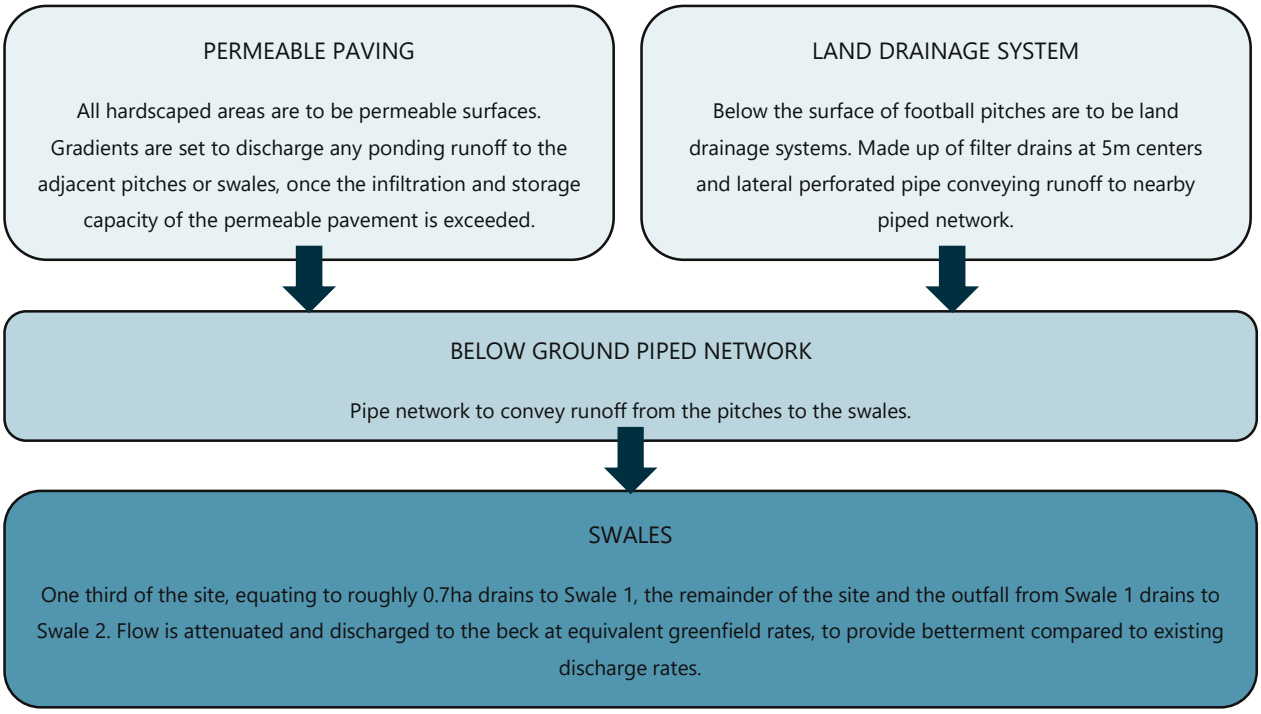
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The above assessment indicates that the most appropriate means of controlling surface water is through the use of:

- Permeable Paving, for bound surface walkways and parking areas
- Infiltration/Filter Trench, comprising land drainage systems to improve the drainage characteristics of football pitches
- Swales, to provide attenuation and conveyance of surface water runoff

4.4.1 Proposed Surface Water Drainage

The following SuDS train is proposed to attenuate, treat and convey the surface water runoff.



For the general arrangement of the proposed surface water drainage, see drawing WRX-BHE-DAR-ZZZ-DR-CI-003001 in Appendix E. This drainage strategy is sufficient to provide peak flow control for the critical 1 in 100-year event, with 30% allowance for climate change. Hydraulic modelling results are discussed in the following section.

For the 1 in 100-yr event with 30% climate change, the pipe network serving the pitches surcharges and floods at controlled locations, resulting in localised ponding on the pitches. The earthworks of the football pitches have been designed with a raised footpath surrounding the lowest portion of the pitches. This is to act as a berm and store the runoff on the surface until it can conveyed down through the drainage network to the swales. The berm provides 550m^3 maximum storage before overtopping, generating a maximum water depth of 400mm.

The top level of the swales has been set to match existing ground levels, the base level of the swales is set to be above the receiving shallow watercourse, this gives a limited working depth range and lower than standard freeboard provision for high return period events. Section 7 of this reports presents the Flood Consequences Assessment, which notes that the site is shown to flood from fluvial sources under a 1 in 1000 year scenario. The swales are placed at the low end of the site, in the area prone to flooding. The strategy for flood management in the 1000-year event is to let the swales be inundated to provide additional flood storage volume. Rising existing land levels around the swales to provide a larger freeboard would

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block overland flow paths into the swale areas which would displace fluvial flood volumes. The lower freeboard heights are therefore considered the best arrangement to manage the drainage of the site and provide benefit to the wider fluvial flood risk.

Details of freeboard provided under different events is included in section 5.3. An assessment of fluvial flood volumes in contained in section. 7.4.2

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5 Proposed Surface Water Drainage Hydraulic Modelling

5.1 Modelling Methodology

The section outlines the hydraulic modelling methodology used to assess the performance of the proposed SuDS train. The modelling has been undertaken in accordance with the Statutory SuDS Standards for Wales and guidance issued by the Welsh Government and Wrexham County Borough Council (WCBC).

5.1.1 Rainfall Data

- Rainfall data has been derived from FEH22 point data. This ensures high-resolution, location specific rainfall estimates.
- Simulations were carried out for the 1 in 2, 1 in 5, 1 in 10, 1 in 30 and 1 in 100-year return periods. A climate change allowance of 30% has also been applied to the 100-year event in line with WCBC guidance.
- Catchment descriptors and rainfall profiles were extracted using the FEH Web Service and validated against site topography and hydrological context.
- Storm durations ranging from 15 minutes to 48 hours were assessed to identify the critical storm event.
- The critical duration was found to be 960min winter storm for the 1 in 100-year + climate change event, which governs the design of the attenuation features.

5.1.2 Calculation Methodology

- Hydraulic modelling was undertaken using Causeway Flow, which is compliant with industry standards.
- No urban creep has been allowed for based on the nature of the site. The site is to be used for football training pitches; there is no risk of further development in the future.

5.1.3 SuDS Feature Modelling

- Land Drainage System has been modelled in the following way

5.1.3.1 Inflows

The pitch areas have been modelled as a green roof inflow. This applies a time delay between rainfall falling on the pitch and making its way into the land drainage system to flow to the pond, which is considered a more realistic response to rainfall than by applying a simple percentage runoff co-efficient. The areas have been simulated in Causeway Flow through Time/Area diagrams calculated for each catchment area. A depression storage value of 5mm has been applied, which represents 5% of the 100mm deep sand carpet layer at the pitch surface.

Non pitch catchment areas have been allocated to the model assuming a 30% run-off co-efficient. This is considered a conservative approach given nearly areas are to be constructed as permeable except for small roof areas of the new pitch irrigation systems.

5.1.3.2 Pitch storage

Each pitch consists of a number of features that will retain water prior to it making its way to the land drainage pipes. The pitch build-up has therefore been modelled as a Depth/Area storage structure, to account for the volume of potential storage provided. This also allows the hydraulic model to represent the retention of water in the pitch build up to allow potential infiltration to occur prior to water flowing to the main carrier drains.

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The volume of storage available within the pitch buildup has been calculated as a weighted average per unit area, as detailed in Table 5—1 below, with each element of the pitch providing a different void potential. The overall value of void in the build-up is 7.5%.

The overall volume of the structure within the hydraulic model for each pitch area equates to the depth of the subsurface multiplied by the weighted void value multiplied by the area of the pitch. Causeway Flow has a lower limit of 10% void for hydraulic structures, the area of the Depth/Area structure has there been factored down to account for the 7.5% void provided.

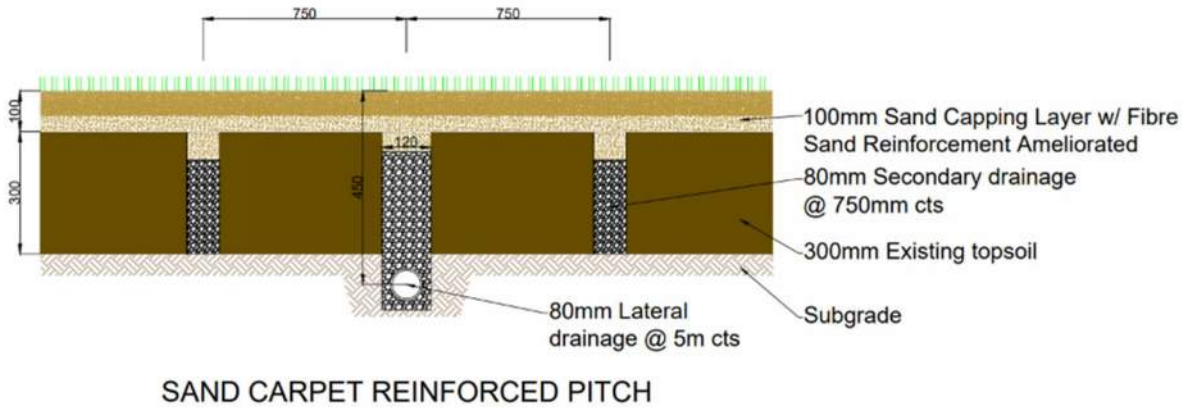


Table 5—1 Pitch construction void calculation.

Construction Element	Width	Number per 5m width of pitch	total width	Depth	Area	Void	Void area	Weighted void average
French drains	0.12m	1	0.12m	0.55m	0.066m^2	33%	0.0218m^2	
Secondary drainage	0.08m	6	0.48m	0.4m	0.192 m^2	33%	0.0634m^2	
Surface	5m	1	5m	0.1m	0.5 m^2	10%	0.05m^2	
Topsoil	4.4m	1	4.4m	0.3m	1.32 m^2	1.5%	0.0198m^2	
Totals			**5m**		**2.078 m^2**		**0.1549 m^2**	**7.5%**

5.1.3.3 Infiltration

The infiltration capacities of the site will remain unchanged from existing, as the site is remaining greenfield in nature and new surfaces being permeable. Infiltration was noted to be variable across the site, with some infiltration tests failing. Infiltration from the hydraulic storage structures representing the pitch areas and the swales has been applied based on the results from the nearest test pit. It is acknowledged that the infiltration tests were undertaken during summer and so may not be representative of winter conditions, a factor of safety of 10 has therefore been applied to infiltration rates to account for uncertainty and to take a conservative approach.

The infiltration area for each pitch in the model is different to the storage structure area for each pitch, due to the storage area being factored down to achieve a 7.5% void. The infiltration area covers the full size of each pitch catchment.

5.2 Catchment Areas

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The hydraulic model considers catchments that are to be served by the new pitch drainage system. The compound area is constructed as a permeable surface, with finished levels graded towards Swale 1. The roof areas of the new tanks and containers in this area will be allowed to drain directly onto the permeable surface, these areas are very small in the wider context of the site. Overland flow from the compound area will therefore enter the swale once the infiltration and storage capacity of the permeable pavement is exceeded. This catchment has been included in the model as a green roof catchment draining directly to Swale 1.

The catchment areas are shown in Figure 5—1 below, and summarised in Table 5—2.



Figure 5—1 - Catchment Areas

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Table 5—2 Catchment Area DetailsTable 5—2

Catchment Name	Catchment Area (m^2)	Pitch Storage Volume (m^3)	Storage area factored for 7.8% Void (m^2)	Nearest Soakaway Test	Infiltration Rate Applied (m/hour)
Pitch Area 1	8,150	286	6,357	TP02	0.193
Pitch Area 2	7,660	269	5,975	TP04	0.000
Pitch Area 3	9,140	321	7,129	TP05	0.030
Pitch Area 4	7,340	258	5,725	TP03	0.011
School Area	3,191	112	2,489	TP01	0.000
Compound Area	1,160	n/a	n/a	TP04	0.000
Totals	**36641**	**1245**	**27675**		

5.3 Summary of Results

Full hydraulic results are contained in Appendix F. Key results are summarised below. The volume of flooding from each pitch area is also summarised, to define the total volume of flooding to be temporarily retained on the pitch surface. This flooding only occurs during the 1 in 100 year event when 30% climate change is applied.

Table 5—3 Swale Levels

Feature	Base level	Min top of bank level
Swale 1	11.250m	11.700m
Swale 2	10.835m	11.570m

5.3.1 Swale 1

Table 5—4 Swale 1 Hydraulic Results Summary

Return Period	Critical Storm	Max Water Depth	Freeboard Remaining	Approx Time to Empty (from max level to <10mm depth)
1 in 2 years	360 min winter	0.021m	0.429m	2.3 hours
1 in 5 Years	240 min winter	0.028m	0.422m	2.4 hours
1 in 10 Years	240 min winter	0.034m	0.416m	2.4 hours
1 in 30 Years	180 min winter	0.064m	0.386m	2.8 hours
1 in 100 Years	180 min winter	0.122m	0.328m	4.5 hours
1 in 100 Years + 30% Climate Change	180 min winter	0.239m	0.211m	8.2 hours

5.3.2 Swale 2

Table 5—5 Swale 2 Hydraulic Results Summary

Return Period	Critical Storm	Max Water Depth	Freeboard Remaining	Approx Time to Empty (from max level to <10mm depth)
1 in 2 years	600 min winter	0.160m	0.575m	19.7 hours
1 in 5 Years	480 min winter	0.278m	0.457m	20.7 hours
1 in 10 Years	480 min winter	0.349m	0.386m	20.5 hours

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1 in 30 Years	720 min winter	0.419m	0.316m	21.8 hours
1 in 100 Years	720 min winter	0.476m	0.259m	23.1 hours
1 in 100 Years + 30% Climate Change	720 min winter	0.551m	0.184m	25.7 hours

5.3.3 Pitch Area Flooding

Flooding on the pitch area only occurs when 30% climate change is applied to the 1 in 100 year rainfall. The winter storms generate more flooding than summer storms, the critical storm is the 480 min winter, as highlighted below.

Pitches grade to a low point of 11.52m. Flooding from the pitch system will flow overland to this point where the berms will retain the flood volume until it can drain down through the system.

Table 5—6 Pitch Surface Flooding Summary

Storm Duration	Pitch Area 2 Flooded Volume (m^3)	Pitch Area 4 Flooded Volume (m^3)	Total Flooded Volume (m^3)	Max Flooded Depth (mm)	Freeboard
240 winter	10.6		10.6		
360 winter	16.4	1.1	17.5		
480 winter	**20.6**		**20.6**	**140mm**	**260mm**
600 winter	18.7		18.7		
720 winter	8.5		8.5		



Figure 5—2 Surface Level Flooding Extent & Depth

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5.3.4 Off Site Discharge Rates

The peak discharge off site is summarised below, together with the betterment provided to existing greenfield rates.

Table 5—7 Site Discharge Rates Summary

Return Period	Discharge off-site	Greenfield Rate	Betterment
1 in 2 years	12.4 l/sec	16.3 l/sec	23.9%
1 in 10 Years	21.9 l/sec	24.9 l/sec	12.0%
1 in 30 Years	24.6 l/sec	31.3 l/sec	21.4%
1 in 100 Years	26.7 l/sec	38.3 l/sec	30.3%
1 in 100 Years + 30% Climate Change	29.2 l/sec	38.3 l/sec	23.8%

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6 Exceedance Route and Consequences

The following design failure scenarios have been considered:

Design Failure Scenario	Consequence
Pipe blockage	If a pipe becomes blocked, the network upstream will surcharge and result in localised ponding on the pitches. For the area upstream of the berm, the berm will store overland flows on the surface to a depth of 400mm, before water would overtop the berm and flow into the beck. For the remaining area of the site, overland flows will convey on the surface towards swale 1 and 2, essentially bypassing the below ground piped network, and flow overland into the beck once the capacity of the swales is exceeded.
Siltation of filter drains	If the filter drains become clogged with silt and sediment, the storage within the gravel trenches will reduce and the flow rate of the discharge from the land drainage system will reduce. This will cause the surrounding ground to become saturated and muddy. In extreme, this will result in localised ponding in the surface and overland flows occur as above.
Swale embankments collapse, reducing attenuation volume	A reduction in attenuation volume of the swales will likely cause water levels to rise and surface water to overtop the swales in extreme events. The surrounding ground will become saturated and overland flows will convey south, in line with the existing topography, into the beck.

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7 Flood Consequences Assessment

7.1 Overview

The Flood Consequences Assessment (FCA) described herein is in support of a planning application for an improved training ground facility in the village of Darland, North Wales. The FCA is on behalf of Wrexham Association Football Club (AFC).

The Darland Training Grounds site is shared between Darland Leisure Centre, Darland High School and Wrexham AFC's academy. Wrexham AFC propose to invest in the Darland Training Grounds in order to improve the training facilities for their academy.

The site at Darland, Rossett, LL12 OEH, is 1km north of Wrexham, and is provided in Figure 7—1 Darland Training Grounds (dashed line) and the development boundary (red line). Highlighting Darland High School, the leisure centre, the small watercourse running parallel to the site boundary at Darland View, the training grounds' existing land drainage outfall location, Gamford Lane, Rossett Road and River Alyn.

The site, situated within the school's playing fields, is bound by the village of Darland to the west and agricultural land to the east. The training grounds are approximately 500m north of the left back of River Alyn, sandwiched between the B5102 at Rossett Road, to the south, and Gamford Lane, to the north. The site can be accessed via footbridges at Darland View, or via gate access on Gamford Lane.

A small intermittent unnamed watercourse exists in an overgrown ditch beyond the western site boundary at Darland View. The unnamed watercourse runs parallel to the site boundary for 200m, prior to leaving the site and heading north along Gamford Lane.

The unnamed watercourse is fed by outfalls from the training grounds existing land drainage system. A recent site investigation observed that the unnamed watercourse is unmaintained and that silt from an adjacent building site has resulted in the blockage of the land drainage outfalls.

Site photographs are provided in Figure 7—2 to Figure 7—7.

The Darland Training Grounds site is a recreational open space playing fields. The existing pitches are to be maintained, although improved, and are considered Permitted Development. The scope of the FCA therefore covers the elements of the site that require planning approval. Though the site is considered as a whole for the purpose of the site specific FCA.

The proposals for a new surface water drainage system to improve the pitches at Wrexham AFC's Darland Training Ground are considered to fall under the water compatible development classification.

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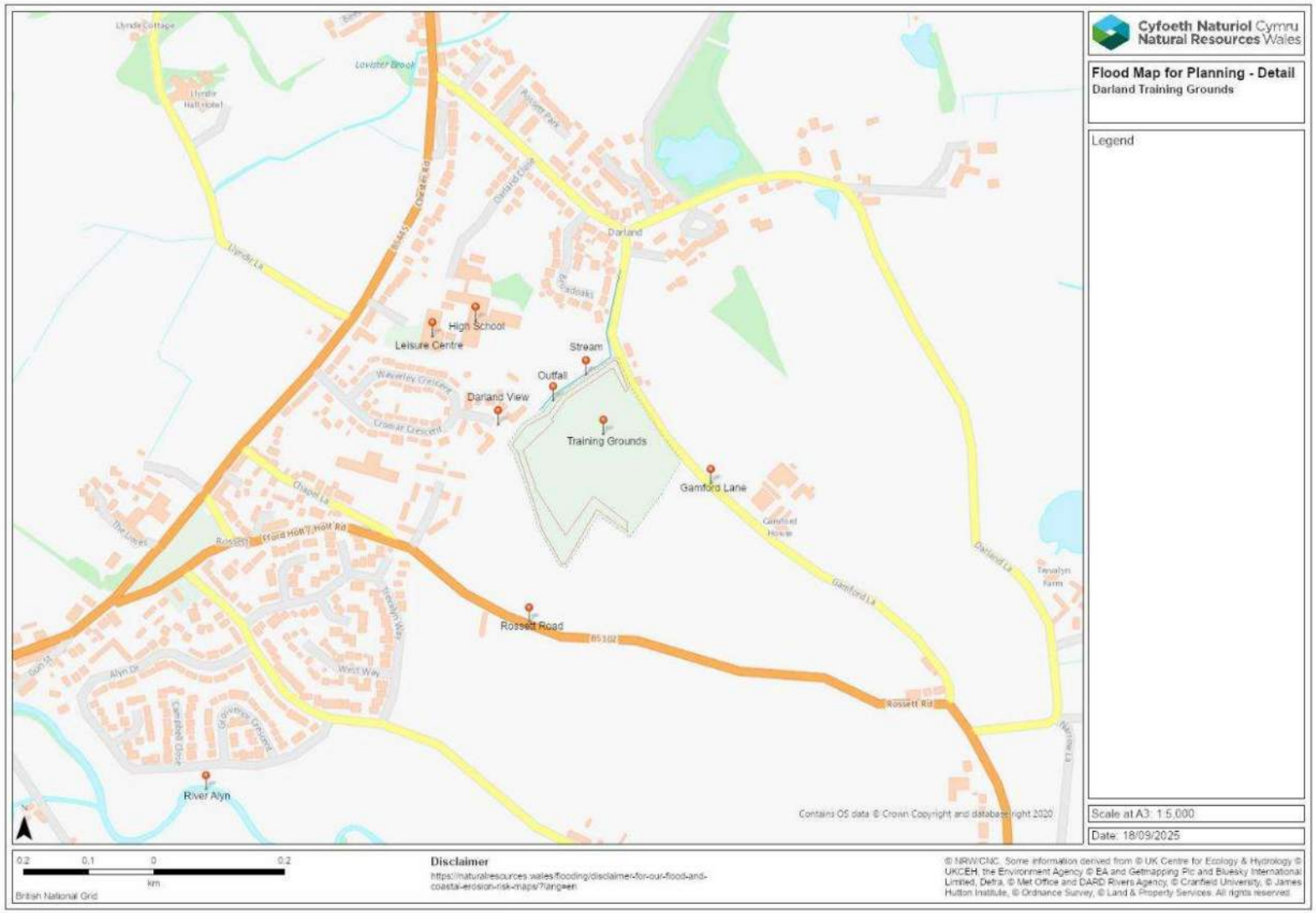


Figure 7—1 Darland Training Grounds (dashed line) and the development boundary (red line). Highlighting Darland High School, the leisure centre, the small watercourse running parallel to the site boundary at Darland View, the training grounds' existing land drainage outfall location, Gamford Lane, Rossett Road and River Alyn.



Figure 7—2 Darland Training Grounds. Taken from the path on the western periphery of the site, looking north towards Gamford Lane, with the unnamed watercourse situated within a ditch in the tree line adjacent to the path.



Figure 7—3 Darland Training Ground pitches. Looking south towards the new development off Rossett Road. Parch marks in the grass highlighting the existing herringbone drainage system.



Figure 7—4 The ditch of the small, intermittent, unnamed watercourse running parallel to the western site boundary.

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Figure 7—5 One of the existing land drainage outfall locations into the ditch. Showing evidence of siltation.

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7.2 Policy and Guidance

This section reviews the relevant planning policies and guidance, including TAN15, the Flood Map for Planning, Local Development Plans and Climate Change considerations.

7.2.1 Planning Policy Wales

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales.

PPW is supplemented by a series of Technical Advice Notes (TANs), Development Management Manuals and Welsh Government Circulars which together provide the national planning policy framework. This suite of documents promotes the Welsh Government's commitment to achieving the goals set out in the Well-being of Future Generations Act (Wales, 2015).

Development proposals are generally determined by Local Planning Authorities which know the respective area and its associated challenges. The proposed surface water drainage design, with swale attenuation for stormwater management, will create a green infrastructure asset and recreational space which improves the social, economic, environmental and cultural well-being of the community.

The relevant flood risk policy and guidance is considered herein.

As outlined by PPW, planning authorities should*:*

- *Provide a framework for well-located, good quality sport, recreational spaces and leisure facilities, and develop policies for the provision, protection and enhancement of facilities.*
- *Promote the development of Green Infrastructure, contributing to the network of green spaces that intersperse and connect regions, offering benefits for social, economic, cultural and environmental resilience.*
- *Adopt a precautionary approach of positive avoidance of development in areas of flooding, with flooding affecting choice of location, the layout and design of developments.*

PPW states that proposed applications should:

- *Consider flood risk at an early stage in formulating development proposals, utilising the National Resources Wales (NRW) Development Advice Maps which provide a preliminary representation of flood risks, informing decisions on the location of development and the requirements necessary to support applications.*
- *Reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself.*
- *In areas where risk is more predictable and flood depths are shallow, it may be concluded that risks can be managed in an acceptable way for development. If it is concluded that risks from surface water or ordinary watercourses can be managed or mitigated, these measures must not increase flood risk elsewhere.*

The Technical Advice Note 15 (TAN15); Development and Flood Risk, is referred to below for further policy advice on development and flood risk.

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7.2.2 TAN15

7.2.2.1 Background

TAN15 provides technical guidance in relation to development, flooding and coastal erosion. The technical advice note supplements the policies set out in PPW to provide a framework within which flood risk can be assessed.

7.2.2.2 Sources of Flood Risk

The main sources of flooding in Wales are river, coastal or flooding from surface water and small watercourses. Flooding from rivers poses a significant threat to communities in Wales. There have been many historical examples where, in times of heavy rainfall, rivers have breached their banks leading to significant damage and personal loss. Similarly, heavy rain falling on waterlogged ground or impermeable surfaces can cause localised flooding and also result in drainage systems and ordinary watercourses quickly becoming inundated. Whilst Wales's extensive coastline faces significant risks from flooding due to storm surges, sea level rise and extreme high tides.

The main source of flooding in Darland and Rossett, on the rural fringes of Wrexham, are main rivers, small watercourses and surface water. Recorded flood events in the River Alyn and River Dee catchments, most notably in November 2000 and October 2023, have impacted communities to the south of the site in Rossett as well as agricultural land to the east. The recorded flood extents have been provided in Figure 7—8 and Figure 7—9.

7.2.2.3 Climate Change

As the climate changes flooding will become more commonplace and severe. The Welsh Government's Climate Change Committee has stated that it expects the climate in Wales to become warmer and wetter, with significant increases in sea level and the frequency and intensity of storms.

Climate change and the Well-being of Future Generations Act (Wales, 2015) are inextricably connected. The Act places a duty on bodies to carry out sustainable development which considers the long-term impact of their decisions, and to take action to prevent and mitigate persistent problems such as the impacts of climate change.

The consideration of climate change is essential to sustainable development which is resilient to the risk of flooding, both now and in the future. It is necessary to take account of the potential impact of climate change over the lifetime of the development to ensure that the development is resilient to future flood risk.

The Welsh Government's climate change allowances guidance sets out the allowances to be used in flood consequence assessments submitted in support of planning applications. The Welsh Government's anticipated increases in peak river flow and peak rainfall intensity are provided in Table 7—1 and Table 7—2 respectively.

The guidance recommends that the central estimate for the 2080s is used to assess the potential impact of climate change as part of a FCA and to inform design levels.

For the Darland Training Ground site discussed herein, in the Dee catchment area, a 20% uplift for both peak river flow and extreme rainfall intensity is recommended following the Welsh Government's 2080s central estimate for climate change allowances.

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Table 7—1 The Welsh Government's peak river flow allowances by major river basin district.

	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2080s
Severn			
Upper end estimate	25%	40%	70%
Central estimate	10%	20%	25%
Lower estimate	0%	5%	5%
West Wales			
Upper end estimate	25%	40%	75%
Central estimate	15%	25%	30%
Lower estimate	5%	10%	15%
Dee			
Upper end estimate	20%	30%	45%
Central estimate	**10%**	**15%**	**20%**
Lower estimate	5%	5%	5%

Table 7—2 The Welsh Government's anticipated change to extreme rainfall intensity

Applies across all of Wales	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Upper end estimate	10%	20%	40%
Central estimate	5%	10%	**20%**

7.2.2.4 National Resources Wales Flood Map for Planning

The Flood Map for Planning service can be viewed on the NRW website and is the starting point for consideration of flood risk in the planning system. The service provides information to inform site specific FCA's and is used as a screening tool by Local Authorities to understand where further assessment of flooding may be required.

The Flood Map for Planning service uses flood zones to indicate the degree to which land is at risk of flooding from rivers, the sea, surface water and small watercourses. The map considers predicted future flood risk, showing how climate change will affect flood risk extents over the next decade.

The Flood Map for Planning contains the following layers;

- Flood Zones 2 and 3 for rivers, the sea and surface water and small watercourses
- TAN15 Defended Zones; areas that benefit from flood defences
- Recorded Flood Extents; areas that are recorded as having flooded previously
- Flood risk from reservoirs
- Shoreline Management Plans & Coastal Erosion, as well as
- Areas where NRW holds detailed local flood models, which may be useful to help inform a FCA to support a planning application.

Table 4—3 sets out the definition of the flood zones.

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Table 7—3 Definition of Flood Map for Planning Flood Zones

Flood Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.
TAN15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard).	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard).	Not applicable.

In summary, using the Flood Map for Planning zones, TAN15 seeks to ensure that the likelihood and impacts of flooding have been appropriately considered.

Caution is exercised when considering applications where the Flood Map for Planning shows areas at risk of flooding. The level of caution increases with the level of vulnerability and likelihood.

The fundamental principles of TAN15 are to restrict new development in Zone 3, subject to limited exceptions, and to ensure that decision makers have taken flood risk matters into consideration in all other zones.

7.2.2.5 Strategic Flood Consequences Assessment

A Strategic Flood Consequences Assessment (SFCA) can inform policies and site selection for Strategic and Local Development Plans. SFCA's should highlight at an early stage those areas where development will be in conflict with planning policy and guidance and may also identify a need to include locally specific approaches in Development Plans. This may be in relation to recorded flood event information, local records of surface water or small watercourse flooding incidents, or areas where there is an expectation that risks may increase with climate change.

Wrexham County Borough Council does not appear to have a publicly available SFCA. The council website provides one Section 19 Flood Investigation Report for the October 2024 flood event which impacted Worthenbury in the River Dee catchment, some 20km south of the site in Darland.

In the absence of a published SFCA for Wrexham County Borough, this FCA draws upon the latest Flood Map for Planning and climate change allowances provided by NRW, ensuring alignment with the TAN15 guidance.

7.2.2.6 Local Development Plan

The Wrexham County Borough Council website's consultation portal states that there is no Local Development Plan (LDP) for the borough.

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A post on the 30th June 2025 states that:

> *By Order of the High Court of Justice (19th May 2025), Wrexham County Borough Council's decision of 20th December 2023 to adopt the Wrexham Local Development Plan (LDP) has been quashed. The LDP is no longer part of the development plan for Wrexham County Borough and is now un-adopted. The development plan for Wrexham County Borough now Comprises Future Wales: the national plan 2040 and the Wrexham Unitary Development Plan 1996-2011 (adopted 2005).*

Future Wales: the national plan 2040 and the Wrexham Unitary Development Plan 1996-2011 has been reviewed.

7.2.2.7 Future Wales: the national plan 2040

The Future Wales 2040 plan highlights Wrexham as one of three main urban clusters in Wales and which houses communities in the 10% most deprived in the country. The plan identifies Wrexham as a National Growth Area which is the main focus for growth and investment in the North of Wales.

Future Wales highlights that Strategic and Local Development Plans must recognise Wrexham's strategic role and ensure key investment decisions support the National Growth Area.

With regards to flood risk, the plan notes that Wrexham contains communities located in areas susceptible to flooding and thus will require strategic decisions on the location and type of development. It highlights that the potential for flooding around Wrexham and Deeside will have implications for the delivery of growth in the region.

Policy 8 of Future Wales sets out the national strategic approach to flood risk management to ensure growth aspirations in National Growth Areas are co-ordinated with strategic decisions on managing flood risk.

The plan states that the Welsh Government and flood risk management authorities will focus on delivering nature-based flood risk management schemes and green infrastructure.

7.2.2.8 Wrexham Unitary Development Plan 1996-2011

With regards to development and flood risk, Policy EC12 of the Wrexham Unitary Development Plan; Development (including the raising of land) within defined floodplains will only be permitted if it:

a. Would not be subject to an unacceptable risk of flooding on-site; and/or

b. Does not result in an unacceptable risk of flooding on or off-site; and/or

c. Does not adversely affect flood management or maintenance schemes

7.2.2.9 Flood Consequences Assessment

For planning authorities to determine an application, a FCA appropriate to the nature and scale of the proposed development must be undertaken. The prime objective of a FCA is to develop a full appreciation of:

- The risk and consequences of flooding on the development; and
- The risk and consequences of the development on flood risk elsewhere.

Where development is allowed, plans or measures must be put in place to manage the consequences. Such measures must be capable of being implemented at the appropriate stage as part of the development and, where necessary, long-term maintenance must be provided.

TAN15 promotes a risk-based approach to planning in areas susceptible to flooding, requiring that the type and vulnerability of development be carefully matched to the level of flood risk.

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The Flood Map for Planning categorizes land into zones based on flood likelihood, guiding decisions on where development is appropriate. The TAN emphasises that responses must be proportionate to the level of risk, recognising that the potential to avoid or mitigate flood risk varies depending on the nature of the development.

As mentioned above, the proposed re-development of the Darland Training Grounds is considered a water compatible development. With regards water compatible development, PPW and TAN15 states that:

- *The use of land at risk of flooding for agriculture, recreation and as public open space is likely to be acceptable in most cases. However, ancillary buildings or structures required for these uses, which in some circumstances are subject to prior approval, may not be acceptable and need to be justified in accordance with the principles of TAN15.*

There are requirements that must be in place for any development that is permitted to be located in flood risk areas. In all circumstances, developers and planning authorities should ensure the following conditions are met:

- No increase in flooding elsewhere
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Flood emergency plans and procedures agreed and in place
- Flood resistant and resilient design
- Acceptable consequences for type of use (see vulnerability categories below)

7.2.2.10 Vulnerability to Flooding

A flood event can have different consequences for different development types. This influences where it is acceptable to locate development. Table 7—4 provides the TAN15 development vulnerability categories as well as the flood free thresholds in the event of flooding, highlighting the criteria for water compatible development.

Table 7—4. Vulnerability category and flood events in which development must be flood-free.

Vulnerability category and types	Flood events in which development must be flood-free (Rivers only)
Highly vulnerable development; residential premises, schools, colleges and universities, hospitals and GP surgeries, especially vulnerable industrial development (power/chemical/waste plants) and emergency services)	0.1% AEP event + CC (1 in 1000 year return period event plus an allowance for climate change)
Less vulnerable development; general industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites, public buildings, places of worship, cemeteries, play areas and renewable energy generation facilities.	1% AEP event + CC (1 in 100 year return period event plus an allowance for climate change)
Water compatible development; boatyards, marinas and essential works required at mooring basins, development associated with canals, flood defences and management infrastructure, **open spaces** and hydro renewable energy generation.	**1% AEP event + CC (1 in 100 year return period event plus an allowance for climate change)**

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Table 7—5. Vulnerability category and tolerable conditions in the extreme flood event.

Vulnerability category and types	**Tolerable conditions in extreme flood event (0.1% AEP event + CC)**
Highly vulnerable development; residential premises, schools, colleges and universities, hospitals and GP surgeries, especially vulnerable industrial development (power/chemical/waste plants) and emergency services)	Maximum depth of flooding: 600mm Maximum velocity of flood waters: 0.3m/s
Less vulnerable development; general industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites, public buildings, places of worship, cemeteries, play areas and renewable energy generation facilities.	Maximum depth of flooding: 600mm Maximum velocity of flood waters: 0.3m/s
Water compatible development; boatyards, marinas and essential works required at mooring basins, development associated with canals, flood defences and management infrastructure, **open spaces** and hydro renewable energy generation.	**Maximum depth of flooding: 600mm** **Maximum velocity of flood waters: 0.3m/s**

When managing consequences in the extreme flood event of the 0.1% AEP event + CC (1 in 1000 year return period event plus an allowance for climate change), it is recognised that it may not be possible to keep all development flood free. The tolerable conditions in the scenario of an extreme flood event for water compatible development, as outlined in TAN15, is highlighted in Table 7—5.

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7.3 Baseline Flood Risk

7.3.1 Flood Map For Planning Flood Risk Screening

The NRW Flood Map for Planning service has been used to provide a preliminary representation of the existing flood risk at the Darland Training Ground site.

The NRW Flood Map for Planning service confirms that:

- There are no recorded flood extents impacting the site directly, though flood events on the River Alyn, impacting Rossett Road, 500m south of the site, have been recorded;
- The site does not sit within a defended zone;
- There is no predicted flood risk from the sea;
- There is no predicted flood risk from reservoirs;
- The site is partially within Rivers Flood Zone 2, and
- Surface Water and Small Watercourses Flood Zone 2 is impacting the southwestern border of the site.

A detailed map download containing all available layers on the service is provided in Figure 7—6.

A map containing the Rivers and Surface Water and Small Watercourses layers only is provided in Figure 7—7.

Flood Zone 2 represents a less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.

The service suggests that the site may be impacted by the small watercourse running parallel to the western boundary as well as overland flow routes from the left bank of the River Alyn, via Rossett Road, in an extreme flood event.

A suite of five Flood Map for Planning downloads are provided in Appendix G in order to show the full context of the site and the associated flood risks. A map providing the red line boundary of the site only is given in Appendix G1. Single layer maps of the Rivers layer and Surface Water and Small Watercourses layer are provided in Appendix G4 and Appendix G5 respectively.

The historical flooding dataset, providing details on the recorded flood events, was requested from NRW for more information on past flooding in the local area. Recorded flood extent maps for the November 2000 and October 2023 are provided in Figure 7—8 and Figure 7—9. The recorded flood event data highlight the prevalence of flooding along Rossett Road, beyond the left bank floodplain of the Alyn, with flooding recorded along Rossett Road and impacting nearby Alyn Drive and Harwoods Lane.

The Flood Map for Planning service's Local Model Manager highlighted that the NRW holds a detailed local flood model of the River Alyn through the village of Rosset, covering part of the site at Darland (see Figure 7—6). The Rossett Flood Risk Study model outputs were requested from NRW for a more detailed inspection of the baseline flood risk.

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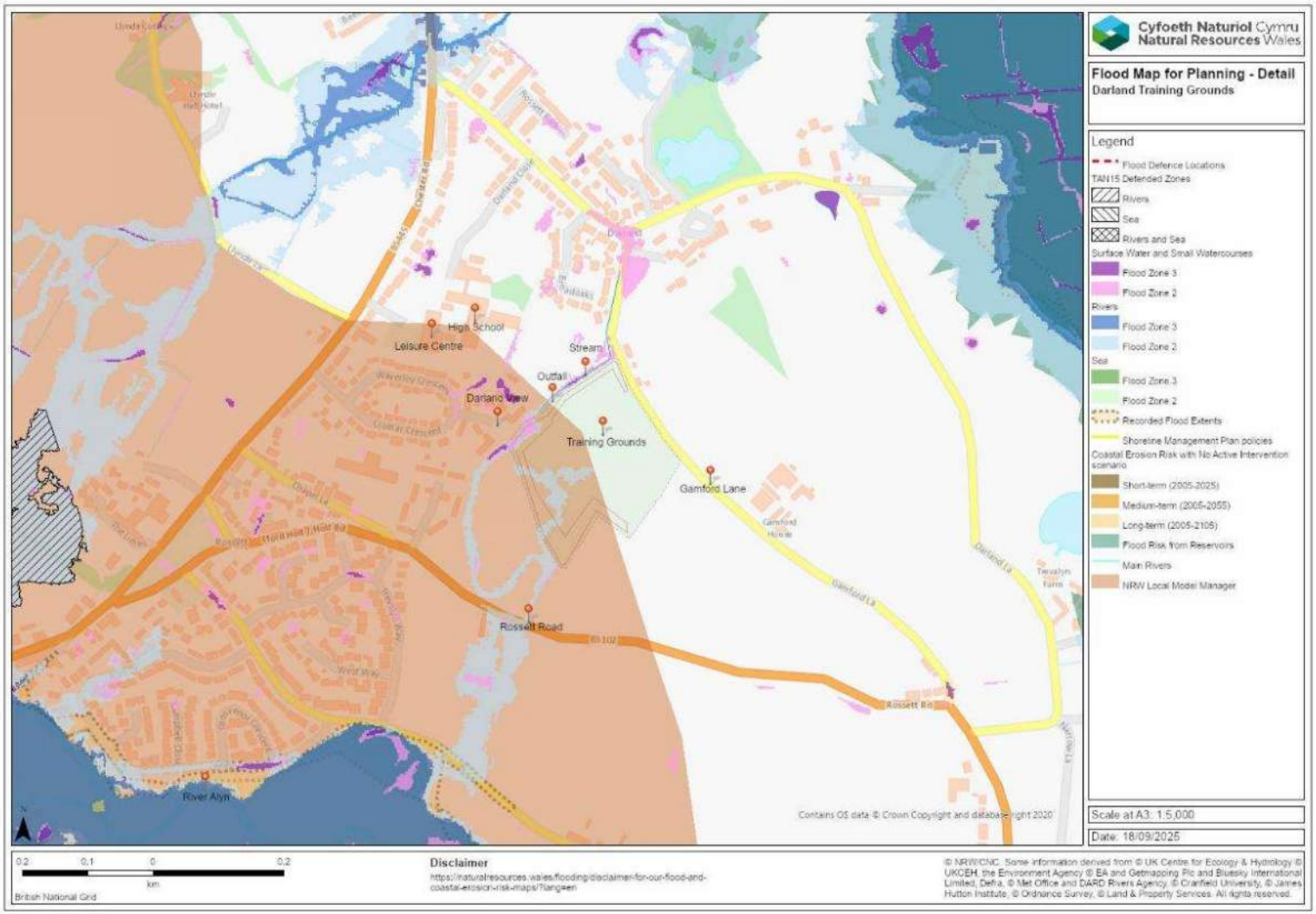


Figure 7—6. NRW Flood Map for Planning, Darland Training Grounds; all layers. Including Darland Training Grounds (dashed line) and the development boundary (red line).

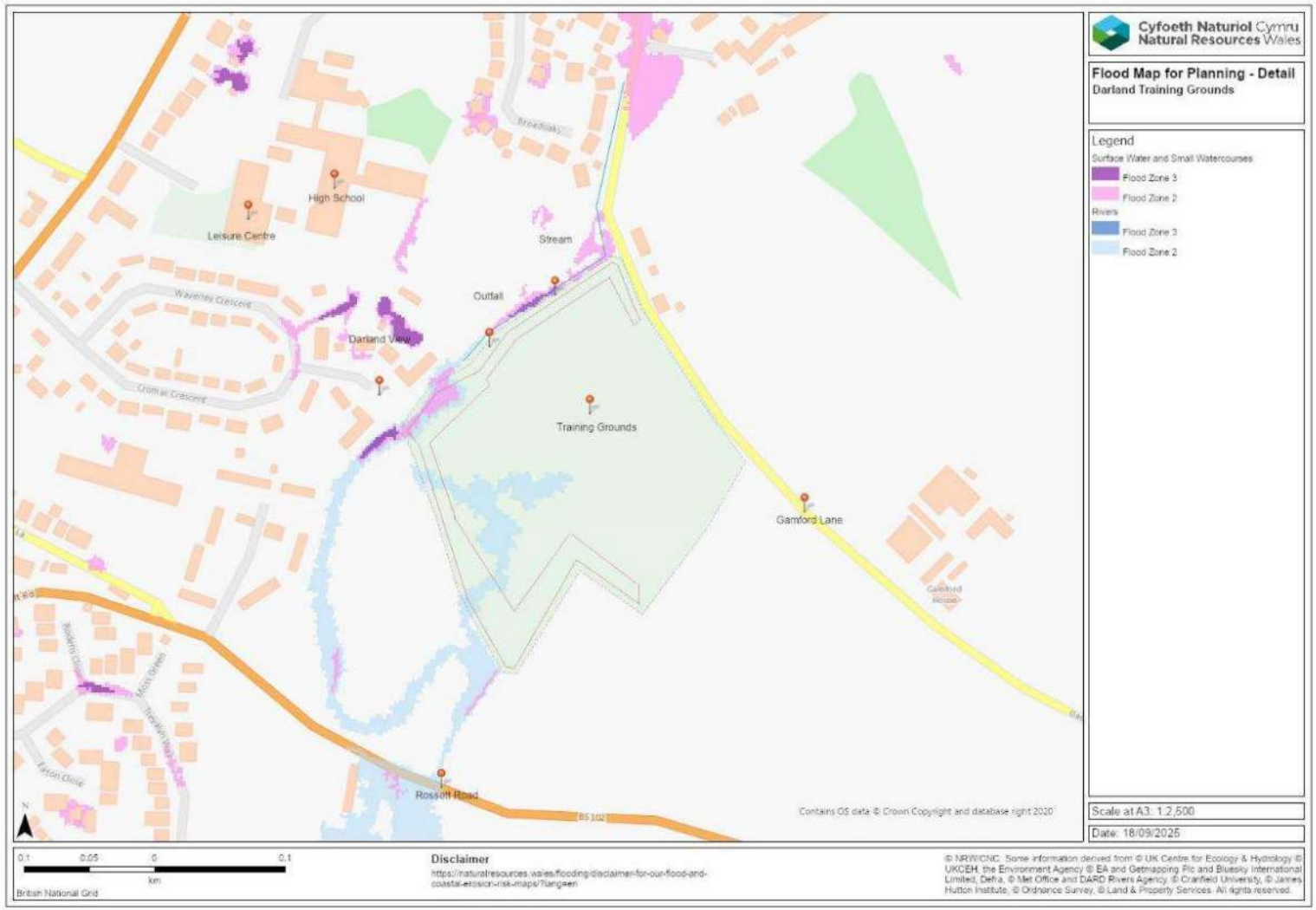


Figure 7—7. NRW Flood Map for Planning, Darland Training Grounds; Rivers and Surface Water and Small Watercourses layers only. Including Darland Training Grounds (dashed line) and the development boundary (red line).



Figure 7—8. Recorded flood extent; Flooding in the River Alyn and River Dee catchments, November 2000.



Figure 7—9. Recorded flood extent; Flooding in the River Alyn and River Dee catchments, October 2023.

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7.3.2 Rivers

This section presents the Rossett Flood Risk Study hydraulic model outputs for a more detailed inspection of the existing baseline flood risk.

7.3.2.1 The Rossett Flood Risk Study

The Rossett Flood Risk Study was carried out by NRW in 2021 as part of updating the Flood Risk Assessment Wales (FRAW) dataset. The study focussed on the River Alyn through Rossett, updating an existing 1D model from 2007 to incorporate a 2D domain, thus providing a better understanding of flood risk.

The study used hydrometric data for the Alyn from the Pont-Y-Capel gauge, which lies 4km upstream of Rossett and has a record since 1965. This long period of the record coupled with confidence in the gauge rating made it suitable for hydrological estimations such as QMED and statistical pooling.

As with every hydraulic modelling study, there are assumptions and limitations inherent to the Rossett Flood Risk Study analyses. The key limitation of the study is associated with the lack of model calibration. Calibration of the model was not carried out due to the lack of a suitable gauge in the lower reaches of the model which would be required to compare to modelled.

7.3.2.2 Rossett Flood Model Results and Discussion

The Rossett model provides flood maps for a range of return periods. The maximum flood depth maps for the 1% AEP event plus an additional 20% allowance for climate change and the 0.1% AEP event plus an additional 20% allowance for climate change have been provided in Figure 7—10 and Figure 7—11.

Figure 7—10 confirms that the site is flood-free in the 1 in 100 year plus climate change flood. That is the 1% AEP event plus an additional 20% allowance for climate change. This is consistent with the acceptability criteria for water compatible development outlined in Table 7—4.

The only return period which impacts the site is the 1 in 1000 year plus climate change flood, that is, the 0.1% AEP event plus an additional 20% allowance for climate change. The maximum flood depth map for this return period has been provided with a topographical basemap in Figure 7—12. The figure demonstrates that the flooding impacting the site is due to flood water from the left bank of River Alyn overtopping the high point of Rossett Road and routing north to the site. Figure 7—13 provides the maximum flood depth map for this return period in greater detail, local to the site. It highlights shallow flood depths of less than or equal to 50mm impacting the site from overland flow from the south, and flood depths less than or equal to 250mm along the western boundary of site, local to the unnamed watercourse at Darland View.

A maximum flood velocity map and a maximum flood hazard rating map for the 0.1% AEP event plus an additional 20% allowance climate change are provided in Figure 7—15 and Figure 7—14 respectively. The figures demonstrate that the flooding on the site is commensurate with a very low flood hazard rating, and with modelled flood velocities of less than 0.3m/s. There are a couple of isolated pixels illustrating a moderate flood hazard for this return period on the western boundary, local to the small unnamed watercourse. The maximum flood depths and maximum flood velocities impacting the site for the 0.1% AEP event plus an additional 20% allowance climate change are consistent with the extreme flood event acceptability criteria for water compatible development, as outlined in TAN15 and presented in Table 7—5.

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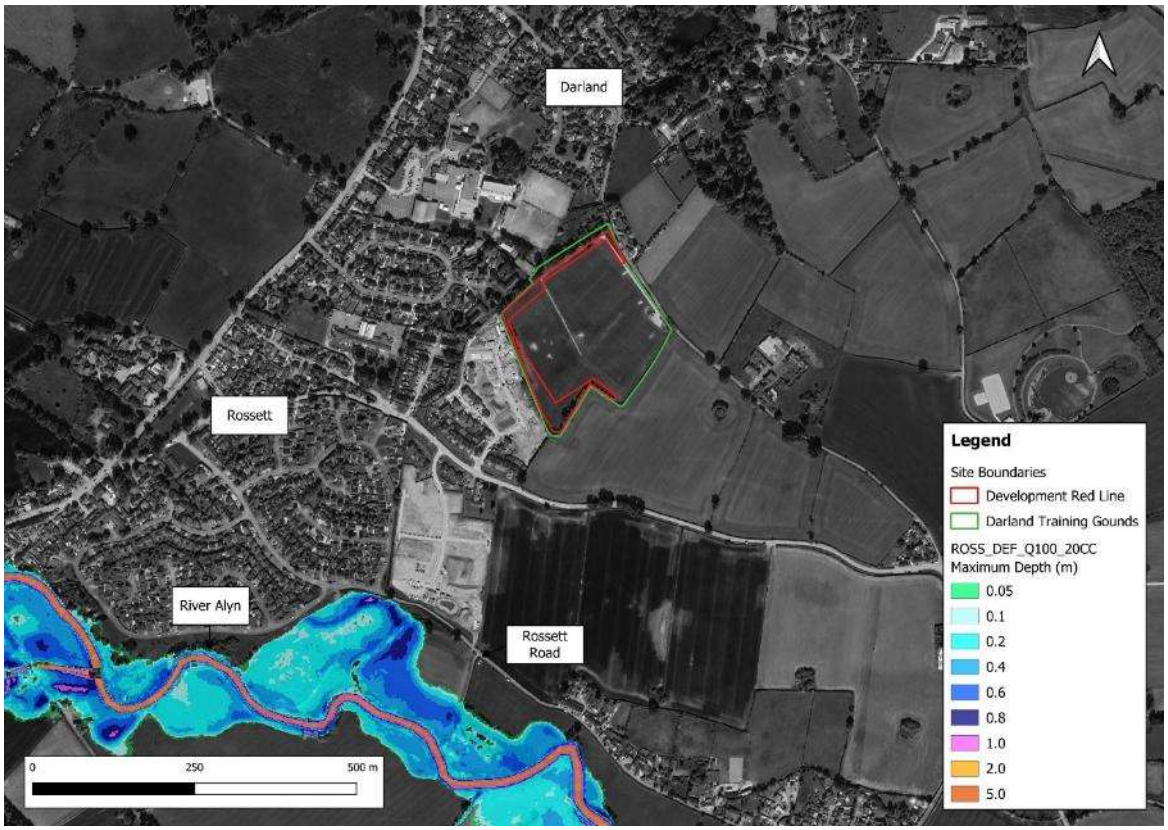


Figure 7—10. Rossett Flood Risk Study Maximum Flood Depths, 1 in 100 Year Return Period Event

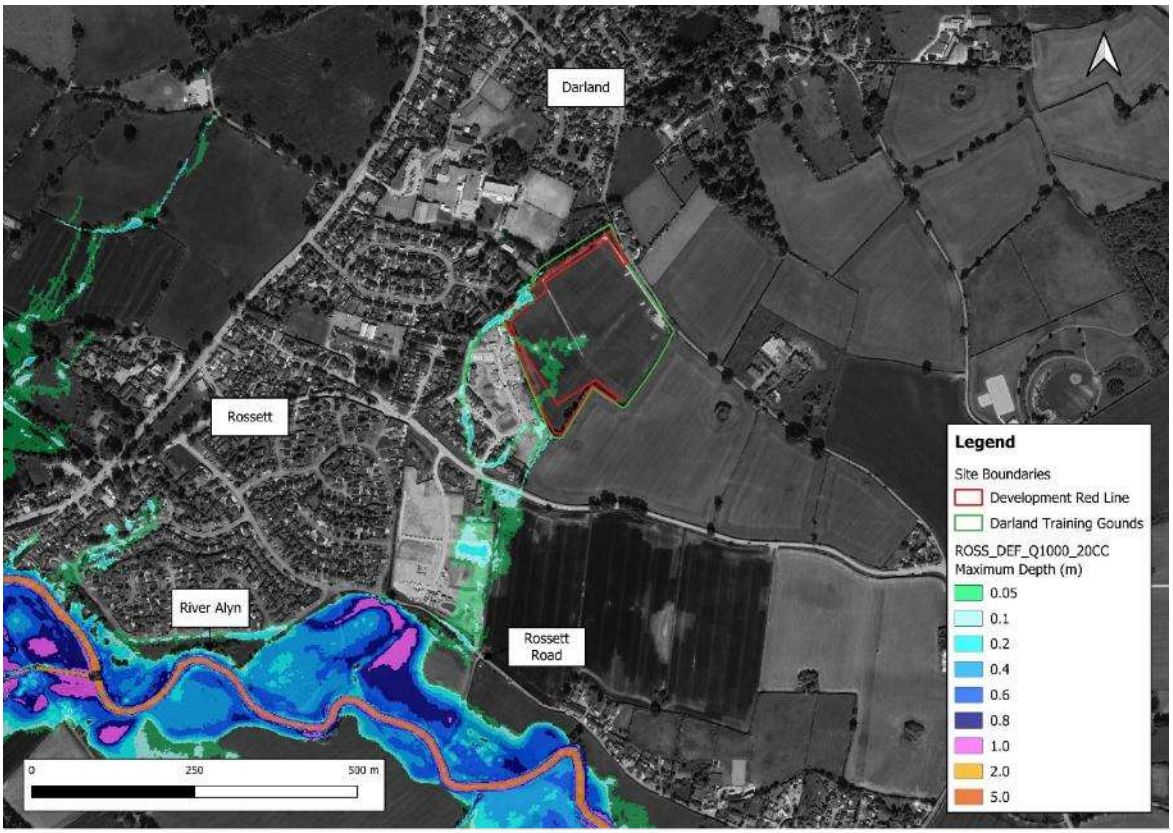


Figure 7—11. Rossett Flood Risk Study Maximum Flood Depths, 1 in 1000 Year Return Period Event + 20% Allowance for Climate Change.

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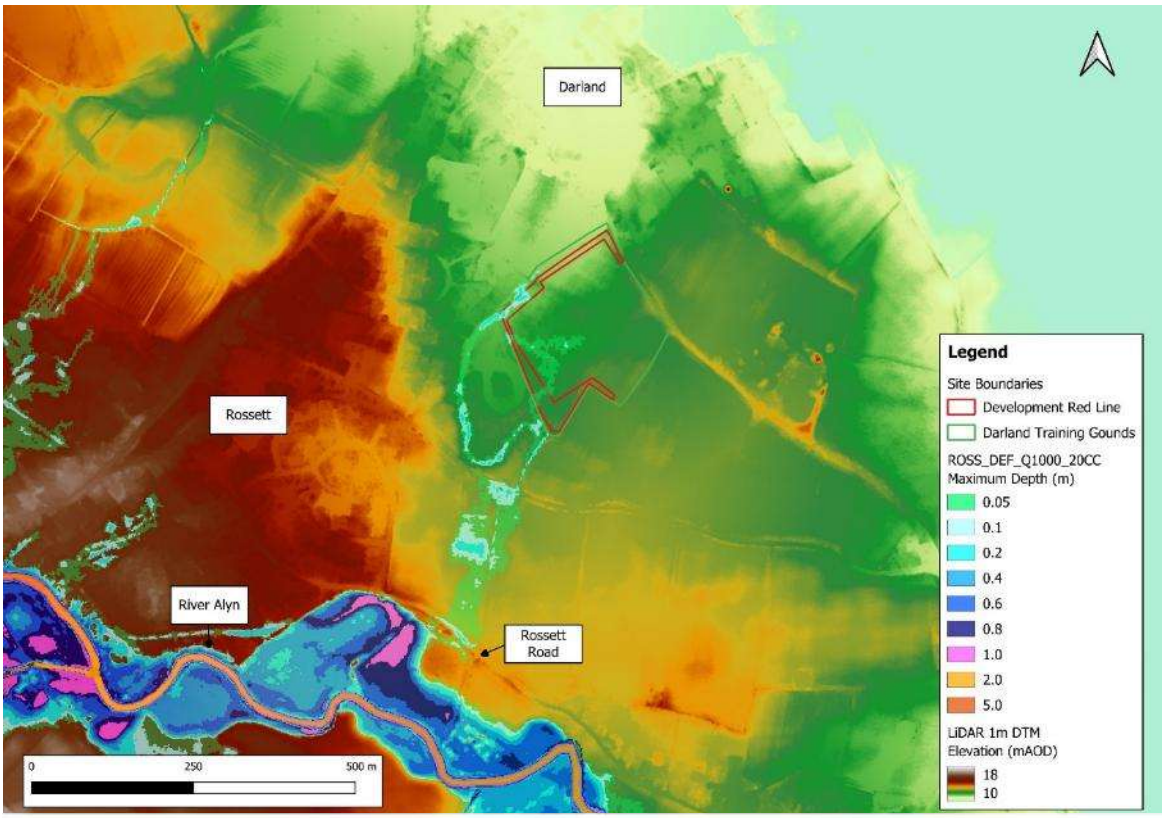


Figure 7—12. Rossett Flood Risk Study Maximum Flood Depths, 1 in 1000 Year Return Period Event + 20% Allowance for Climate Change. Topographic Basemap.

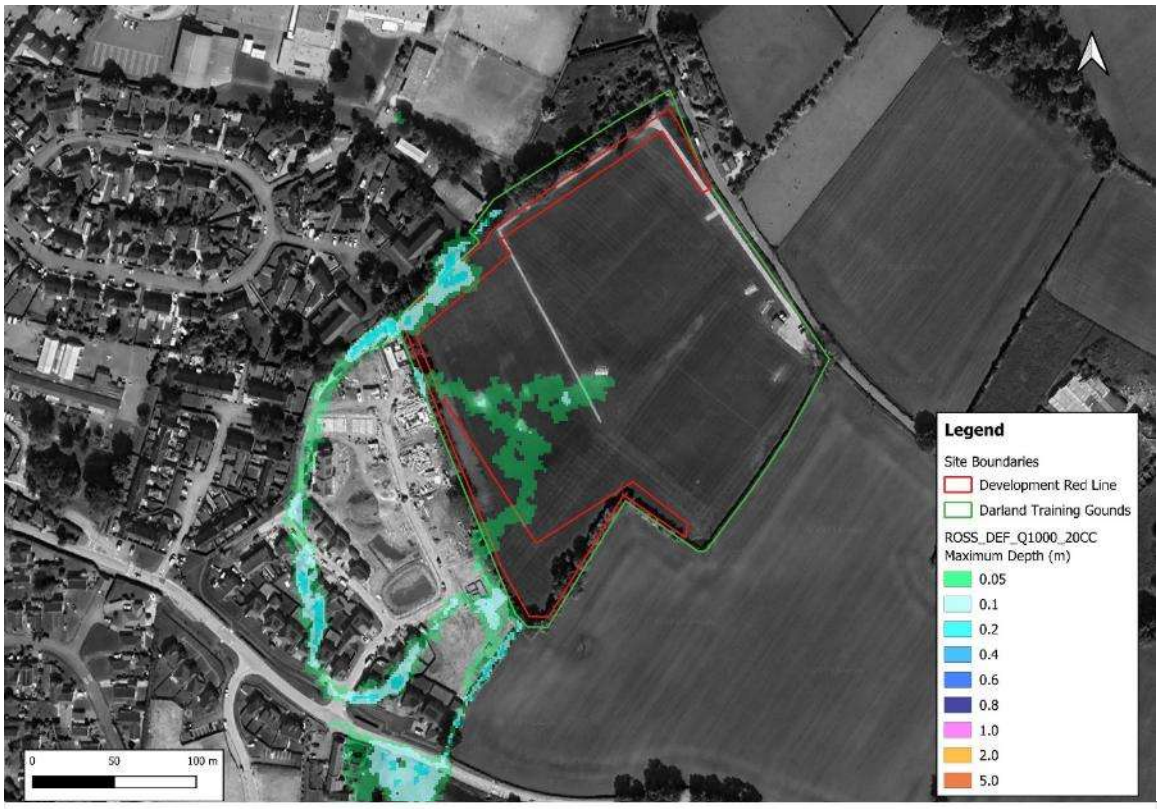


Figure 7—13 Rossett Flood Risk Study Maximum Flood Depths, 1 in 1000 Year Return Period Event + 20% Allowance for Climate Change. Site Extent.

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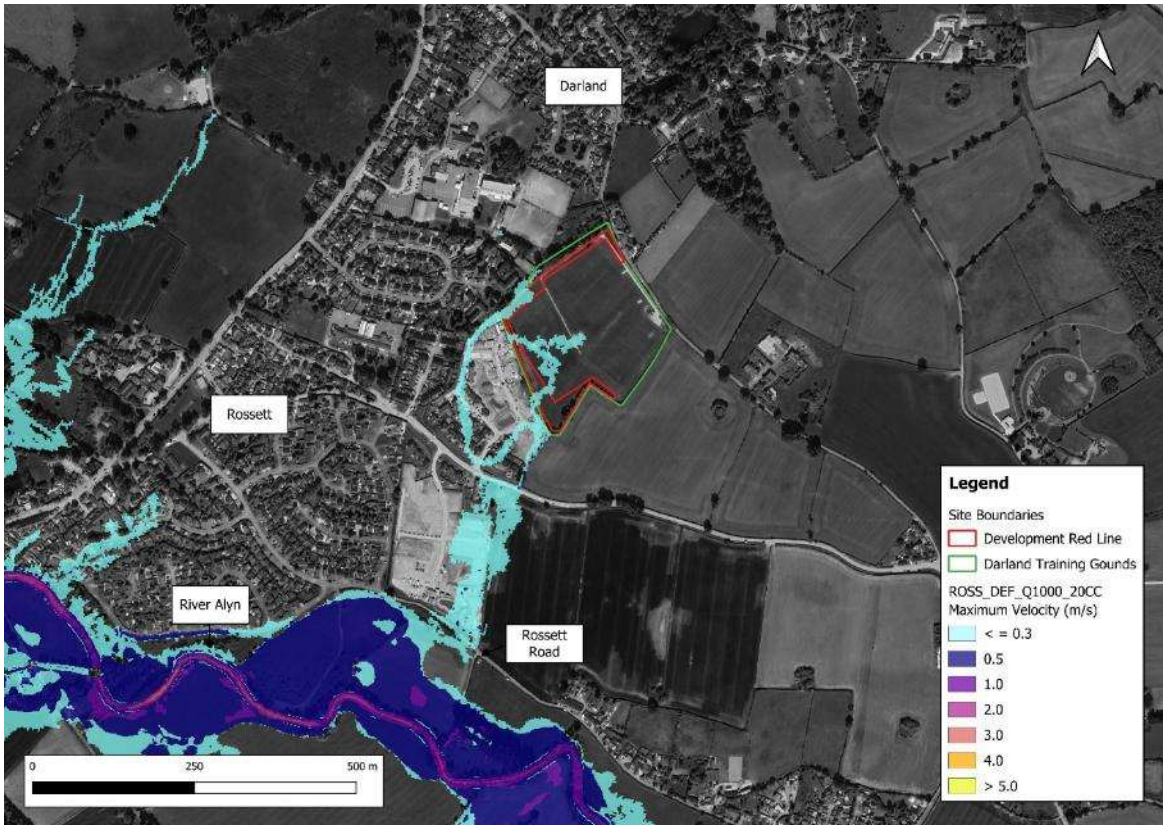


Figure 7—15 Rossett Flood Risk Study Maximum Flood Depths, 1 in 1000 Year Return Period Event + 20% Allowance for Climate Change. Topographic Basemap.



Figure 7—14 Rossett Flood Risk Study Maximum Flood Hazard Rating, 1 in 1000 Year Return Period Event + 20% Allowance for Climate Change.

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Figure 7—16 NRW Surface Water and Small Watercourse Flood Zones.

7.3.3 NRW Surface Water and Small Watercourse Flood Zones

The NRW Surface Water and Small Watercourse Flood Zones dataset was downloaded from the Flood Map for Planning Service and has been provided in greater detail in Figure 7—16.

The map demonstrates that there is a portion of Surface Water and Small Watercourses Flood Zone 2 within the site's planning application red line boundary, in the northwestern corner of the site. Flood Zone 2 represents a less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.

Surface Water and Small Watercourses Flood Zones 2 and 3 are present when considering the Darland Training Ground site as a whole, with a small region of Flood Zone 3 along the northwestern border, within the area of considered as Permitted Development.

The Surface Water and Small Watercourses Flood Zone extents are commensurate with the extents of the Rossett Flood Risk Study discussed above, local to the small unnamed watercourse at Darland View.

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7.4 Impact of Proposed Development on Flood Risk

This section evaluates the impact of the proposals on flow paths and the provision of floodplain storage.

7.4.1 Proposed Development Overview

Wrexham AFC's proposals for the site at Darland Training Grounds involves a re-work of the existing pitches, providing a new surface and re-grading to smooth out levels, giving a uniform fall to each pitch.

A topographic survey showing existing levels is provided in Appendix A. The plan of the site demonstrating the proposed cut and fill for existing to proposed ground levels is provided in Appendix H.

The access path around the perimeter and through the centre of the site will also be upgraded as part of the proposals, as well as the vehicle entrance on Gamford Lane.

Paramount to the proposed upgrades will be the provision of a new and improved land drainage system. The drainage strategy is for surface water to be disposed of to ground, through the pitch build-up, and attenuated via two interlinked swales. An outfall is provided from the swales to the unnamed watercourse on the northwestern boundary, retaining the existing land drainage discharge location.

A detailed description of the proposed development is provided in Chapter 3. The proposed site layout is provided in Figure 3—1.

7.4.2 Drainage Design Flood Mitigation

The 1 in 100 year return period discharge rates from the site, in an undeveloped, greenfield state, have been calculated using the UK SuDs tool, and is outlined in section 2.2, demonstrating a greenfield rate of 38.3 l/s. It is noted that the existing system will alter the response of the site to rainfall and increase the speed and rate at which rainfall is conveyed to the unnamed watercourse. Moreover, the existing system is likely to be inundated during extreme events, meaning water would enter by a combination of pipe flow from the system and overland flow across the existing ground. More information on the existing land drainage system is provided in section 2.1.

A new and improved land drainage system is proposed as part of the development. The proposed peak discharge rates are to be restricted to equivalent greenfield rates by the use of a orifice plate flow control. The drainage design for the new development will therefore be engineered to meet the greenfield rates noted above, providing a betterment to the current drainage system and therefore helping to reduce flood risk off-site. This betterment is achieved by two 600mm deep attenuation swales, providing a total attenuation volume of approximately 1,300m^3, increasing storage onsite. Once the infiltration potential of the pitches and swales are exceeded, the surface water will flow into the unnamed watercourse.

The swales are proposed at the low points on the southern and western edges of the site, as shown in Figure 3—1. Any flood water making its way onto the site from the south at these proposed locations will enter the attenuation swales. The Rosset Flood Risk Study 1 in 1000 year return period event plus a 20% allowance for climate change flood extents highlights the placement of the attenuation swales in areas where there is a risk of flooding (see Figure 7—13). Therefore, the attenuation swales have been sized to not only to attenuate run-off from the site, but also to accommodate and attenuate the existing flood volume at these locations.

7.4.2.1 Swale 1

Swale 1 is placed on the southern site boundary, directly south of the access path through the centre of the training grounds, beyond the touch line of Pitch Area 1. The location of Swale 1 is shown in Figure 3—1.

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The access path through the centre of the training grounds provides a small embankment between the pitches. The proposed elevation of the path at the location of the baseline modelled flood extents shown in Figure 7—13 is 11.94mAOD. This is more than 100mm above that of the modelled flood levels in the Rosset Flood Risk Study's 1 in 1000 year plus climate change event at this location. This, coupled with the re-grading of the southern half of the site in the proposed case, suggests that the raising of the path through the centre of the training grounds will provide an appropriate access and evacuation route which could remain operational under this extreme flood scenario.

The existing shallow overland flow (less than 50mm) from the southern site boundary would be intercepted and stored by swale 1 in the proposed case, further reducing the flood risk to the path and pitches on site. As mentioned above, the attenuation swales have been sized to not only to attenuate run-off from the site, but also to accommodate and attenuate the existing flood volume at these locations. Swale 1 has a proposed total available volume of 508m^3, 94m^3 of which is required for the pitch drainage strategy. This leaves a further 414m^3 for flood storage at this swale.

7.4.2.2 Swale 2

Swale 2 is placed on the western site boundary, to the east of the training area in the southern half of the site. The location of Swale 2 is shown in Figure 3—1.

Swale 2 has a proposed total available volume of 790m^3, 427m^3 of which is required for the pitch drainage strategy, leaving 363m^3 for flood storage at this swale. Due to the modelled flood extents (of less than or equal to 250mm) along the western boundary, an analysis has been carried out to quantify the existing flood volume at this location.

A proof of concept was carried out in order to quantity the approximate area of space required to store the existing baseline flood depths at the Swale 2 location. Depth rasters were created at 100mm elevation bands and inspected within the Swale 2 region to quantify the total volume requirement for the existing flood depths at this location. A total volume of 60m^3 is calculated to be required to store the volume of flooding at this location, in the scenario of the extreme flood event, leaving a further 303m^3 available in the swale on top of the 427m^3 for the site drainage.

Table 7—6 Indicative Swale 2 flood storage requirements.

Swale 2		
Elevation band (mAOD)	Approx volume required to store baseline flood depths (m^3)	Approx area of space required to store the depth of flooding (m^2)
11.57-11.58	7.71	55
11.58-11.59	15.77	99
11.59-11.60	9.74	62
11.60-11.61	6.94	52
11.61-11.62	5.74	50
11.62-11.63	3.01	45
11.63-11.64	4.03	41
11.64-11.65	4.85	39
11.65-11.66	2.47	16
	Total: 60	**Total: 459**

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7.5 Conclusions

Wrexham has and been identified as a National Growth Area by the national plan of Future Wales (2040) and is the main focus for growth and investment in North Wales. A co-ordinated and strategic approach to flood risk management considering appropriate location and development type as well as the promotion of nature-based solutions and green infrastructure is required to ensure growth aspirations for the region.

Wrexham AFC's plans to improve the Darland Training Grounds site align with economic growth aspirations whilst providing a green infrastructure asset and recreational space with nature-based solutions to manage flood risk. The new and improved facilities will contribute towards the social, economic, environmental and cultural well-being of communities in Darland, Rossett and Wrexham.

A FCA appropriate to the nature and scale of the proposed development has been undertaken to develop a full appreciation of the risk and the consequences of flooding on the development and elsewhere. Flood risk has been considered at an early stage in formulating the design of the new and improved training grounds, with the flood risk screening informing decisions on the layout of the design.

The NRW Flood Map for Planning service confirms that the site is partially within Rivers Flood Zone 2 and Surface Water and Small Watercourses Flood Zone 2, which represent a less than a 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.

The proposal for the improvement of Darland Training Grounds is considered a water compatible development type, with the vulnerability of this development type proportionate to the level of flood risk identified.

The site is impacted by surface water runoff and the small watercourse running parallel to the western boundary of the site. The site is impacted by overland flow routes from the left bank of the River Alyn in the extreme flood scenario of the 0.1% annual exceedance probability event including a 20% allowance for climate change.

The Rossett Flood Risk Study model was requested from NRW for further inspection of the flood risk from River Alyn. A range of return period events have been considered as well as the impact of the flooding identified for the extreme flood scenario of the 0.1% annual exceedance probability event including a 20% allowance for climate change.

The 0.1% annual exceedance probability event including a 20% allowance for climate change modelled flood depths impacting the site are shallow. Depths of 50mm impact the site from overland flow from the south whilst depths of 200-250mm occur along the western boundary of site, local to the unnamed watercourse at Darland View. The modelled output velocities for the flooding on the site for this extreme return period event are less than 0.3m/s.

Whilst the flood risk for this water compatible development type meet the acceptability criteria regarding flood events in which development must be flood-free and tolerable flood depth and velocity conditions in extreme flood events, a precautionary approach to flooding has been taken by the plan of works, with predicted flooding affecting the choice of the layout, location and design of the proposals.

The proposed drainage strategy will provide a betterment on discharge rates over the existing drainage system, and a 24% betterment over existing greenfield rates provided for a 1 in 100 year event with 30% climate change applied. The regrading of the site and the two proposed attenuation swales reduce flood risk both on and off the development site. The attenuation swales have been sized to not only to attenuate run-off from the site, but also to accommodate and attenuate the existing flood volume at these locations. The proposals therefore provide more volume on site in comparison to the existing case, even when discounting the volume required for the drainage system, ensuring a net benefit to flood risk.

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7.6 Recommendations

- The proposed measures to manage the flood consequences should be implemented at the appropriate stage of the development.
- The proposed measures to manage the flood consequences will require long-term maintenance.
- The proposals incorporate a safe access and egress route which will remain active in times of flood. This should be accompanied by a flood emergency plans and agreed procedures.

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Appendix A – Topo Drawing

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NOTES

SURVEY CO-ORDINATE SCHEDULE

STATION	EASTING	NORTHING	HEIGHT	STATION	EASTING	NORTHING	HEIGHT
S1	337369.677	357641.106	11.449				
S2	337432.052	357603.047	11.397				
S3	337451.998	357609.654	11.249				
S4	337464.858	357618.368	11.264				
S5	337479.243	357630.547	11.504				
S2A	337449.751	357586.271	11.413				
ST01	337385.304	357668.922	11.273				
ST02	337416.192	357710.871	11.279				
ST03	337399.627	357720.607	11.463				

LAND SURVEY INFORMATION

GRID: X

VERTICAL DATUM: X
HEIGHT ESTABLISHED VIA 'TRIMBLE VRS NOW NETWORK' COMMERCIAL RTK GPS CORRECTION SERVICE

LOCAL SCALE FACTOR:X

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The completeness of any underground survey cannot be 100% guaranteed and the results from these types of surveys are not infallible. If the location or depth of services/features is of particular importance to a project then it is strongly advised that discussions are held with Subsite Surveys Ltd regarding any possible limitations or anomalies. It is also strongly advised that trial excavations should be undertaken to confirm survey results. We cannot be held responsible for any inaccuracies beyond those that could be reasonably expected by a competent company.

ABBREVIATIONS (Land & Utilities)

AR ASSUMED ROUTE
AV AIR VALVE
BB BELISHA BEACON
BD BACKDROP
Bdl BED LEVEL
BH BOREHOLE
BHch BASEMENT HATCH COVER
Bin LITTER / GRIT SALT BIN
BL BASEMENT LIGHT
Bol BOLLARD
BP BOUNDARY POST
BS BUS STOP
BTIC BRITISH TELECOM CHAMBER
CatL CATENARY LEVEL
CATV CABLE TV COVER
CB CONTROL BOX
CBlt CONVEYOR BELT
CC COAL CHUTE
CGrd CATTLE GRID
ChL CHANNEL LEVEL
Chy CHIMNEY
CI CAST IRON
CL COVER LEVEL
CO CONCRETE
CP CABLE PIT
CpL COPING LEVEL
Cpsn CAPSTAN
Cpst CAMERA POST
CR CABLE RISER
CrL CROWN LEVEL
CulP CULVERT PIPE
CWM CABLE WINDING MACHINERY
d DEPTH
Dia. DIAMETER
DS DIRECTION SIGN
EIC ELECTRIC INSPECTION COVER
EoC EDGE OF CANOPY
EOR END OF RECORDS
EOT END OF TRACE
EP ELECTRICITY POLE
ER EARTH ROD
EShwr EMERGENCY SHOWER
ESP ELECTRICITY SUPPLY POINT
Esw ELECTRICAL SWITCH
FB FOOTBRIDGE
FH FIRE HYDRANT
FL FLOOR LEVEL
FS FLAG STAFF / POLE
G GULLY
G= GIRTH
GIP GAS INLET PIPE
GP GUIDE POST
GPR TRACED BY G.P.R
Grl GRILLE
GV GAS VALVE
Hgt HEIGHT
Hrl HANDRAIL
HV HIGH VOLTAGE
IC INSPECTION CHAMBER
IL INVERT LEVEL
IP INLET PIPE
JN JUNCTION
KO KERB OUTLET
Lby LIFEBOUY
Lck LOCK GATE
Ldr LADDER
LH LAMP HOLE
LP LAMP POST
LV LOW VOLTAGE
MgP MOORING POST
mH METERS HIGH
Mhcy MACHINERY
MH MANHOLE
Mkr MARKER POST
MkrE MARKER POST (ELECTRIC)
MkrG MARKER POST (GAS)
MkrR MARKER POST (RAILWAY)
MkrT MARKER POST (TELECOM)
MkrW MARKER POST (WATER)
MP MILE POST
MS MILE STONE
NL NOT LOCATED
NP NAME PLATE
OSA OUTSIDE SURVEY AREA
OSBM O.S BENCH MARK
OGP OVERGROUND PIPE
OHCu O/H CABLE (UNIDENTIFIED)
OHE OVERHEAD CABLE (ELECTRIC)
OHG OVERHEAD GANTRY
OHP OVERHEAD PIPE
OHT OVERHEAD CABLE (TELECOM)
OP OUTLET PIPE
P POST
Pb PARK BENCH
PB POST BOX
PCsg PEDESTRIAN CROSSING
PE POLYETHALINE
PF PITCH FIBER
Pl PILE
Pir MOVEMENT DETECTOR
Pmd PLANT MOTOR DRIVE
PP PETROL / DIESEL PUMP
PR PIPE RISER
Psk PENSTOCK
PU PUMP
PV PIPE (VERTICAL)
PVC POLYVINYL CHLORIDE
Pyl PYLON
Pz PIEZOMETER
RE RODDING EYE
RG RAIN GAUGE
RMP RESERVOIR MONITORING PNT
RP REFLECTOR POST
RS ROAD SIGN
RSP RAILWAY SIGNAL POST
RWP RAIN WATER PIPE
S SPREAD
SA SURVEY ABANDONED
SB SIGN BOARD
Shlt SHELTER (BUS / TRAM)
SI SPUN IRON
SL SOFFIT LEVEL
SltL SILT LEVEL (TOP)
SMP SETTLEMENT MONITORING PNT
SiL SIGNAL LOST
SP SIGN POST
SPil SHEET PILING
Spr SPRING
SPt SAMPLING POINT
ST STOP TAP
Sti STILE
Stl STRUCTURE TOP LEVEL
Stp STUMP (TREE)
StP STAND PIPE
StPo STAY POST
StW STAY WIRE
SV STOP VALVE
SVP SOIL VENT PIPE
TBM TEMPORARY BENCH MARK
TCB TELEPHONE CALL BOX
TEL TELECOM CHAMBER COVER
TFR TAKEN FROM RECORDS
Thl THRESHOLD LEVEL
TL TRAFFIC LIGHT
TP TELEGRAPH POLE
Tpt TRIAL PIT
Tr TROUGH
UTF UNABLE TO FIND
UTGA UNABLE TO GAIN ACCESS
UTL UNABLE TO LIFT
UTR UNABLE TO ROD
UTS UNABLE TO SURVEY
UTT UNABLE TO TRACE
VC VITREOUS CLAY
VP VENT PIPE
VR VAPOUR RECOVERY
VS VENTILATION SHAFT
VW VALVE / SLUICE WHEEL
WB WEIGHBRIDGE
WL WATER LEVEL
WM WATER METER
WO WASH OUT VALVE
Wr WEIR
WrL WEIR LEVEL
WrPl WEIR PLATE (TOP)
WWP WASTE WATER PIPE

FENCE TYPES:
AMF ARMCO
BWF BARBED WIRE
CBF CLOSE BOARDED
CIF CORRUGATED IRON
CLF CHAIN LINK
CPF CHESTNUT PALING
IRF IRON RAILING
IWF INTERWOVEN
PCF POST & CHAIN
PIF POST & IRON RAIL
PRF POST & RAIL
PWF POST & WIRE
SPF STEEL PALLISADE
WMF WIRE MESH

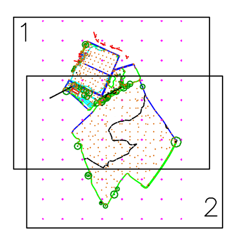
BUILDING
BANKING
DRAINAGE CHANNEL
FENCE
STEPS
LINE MARKINGS
WALL
VERGE
VEGETATION
ROOF LINES

FH FIRE HYDRANT
SV STOP VALVE
MH CL 0.00m MANHOLE
LP LAMP POST
RS ROAD SIGN
B BOLLARD
TH 57.68 THRESHOLD LEVEL
O.S BENCH MARK
ST03 57.779 SURVEY CONTROL STATION
TREE
HEDGE
+ 57.57 SPOT LEVEL
ToRL 65.74 RIDGE LEVEL
Eaves 18.33 EAVES LEVEL
FL 59.44 FENCE LEVEL

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m TO EXPOSE HIDDEN SERVICES.

ISSUE	DATE	DESCRIPTION

SHEET LAYOUT



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DWG No: 0324-GAT-002
REV.

TITLE:
Darland High School
Chester Rd
Rossett
Wrexham
LL12 0DL

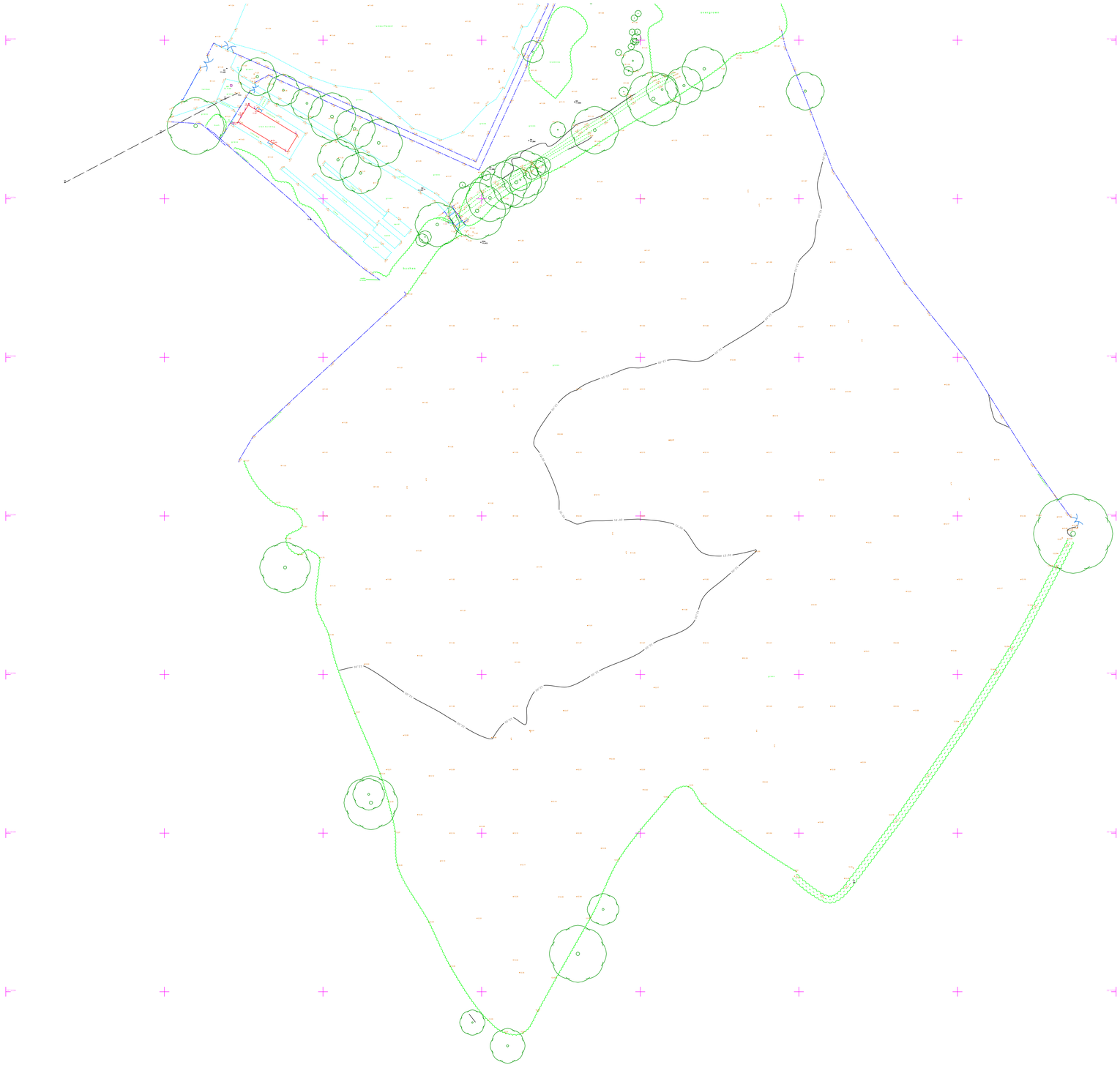
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SURVEYOR: JA
DRAWN: JA
DATE: 28/03/2024

SURVEY TYPE
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DRAINAGE [ ]
UTILITY [ ]

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NOTES:

SURVEY CO-ORDINATE SCHEDULE

STATION	EASTING	NORTHING	HEIGHT
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06	331252.724	351923.243	71.579
07	331252.724	351923.243	71.579

LAND SURVEY INFORMATION

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VERTICAL DATUM: X
HEIGHT ESTABLISHED VIA "TRIMBLE VRS NOW NETWORK" COMMERCIAL RTK GPS CORRECTION SERVICE

LOCAL SCALE FACTOR:X

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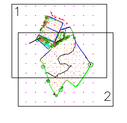
ABBREVIATIONS (Land & Utilities)

AR	ASSUMED ROUTE	KO	KERB OUTLET	SL	SIGNAL LOST
AV	AIR VALVE	Lby	LAYBY/LY	SP	SIGN POST
BB	BELL BOLLARD/BEACON	LC	LEVEL CROSSING	SPG	SPRAY PLATING
BK	BACKDROP	Ld	LADDER	Spr	SPRING
BM	BED LEVEL	LH	LAMP HOLE	SPt	SAMPLING POINT
BS	BOLLARD SIGN	LP	LAMP POST	SS	SOIL STACK
Bsmt	BASEMENT MATCH COVER	LV	LOW VOLTAGE	SV	STOP VALVE
Bin	LITTER / UNIT/ SALT BIN	MgP	MOORING POST	Stc	STRUCTURE TOP LEVEL
BL	BOLLARD LIGHT	Mk	MARKER	Std	STAND PIPE
Bll	BILLARD	Mchy	MACHINERY	Stl	STAND PIPE
BP	BOUNDARY POST	Mh	MANHOLE	Stk	STAY POST
BT	BT MANHOLE	MH	MANHOLE (ELECTRIC)	Stn	STAY WIRE
BTC	BRITISH TELECOM CHAMBER	MoC	MARKER POST (ELECTRIC)	SV	STOP VALVE
BW	BOUNDARY WALL	MoG	MARKER POST (GAS)	TBM	TEMPORARY BENCH MARK
CATV	CABLE TV COVER	MoW	MARKER POST (WALWAY)	TBR	TEMPORARY BENCH MARK
CB	CATCH PIT/ CB	MoT	MARKER POST (TELCOM)	TC	TELECOM CABLE MARKER
CBH	CONDITION BELL/	MoV	MARKER POST (WATER)	TCV	TELECOM CABLE COVER
CC	COAL CHUTE	MP	MILE POST	TFR	TAKEN FROM RECORDS
CH	CHIMNEY STACK	MS	MAST (LIGHTING)	TL	TRAFFIC LIGHT
Chn	CHANNEL LEVEL	NL	NOT LOCATED	TL	TRAFFIC LIGHT
Chy	CHIMNEY	NP	NAME PLATE	TP	TELEGRAPH POLE
CL	CABLE JUNCTION	NSA	NOT SURVEY AREA	TR	TRENCH
CL	COVER LEVEL	OSBM	O.S. BENCH MARK	Tr	TROUGH
CO	CONCRETE	OGP	OVERGROUND PIPE	UTF	UNABLE TO FIND
CO	CLEAN OUT	OHC	OVERHEAD CABLE(STAYED)	UTG	UNABLE TO GAIN ACCESS
CoL	COPING LEVEL	OHE	OVERHEAD CABLE (ELECTRIC)	UTL	UNABLE TO LIFT
Cpst	CAPSTAN	OHG	OVERHEAD GANTRY	UTR	UNABLE TO ROD
CP	CONCRETE POST	OHL	OVERHEAD LINE	UTS	UNABLE TO SURVEY
CR	CABLE RISER	OHT	OVERHEAD CABLE (TELECOM)	UTT	UNABLE TO TRACE
Crk	CROWN LEVEL	OP	OUTLET PIPE	VC	VITREOUS CLAY
CS	CABLE STAKE	P	PIPE	VC	VITREOUS CLAY
CWM	CABLE WINDING MACHINERY	Pb	PARK BENCH	VR	VAPOUR RECOVERY
d	DEPTH	PB	POST BOX	VS	VENTILATION SHAFT
D	DRAIN COVER	PC	PEDESTRIAN CROSSING	WC	WATER COURSE/ WHEEL
DS	DIRECTION SIGN	PI	POLYTHALINE	WE	WEIGHBRIDGE
EAC	ELECTRICITY JUNCTION COVER	PIF	PIPE FIBER	WL	WATER LEVEL
ECP	CASE TOP (ENTRY)	PL	PILLAR	WL	WATER LEVEL
EDP	END OF DUCTS	PM	PEDESTRIAN DETECTOR	WO	WASH OUT VALVE
EOT	END OF TELECOM	Pmd	PUMP/WATER DRUM	WP	WATER POST
EP	ELECTRICITY POLE	PP	PETROL / DIESEL PUMP	Wrs	WEIR LEVEL
ES	ELECTRIC SIGN	PR	PRESSURE	WS	WEIR LEVEL (SIP)
ESw	EMERGENCY SHOWER	Pst	PENSTOCK	WWP	WASTE WATER PIPE
ESP	ELECTRICITY SUPPLY POINT	PU	PUMP		FENCE TYPES:
EV	ELECTRIC VENTILATION	PV	PUMP (VERTICAL)		
FB	FOOTBRIDGE	PVC	POLYVINYL CHLORIDE	AWF	ARMCO
FH	FIRE HYDRANT	PJ	PYLON	BWF	BARBED WIRE
FL	FLOOD LIGHT	R	RAIN METER	CBF	CLOSE BOARDED
FS	FLAG STAFF / POLE	RE	RODDING EYE	CF	CORRUGATED IRON
G	GULLY	RG	RAIN GAUGE	CLF	CHAIN LINK
GP	GUARD POST	RGM	RAIN GAUGE MONITORING PNT	HF	HIGH RAILING
GR	GAS INLET PIPE	RP	REFLECTOR POST	IRF	IRON RAILING
GP	GUIDE POST	RS	ROAD SIGN	MF	MESH/MOON
GRP	GRATE/ BY G.P.R	RSJ	RAILWAY SIGNAL POST	PF	POST & PANEL
GV	GRILLE	RWP	RAIN WATER PIPE	PrF	POST & RAIL
Gv	GAS VALVE	S	SPRING	PWF	POST & WIRE
HC	HOUSE	SA	SURVEY ABANDONED	SPF	STEEL PALISADE
HR	HANDRAIL	SB	SIGN BOARD	WeF	WIRE MESH
HV	HIGH VOLTAGE	SHV	SHELTER (BUS / TRAM)		
IC	INSPECTION CHAMBER	SI	SIGN		
IL	INVERT LEVEL	SL	SUPPLY LEVEL		
JB	JUNCTION BOX	SLP	SLOPE (TOP/BOT)		
JN	JUNCTION	SMP	SETTLEMENT MONITORING PNT		

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m TO EXPOSE HIDDEN SERVICES.

ISSUE	DATE	DESCRIPTION

SHEET LAYOUT



CLIENT: Gardiner and Theobald	DWG No: 0324-GAT-002	REV:
TITLE: Darland High School, Chester Rd, Rossett, Wrexham, LL12 0DL	SCALE: 1:500@A0	
	SURVEYOR: JA	
	DRAWN: JA	
	DATE: 28/03/2024	

SURVEY TYPE

TOPOGRAPHICAL	X
DRAINAGE	
UTILITY	

SUBSITE SURVEYS

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Registered Office: Willow House, Low Lane, Braithwaite, Doncaster, DN7 5SS

Appendix B – GI Report

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GEOTECHNICS

BUILD ON CONFIDENCE

Wrexham Academy Trial Pits

Project No:	PN254776
Client:	Wrexham AFC
Engineer:	Buro Happold
Date:	August 2025

Factual Report



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GEOTECHNICS
BUILD ON CONFIDENCE

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APPENDIX 3	Trial Pit Records
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1.0 INTRODUCTION

A geotechnical investigation was undertaken by Geotechnics Limited at the site of proposed developments on playing fields located behind Darland High School in Rossett, Wrexham. The investigation was carried out to the instructions of the Engineer, Buro Happold on behalf of the Client, Wrexham AFC via their agent, Gardiner & Theobald LLP. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the ground and groundwater conditions relating to the design of the proposed works within the limitations posed by exploratory hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The investigation comprised machine-excavated trial pits, in situ testing and reporting. A Factual Report was also commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 2 to 5 of this report. Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 6 to aid an understanding of the procedures followed and the context in which the report should be read.

In addition, the report is presented in electronic format in accordance with "The Electronic Transfer of Geotechnical Data from Ground Investigations" published by the AGS (the AGS Format) are presented separately as a digital file.

4.0 THE SITE

4.1 Location

The site is located within a parcel of land behind Darland High School in Rossett, Wrexham. The site is immediately adjacent to the southeast of the school and borders Gamford Lane. The approximate Ordnance Survey National Grid Reference for the site centre of the site is SJ 374 574 and an extract from the relevant 1:50,000 Scale O.S. Map (Sheet No. 117) is included as Appendix 1.

4.2 Description

The site is irregular in shape, with maximum plan dimensions of approximately 200m from northeast to southwest, and roughly 140m from southeast to northwest. The site is currently undeveloped and recently used as playing fields.

The site is bounded to the east by Gamford Lane, to the south and west by agricultural fields, and to the north by Darland School and adjacent residential properties.

Access to the site is gained via Gamford Lane.

4.3 Site Geology

The British Geological Survey website, https://mapapps2.bgs.ac.uk/geoindex/home.html, accessed on 28th August 2025, shows the site to be underlain by River Terrace Deposits (Undifferentiated) generally described as *sand and gravel, locally with lenses of silt, clay or peat*.

Immediately to the northwest of the site, the presence of Alluvium is indicated, whilst Glacial Till is shown to the southeast of the site.

The superficial soils are shown to be underlain by rocks of the Salop Formation, part of the Warwickshire Group. These rocks are generally described as *red and red-brown mudstone, and red-brown (mostly sublitharenite) sandstone containing beds of pebbly sandstone and conglomerate.*

The inferred trace of a fault trending roughly east-northeast to west-southwest is shown approximately 650m north-northwest of the site. The displacement of the fault is not indicated.

4.4 Hydrogeology

The Government's DEFRA Magic Map website, https://magic.defra.gov.uk/MagicMap.aspx, accessed on 28th August 2025, shows that the superficial deposits and underlying bedrock are both classified as Secondary A Aquifers. A Secondary A Aquifer is defined as an aquifer that comprises permeable layers that can support local water supplies, and may form an important source of base flow to rivers.

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a tender for work designed by the Engineer for ground investigation of the site in accordance with the Client's requirements.

5.2 General

The procedures followed in this site investigation are based on BS 5930: 2015+A1:2020 – Code of Practice for Site Investigations and BS 10175:2011+A2:2017 - Investigation of Potentially Contaminated Sites. The soils and rocks encountered have been described in accordance with BS5930:2015+A1:2020, BS EN ISO 14688-1:2018 and BS EN ISO 14689:2018.

The Exploratory Hole locations were selected by the Engineer and their positions are shown on the Exploratory Hole Location Plan in Appendix 2. The co-ordinates and levels shown on the Exploratory Hole Records were measured using a Leica Rover GPS survey device. The depths quoted on the exploratory hole records are in metres below ground level.

At each exploratory hole location an inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT).

5.3 Trial Pits

Five Trial Pits (numbered TP01 to TP05) were excavated to depths ranging between 0.75m and 1.90m below ground level using a 3 tonne excavator between 18th and 20th August 2025. This work was supervised on site by a geotechnical / geo-environmental engineer.

The profiles of strata or other features were recorded as excavation proceeded and measurements taken from ground level. On the instruction of Buro Happold, no samples were collected from the excavations. Soakaway testing was undertaken in each excavation (see Section 5.4). Groundwater observations and trench stability notes are included on the Trial Pit Records, presented in Appendix 3. Photographs of the pits are presented in Appendix 4.

5.4 Soakaway Tests

A total of eight soakaway tests were carried out in Trial Pits TP01 to TP05 at depths of between 0.25m and 1.90m below ground level in general accordance with the method given in BRE Digest 365 "Soakaway Design", 2016. Digital water level loggers were installed to allow continuous recording of the water levels. The Digest requires the test to be repeated three times at each location, however, due to the slow soakage of the water from the test pit it was only possible to carry out a single test in Trial Pits TP01 and TP04 in the 30 hour period allowed for each test, as stipulated by the Engineer. In Trial Pits TP02, TP03 and TP05, two tests were carried out in each excavation as requested by the Engineer. The results of the tests are presented in Appendix 5.

5.5 Instrumentation and Monitoring

No monitoring installations were commissioned by the Client or Engineer.

6.0 LABORATORY TESTING

6.1 Geotechnical

No geotechnical testing was commissioned by the Client or Engineer.

6.2 Contamination

No contamination testing was commissioned by the Client or Engineer.

Signed for and on behalf of Geotechnics Limited.

Prepared by:

Aaron Field
BSc. (Hons) MSc., EurGeol, CGeol FGS
Registered Ground Engineering Professional
Principal Engineering Geologist

Reviewed by:

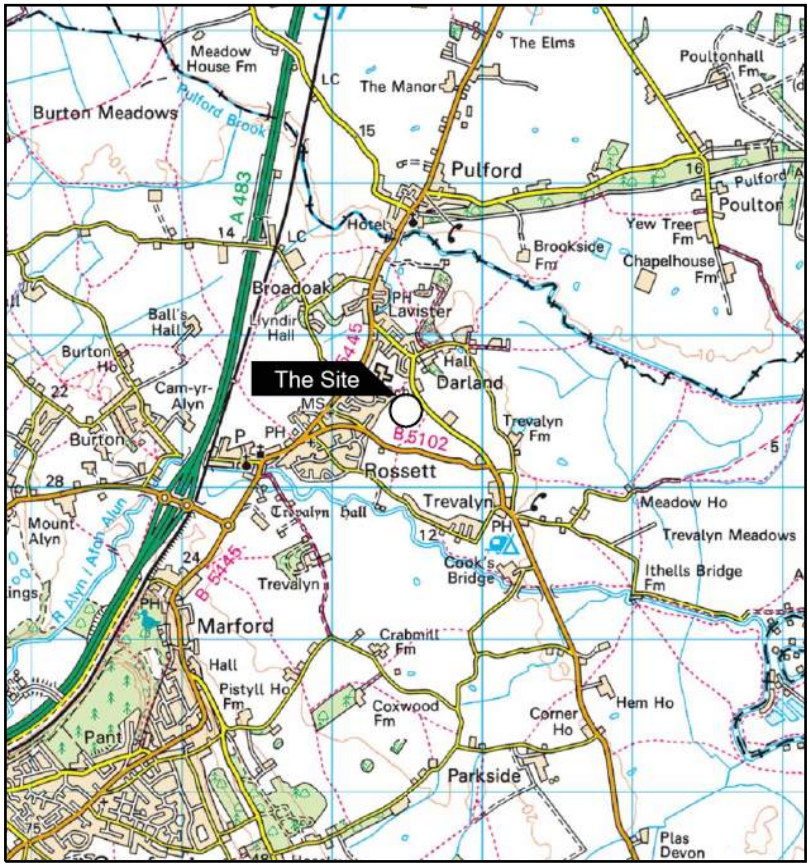
Conor Southall
BSc. (Hons), FGS
Senior Engineer

APPENDIX 1

Site Location Plan

APPENDIX 1

Site Location Plan



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APPENDIX 2

Exploratory Hole Location Plan



N

Legend

Locations By Type - TP

GEOTECHNICS

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Engineer:
Buro Happold

Client:
Wrexham AFC

Project:
Wrexham Academy Trial Pits

Drawing Title:
Exploratory Hole Location Plan

Scale:	Date:
1:1500 at A3	**28/08/2025**
Project No.: **PN254776**	**Exploratory Hole Location Plan**

FIELDWORK RESULTS - *Location Summary*

Project Wrexham Academy Trial Pits **Engineer** Buro Happold **Project No.** PN254776

Client Wrexham AFC

Location	Location Type	Easting (m)	Northing (m)	Ground Level (m OD)	Final Depth (m bgl)
TP01	TP	337424.4	357559.2	11.65	1.75
TP02	TP	337437.0	357395.0	12.11	1.90
TP03	TP	337508.5	357553.7	11.96	0.75
TP04	TP	337523.3	357477.2	11.96	0.80
TP05	TP	337572.3	357532.8	12.16	0.81

APPENDIX 3

Trial Pit Records

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample
ES	Soil sample for environmental testing
EW	Water sample for environmental testing
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Undisturbed open drive sample - with blows required to drive sampler (UF - failed U sample)
UT	Thin wall open drive tube sample - with blows required to drive sampler (UTF - failed UT sample)
W	Water sample

In Situ Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
cu	Undrained shear strength from laboratory test
HV	Strength from Hand Vane - Peak (R – Remoulded strength)
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
PID	Photo-Ionisation Detector
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Rec	Recovery of Dynamic Sample
Temp	Temperature
TC	Thermal Conductivity
TR	Thermal Resistivity
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w	Water content

SPT

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike

Depth Water Rose To

Instrumentation

Seal

Filter

Seal



Strata — Legend

Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

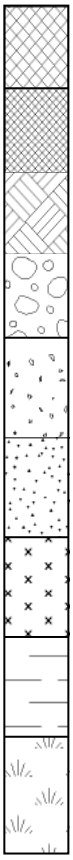
Gravel

Sand

Silt

Clay

Peat



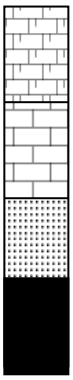
Note: Composite soil types shown by combined symbols

Chalk

Limestone

Sandstone

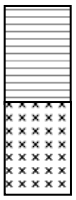
Coal



Strata, Continued

Mudstone

Siltstone

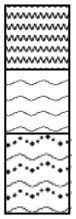


Metamorphic Rock

Fine Grained

Medium Grained

Coarse Grained

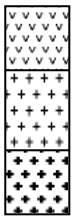


Igneous Rock

Fine Grained

Medium Grained

Coarse Grained



Backfill Materials

Arisings

Bentonite

Concrete

Sand

Grout

Gravel

Asphalt/Tarmacadam



Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
	Fractures/metre
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

GEOTECHNICS

TRIAL PIT RECORD - Trial Pit

Project	Wrexham Academy Trial Pits	**Engineer**	Buro Happold	**Project No.**	PN254776
				Location ID	TP01
Client	Wrexham AFC	**National Grid Coordinates**	337424.4 E 357559.2 N	**Ground Level**	11.65 m OD

Samples and Tests | Strata | Scale 1:25

Depth	Sample Type	Stratum No.	Results	Description	Depth	Legend	Level (m OD)
				TOPSOIL: Light brown slightly gravelly slightly clayey fine to coarse sand. Gravel is subangular to rounded fine to medium of various lithologies.	0.15		11.50
				Light brown gravelly slightly silty fine to medium SAND. Gravel is subangular to rounded fine to medium of sandstone and quartzite.			
				Firm to stiff dark reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium sandstone, quartzite and coal.	0.75		10.90
				End of Excavation	1.75		9.90

Excavation

Plant	3T tracked excavator	**Width (B)**	0.50
Date	19/08/2025	**Length (C)**	1.50
Shoring	None.	**Orientation (degrees)**	040
		Date Backfilled	20/08/2025
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Rose to	in Mins	Remarks
				None encountered.

Remarks

Trial Pit logged in situ to a depth of 1.20m and then at the surface from arisings recovered from the excavator bucket.
No samples were taken on the instruction of Buro Happold.
Soakaway Test carried out between 0.50m and 1.75m depth.
Trial Pit backfilled with arisings on completion.

Logged by JP
Checked by AW
Figure Sheet 1 of 1
29/08/2025

Symbols and abbrevations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

GEOTECHNICS

TRIAL PIT RECORD - *Trial Pit*

Project	Wrexham Academy Trial Pits	**Engineer**	Buro Happold	**Project No.**	PN254776
				Location ID	TP02
Client	Wrexham AFC	**National Grid Coordinates**	337437.0 E 357395.0 N	**Ground Level**	12.11 m OD

Samples and Tests | Strata | Scale 1:25

Depth	Sample Type	Stratum No.	Results	Description	Depth	Legend	Level (m OD)
				TOPSOIL: Light brown slightly gravelly slightly clayey fine to coarse sand. Gravel is subangular to rounded fine to medium of various lithologies.	0.10		12.01
				Firm to stiff light brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to rounded fine to coarse of various lithologies.			
				Soft to firm orangish brown slightly gravelly sandy CLAY. Gravel is subrounded to rounded fine to medium of various lithologies.	0.50		11.61
				Multicoloured sandy slightly silty subrounded to rounded fine to coarse GRAVEL of various lithologies. Low cobble content of various lithologies.	0.90		11.21
				At 1.90m, trial pit collapsed back to 1.60m.			
				End of Excavation	1.90		10.21

Excavation

Plant	3T tracked excavator	**Width (B)**	0.50
Date	19/08/2025	**Length (C)**	1.50
Shoring	None.	**Orientation (degrees)**	040
		Date Backfilled	20/08/2025
Stability	Unstable, collapsed to 1.60m.		

Groundwater

Depth Observed	Depth of Pit	Rose to	in Mins	Remarks
1.60	1.90	1.59	20	Medium to fast inflow.

Remarks

Trial Pit logged in situ to a depth of 1.20m and then at the surface from arisings recovered from the excavator bucket.
No samples were taken on the instruction of Buro Happold.
Soakaway Test carried out between 0.50m and 1.60m depth.
Trial Pit backfilled with arisings on completion.

Logged by JP
Checked by AW
Figure Sheet 1 of 1
29/08/2025

Symbols and abbrevations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

GEOTECHNICS

TRIAL PIT RECORD - *Trial Pit*

Project	Wrexham Academy Trial Pits	**Engineer**	Buro Happold	**Project No.**	PN254776
				Location ID	TP03
Client	Wrexham AFC	**National Grid Coordinates**	337508.5 E 357553.7 N	**Ground Level**	11.96 m OD

Samples and Tests | Strata | Scale 1:25

Depth	Sample Type	Stratum No.	Results	Description	Depth	Legend	Level (m OD)
				Grass over TOPSOIL: Soft brown slightly gravelly sandy clay. Gravel is subangular to rounded fine to coarse of various lithologies, predominantly sandstone and quartzite.	0.15		11.81
				Light brown gravelly slightly clayey fine to medium SAND with occasional pockets of brown clay. Gravel is subrounded to rounded fine to coarse of sandstone and quartzite.			
				End of Excavation	0.75		11.21

Excavation

Plant	3T tracked excavator	**Width (B)**	0.40
Date	18/08/2025	**Length (C)**	1.00
Shoring	None.	**Orientation (degrees)**	315
		Date Backfilled	20/08/2025
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Rose to	in Mins	Remarks
				None encountered.

Remarks

Trial Pit logged in situ to a depth of 0.75m.
No samples were taken on the instruction of Buro Happold.
Soakaway Test carried out between 0.25m and 0.75m depth.
Trial Pit backfilled with arisings on completion.

Logged by JP
Checked by AW
Figure Sheet 1 of 1
29/08/2025

Symbols and abbrevations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

GEOTECHNICS

TRIAL PIT RECORD - Trial Pit

Project	Wrexham Academy Trial Pits	**Engineer**	Buro Happold	**Project No.**	PN254776
				Location ID	TP04
Client	Wrexham AFC	**National Grid Coordinates**	337523.3 E 357477.2 N	**Ground Level**	11.96 m OD

Samples and Tests | Strata | Scale 1:25

Depth	Sample Type	Stratum No.	Results	Description	Depth	Legend	Level (m OD)
				Grass over TOPSOIL: Soft brown slightly gravelly sandy clay. Gravel is subangular to rounded fine to coarse of various lithologies, predominantly sandstone and quartzite.	0.15		11.81
				MADE GROUND: Soft to firm light brown slightly gravelly sandy clay. Gravel is angular to subrounded fine to medium of sandstone, quartzite and brick fragments.	0.45		11.51
				Firm to stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to rounded fine to medium of sandstone, quartzite and quartz. Below 0.65m, yellowish brown mottled grey.			
				End of Excavation	0.80		11.16

Excavation

Plant	3T tracked excavator	**Width (B)**	0.35
Date	18/08/2025	**Length (C)**	1.00
Shoring	None.	**Orientation (degrees)**	040
		Date Backfilled	20/08/2025
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Rose to	in Mins	Remarks
				None encountered.

Remarks

Trial Pit logged in situ to a depth of 0.80m.
No samples were taken on the instruction of Buro Happold.
Soakaway Test carried out between 0.25m and 0.80m depth.
Trial Pit backfilled with arisings on completion.

Symbols and abbrevations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by JP
Checked by AW
Figure Sheet 1 of 1
29/08/2025

GEOTECHNICS

TRIAL PIT RECORD - *Trial Pit*

Project	Wrexham Academy Trial Pits	**Engineer**	Buro Happold	**Project No.**	PN254776
				Location ID	TP05
Client	Wrexham AFC	**National Grid Coordinates**	337572.3 E 357532.8 N	**Ground Level**	12.16 m OD

Samples and Tests | Strata | Scale 1:25

Depth	Sample Type	Stratum No.	Results	Description	Depth	Legend	Level (m OD)
				Grass over TOPSOIL: Soft brown slightly gravelly sandy clay. Gravel is subangular to rounded fine to coarse of various lithologies, predominantly sandstone and quartzite.			
					0.20		11.96
				Light brown gravelly slightly silty fine to medium SAND. Gravel is subangular to rounded fine to medium of sandstone and quartzite.			
					0.62		11.54
				Orangish brown gravelly slightly clayey fine to coarse SAND. Gravel is subrounded to rounded fine to coarse of sandstone and quartzite.			
					0.81		11.35
				End of Excavation			

Excavation

Plant	3T tracked excavator	**Width (B)**	0.40
Date	18/08/2025	**Length (C)**	1.00
Shoring	None.	**Orientation (degrees)**	040
		Date Backfilled	20/08/2025
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Rose to	in Mins	Remarks
				None encountered.

Remarks

Trial Pit logged in situ to a depth of 0.81m.
No samples were taken on the instruction of Buro Happold.
Soakaway Test carried out between 0.25m and 0.81m depth.
Trial Pit backfilled with arisings on completion.

Logged by JP
Checked by AW
Figure Sheet 1 of 1
29/08/2025

Symbols and abbrevations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

GEOTECHNICS

APPENDIX 4

Trial Pit Photographs

TP01 [Photo 1]



TP01 [Photo 2]


PHOTOGRAPHIC BOARD
GEOTECHNICS
PROJECT NAME
WREXHAM AFC ACADEMY TPs
PROJECT NUMBER
PN254776
HOLE ID
TP1
DATE
19/08/25
NOTES
1.75m

TP01 [Photo 3]


PHOTOGRAPHIC BOARD
PROJECT NAME
WREXHAM AFC ACADEMY TPS
PROJECT NUMBER
PN254776
HOLE ID
TP1
NOTES
1.75m
DATE
11/08/25

TP01 [Photo 4]



TP01 [Photo 5]


PHOTOGRAPHIC BOARD
PROJECT NAME
WREXHAM AFC ACADEMY TPS
PROJECT NUMBER
PN254776
HOLE ID
TP1
1.75m
DATE
17/08/25

TP01 [Photo 6]


GEOTECHNICS
PHOTOGRAPHIC BOARD
PROJECT NAME
WREXHAM AFC ACADEMY TPs
PROJECT NUMBER
PN254776
HOLE ID
TP1
DATE
19/08/25
NOTES
1.75m
cm
10
20
30
40

TP02 [Photo 1]



TP02 [Photo 2]



TP02 [Photo 3]



TP02 [Photo 4]



TP02 [Photo 5]


GEOTECHNICS
PHOTOGRAPHIC BOARD
PROJECT NAME
WREXHAM AFC ACADEMY TP
PROJECT NUMBER
PN254776
DATE
11/08/25
HOLE ID
TP2
NOTES

TP02 [Photo 6]


PHOTOGRAPHIC BOARD
PROJECT NAME
WREXHAM AFC ACADEMY TPs
PROJECT NUMBER
PN254776
HOLE ID
TP2
DATE
19/08/25
NOTES

TP03 [Photo 1]



TP03 [Photo 2]



TP03 [Photo 3]


PHOTOGRAPHIC BOARD
GEOTECHNICS
BUILD ON CONFIDENCE
PROJECT NAME
WREXHAM AFC ACADEMY TPS
PROJECT NUMBER
PN254776
HOLE ID
TP3
NOTES
0.75m
DATE
18/08/25
cm
10
20
30
40

TP03 [Photo 4]


GEOTECHNICS
PHOTOGRAPHIC BOARD
PROJECT NAME
WREXHAM AFC ACADEMY TPs
PROJECT NUMBER
PN254776
HOLE ID
TP3
DATE
19/08/25
NOTES
0.75m

TP04 [Photo 1]



TP04 [Photo 2]


PHOTOGRAPHIC BOARD
GEOTECHNICS
BUILD ON CONFIDENCE
PROJECT NAME
WREXHAM AFC ACADEMY TPs
PROJECT NUMBER
PN254776
HOLE ID
TP4
NOTES
0.75m
DATE
18/08/25
cm
10
20
30
40

TP04 [Photo 3]


GEOTECHNICS
BUILD ON CONFIDENCE
PHOTOGRAPHIC BOARD
PROJECT NAME
WREXHAM AFC ACADEMY TPs
PROJECT NUMBER
PN254776
HOLE ID
TP4
DATE
18/08/25
NOTES
0.75m
cm
10
20
30
40

TP04 [Photo 4]



TP04 [Photo 5]


GEOTECHNICS
PHOTOGRAPHIC BOARD
PROJECT NAME
WREXHAM AFC ACADEMY TPS
PROJECT NUMBER
PN254776
DATE
18/08/25
HOLE ID
TP4
NOTES
0.75m

TP04 [Photo 6]



TP05 [Photo 1]



TP05 [Photo 2]



TP05 [Photo 3]


PHOTOGRAPHIC BOARD
GEOTECHNICS
BUILD ON CONFIDENCE
PROJECT NAME
WREXHAM AFC ACADEMY TPs
PROJECT NUMBER
PN254776
HOLE ID
TP5
DATE
18/08/25
NOTES
0.81~
cm
10
20
30
40

TP05 [Photo 4]


PHOTOGRAPHIC BOARD
GEOTECHNICS
PROJECT NAME
WREXHAM AFC ACADEMY TPs
PROJECT NUMBER
PN254776
HOLE ID
TP5
DATE
18/08/25
NOTES
0.81m

APPENDIX 5

Soakaway Test Results

APPENDIX 5

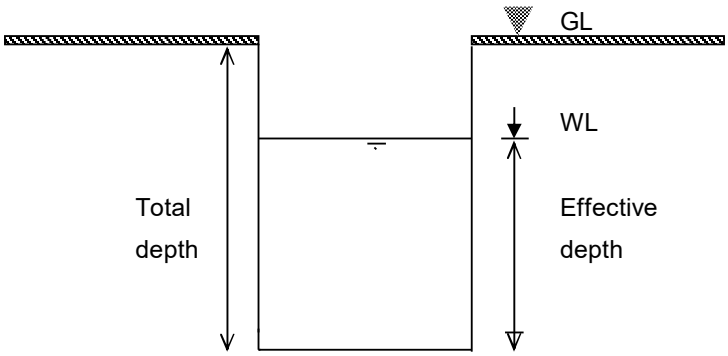
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP01
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	18/08/2025

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.46	1.29	100.00
1.00	0.48	1.27	98.45
2.00	0.50	1.25	96.90
3.00	0.51	1.24	96.12
4.00	0.52	1.23	95.35
5.00	0.52	1.23	95.35
6.00	0.52	1.23	95.35
8.00	0.52	1.23	95.35
10.00	0.53	1.22	94.57
15.00	0.54	1.21	93.80
20.00	0.54	1.21	93.80
30.00	0.56	1.19	92.25
40.00	0.56	1.19	92.25
50.00	0.58	1.17	90.70
60.00	0.57	1.18	91.47
90.00	0.58	1.17	90.70
120.00	0.60	1.15	89.15
180.00	0.61	1.14	88.37
240.00	0.63	1.12	86.82
360.00	0.65	1.10	85.27
480.00	0.65	1.10	85.27
600.00	0.65	1.10	85.27
840.00	0.65	1.10	85.27
1200.00	0.66	1.09	84.50
1440.00	0.66	1.09	84.50
1680.00	0.69	1.06	82.17
1800.00	0.69	1.06	82.17

TRIAL PIT SOAKAWAY



Trial pit length	=	1.500 m
Trial pit width	=	0.500 m
Trial pit depth	=	1.750 m
Effective depth (Head of Water)	=	1.290 m

Initial depth from GL	=	0.460m		
% of effective depth	Head (m)	Depth from GL (m)		Time (mins)
75%	0.968	0.783		0.00
25%	0.323	1.428		0.00
Vp75-25	=	0.484	m3	
ap50	=	3.330	m2	
tp75-25	=	0.000	min	
Soil Infiltration, f	=		m/sec	

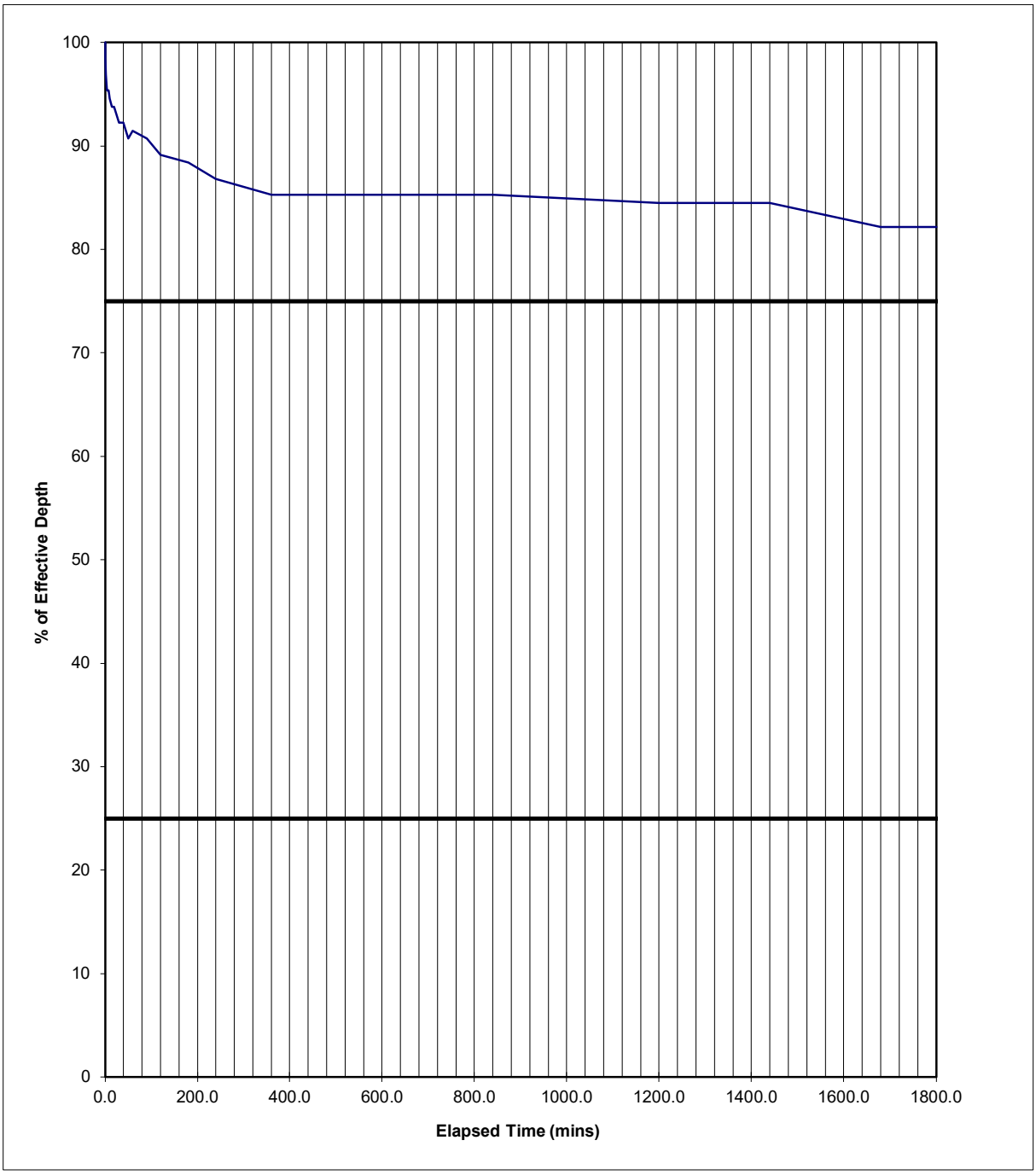
Remarks Unable to calculate Soil Infiltration due to insufficient fall in head - test left for 30 hours.

GEOTECHNICS

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP01
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	18/08/2025



tp75	=
tp25	=

Remarks Unable to calculate Soil Infiltration due to insufficient fall in head - test left for 30 hours.

GEOTECHNICS

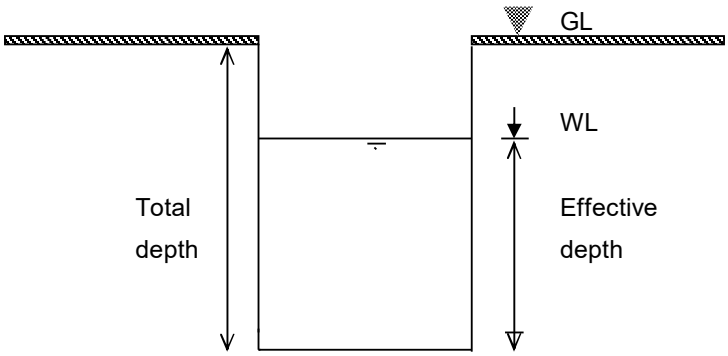
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP02
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	19/08/2025

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.48	1.12	100.00
1.00	0.59	1.01	90.18
2.00	0.70	0.90	80.36
3.00	0.76	0.84	75.00
4.00	0.82	0.78	69.64
5.00	0.87	0.73	65.18
6.00	0.96	0.64	57.14
8.00	0.97	0.63	56.25
10.00	1.02	0.58	51.79
15.00	1.10	0.50	44.64
20.00	1.20	0.40	35.71
25.00	1.23	0.37	33.04
30.00	1.27	0.33	29.46
35.00	1.28	0.32	28.57
40.00	1.31	0.29	25.89
45.00	1.33	0.27	24.11
50.00	1.34	0.26	23.21
60.00	1.36	0.24	21.43
70.00	1.39	0.21	18.75
80.00	1.39	0.21	18.75
90.00	1.40	0.20	17.86
100.00	1.42	0.18	16.07
110.00	1.42	0.18	16.07
120.00	1.43	0.17	15.18
130.00	1.43	0.17	15.18
140.00	1.44	0.16	14.29
150.00	1.45	0.15	13.39

TRIAL PIT SOAKAWAY



Trial pit length	=	1.500 m
Trial pit width	=	0.500 m
Trial pit depth	=	1.600 m
Effective depth (Head of Water)	=	1.120 m

Initial depth from GL	=	0.480m		
% of effective depth	Head (m)	Depth from GL (m)		Time (mins)
75%	0.840	0.760		3.00
25%	0.280	1.320		42.50
Vp75-25	=	0.420	m3	
ap50	=	2.990	m2	
tp75-25	=	39.500	min	
Soil Infiltration, f	=	**5.93E-05**	m/sec	

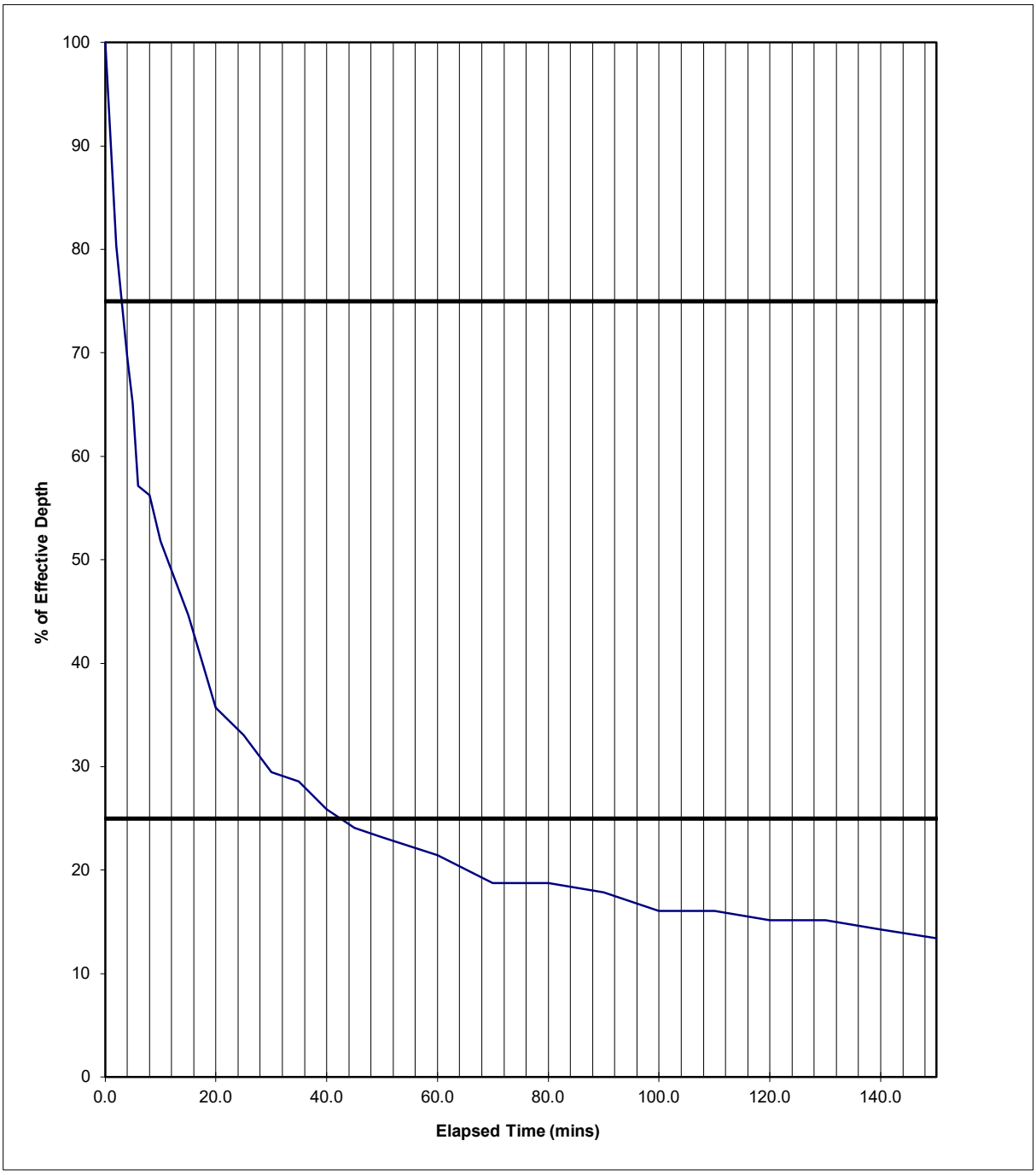
Remarks

GEOTECHNICS

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP02
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	19/08/2025



tp75	=	3.00
tp25	=	42.50

Remarks

GEOTECHNICS

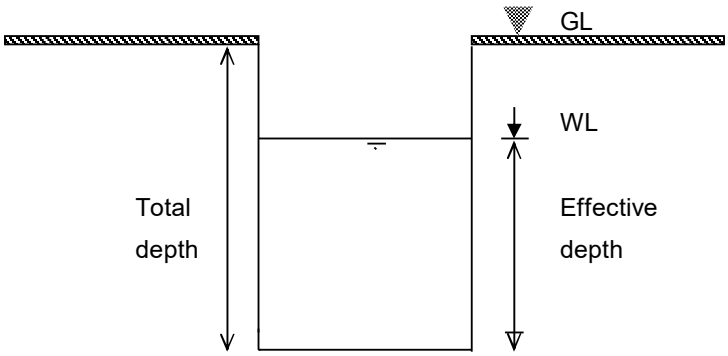
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP02
		Test No	2
		Project No	PN254776
Client	Wrexham AFC	Date	20/08/2025

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.50	1.10	100.00
1.00	0.57	1.03	93.64
2.00	0.63	0.97	88.18
3.00	0.69	0.91	82.73
4.00	0.73	0.87	79.09
5.00	0.77	0.84	75.91
7.00	0.83	0.77	70.00
10.00	0.93	0.67	60.91
15.00	0.98	0.62	56.36
20.00	1.08	0.53	47.73
25.00	1.23	0.37	33.47
30.00	1.26	0.34	31.18
35.00	1.28	0.32	29.08
40.00	1.30	0.30	27.36
45.00	1.31	0.29	26.36
50.00	1.33	0.27	24.55
60.00	1.35	0.25	22.73
70.00	1.37	0.23	20.91
80.00	1.38	0.22	20.00
90.00	1.40	0.20	18.18
100.00	1.41	0.19	17.27
110.00	1.42	0.18	16.36
120.00	1.42	0.18	16.36
130.00	1.42	0.18	16.36
140.00	1.43	0.17	15.45
150.00	1.43	0.17	15.45

TRIAL PIT SOAKAWAY



Trial pit length	=	1.500 m
Trial pit width	=	0.500 m
Trial pit depth	=	1.600 m
Effective depth (Head of Water)	=	1.100 m

Initial depth from GL	=	0.500m		
% of effective depth	Head (m)	Depth from GL (m)		Time (mins)
75%	0.825	0.775		5.30
25%	0.275	1.325		48.80
Vp75-25	=	0.413	m3	
ap50	=	2.950	m2	
tp75-25	=	43.500	min	
Soil Infiltration, f	=	**5.36E-05**	m/sec	

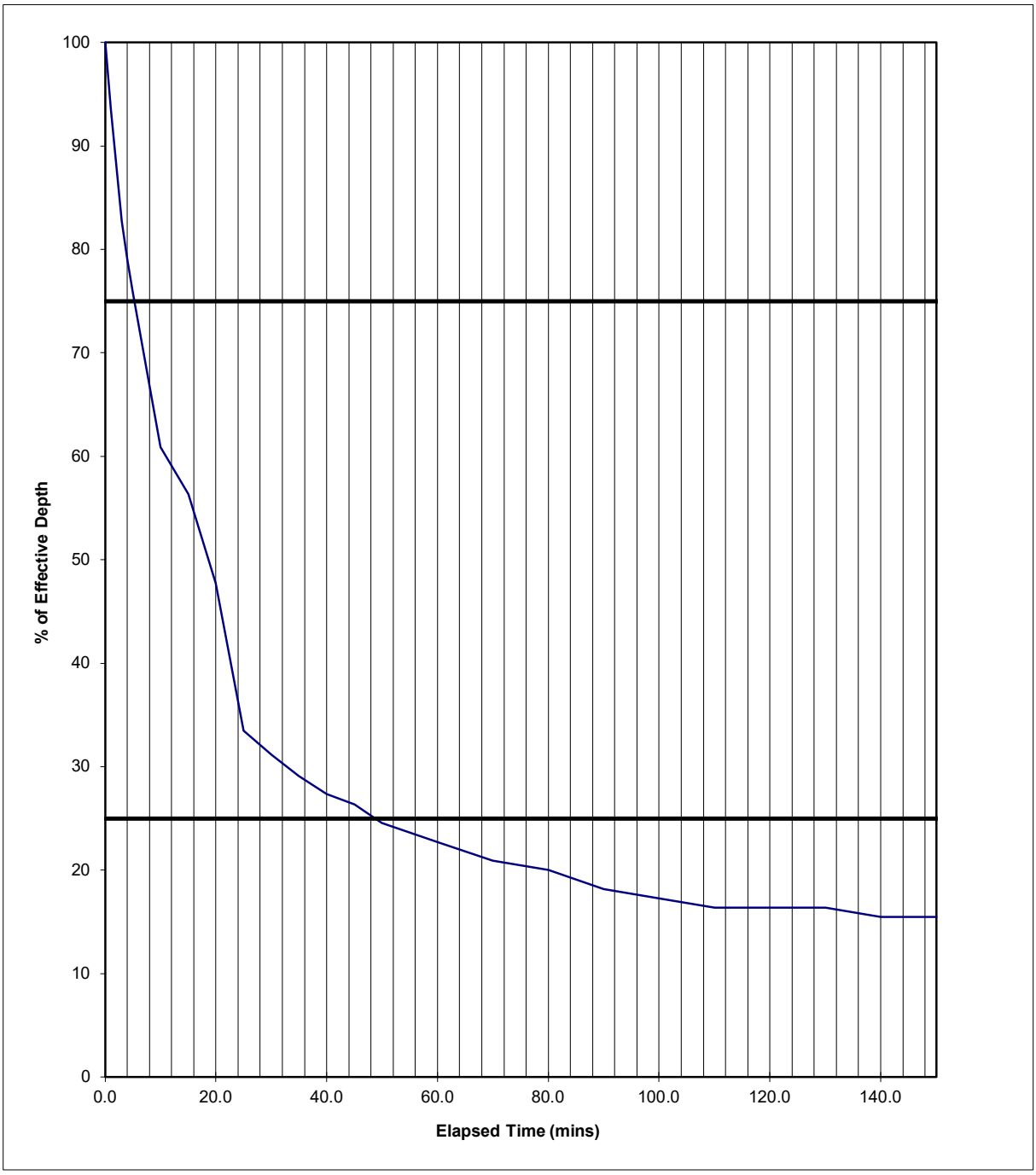
Remarks

GEOTECHNICS

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP02
		Test No	2
		Project No	PN254776
Client	Wrexham AFC	Date	20/08/2025



tp75	=	5.30
tp25	=	48.80

Remarks

GEOTECHNICS

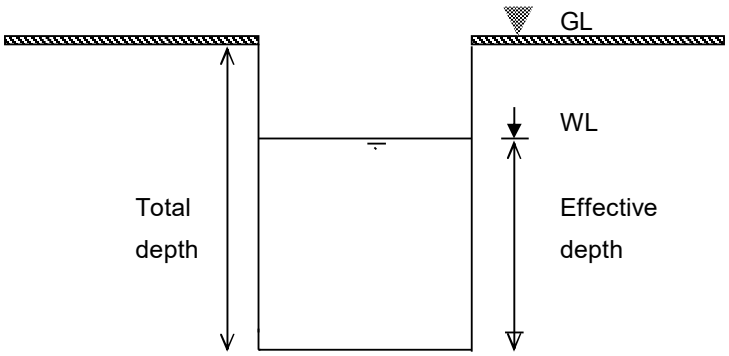
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP03
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	18/08/2025

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.23	0.53	100.00
1.00	0.24	0.51	96.95
2.00	0.25	0.50	95.24
3.00	0.26	0.49	93.33
4.00	0.27	0.49	92.38
5.00	0.27	0.48	91.43
10.00	0.31	0.44	83.81
15.00	0.32	0.44	82.86
20.00	0.34	0.41	78.10
25.00	0.35	0.40	76.97
30.00	0.37	0.38	72.38
35.00	0.38	0.37	70.65
40.00	0.38	0.37	70.86
45.00	0.40	0.35	67.05
50.00	0.40	0.35	67.58
60.00	0.42	0.34	63.81
70.00	0.43	0.32	61.43
80.00	0.43	0.32	60.44
90.00	0.45	0.30	57.68
120.00	0.47	0.28	53.52
150.00	0.49	0.26	48.76
180.00	0.51	0.24	45.75
240.00	0.54	0.21	39.66
300.00	0.56	0.19	35.30
360.00	0.59	0.16	30.17
420.00	0.61	0.14	27.10
480.00	0.64	0.11	21.60

TRIAL PIT SOAKAWAY



Trial pit length	=	1.000	m
Trial pit width	=	0.400	m
Trial pit depth	=	0.750	m
Effective depth (Head of Water)	=	0.525	m

Initial depth from GL	=	0.225m		
% of effective depth	Head (m)	Depth from GL (m)		Time (mins)
75%	0.394	0.356		27.20
25%	0.131	0.619		442.50
Vp75-25	=	0.105	m3	
ap50	=	1.135	m2	
tp75-25	=	415.300	min	
Soil Infiltration, f	=	**3.71E-06**	m/sec	

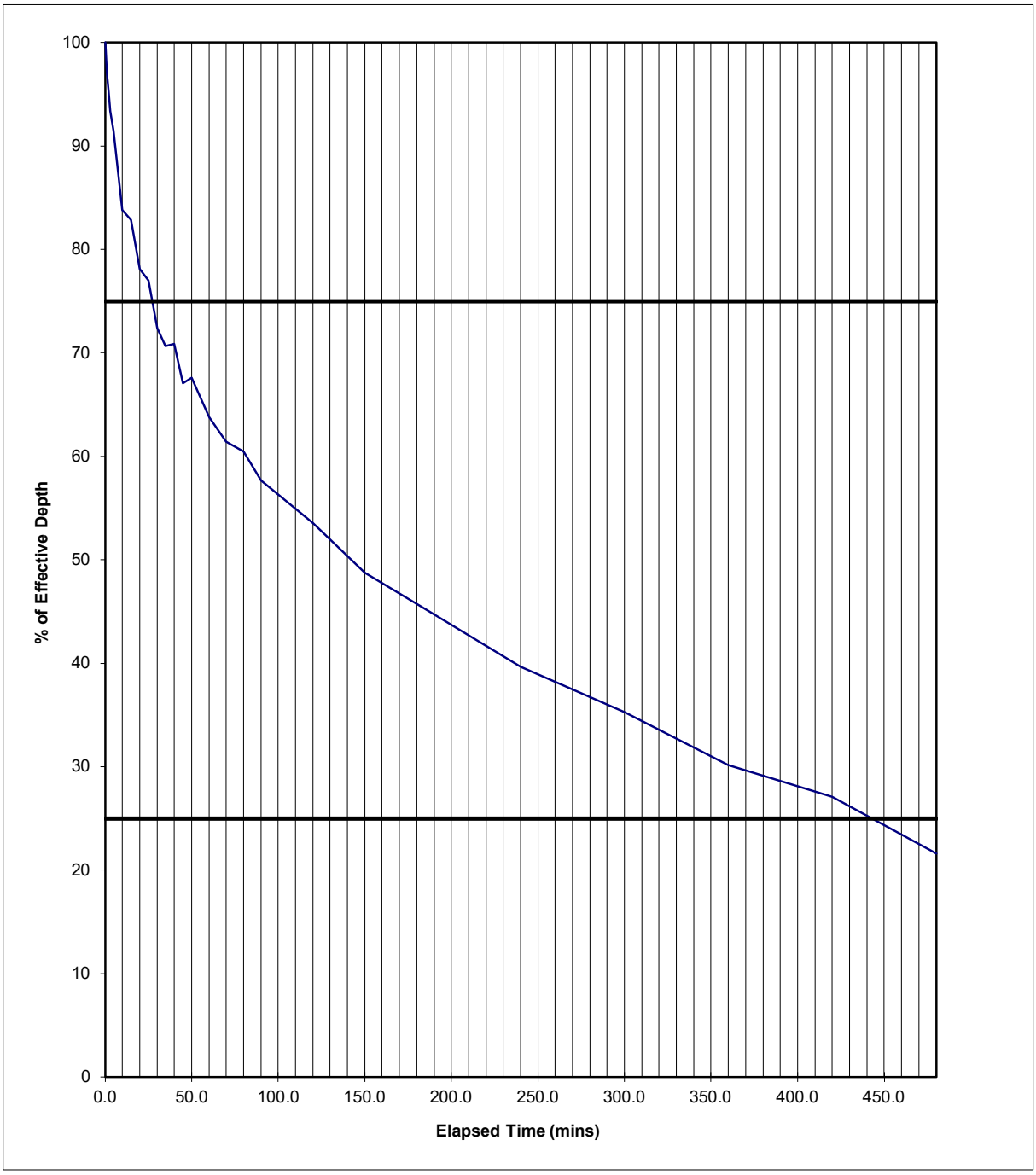
Remarks

GEOTECHNICS

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP03
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	18/08/2025



tp75	=	27.20
tp25	=	442.50

Remarks

GEOTECHNICS

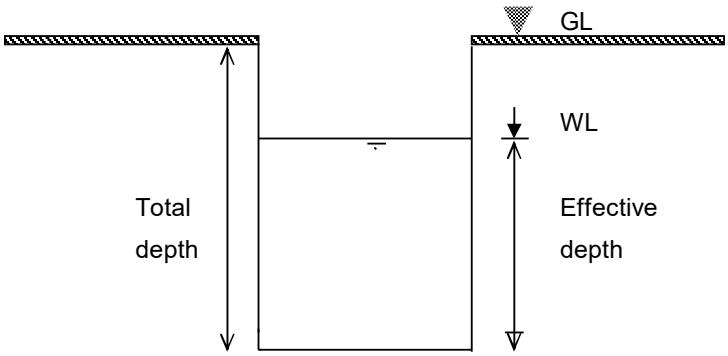
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP03
		Test No	2
		Project No	PN254776
Client	Wrexham AFC	Date	19/08/2025

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.24	0.51	100.00
1.00	0.25	0.51	99.02
2.00	0.25	0.50	98.04
3.00	0.25	0.50	98.04
4.00	0.25	0.50	98.04
5.00	0.26	0.50	97.06
10.00	0.33	0.42	82.35
15.00	0.34	0.41	81.02
20.00	0.35	0.40	78.69
25.00	0.36	0.39	75.65
30.00	0.36	0.39	75.55
35.00	0.37	0.38	75.25
40.00	0.37	0.38	74.53
45.00	0.38	0.37	73.45
50.00	0.38	0.37	73.10
60.00	0.39	0.36	70.80
90.00	0.42	0.33	64.47
120.00	0.45	0.30	58.55
180.00	0.49	0.26	50.53
240.00	0.52	0.23	45.86
300.00	0.54	0.21	40.53
360.00	0.56	0.19	36.88
420.00	0.58	0.17	33.12
480.00	0.61	0.14	28.04
540.00	0.62	0.13	25.31
600.00	0.64	0.11	22.02
660.00	0.66	0.09	17.22

TRIAL PIT SOAKAWAY



Trial pit length	=	1.000	m
Trial pit width	=	0.400	m
Trial pit depth	=	0.750	m
Effective depth (Head of Water)	=	0.510	m

Initial depth from GL	=	0.240m		
% of effective depth	Head (m)	Depth from GL (m)		Time (mins)
75%	0.383	0.368		37.00
25%	0.128	0.623		545.00
Vp75-25	=	0.102	m3	
ap50	=	1.114	m2	
tp75-25	=	508.000	min	
Soil Infiltration, f	=	**3.00E-06**	m/sec	

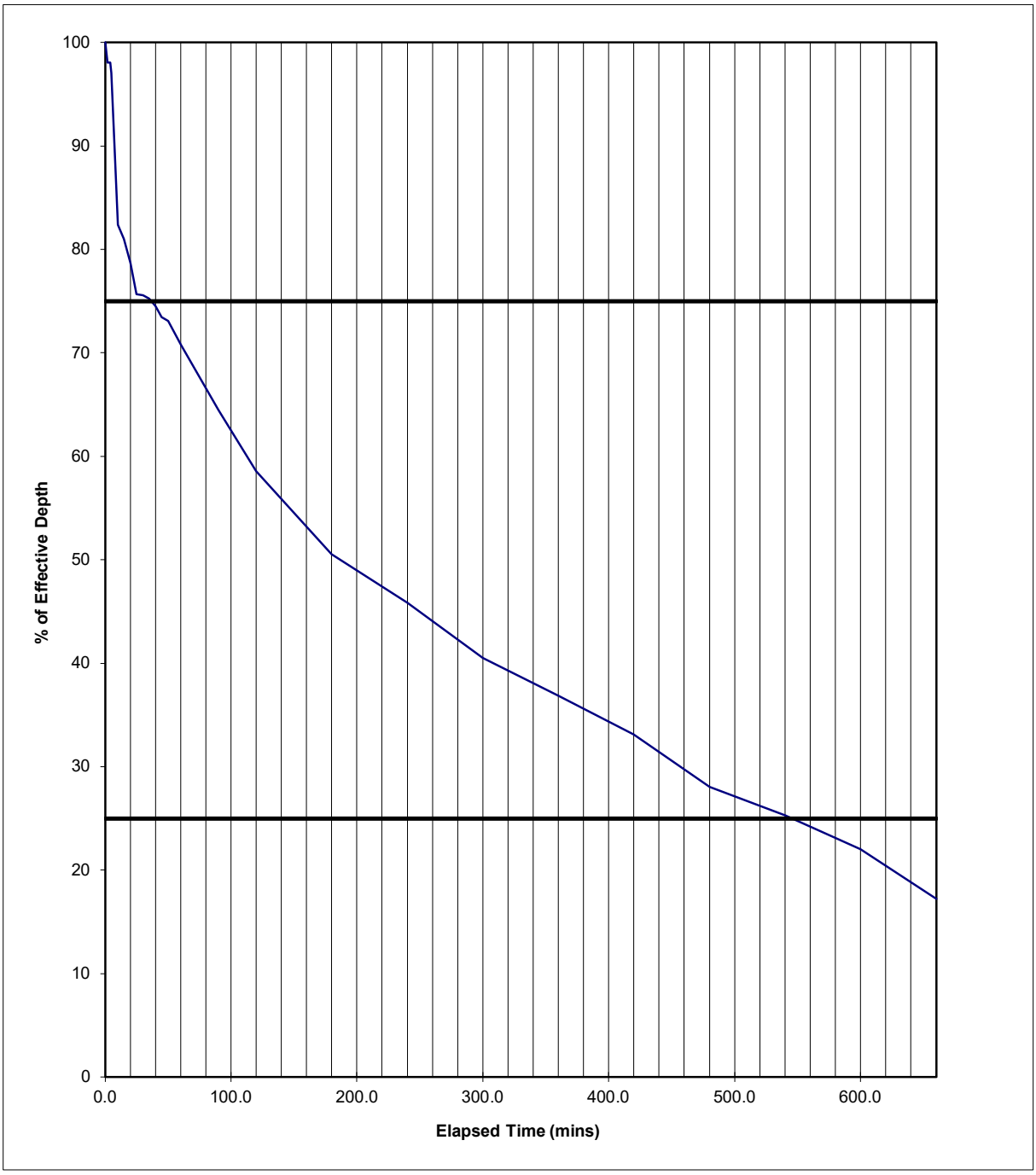
Remarks

GEOTECHNICS

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP03
		Test No	2
		Project No	PN254776
Client	Wrexham AFC	Date	19/08/2025



tp75	=	37.00
tp25	=	545.00

Remarks

GEOTECHNICS

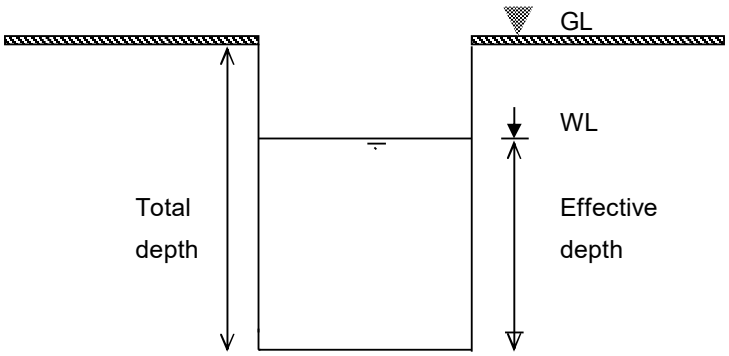
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP04
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	18/08/2025

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.21	0.59	100.00
1.00	0.26	0.54	91.53
2.00	0.28	0.52	88.14
3.00	0.30	0.50	84.75
4.00	0.32	0.48	81.36
5.00	0.34	0.46	77.97
10.00	0.37	0.43	72.88
15.00	0.40	0.40	67.80
20.00	0.42	0.39	65.25
25.00	0.43	0.37	62.71
30.00	0.44	0.37	61.86
60.00	0.47	0.33	55.93
90.00	0.50	0.30	50.85
120.00	0.52	0.28	47.46
150.00	0.53	0.27	45.85
180.00	0.53	0.27	45.76
240.00	0.54	0.26	43.98
300.00	0.55	0.25	42.59
360.00	0.55	0.25	42.03
420.00	0.56	0.24	41.15
480.00	0.56	0.24	40.59
600.00	0.57	0.23	38.68
840.00	0.59	0.21	35.39
1200.00	0.60	0.20	33.08
1440.00	0.62	0.18	30.86
1680.00	0.62	0.18	29.97
1800.00	0.64	0.16	27.69

TRIAL PIT SOAKAWAY



Trial pit length	=	1.000 m
Trial pit width	=	0.350 m
Trial pit depth	=	0.800 m
Effective depth (Head of Water)	=	0.590 m

Initial depth from GL	=	0.210m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.443	0.358	
25%	0.148	0.653	
Vp75-25	=		m3
ap50	=		m2
tp75-25	=		min
Soil Infiltration, f	=	*	m/sec

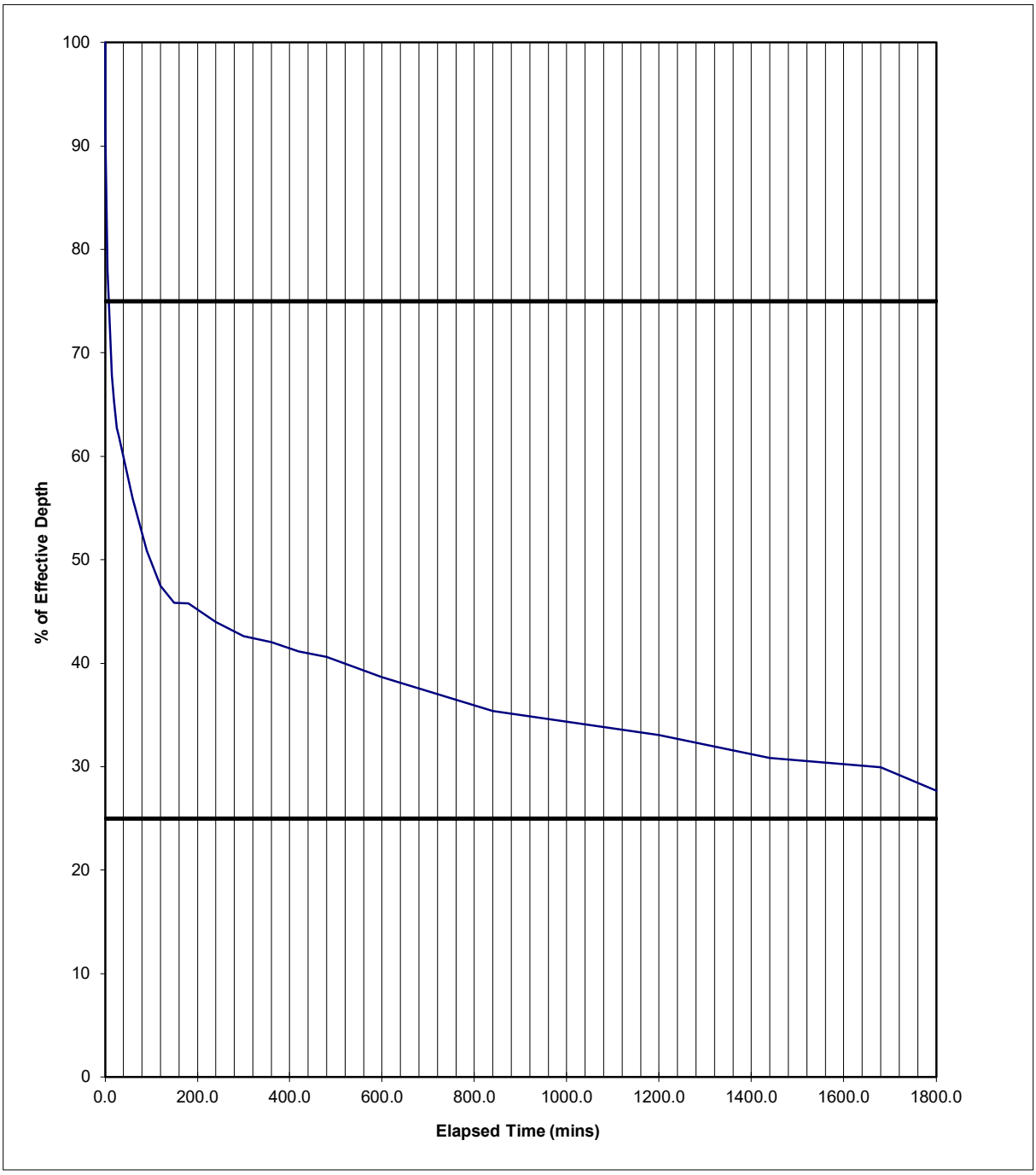
Remarks Unable to calculate Soil Infiltration due to insufficient fall in head - test left for 30 hours.

GEOTECHNICS

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP04
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	18/08/2025



tp75	=
tp25	=

Remarks Unable to calculate Soil Infiltration due to insufficient fall in head - test left for 30 hours.

GEOTECHNICS

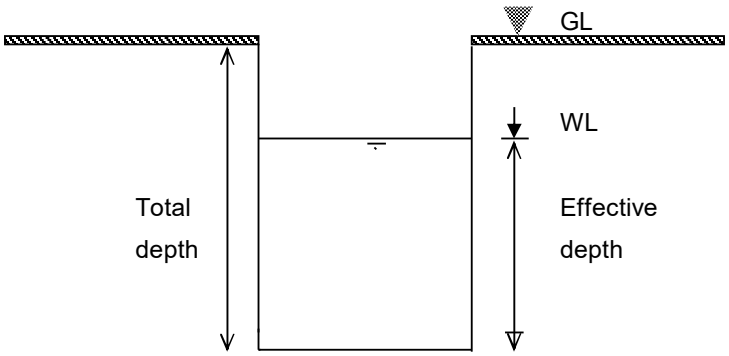
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP05
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	18/08/2025

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.23	0.58	100.00
1.00	0.25	0.56	96.55
2.00	0.27	0.55	93.97
3.00	0.28	0.53	91.38
4.00	0.30	0.52	88.79
5.00	0.31	0.50	86.21
10.00	0.35	0.46	79.31
15.00	0.39	0.42	72.41
20.00	0.42	0.40	68.10
25.00	0.44	0.38	64.66
30.00	0.46	0.36	61.21
35.00	0.48	0.34	57.76
60.00	0.54	0.27	46.91
70.00	0.55	0.26	44.72
80.00	0.57	0.24	41.90
90.00	0.58	0.23	39.66
120.00	0.62	0.19	33.11
150.00	0.65	0.16	28.41
180.00	0.67	0.14	23.64
240.00	0.73	0.08	13.45

TRIAL PIT SOAKAWAY



Trial pit length	=	1.000	m
Trial pit width	=	0.400	m
Trial pit depth	=	0.810	m
Effective depth (Head of Water)	=	0.580	m

Initial depth from GL	=	0.230m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.435	0.375	13.00
25%	0.145	0.665	171.00
Vp75-25	=	0.116	m3
ap50	=	1.212	m2
tp75-25	=	158.000	min
Soil Infiltration, f	=	**1.01E-05**	m/sec

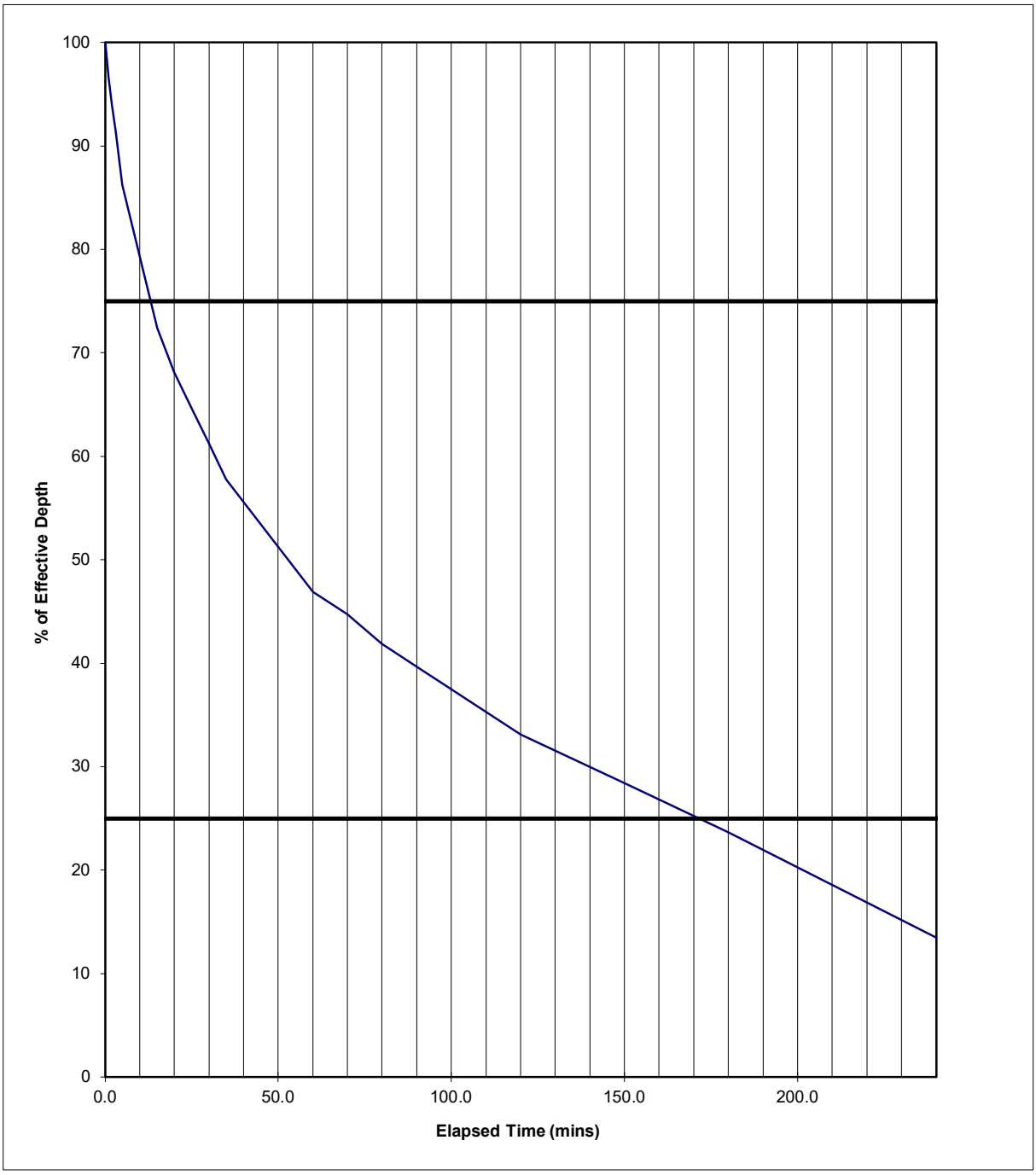
Remarks

GEOTECHNICS

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP05
		Test No	1
		Project No	PN254776
Client	Wrexham AFC	Date	18/08/2025



tp75	=	13.00
tp25	=	171.00

Remarks

GEOTECHNICS

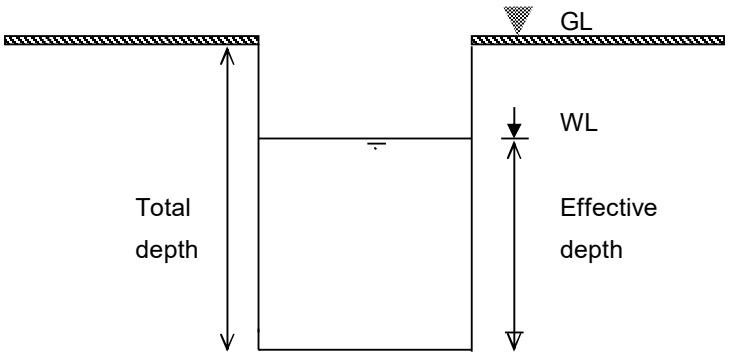
INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP05
		Test No	2
		Project No	PN254776
Client	Wrexham AFC	Date	19/08/2025

ELAPSED TIME (mins)	DEPTH of water below ground level (m)	HEAD (m)	HEAD (%)
0.00	0.23	0.59	100.00
1.00	0.23	0.58	99.15
2.00	0.24	0.57	97.44
3.00	0.25	0.56	95.73
4.00	0.26	0.56	94.87
5.00	0.27	0.55	93.16
10.00	0.28	0.53	90.60
15.00	0.31	0.50	85.47
20.00	0.33	0.48	82.39
25.00	0.35	0.46	78.99
30.00	0.37	0.44	75.21
35.00	0.38	0.43	73.08
60.00	0.45	0.37	62.39
70.00	0.47	0.34	58.47
80.00	0.49	0.32	54.45
90.00	0.52	0.29	48.88
120.00	0.56	0.25	43.56
150.00	0.59	0.22	37.35
180.00	0.62	0.19	31.83
240.00	0.68	0.13	22.37
300.00	0.73	0.08	14.09

TRIAL PIT SOAKAWAY



Trial pit length	=	1.000	m
Trial pit width	=	0.400	m
Trial pit depth	=	0.810	m
Effective depth (Head of Water)	=	0.585	m

Initial depth from GL	=	0.225m	
% of effective depth	Head (m)	Depth from GL (m)	Time (mins)
75%	0.439	0.371	30.40
25%	0.146	0.664	223.00
Vp75-25	=	0.117	m3
ap50	=	1.219	m2
tp75-25	=	192.600	min
Soil Infiltration, f	=	**8.31E-06**	m/sec

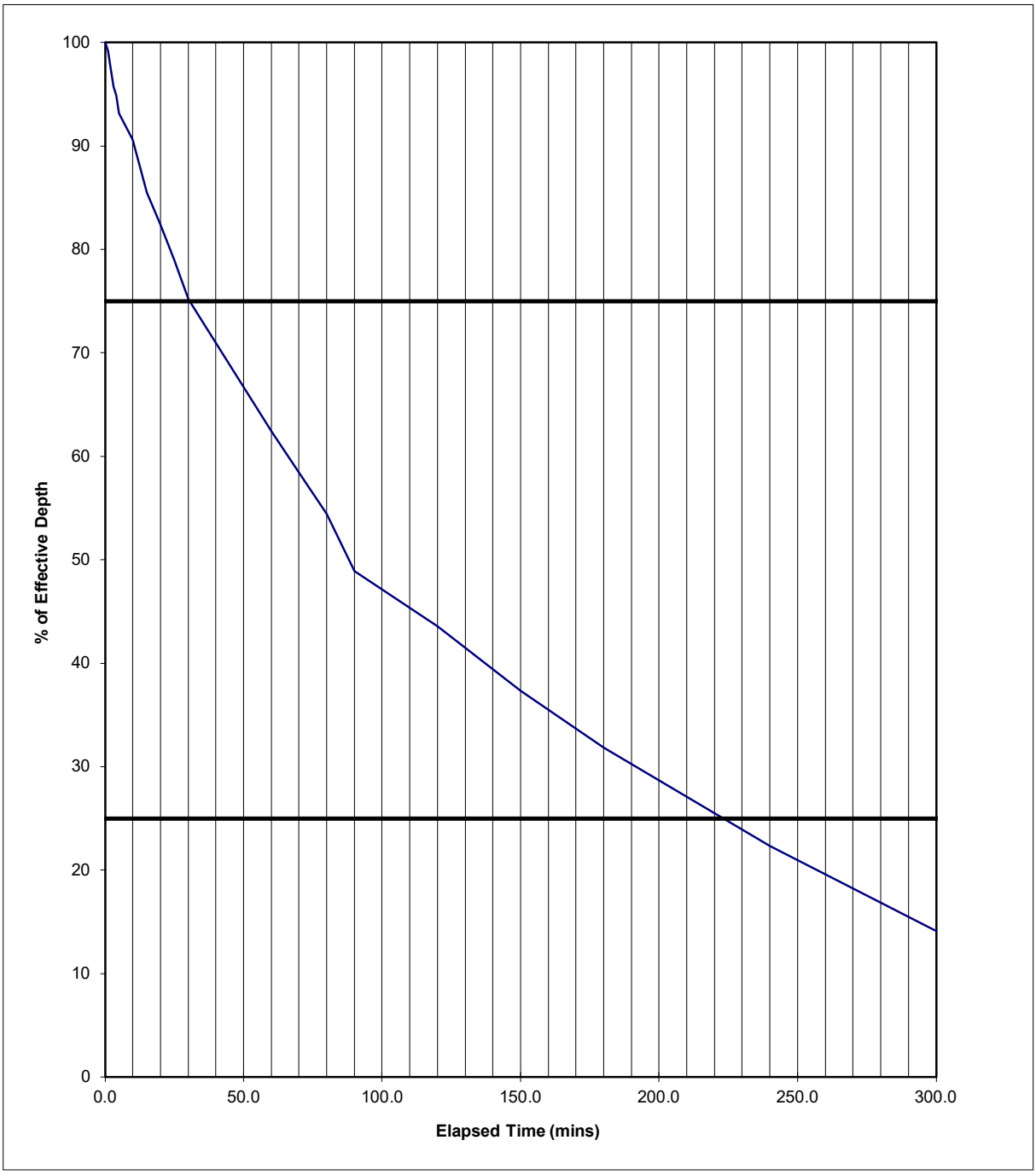
Remarks

GEOTECHNICS

INSITU TESTING - Soakaway Test

Form INS009 Rev 7

Project	Wrexham Academy Trial Pits	Trial Pit	TP05
		Test No	2
		Project No	PN254776
Client	Wrexham AFC	Date	19/08/2025



tp75	=	30.40
tp25	=	223.00

Remarks

GEOTECHNICS

APPENDIX 6

Investigation Techniques and General Notes

INVESTIGATION TECHNIQUES

INTRODUCTION

The following brief review of Ground Investigation techniques, generally used as part of most Site Investigations in the UK, summarises their methodology, advantages and limitations. Detailed descriptions of the techniques are available and can be provided on request. This review should be read in conjunction with the accompanying General Notes.

TRIAL PITS

The trial pit is amongst the simplest yet most effective means of identifying shallow ground conditions on a site. Its advantages include simplicity, speed, potential accuracy and cost-effectiveness. The trial pit is most commonly formed using a back-acting excavator which can typically determine ground conditions to some 4 metres below ground level. Hand excavation is often used to locate, expose and detail existing foundations, features or services. In general, it is difficult to extend pits significantly below the water table in predominantly granular soils, where flows can cause instability. Unless otherwise stated, the trial pits will not have been provided with temporary side support during their construction. Under such circumstances, entrance into the pit is not permitted and hence observations will have been made from the ground surface and samples taken from the excavator bucket.

Where access for personnel is required to allow close observation of the exposed strata, the taking of samples and the carrying out of in situ tests, the sides of the trial pits (Observation Pits in BS 5930:2015) will be made safe using temporary supports or the sides battered back to a stable angle. Some limited access to such Trial Pits (Observation Pits) at depths less than 1m may be allowed in stable conditions or where the sides are benched or battered back to a safe angle.

Trends in strata type, level and thickness can be determined, shear surfaces identified and the behaviour of plant, excavation sides and excavated materials can be related to the construction process. They are particularly valuable in land slip investigations. Some types of in situ test can be undertaken in such pits and large disturbed or block samples obtained.

CABLE PERCUSSION BORING

The light Cable Percussion technique of soft ground boring, typically at a diameter of 150mm, is a well-established simple and flexible method of boring vertical holes and generally allows data to be obtained in respect of strata conditions other than rock. A tubular cutter (for cohesive soils) or shell with a flap valve (for granular soils) is repeatedly lifted and dropped using a winch and rope operating from an "A" frame. Soil which enters these tools is regularly removed and either sampled for subsequent examination or test, or laid to one side for later removal off site and licensed disposal or, if permitted by the Client, use as backfill. Steel casing will have been used to prevent collapse of the borehole sides where necessary. A degree of disturbance of soil and mixing of layers is inevitable and the presence of very thin layers of different soils within a particular stratum may not be identified. Changes in strata type can only be detected on recognition of a change in soil samples at the surface, after the interface has been passed. For the foregoing reasons, depth measurements should not be considered to be more accurate than 0.10 metre. The technique can determine ground conditions to depths in excess of 30 metres under suitable circumstances and usually causes less surface disturbance than trial pitting.

In cohesive soils cylindrical samples are retrieved by driving or pushing in 100mm nominal diameter tubes. In soft soils, piston sampling or vane testing may be undertaken. In granular soils and often in cohesive materials, in situ Standard Penetration Tests (SPT's) are performed. The SPT records the number of standard blows required to drive a 50mm diameter open or cone ended probe for 300mm after an initial 150mm penetration. A modified method of recording is used in denser strata. Small disturbed samples are obtained throughout.

ROTARY DRILLING

Rotary Drilling to produce cores by rotating an annular diamond-impregnated tube or barrel into the ground is the technique most appropriate to the forming of site investigation boreholes through rock or other hard strata. It has the advantage of being able to be used vertically or at an angle. Core diameters of less than 100mm are most common for site investigation purposes. Core is normally retrieved in plastic lining tubes. A flushing fluid such as air, water or foam is used to cool the bit and carry cuttings to the surface. Depths in excess of 60 metres can be achieved under suitable circumstances using rotary techniques, with minimal surface disturbance.

Examination of cores allows detailed rock description and generally enables angled discontinuity surfaces to be observed. However, vertical holes do not necessarily reveal the presence of vertical or near-vertical fissures or joint discontinuities. The core type and/or techniques used will depend on the ground conditions. Where open hole rotary drilling is employed, descriptions of strata result from examination at the surface of small particles ejected from the borehole in the flushing medium. In consequence, no indication of fissuring, bedding, consistency or degree of weathering can be obtained.

DYNAMIC SAMPLING

This technique involves the driving of an open-ended tube into the ground and retrieval of the soil which enters the tube. It was previously called window or windowless sampling. The term "window sample" arose from the original device which had a "window" or slot cut into the side of the tube through which samples were taken. This was superseded by the use of a thin-walled plastic liner to retrieve the soil sample from within a sampler (windowless sampling) which has a solid wall. Line diameters range from 36 to 86mm. Such samples can be used for qualitative logging, selection of samples for classification and chemical analysis and for obtaining a rudimentary assessment of strength.

Driving devices can be hand-held or machine mounted and the drive tubes are typically in 1m lengths. Depending on the type of rig used, the hole formed can be cased to prevent collapse of the borehole sides. Where the type of rig does not allow the insertion of casing, the success of this technique can be limited when soils and groundwater conditions are such that the sides of the hole collapse on withdrawal of the sampler. Obstructions within the ground, the density of the material or its strength can also limit the depth and rate of penetration of this light-weight investigation technique. Nevertheless, it is a valuable tool where access is constrained such as within buildings or on embankments. Depths of up to 10m can be achieved in suitable circumstances depending on the rig type but depths of 5m to 6m are more common.

EXPLORATORY HOLE RECORDS

The data obtained by these techniques are generally presented on Trial Pit, Borehole, Drillhole or Dynamic Sample Records. The descriptions of strata result from information gathered from a number of sources which may include published geological data, preliminary field observations and descriptions, in situ test results, laboratory test results and specimen descriptions. A key to the symbols and abbreviations used accompanies the records. The descriptions on the exploratory hole records accommodate but may not necessarily be identical to those on any preliminary records or the laboratory summaries.

The records show ground conditions at the exploratory hole locations. The degree to which they can be used to represent conditions between or beyond such holes, however, is a matter for geological interpretation rather than factual reporting and the associated uncertainties must be recognised.

DYNAMIC PROBING

This technique typically measures the number of blows of a standard weight falling over a standard height to advance a cone-ended rod over sequential standard distances (typically 100mm). Some devices measure the penetration of the probe per standard blow. It is essentially a profiling tool and is best used in conjunction with other investigation techniques where site-specific correlation can be used to delineate the distribution of soft or loose soils or the upper horizon of a dense or strong layer such as rock.

Both machine-driven and hand-driven equipment is available, the selection depending upon access restrictions and the depth of penetration required. It is particularly useful where access for larger equipment is not available, disturbance is to be minimised or where there are cost constraints. No samples are recovered and some techniques leave a sacrificial cone head in the ground. As with other lightweight techniques, progress is limited in strong or dense soils. The results are presented both numerically and graphically. Depths of up to 10m are commonly achieved in suitable circumstances.

The hand-driven DCP probing device has been calibrated by the Highways Agency to provide a profile of CBR values over a range of depths.

INSTRUMENTATION

The most common form of instrument used in site investigation is either the standpipe or else the standpipe piezometer which can be installed in investigation holes. They are used to facilitate monitoring of groundwater levels and water sampling over a period of time following site work. Normally a standpipe would be formed using rigid plastic tubing which has been perforated or slotted over much of its length whilst a standpipe piezometer would have a filter tip which would be placed at a selected level and the hole sealed above and sometimes below to isolate the zone of interest. Groundwater levels are determined using an electronic "dip meter" to measure the depth to the water surface from ground level. Piezometers can also be used to measure permeability. They are simple and inexpensive instruments for long term monitoring but response times can limit their use in tidal areas and access to the ground surface at each instrument is necessary. Remote reading requires more sophisticated hydraulic, electronic or pneumatic equipment.

Settlement can be monitored using surface or buried target plates whilst lateral movement over a range of depths is monitored using slip indicator or inclinometer equipment.

GENERAL NOTES

1. The report is prepared for the exclusive use of the Client named in the document and copyright subsists with Geotechnics Limited. Prior written permission must be obtained to reproduce all or part of the report. It is prepared on the understanding that its contents are only disclosed to parties directly involved in the current investigation, preparation and development of the site.

2. Further copies may be obtained with the Client's written permission, from Geotechnics Limited with whom the master copy of the document will be retained.

3. The report and/or opinion is prepared for the specific purpose stated in the document and in relation to the nature and extent of proposals made available to Geotechnics Limited at that time. Re-consideration will be necessary should those details change. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Geotechnics Limited.

4. The assessment of the significance of the factual data, where called for, is provided to assist the Client and their Engineer and/or Advisers in the preparation of their designs.

5. The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. The data from any commissioned desk study and site reconnaissance are also drawn upon. There may be special conditions appertaining to the site, however, which are not revealed by the investigation and which may not be taken into account in the report.

6. Methods of construction and/or design other than those proposed by the designers or referred to in the report may require consideration during the evolution of the proposals and further assessment of the geotechnical and any geoenvironmental data would be required to provide discussion and evaluations appropriate to these methods.

7. The accuracy of results reported depends upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristics of the strata as a whole (see accompanying notes on Investigation Techniques). Where such measurements are critical, the technique of investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the Company where necessary.

8. The samples selected for laboratory test are prepared and tested in accordance with the relevant Clauses and Parts of BS EN ISO 17892 and BS 1377 Parts 1 to 8, where appropriate, in Geotechnics Limited's UKAS accredited Laboratory, where possible. A list of tests is given.

9. Tests requiring the use of another laboratory having UKAS accreditation where possible are identified.

10. Any unavoidable variations from specified procedures are identified in the report.

11. Specimens are cut vertically, where this is relevant and can be identified, unless otherwise stated

12. All the data required by the test procedures are recorded on individual test sheets but the results in the report are presented in summary form to aid understanding and assimilation for design purposes. Where all details are required, these can be made available.

13. Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on either visual, verbal, written, cartographical, photographic or published evidence, this is for guidance only and no liability can be accepted for its accuracy.

14. The Code of Practice for Ground Investigations – BS 5930:2015 calls for man-made soils to be described as Anthropogenic Ground with soils placed in an un-controlled manner classified as Made Ground and soils placed in a controlled manner as Fill. In view of the difficulty in always accurately determining the origin of man-made soils in exploratory holes, Geotechnics Limited classify such materials as Made Ground. Where soils can be clearly identified as being placed in a controlled manner then further classification of the soils as Fill has been added to the Exploratory Hole Records.

15. Classification of man-made soils is based on the inspection of retrieved samples or exposed excavations. Where it is obvious that foreign matter such as paper, plastic or metal is present, classification is clear. Frequently, however, for man-made soils that arise from the adjacent ground or from the backfilling of excavations, their visual characteristics can closely resemble those of undisturbed ground. Other evidence such as site history, exploratory hole location or other tests may need to be drawn upon to provide clarification. For these reasons, classification of soils on the exploratory hole records as either Made Ground or naturally occurring strata, the boundary between them and any interpretation that this gives rise to should be regarded as provisional and subject to re-evaluation in the light of further data.

16. The classification of materials as Topsoil is generally based on visual description and should not be interpreted to mean that the material so described complies with the criteria for Topsoil used in BS 3882:2015. Specific testing would be necessary where such a definition is a requirement.

17. Ground conditions should be monitored during the construction of the works and the report should be re-evaluated in the light of these data by the supervising geotechnical engineers.

18. Any comments on groundwater conditions are based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.

19. Any bearing capacities for conventional spread foundations which are given in the report and interpreted from the investigation are for bases at a minimum depth of 1m below finished ground level in naturally occurring strata and at broadly similar levels throughout individual structures, unless otherwise stated. Typically they are based on serviceability criteria taking account of an assessment of the shear strength and/or density data obtained by the investigation. The foundations should be designed in accordance with the good practice embodied in BS 8004:2015 - Foundations, supplemented for housing by NHBC Standards. Foundation design is an iterative process and bearing pressures may need adjustment or other measures may need to be taken in the context of final layouts and levels prior to finalisation of proposals.

20. Unless specifically stated, the investigation does not take account of the possible effects of mineral extraction or of gases from fill or natural sources within, below or outside the site.

21. The costs or economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical or geoenvironmental considerations and hence their evaluation is outside the scope of the report.

Appendix C – Greenfield Run-off Calcs

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Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

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.

Project details

Date	15/10/2025
Calculated by	NJH
Reference	Darland Academy
Model version	2.2.1

Location

Site name	Darland Academy
Site location	Darland High School



Site easting (British National Grid)	337513
Site northing (British National Grid)	357506

Site details

Total site area (ha)	3.68 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	693 mm		693
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	17.6 l/s		

Growth curve factors

	My value		Map value
Hydrological region	9		9
1 year growth factor	0.88		
2 year growth factor	0.93		
10 year growth factor	1.42		
30 year growth factor	1.78		
100 year growth factor	2.18		
200 year growth factor	2.46		

Results

Method	IH124
Flow rate 1 year (l/s)	15.5 l/s
Flow rate 2 year (l/s)	16.3 l/s
Flow rate 10 years (l/s)	24.9 l/s
Flow rate 30 years (l/s)	31.3 l/s
Flow rate 100 years (l/s)	38.3 l/s
Flow rate 200 years (l/s)	43.2 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.1) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix D – Proposed Site Layout

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MILIEU LANDSCAPE DESIGN
Chartered Landscape Architects

Halls Arms Business Centre
Clitheroe Road
Knowle Green
Longridge
Preston
PR3 2YQ

Tel: 0333 242 5109

www.milieulandscape.com

Do NOT Scale From This Drawing.
All dimensions are to be checked on site prior to construction.

The drawing shall only be used for the purpose for which it was prepared. Drawings issued for planning approval shall not be used for the purposes of costing or construction.

NOTES:

> Drawing issued for planning, to be used for this purpose ONLY.
> All measures and setting out is to be checked on site prior to installation and agreed with LA.
> Drawing to be coordinated with the requirements of other disciplines and planning conditions.

- Bound gravel and crushed stone maintenance route 25mm to dust. Buff / silver colour without a retained edge.
- Swale grass land, 100mm site won sand and low fertility soil, seeded with Emorsgate EM8 Mixture for Wetlands.
- Low management grass areas, implemented for biodiversity, Germinal A4 seed mixture.
- Proposed new hedgerow planting, mixture of native spiked species. 4/m 500mm spacing double row. Planted at minimum 1.2m to give instant impact.
- Proposed timber and stock wire fencing. To provide a reinforced line to assist with the growth of the hedging.

1m 5m 10m 15m 20m 30m

NORTH

Rev	Description	Date
P10	Proposed path levels	23/10/25
P09	Updated Notes	22/10/25
P08	Planning boundary update	21/10/25
P07	Adjusted Pitch Locations	07/10/25
P06	Option for Ph2 Dugout	22/09/25
P05	1ha Boundary	18/08/25
P04	Clouded Area	11/08/25
P03	Updated Central Path	29/07/25
P02	Updated Phase 2 Layout	23/07/25
P01	Information	19/06/25

PURPOSE OF ISSUE
PLANNING

PROJECT
Darland Academy

TITLE
Phase 2 Works
General Arrangement

CLIENT
Wrexham AFC

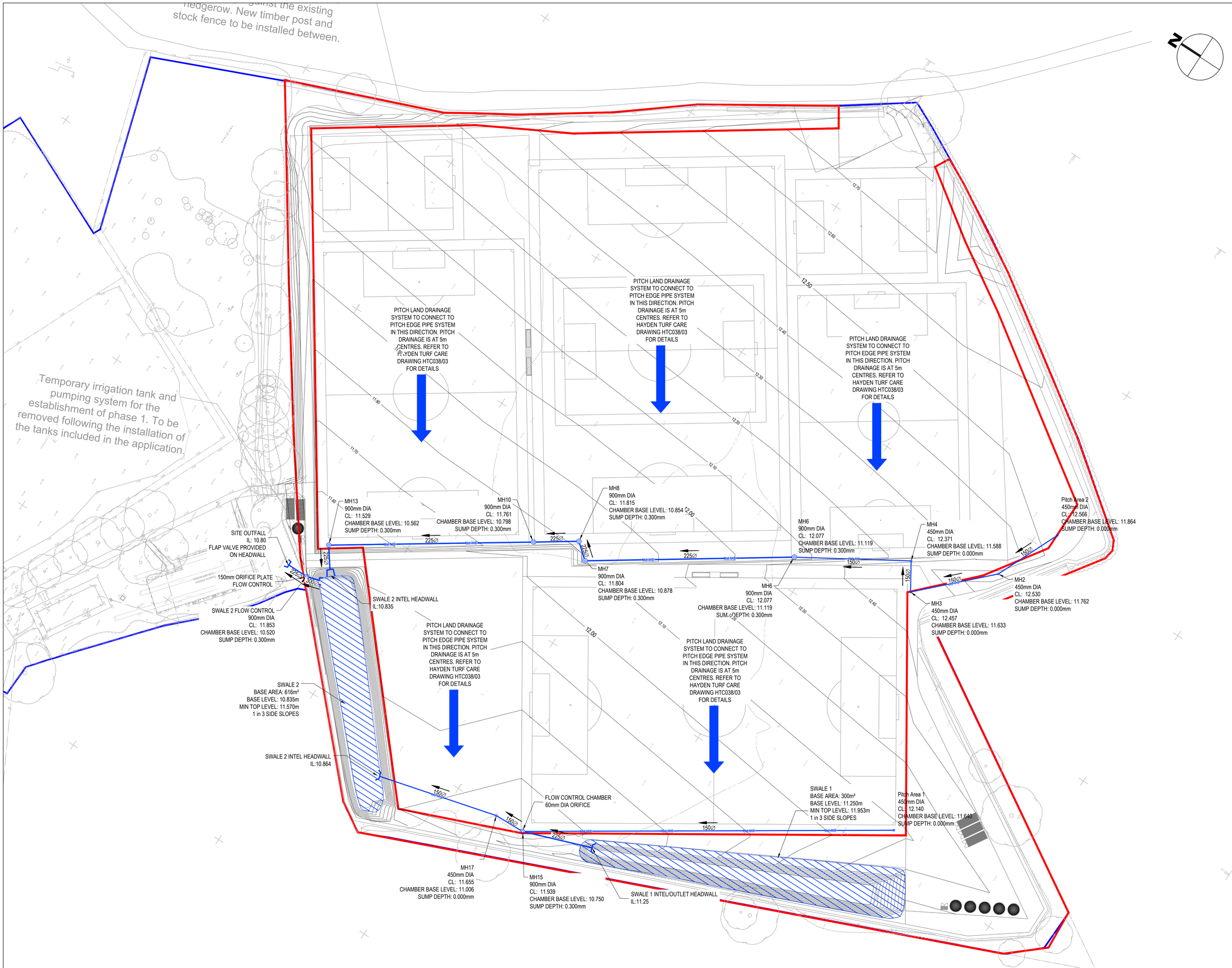
DRAWN BY	CHECKED BY	DATE
-	CF	19/06/25

SCALE (@ A1)	PROJECT NUMBER
1 : 500	25239

DRAWING NUMBER
WRX-MLD-XX-XX-DR-L-1105
S0 P10

Appendix E – Surface Water Drainage Layout

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DO NOT SCALE THIS DRAWING.

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.
COMPLETION OF GPR SURVEY TO IDENTIFY SERVICES.

MAINTENANCE/CLEANING/OPERATION.
NO UNUSUAL HAZARDS, TO BE REVIEWED AS DESIGN PROGRESSES.

DECOMMISSIONING/DEMOLITION.
NO UNUSUAL HAZARDS, TO BE REVIEWED AS DESIGN PROGRESSES.

KEY

1. ALL DIMENSIONS ARE IN METERS UNLESS STATED OTHERWISE.
2. ALL LEVELS ARE TO ORDNANCE SURVEY DATUM UNLESS STATED OTHERWISE.

SW DRAINAGE

Rev	Description	Date	Iss'd	Rev'd	App'd
P05	FOR INFORMATION	23.10.2025	SBH	NJH	NJH
P04	FOR INFORMATION	10.07.2025	SBH	AD	NJH
P03	FOR INFORMATION	09.07.2025	SBH	AD	NJH
P02	FOR INFORMATION	09.07.2025	SBH	AD	NJH
P01	FOR INFORMATION	08.07.2025	SBH	AD	NJH

INFORMATION
Project Stage

INFORMATION
Status of Drawing

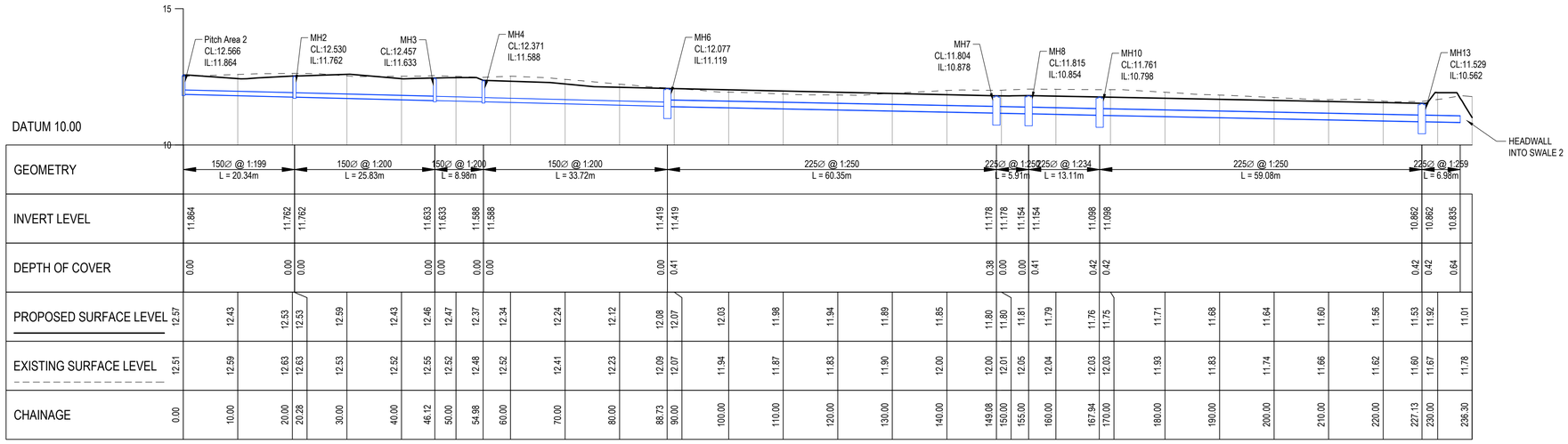
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Architect: *POPULOUS*
Project: **WREXHAM AFC KOP STAND**
Drg Title: BELOW GROUND DRAINAGE SURFACE WATER GENERAL ARRANGEMENT

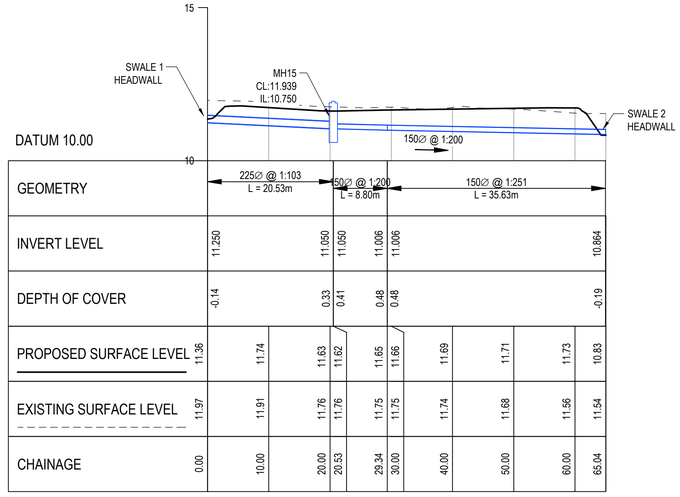
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Scale@A1 1:500
Drawn/Designed By. SH
Checked By. AD
Approved By. NJH
Drawing No. WRX-BHE-DAR-ZZZ-DR-CI-003001
Revision P05

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LONGITUDINAL SECTION - SW ALIGNMENT 1

HORZ SCALE 1: 500
VERT SCALE 1: 100



LONGITUDINAL SECTION - SW ALIGNMENT 2

HORZ SCALE 1: 500
VERT SCALE 1: 100

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2. ALL LEVELS ARE TO ORDNANCE SURVEY DATUM UNLESS STATED OTHERWISE.
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6. FOR KNOWN EXISTING TOPOGRAPHIC INFORMATION REFER TO SUBSITE SURVEY 1224-GAT-001.
7. FOR ARCHITECTURAL BACKGROUND REFER TO WRX-POP-KOP-L00-DR-AR-021020.
8. FOR LANDSCAPE ARCHITECTURAL PLAN REFER TO WRX-POP-KOP-L00-DR-LA-701000.
9. ALL RAINWATER DOWNPIPE POSITIONS ARE ASSUMED AND LIKELY TO CHANGE AS DESIGN PROGRESSES.
10. ALL PIPE CONNECTIONS FROM RAIN GARDENS AND CHANNEL DRAINS TO STORM WATER NETWORK ARE ASSUMED TO BE 100mm.
11. INTERNAL FW AND RWP CONNECTIONS ARE SHOWN AS ASSUMED AT THIS STAGE IN DESIGN. TO BE REFINED ONCE ABOVE GROUND PUBLIC HEALTH AND RAINWATER NETWORKS ARE DEVELOPED.

Rev	Description	Date	Iss'd	Rev'd	App'd
P02	FOR INFORMATION	23.10.2025	SBH	NJH	NJH
P01	FOR INFORMATION	08.07.2025	SBH	AD	NJH

INFORMATION
Project Stage

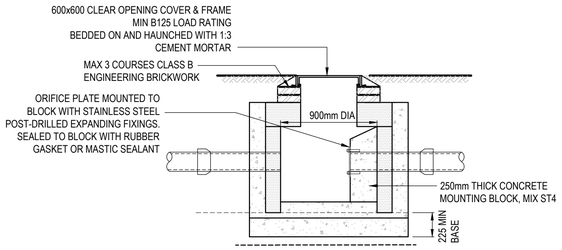
INFORMATION
Status of Drawing

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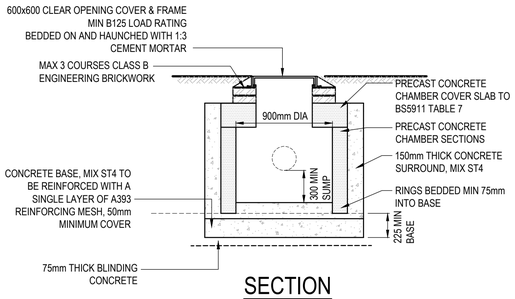
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Architect: *POPULOUS*
Project: **WREXHAM AFC KOP STAND**
Drg Title: BELOW GROUND DRAINAGE SURFACE WATER PROFILES SHEET 1

Job No. 067784
Scale@A1 AS SHOWN
Drawn/Designed By. SH
Checked By. AD
Approved By. NJH
Drawing No. WRX-BHE-DAR-ZZZ-DR-CI-003201
Revision P02

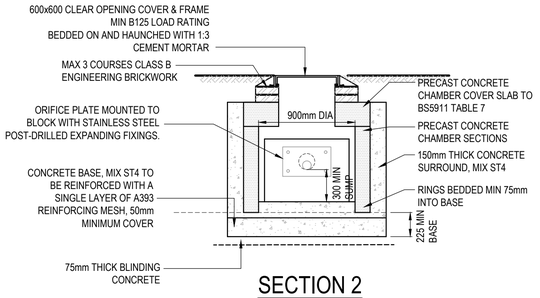
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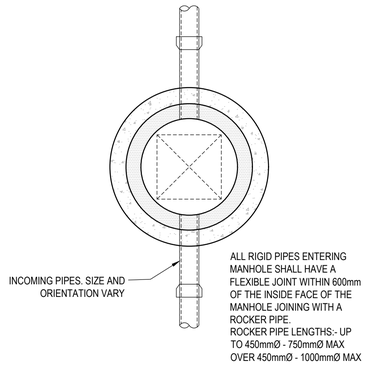
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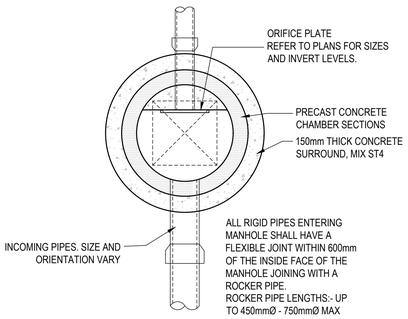
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PLAN

900mm MANHOLE DETAIL

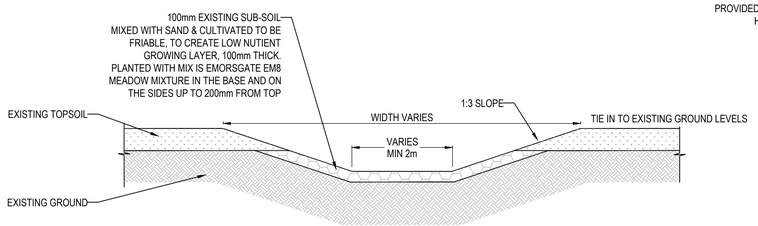
FOR USE FOR PIPEWORK >150mm DIA
REFER TO GA PLANS FOR SIZE AND INVERT LEVEL OF INCOMING/OUTGOING PIPES



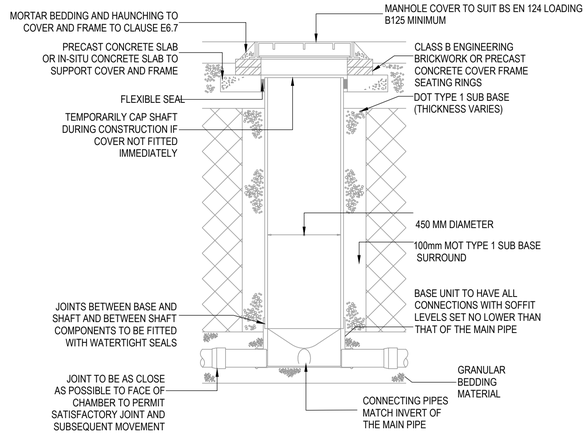
PLAN

ORIFICE PLATE MANHOLE DETAIL

REFER TO GA PLANS FOR SIZE AND INVERT LEVEL OF ORIFICE PLATE AND
INCOMING/OUTGOING PIPES



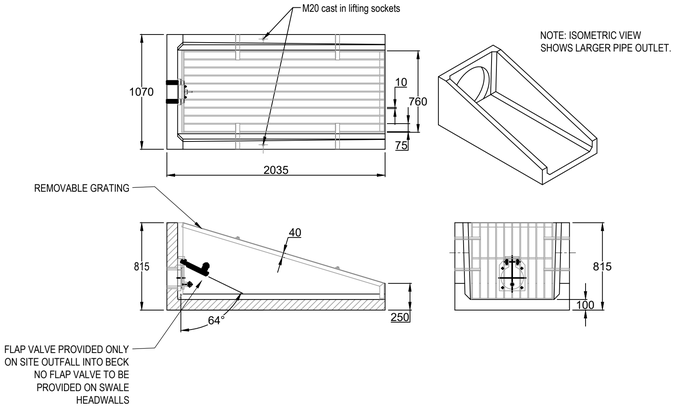
TYPICAL CROSS SECTION THROUGH SWALE - UNLINED



450mm DIA CHAMBER DETAIL

FOR USE FOR PIPEWORK UP TO 150mm DIA
REFER TO GA PLANS FOR SIZE AND INVERT LEVEL OF INCOMING/OUTGOING PIPES

PLASTIC CHAMBERS AND RINGS SHALL COMPLY WITH BS EN 13598-1 AND
BS EN 13598-2 OR HAVE EQUIVALENT INDEPENDENT APPROVAL



HEADWALL DETAIL FOR SWALE INLETS AND OUTLETS AND SITE DISCHARGE

ALTHON H50C OR SIMIALR APPROVED
SIZE OF OUTLET/FLAP VALVE TO MATCH CONNECTING PIPEWORK
REFER TO GA PLANS FOR SIZE AND INVERT LEVEL OF INCOMING/OUTGOING PIPES

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Rev	Description	Date	Iss'd	Rev'd	App'd
P02	FOR INFORMATION	23.10.2025	SBH	GW	NJH
P01	FOR INFORMATION	09.07.2025	SBH	AD	NJH

INFORMATION

Project Stage

INFORMATION

Status of Drawing

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Architect: *POPULOUS*
Project: **WREXHAM AFC KOP STAND**
Drg Title: BELOW GROUND DRAINAGE SURFACE WATER DETAILS

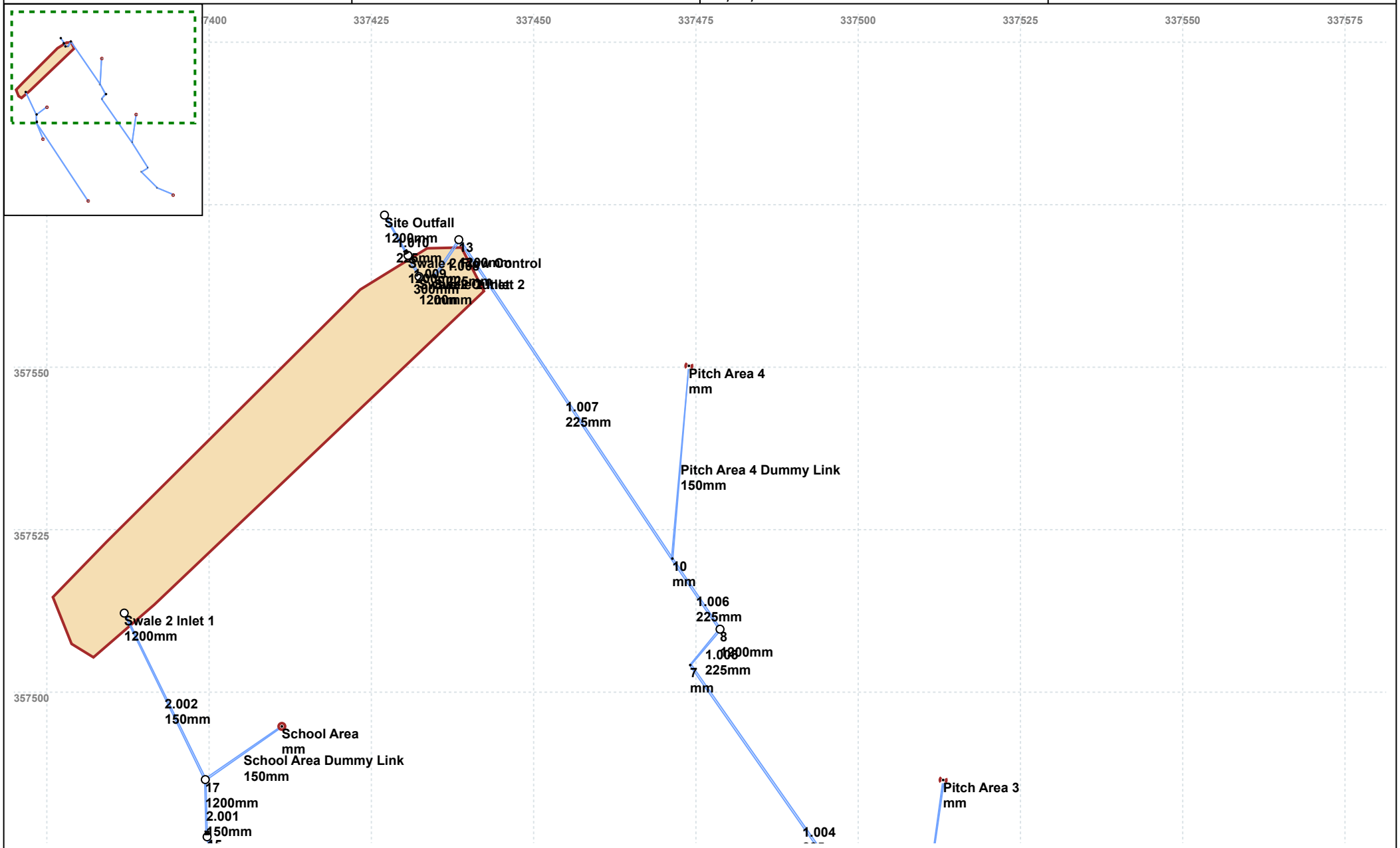
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Scale@A1 AS SHOWN
Drawn/Designed By. SH
Checked By. AD
Approved By. NJH
Drawing No. WRX-BHE-DAR-ZZZ-DR-CI-003501
Revision P02

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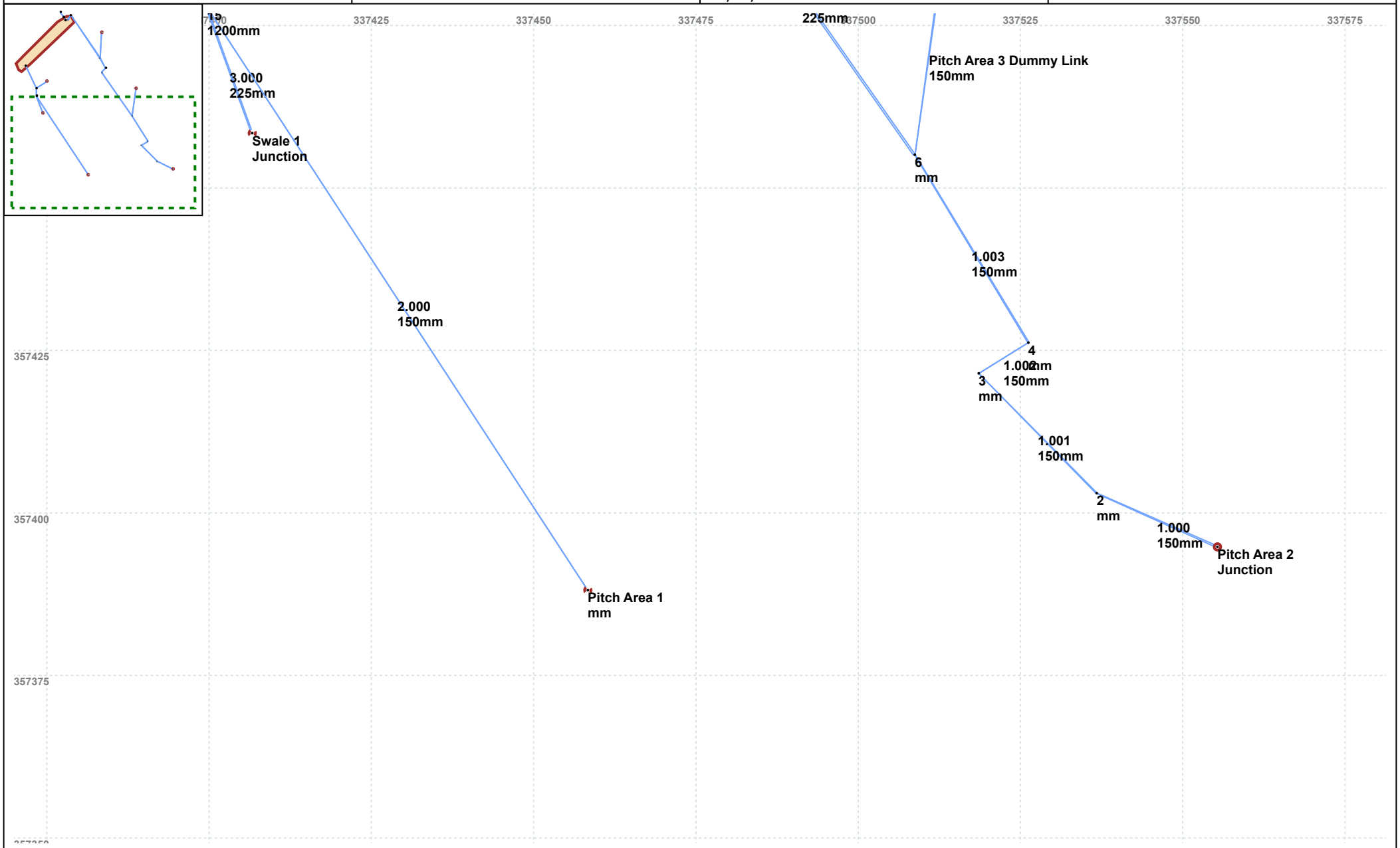
Appendix F – Surface Water Drainage Calculations

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Causeway	Buro Happold Ltd Camden Mill Lower Bristol Rd Bath	File: 251022_Darland SW Model.pfd Network: SW1 Nick Hall 16/10/2025	Page 1 WAFC Darland Academy SW Drainge Design



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Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	2	Maximum Rainfall (mm/hr)	5.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Easting (m)	Northing (m)	Depth (m)
3			12.471	Manhole	337518.575	357421.473	0.838
4			12.340	Manhole	337526.219	357426.188	0.752
Pitch Area 3	0.914	5.00	12.062	Manhole	337513.090	357486.487	0.450
6			12.049	Manhole	337508.718	357455.097	0.630
8			11.815	Manhole	337478.717	357509.691	0.665
10			11.761	Manhole	337471.375	357520.552	0.663
Pitch Area 4	0.734	5.00	11.773	Manhole	337473.916	357550.207	0.450
13			11.529	Manhole	337438.471	357569.618	0.667
Swale 2 Inlet 2			11.917	Manhole	337434.667	357563.900	1.082
Pitch Area 1	0.815	5.00	12.090	Manhole	337458.351	357388.127	0.450
Swale 1	0.035	5.00	12.037	Junction	337406.654	357458.432	0.787
15			11.940	Manhole	337399.693	357477.749	0.890
School Area	0.319	5.00	11.919	Manhole	337411.209	357494.734	0.450
17			11.904	Manhole	337399.417	357486.549	0.898
Swale 2 Inlet 1			11.708	Manhole	337386.926	357512.164	0.873
Swale 2 Outlet		5.00	11.767	Manhole	337432.343	357563.943	0.932
Swale 2 Flow Control			11.802	Manhole	337430.639	357567.202	0.982
Site Outfall			11.700	Manhole	337427.021	357573.401	0.909
2			12.331	Manhole	337536.739	357403.042	0.569
Pitch Area 2	0.766	5.00	12.365	Junction	337555.350	357394.771	0.501
7			11.986	Manhole	337474.125	357504.171	0.807

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
1.000	Pitch Area 2	2	20.366	0.600	Colebrook-White	11.864	11.762	0.102	200.0	150	Circular	5.48	5.0
1.001	2	3	25.877	0.600	Colebrook-White	11.762	11.633	0.129	200.0	150	Circular	6.09	5.0
1.002	3	4	8.981	0.600	Colebrook-White	11.633	11.588	0.045	200.0	150	Circular	6.30	5.0
1.003	4	6	33.794	0.600	Colebrook-White	11.588	11.419	0.169	200.0	150	Circular	7.10	5.0
Pitch Area 3 Dummy Link	Pitch Area 3	6	31.693	0.600	Colebrook-White	11.612	11.454	0.158	200.0	150	Circular	5.75	5.0
1.004	6	7	60.041	0.600	Colebrook-White	11.419	11.179	0.240	250.0	225	Circular	8.32	5.0
1.005	7	8	7.180	0.600	Colebrook-White	11.179	11.150	0.029	250.0	225	Circular	8.46	5.0
1.006	8	10	13.110	0.600	Colebrook-White	11.150	11.098	0.052	250.0	225	Circular	8.73	5.0
Pitch Area 4 Dummy Link	Pitch Area 4	10	29.764	0.600	Colebrook-White	11.323	11.174	0.149	200.0	150	Circular	5.70	5.0
1.007	10	13	59.077	0.600	Colebrook-White	11.098	10.862	0.236	250.0	225	Circular	9.93	5.0
1.008	13	Swale 2 Inlet 2	6.868	0.600	Colebrook-White	10.862	10.835	0.027	250.0	225	Circular	10.06	5.0
3.000	Swale 1	15	20.533	0.600	Colebrook-White	11.250	11.050	0.200	102.7	225	Circular	5.27	5.0
2.001	15	17	8.804	0.600	Colebrook-White	11.050	11.006	0.044	200.0	150	Circular	7.73	5.0
School Area Dummy Link	School Area	17	14.354	0.600	Colebrook-White	11.469	11.397	0.072	200.0	150	Circular	5.34	5.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	Minimum Depth (m)	Maximum Depth (m)	Σ Add Inflow (l/s)
1.000	0.707	12.5	10.4	0.351	0.419	0.0
1.001	0.707	12.5	10.4	0.419	0.688	0.0
1.002	0.707	12.5	10.4	0.602	0.730	0.0
1.003	0.707	12.5	10.4	0.467	0.602	0.0
Pitch Area 3 Dummy Link	0.707	12.5	12.4	0.300	0.445	0.0
1.004	0.822	32.7	22.8	0.403	0.582	0.0
1.005	0.822	32.7	22.8	0.403	0.582	0.0
1.006	0.822	32.7	22.8	0.438	0.440	0.0
Pitch Area 4 Dummy Link	0.707	12.5	10.0	0.300	0.437	0.0
1.007	0.822	32.7	32.7	0.438	0.442	0.0
1.008	0.822	32.7	32.7	0.442	0.857	0.0
3.000	1.290	51.3	0.5	0.541	0.665	0.0
2.001	0.707	12.5	11.5	0.740	0.748	0.0
School Area Dummy Link	0.707	12.5	4.3	0.300	0.357	0.0

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
2.002	17	Swale 2 Inlet 1	28.498	0.600	Colebrook-White	11.006	10.864	0.142	200.0	150	Circular	8.41	5.0
2.000	Pitch Area 1	15	107.111	0.600	Colebrook-White	11.640	11.104	0.536	200.0	150	Circular	7.53	5.0
1.009	Swale 2 Outlet	Swale 2 Flow Control	3.678	0.600	Colebrook-White	10.835	10.820	0.015	250.0	300	Circular	5.06	5.0
1.010	Swale 2 Flow Control	Site Outfall	7.178	0.600	Colebrook-White	10.820	10.791	0.029	250.0	225	Circular	5.21	5.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	Minimum Depth (m)	Maximum Depth (m)	Σ Add Inflow (l/s)
2.002	0.707	12.5	15.8	0.694	0.748	0.0
2.000	0.707	12.5	11.0	0.300	0.686	0.0
1.009	0.990	70.0	0.0	0.632	0.682	0.0
1.010	0.822	32.7	0.0	0.684	0.796	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	20.366	200.0	150	Circular	12.365	11.864	0.351	12.331	11.762	0.419
1.001	25.877	200.0	150	Circular	12.331	11.762	0.419	12.471	11.633	0.688
1.002	8.981	200.0	150	Circular	12.471	11.633	0.688	12.340	11.588	0.602
1.003	33.794	200.0	150	Circular	12.340	11.588	0.602	12.049	11.419	0.480
Pitch Area 3 Dummy Link	31.693	200.0	150	Circular	12.062	11.612	0.300	12.049	11.454	0.445
1.004	60.041	250.0	225	Circular	12.049	11.419	0.405	11.986	11.179	0.582

Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	Node Type
1.000	Pitch Area 2		Junction	2		Manhole
1.001	2		Manhole	3		Manhole
1.002	3		Manhole	4		Manhole
1.003	4		Manhole	6		Manhole
Pitch Area 3 Dummy Link	Pitch Area 3		Manhole	6		Manhole
1.004	6		Manhole	7		Manhole

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.005	7.180	250.0	225	Circular	11.986	11.179	0.582	11.815	11.150	0.440
1.006	13.110	250.0	225	Circular	11.815	11.150	0.440	11.761	11.098	0.438
Pitch Area 4 Dummy Link	29.764	200.0	150	Circular	11.773	11.323	0.300	11.761	11.174	0.437
1.007	59.077	250.0	225	Circular	11.761	11.098	0.438	11.529	10.862	0.442
1.008	6.868	250.0	225	Circular	11.529	10.862	0.442	11.917	10.835	0.857
3.000	20.533	102.7	225	Circular	12.037	11.250	0.562	11.940	11.050	0.665
2.001	8.804	200.0	150	Circular	11.940	11.050	0.740	11.904	11.006	0.748
School Area Dummy Link	14.354	200.0	150	Circular	11.919	11.469	0.300	11.904	11.397	0.357
2.002	28.498	200.0	150	Circular	11.904	11.006	0.748	11.708	10.864	0.694
2.000	107.111	200.0	150	Circular	12.090	11.640	0.300	11.940	11.104	0.686
1.009	3.678	250.0	300	Circular	11.767	10.835	0.632	11.802	10.820	0.682
1.010	7.178	250.0	225	Circular	11.802	10.820	0.757	11.700	10.791	0.684

Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	Node Type
1.005	7		Manhole	8	1200	Manhole
1.006	8	1200	Manhole	10		Manhole
Pitch Area 4 Dummy Link	Pitch Area 4		Manhole	10		Manhole
1.007	10		Manhole	13	1200	Manhole
1.008	13	1200	Manhole	Swale 2 Inlet 2		Manhole
3.000	Swale 1	1200	Junction	15	1200	Manhole
2.001	15	1200	Manhole	17	1200	Manhole
School Area Dummy Link	School Area		Manhole	17	1200	Manhole
2.002	17	1200	Manhole	Swale 2 Inlet 1	1200	Manhole
2.000	Pitch Area 1		Manhole	15	1200	Manhole
1.009	Swale 2 Outlet	1200	Manhole	Swale 2 Flow Control	1200	Manhole
1.010	Swale 2 Flow Control	1200	Manhole	Site Outfall	1200	Manhole

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	2880	Check Discharge Volume	x

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Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	2160	2880

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	30	0	0	0
5	0	0	0	100	0	0	0
10	0	0	0	100	30	0	0

Node Pitch Area 1 Time-Area Diagram

Overrides Design Area ✓ | Depression Storage Area (m²) 8150 | Evapo-transpiration (mm/day) 3
Overrides Design Additional Inflow x | Depression Storage Depth (mm) 5
Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.095	16-20	0.059	32-36	0.036	48-52	0.022	64-68	0.014	80-84	0.009	96-100	0.005	112-116	0.003
4-8	0.084	20-24	0.052	36-40	0.032	52-56	0.020	68-72	0.012	84-88	0.008	100-104	0.005	116-120	0.003
8-12	0.075	24-28	0.046	40-44	0.029	56-60	0.018	72-76	0.011	88-92	0.007	104-108	0.004		
12-16	0.066	28-32	0.041	44-48	0.025	60-64	0.016	76-80	0.010	92-96	0.006	108-112	0.004		

Node Pitch Area 2 Time-Area Diagram

Overrides Design Area ✓ | Depression Storage Area (m²) 7660 | Evapo-transpiration (mm/day) 3
Overrides Design Additional Inflow x | Depression Storage Depth (mm) 5
Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.089	16-20	0.055	32-36	0.034	48-52	0.021	64-68	0.013	80-84	0.008	96-100	0.005	112-116	0.003
4-8	0.079	20-24	0.049	36-40	0.030	52-56	0.019	68-72	0.012	84-88	0.007	100-104	0.004	116-120	0.003
8-12	0.070	24-28	0.043	40-44	0.027	56-60	0.017	72-76	0.010	88-92	0.006	104-108	0.004		
12-16	0.062	28-32	0.038	44-48	0.024	60-64	0.015	76-80	0.009	92-96	0.006	108-112	0.003		

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Node Pitch Area 3 Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	9140	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		
		Applies to All storms			

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.106	16-20	0.066	32-36	0.041	48-52	0.025	64-68	0.016	80-84	0.010	96-100	0.006	112-116	0.004
4-8	0.094	20-24	0.058	36-40	0.036	52-56	0.022	68-72	0.014	84-88	0.009	100-104	0.005	116-120	0.003
8-12	0.084	24-28	0.052	40-44	0.032	56-60	0.020	72-76	0.012	88-92	0.008	104-108	0.005		
12-16	0.074	28-32	0.046	44-48	0.028	60-64	0.018	76-80	0.011	92-96	0.007	108-112	0.004		

Node Pitch Area 4 Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	7340	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		
		Applies to All storms			

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.085	16-20	0.053	32-36	0.033	48-52	0.020	64-68	0.013	80-84	0.008	96-100	0.005	112-116	0.003
4-8	0.076	20-24	0.047	36-40	0.029	52-56	0.018	68-72	0.011	84-88	0.007	100-104	0.004	116-120	0.003
8-12	0.067	24-28	0.042	40-44	0.026	56-60	0.016	72-76	0.010	88-92	0.006	104-108	0.004		
12-16	0.060	28-32	0.037	44-48	0.023	60-64	0.014	76-80	0.009	92-96	0.005	108-112	0.003		

Node School Area Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	3191	Evapo-transpiration (mm/day)	3
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		
		Applies to All storms			

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Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.037	16-20	0.023	32-36	0.014	48-52	0.009	64-68	0.005	80-84	0.003	96-100	0.002	112-116	0.001
4-8	0.033	20-24	0.020	36-40	0.013	52-56	0.008	68-72	0.005	84-88	0.003	100-104	0.002	116-120	0.001
8-12	0.029	24-28	0.018	40-44	0.011	56-60	0.007	72-76	0.004	88-92	0.003	104-108	0.002		
12-16	0.026	28-32	0.016	44-48	0.010	60-64	0.006	76-80	0.004	92-96	0.002	108-112	0.001		

Node Swale 1 Time-Area Diagram

Overrides Design Area	✓	Depression Storage Area (m²)	1160	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	5		
		Applies to All storms			

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.013	16-20	0.008	32-36	0.005	48-52	0.003	64-68	0.002	80-84	0.001	96-100	0.001	112-116	0.000
4-8	0.012	20-24	0.007	36-40	0.005	52-56	0.003	68-72	0.002	84-88	0.001	100-104	0.001	116-120	0.000
8-12	0.011	24-28	0.007	40-44	0.004	56-60	0.003	72-76	0.002	88-92	0.001	104-108	0.001		
12-16	0.009	28-32	0.006	44-48	0.004	60-64	0.002	76-80	0.001	92-96	0.001	108-112	0.001		

Node Swale 2 Flow Control Online Orifice Control

Flap Valve	x	Replaces Downstream Link	x	Design Depth (m)	0.600	Diameter (m)	0.150
Downstream Link	1.010	Invert Level (m)	10.820	Design Flow (l/s)	35.0	Discharge Coefficient	0.600

Node 15 Online Orifice Control

Flap Valve	x	Invert Level (m)	11.050	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.060		

Node Pitch Area 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.19300	Safety Factor	10.0	Invert Level (m)	11.640
Side Inf Coefficient (m/hr)	0.19300	Porosity	0.10	Time to half empty (mins)	40

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	6357.0	8150.0	0.450	6357.0	8150.0

Node Pitch Area 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	10.0	Invert Level (m)	11.864
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.10	Time to half empty (mins)	392

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	5975.0	7660.0	0.450	5975.0	7660.0

Node Pitch Area 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03000	Safety Factor	10.0	Invert Level (m)	11.612
Side Inf Coefficient (m/hr)	0.03000	Porosity	0.10	Time to half empty (mins)	280

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7129.0	9140.0	0.450	7129.0	9140.0

Node Pitch Area 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.01100	Safety Factor	10.0	Invert Level (m)	11.323
Side Inf Coefficient (m/hr)	0.01100	Porosity	0.10	Time to half empty (mins)	456

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	5725.0	7340.0	0.450	5725.0	7340.0

Node School Area Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	10.0	Invert Level (m)	11.472
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.10	Time to half empty (mins)	88

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	2489.0	3191.0	0.450	2489.0	3191.0

Node Swale 2 Outlet Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	60.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.835	Main Channel Slope (1:X)	999999.0
Safety Factor	10.0	Time to half empty (mins)	150	Main Channel n	0.035

Inlets

Swale 2 Inlet 1 | Swale 2 Inlet 2

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	616.0	650.0	0.700	1026.0	1026.0

Node Swale 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.19300	Safety Factor	10.0	Invert Level (m)	11.250
Side Inf Coefficient (m/hr)	0.19300	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	300.0	300.0	0.850	970.0	970.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	98.235	27.797	5 year 60 minute summer	67.273	17.778
2 year 15 minute winter	68.937	27.797	5 year 60 minute winter	44.695	17.778
2 year 30 minute summer	63.781	18.048	5 year 120 minute summer	43.178	11.411
2 year 30 minute winter	44.758	18.048	5 year 120 minute winter	28.686	11.411
2 year 60 minute summer	42.946	11.349	5 year 180 minute summer	33.709	8.675
2 year 60 minute winter	28.532	11.349	5 year 180 minute winter	21.912	8.675
2 year 120 minute summer	29.467	7.787	5 year 240 minute summer	26.880	7.104
2 year 120 minute winter	19.577	7.787	5 year 240 minute winter	17.858	7.104
2 year 180 minute summer	23.699	6.098	5 year 360 minute summer	20.694	5.325
2 year 180 minute winter	15.405	6.098	5 year 360 minute winter	13.452	5.325
2 year 240 minute summer	19.204	5.075	5 year 480 minute summer	16.343	4.319
2 year 240 minute winter	12.759	5.075	5 year 480 minute winter	10.858	4.319
2 year 360 minute summer	14.994	3.858	5 year 600 minute summer	13.392	3.663
2 year 360 minute winter	9.746	3.858	5 year 600 minute winter	9.150	3.663
2 year 480 minute summer	11.926	3.152	5 year 720 minute summer	11.930	3.197
2 year 480 minute winter	7.923	3.152	5 year 720 minute winter	8.018	3.197
2 year 600 minute summer	9.811	2.684	5 year 960 minute summer	9.779	2.575
2 year 600 minute winter	6.703	2.684	5 year 960 minute winter	6.478	2.575
2 year 720 minute summer	8.761	2.348	5 year 1440 minute summer	7.068	1.894
2 year 720 minute winter	5.888	2.348	5 year 1440 minute winter	4.750	1.894
2 year 960 minute summer	7.194	1.894	5 year 2160 minute summer	5.034	1.391
2 year 960 minute winter	4.765	1.894	5 year 2160 minute winter	3.468	1.391
2 year 1440 minute summer	5.204	1.395	5 year 2880 minute summer	4.183	1.121
2 year 1440 minute winter	3.498	1.395	5 year 2880 minute winter	2.811	1.121
2 year 2160 minute summer	3.722	1.029	10 year 15 minute summer	191.891	54.299
2 year 2160 minute winter	2.565	1.029	10 year 15 minute winter	134.661	54.299
2 year 2880 minute summer	3.109	0.833	10 year 30 minute summer	125.631	35.549
2 year 2880 minute winter	2.090	0.833	10 year 30 minute winter	88.162	35.549
5 year 15 minute summer	153.829	43.528	10 year 60 minute summer	84.855	22.425
5 year 15 minute winter	107.950	43.528	10 year 60 minute winter	56.376	22.425
5 year 30 minute summer	100.061	28.314	10 year 120 minute summer	52.835	13.963
5 year 30 minute winter	70.218	28.314	10 year 120 minute winter	35.102	13.963

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 180 minute summer	40.782	10.494	30 year 360 minute summer	31.460	8.096
10 year 180 minute winter	26.509	10.494	30 year 360 minute winter	20.450	8.096
10 year 240 minute summer	32.331	8.544	30 year 480 minute summer	24.859	6.570
10 year 240 minute winter	21.480	8.544	30 year 480 minute winter	16.516	6.570
10 year 360 minute summer	24.758	6.371	30 year 600 minute summer	20.423	5.586
10 year 360 minute winter	16.093	6.371	30 year 600 minute winter	13.954	5.586
10 year 480 minute summer	19.520	5.159	30 year 720 minute summer	18.250	4.891
10 year 480 minute winter	12.968	5.159	30 year 720 minute winter	12.265	4.891
10 year 600 minute summer	15.990	4.374	30 year 960 minute summer	15.039	3.960
10 year 600 minute winter	10.925	4.374	30 year 960 minute winter	9.962	3.960
10 year 720 minute summer	14.249	3.819	30 year 1440 minute summer	10.888	2.918
10 year 720 minute winter	9.576	3.819	30 year 1440 minute winter	7.317	2.918
10 year 960 minute summer	11.699	3.081	30 year 2160 minute summer	7.667	2.119
10 year 960 minute winter	7.750	3.081	30 year 2160 minute winter	5.283	2.119
10 year 1440 minute summer	8.458	2.267	30 year 2880 minute summer	6.283	1.684
10 year 1440 minute winter	5.684	2.267	30 year 2880 minute winter	4.223	1.684
10 year 2160 minute summer	6.005	1.660	100 year 15 minute summer	318.756	90.197
10 year 2160 minute winter	4.138	1.660	100 year 15 minute winter	223.688	90.197
10 year 2880 minute summer	4.969	1.332	100 year 30 minute summer	212.567	60.149
10 year 2880 minute winter	3.340	1.332	100 year 30 minute winter	149.170	60.149
30 year 15 minute summer	251.987	71.304	100 year 60 minute summer	145.684	38.500
30 year 15 minute winter	176.833	71.304	100 year 60 minute winter	96.789	38.500
30 year 30 minute summer	166.978	47.249	100 year 120 minute summer	86.559	22.875
30 year 30 minute winter	117.178	47.249	100 year 120 minute winter	57.508	22.875
30 year 60 minute summer	113.044	29.874	100 year 180 minute summer	65.842	16.943
30 year 60 minute winter	75.104	29.874	100 year 180 minute winter	42.799	16.943
30 year 120 minute summer	68.299	18.049	100 year 240 minute summer	51.936	13.725
30 year 120 minute winter	45.376	18.049	100 year 240 minute winter	34.505	13.725
30 year 180 minute summer	52.202	13.433	100 year 360 minute summer	39.784	10.238
30 year 180 minute winter	33.932	13.433	100 year 360 minute winter	25.861	10.238
30 year 240 minute summer	41.208	10.890	100 year 480 minute summer	31.539	8.335
30 year 240 minute winter	27.378	10.890	100 year 480 minute winter	20.954	8.335

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 600 minute summer	25.964	7.102	100 year +30% CC 180 minute summer	85.594	22.026
100 year 600 minute winter	17.740	7.102	100 year +30% CC 180 minute winter	55.639	22.026
100 year 720 minute summer	23.228	6.225	100 year +30% CC 240 minute summer	67.517	17.843
100 year 720 minute winter	15.611	6.225	100 year +30% CC 240 minute winter	44.857	17.843
100 year 960 minute summer	19.135	5.039	100 year +30% CC 360 minute summer	51.720	13.309
100 year 960 minute winter	12.675	5.039	100 year +30% CC 360 minute winter	33.619	13.309
100 year 1440 minute summer	13.814	3.702	100 year +30% CC 480 minute summer	41.001	10.835
100 year 1440 minute winter	9.284	3.702	100 year +30% CC 480 minute winter	27.240	10.835
100 year 2160 minute summer	9.639	2.664	100 year +30% CC 600 minute summer	33.753	9.232
100 year 2160 minute winter	6.641	2.664	100 year +30% CC 600 minute winter	23.062	9.232
100 year 2880 minute summer	7.822	2.096	100 year +30% CC 720 minute summer	30.196	8.093
100 year 2880 minute winter	5.257	2.096	100 year +30% CC 720 minute winter	20.294	8.093
100 year +30% CC 15 minute summer	414.382	117.256	100 year +30% CC 960 minute summer	24.875	6.550
100 year +30% CC 15 minute winter	290.795	117.256	100 year +30% CC 960 minute winter	16.478	6.550
100 year +30% CC 30 minute summer	276.337	78.194	100 year +30% CC 1440 minute summer	17.958	4.813
100 year +30% CC 30 minute winter	193.921	78.194	100 year +30% CC 1440 minute winter	12.069	4.813
100 year +30% CC 60 minute summer	189.389	50.050	100 year +30% CC 2160 minute summer	12.530	3.463
100 year +30% CC 60 minute winter	125.826	50.050	100 year +30% CC 2160 minute winter	8.634	3.463
100 year +30% CC 120 minute summer	112.527	29.738	100 year +30% CC 2880 minute summer	10.169	2.725
100 year +30% CC 120 minute winter	74.760	29.738	100 year +30% CC 2880 minute winter	6.834	2.725

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	3	272	11.725	0.092	7.7	0.0000	0.0000	OK
480 minute winter	4	344	11.674	0.086	7.7	0.0000	0.0000	OK
360 minute winter	Pitch Area 3	256	11.672	0.060	17.7	42.4285	0.0000	OK
360 minute winter	6	272	11.511	0.092	11.6	0.0000	0.0000	OK
360 minute winter	8	272	11.250	0.100	11.6	0.1135	0.0000	OK
360 minute winter	10	272	11.214	0.116	17.6	0.0000	0.0000	OK
360 minute winter	Pitch Area 4	264	11.398	0.075	14.2	42.8733	0.0000	OK
480 minute winter	13	360	11.024	0.162	17.0	0.1827	0.0000	OK
480 minute winter	Swale 2 Inlet 2	376	11.013	0.178	17.0	0.0000	0.0000	OK
180 minute winter	Pitch Area 1	128	11.660	0.020	20.8	12.4419	0.0000	OK
360 minute winter	Swale 1	256	11.271	0.021	2.3	6.3985	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	3	1.002	4	7.7	0.710	0.620	0.0980	
480 minute winter	4	1.003	6	7.7	0.718	0.616	0.3636	
360 minute winter	Pitch Area 3	Pitch Area 3 Dummy Link	6	4.0	0.633	0.322	0.2014	
360 minute winter	Pitch Area 3	Infiltration		7.6				
360 minute winter	6	1.004	7	11.6	0.708	0.356	0.9879	
360 minute winter	8	1.006	10	11.6	0.616	0.356	0.2479	
360 minute winter	10	1.007	13	17.6	0.722	0.539	1.4874	
360 minute winter	Pitch Area 4	Pitch Area 4 Dummy Link	10	6.0	0.707	0.479	0.2522	
360 minute winter	Pitch Area 4	Infiltration		2.2				
480 minute winter	13	1.008	Swale 2 Inlet 2	17.0	0.602	0.520	0.2204	
480 minute winter	Swale 2 Inlet 2	Flow through pond	Swale 2 Outlet	15.3	0.036	0.056	106.1817	
180 minute winter	Pitch Area 1	2.000	15	0.4	0.344	0.036	0.1388	
180 minute winter	Pitch Area 1	Infiltration		17.1				
360 minute winter	Swale 1	3.000	15	0.9	0.213	0.018	0.1054	
360 minute winter	Swale 1	Infiltration		0.7				

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	15	248	11.110	0.060	1.1	0.0679	0.0000	OK
360 minute winter	School Area	248	11.533	0.064	6.2	15.2486	0.0000	OK
240 minute winter	17	188	11.077	0.071	5.5	0.0807	0.0000	OK
600 minute winter	Swale 2 Inlet 1	480	10.997	0.162	4.8	0.1837	0.0000	OK
480 minute winter	Swale 2 Outlet	424	10.995	0.160	15.3	0.1809	0.0000	OK
480 minute winter	Swale 2 Flow Control	424	10.992	0.172	12.4	0.1947	0.0000	OK
480 minute winter	Site Outfall	424	10.882	0.091	12.4	0.0000	0.0000	OK
360 minute winter	2	272	11.849	0.087	7.7	0.0000	0.0000	OK
360 minute winter	Pitch Area 2	272	11.951	0.087	14.8	51.8304	0.0000	OK
360 minute winter	7	272	11.282	0.103	11.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	15	Orifice	17	1.2				
360 minute winter	School Area	School Area Dummy Link	17	4.4	0.643	0.354	0.0988	
240 minute winter	17	2.002	Swale 2 Inlet 1	5.5	0.689	0.441	0.2685	
600 minute winter	Swale 2 Inlet 1	Flow through pond	Swale 2 Outlet	14.8	0.030	0.054	106.1566	
480 minute winter	Swale 2 Outlet	1.009	Swale 2 Flow Control	12.4	0.327	0.177	0.1472	
480 minute winter	Swale 2 Flow Control	1.010	Site Outfall	12.4	0.760	0.380	0.1173	263.8
360 minute winter	2	1.001	3	7.7	0.705	0.620	0.2845	
360 minute winter	Pitch Area 2	1.000	2	7.7	0.731	0.620	0.2159	
360 minute winter	7	1.005	8	11.6	0.669	0.356	0.1250	

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Results for 5 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	3	264	11.766	0.133	12.0	0.0000	0.0000	OK
360 minute winter	4	272	11.710	0.122	12.0	0.0000	0.0000	OK
240 minute winter	Pitch Area 3	192	11.708	0.096	29.8	68.7108	0.0000	OK
240 minute winter	6	200	11.548	0.129	20.8	0.0000	0.0000	OK
360 minute winter	8	280	11.386	0.236	20.4	0.2673	0.0000	SURCHARGED
360 minute winter	10	280	11.360	0.262	30.5	0.0000	0.0000	SURCHARGED
240 minute winter	Pitch Area 4	196	11.432	0.109	24.0	62.3121	0.0000	OK
360 minute winter	13	312	11.174	0.312	30.0	0.3532	0.0000	SURCHARGED
360 minute winter	Swale 2 Inlet 2	328	11.149	0.314	30.0	0.0000	0.0000	OK
120 minute winter	Pitch Area 1	94	11.670	0.030	33.1	19.0450	0.0000	OK
240 minute winter	Swale 1	184	11.278	0.028	3.8	8.6042	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	3	1.002	4	12.0	0.756	0.963	0.1430	
360 minute winter	4	1.003	6	12.0	0.769	0.962	0.5294	
240 minute winter	Pitch Area 3	Pitch Area 3 Dummy Link	6	8.9	0.759	0.712	0.3722	
240 minute winter	Pitch Area 3	Infiltration		7.6				
240 minute winter	6	1.004	7	20.8	0.788	0.635	1.8727	
360 minute winter	8	1.006	10	20.4	0.670	0.623	0.5214	
360 minute winter	10	1.007	13	30.0	0.791	0.919	2.3496	
240 minute winter	Pitch Area 4	Pitch Area 4 Dummy Link	10	11.0	0.813	0.877	0.4635	
240 minute winter	Pitch Area 4	Infiltration		2.2				
360 minute winter	13	1.008	Swale 2 Inlet 2	30.0	0.753	0.916	0.2731	
360 minute winter	Swale 2 Inlet 2	Flow through pond	Swale 2 Outlet	26.0	0.045	0.095	192.7654	
120 minute winter	Pitch Area 1	2.000	15	1.1	0.442	0.088	0.5121	
120 minute winter	Pitch Area 1	Infiltration		26.2				
240 minute winter	Swale 1	3.000	15	1.7	0.178	0.032	0.3004	
240 minute winter	Swale 1	Infiltration		0.9				

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Results for 5 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	15	184	11.192	0.142	2.4	0.1610	0.0000	OK
240 minute winter	School Area	180	11.555	0.086	10.4	20.8882	0.0000	OK
480 minute winter	17	408	11.127	0.120	8.1	0.1363	0.0000	OK
480 minute winter	Swale 2 Inlet 1	416	11.117	0.282	8.1	0.3189	0.0000	OK
480 minute winter	Swale 2 Outlet	424	11.113	0.278	25.3	0.3147	0.0000	OK
480 minute winter	Swale 2 Flow Control	424	11.111	0.291	18.8	0.3288	0.0000	SURCHARGED
480 minute winter	Site Outfall	424	10.905	0.113	18.8	0.0000	0.0000	OK
360 minute winter	2	264	11.887	0.125	12.0	0.0000	0.0000	OK
360 minute winter	Pitch Area 2	264	11.986	0.122	20.5	72.8183	0.0000	OK
360 minute winter	7	280	11.403	0.224	20.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	15	Orifice	17	2.2				
240 minute winter	School Area	School Area Dummy Link	17	7.3	0.739	0.587	0.1425	
480 minute winter	17	2.002	Swale 2 Inlet 1	8.1	0.710	0.650	0.4669	
480 minute winter	Swale 2 Inlet 1	Flow through pond	Swale 2 Outlet	25.3	0.039	0.093	194.1279	
480 minute winter	Swale 2 Outlet	1.009	Swale 2 Flow Control	18.8	0.327	0.269	0.2537	
480 minute winter	Swale 2 Flow Control	1.010	Site Outfall	18.8	0.856	0.575	0.1576	448.4
360 minute winter	2	1.001	3	12.0	0.748	0.963	0.4165	
360 minute winter	Pitch Area 2	1.000	2	12.0	0.778	0.963	0.3159	
360 minute winter	7	1.005	8	20.4	0.715	0.623	0.2854	

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Results for 10 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	3	216	11.795	0.162	12.7	0.0000	0.0000	SURCHARGED
240 minute winter	4	216	11.743	0.155	12.7	0.0000	0.0000	SURCHARGED
240 minute winter	Pitch Area 3	192	11.736	0.124	35.9	88.4958	0.0000	OK
240 minute winter	6	216	11.581	0.162	24.5	0.0000	0.0000	OK
360 minute winter	8	296	11.461	0.311	23.8	0.3512	0.0000	SURCHARGED
360 minute winter	10	312	11.429	0.331	32.4	0.0000	0.0000	SURCHARGED
240 minute winter	Pitch Area 4	224	11.478	0.155	28.9	88.5047	0.0000	FLOOD RISK
480 minute winter	13	416	11.248	0.386	31.3	0.4364	0.0000	FLOOD RISK
480 minute winter	Swale 2 Inlet 2	432	11.223	0.388	31.3	0.0000	0.0000	OK
120 minute winter	Pitch Area 1	92	11.678	0.038	40.5	24.0384	0.0000	OK
240 minute winter	Swale 1	192	11.284	0.034	4.6	10.6633	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	3	1.002	4	12.7	0.761	1.019	0.1581	
240 minute winter	4	1.003	6	12.7	0.795	1.020	0.5949	
240 minute winter	Pitch Area 3	Pitch Area 3 Dummy Link	6	12.0	0.809	0.964	0.4910	
240 minute winter	Pitch Area 3	Infiltration		7.6				
240 minute winter	6	1.004	7	24.3	0.797	0.743	2.1106	
360 minute winter	8	1.006	10	23.8	0.670	0.727	0.5214	
360 minute winter	10	1.007	13	32.4	0.816	0.990	2.3496	
240 minute winter	Pitch Area 4	Pitch Area 4 Dummy Link	10	11.8	0.813	0.941	0.5240	
240 minute winter	Pitch Area 4	Infiltration		2.2				
480 minute winter	13	1.008	Swale 2 Inlet 2	31.3	0.786	0.957	0.2731	
480 minute winter	Swale 2 Inlet 2	Flow through pond	Swale 2 Outlet	28.1	0.040	0.103	250.6655	
120 minute winter	Pitch Area 1	2.000	15	1.8	0.480	0.140	1.1037	
120 minute winter	Pitch Area 1	Infiltration		33.0				
240 minute winter	Swale 1	3.000	15	2.2	0.148	0.043	0.4469	
240 minute winter	Swale 1	Infiltration		1.1				

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Results for 10 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	15	188	11.288	0.238	3.4	0.2686	0.0000	SURCHARGED
180 minute winter	School Area	144	11.571	0.102	14.0	24.8032	0.0000	OK
360 minute winter	17	280	11.200	0.194	11.1	0.2189	0.0000	SURCHARGED
480 minute winter	Swale 2 Inlet 1	464	11.186	0.351	9.9	0.3975	0.0000	OK
480 minute winter	Swale 2 Outlet	472	11.184	0.349	28.1	0.3945	0.0000	SURCHARGED
480 minute winter	Swale 2 Flow Control	472	11.180	0.360	21.9	0.4071	0.0000	SURCHARGED
480 minute winter	Site Outfall	472	10.914	0.123	21.9	0.0000	0.0000	OK
240 minute winter	2	216	11.924	0.162	12.8	0.0000	0.0000	SURCHARGED
240 minute winter	Pitch Area 2	212	12.021	0.157	30.0	93.8416	0.0000	SURCHARGED
360 minute winter	7	296	11.482	0.303	23.8	0.0000	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	15	Orifice	17	2.9				
180 minute winter	School Area	School Area Dummy Link	17	9.4	0.791	0.752	0.1703	
360 minute winter	17	2.002	Swale 2 Inlet 1	11.0	0.739	0.882	0.5017	
480 minute winter	Swale 2 Inlet 1	Flow through pond	Swale 2 Outlet	28.1	0.040	0.103	250.6655	
480 minute winter	Swale 2 Outlet	1.009	Swale 2 Flow Control	21.9	0.326	0.313	0.2590	
480 minute winter	Swale 2 Flow Control	1.010	Site Outfall	21.9	0.896	0.669	0.1751	586.4
240 minute winter	2	1.001	3	12.7	0.751	1.019	0.4556	
240 minute winter	Pitch Area 2	1.000	2	12.8	0.780	1.022	0.3585	
360 minute winter	7	1.005	8	23.8	0.717	0.727	0.2856	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	3	236	11.873	0.240	12.7	0.0000	0.0000	SURCHARGED
240 minute winter	4	236	11.822	0.234	12.7	0.0000	0.0000	SURCHARGED
240 minute winter	Pitch Area 3	212	11.797	0.185	45.9	132.1673	0.0000	FLOOD RISK
360 minute winter	6	304	11.658	0.239	24.9	0.0000	0.0000	SURCHARGED
480 minute winter	8	416	11.527	0.377	24.0	0.4260	0.0000	FLOOD RISK
480 minute winter	10	416	11.497	0.399	32.5	0.0000	0.0000	FLOOD RISK
360 minute winter	Pitch Area 4	304	11.554	0.231	30.2	132.4457	0.0000	FLOOD RISK
600 minute winter	13	510	11.327	0.465	31.5	0.5254	0.0000	FLOOD RISK
600 minute winter	Swale 2 Inlet 2	555	11.301	0.466	31.5	0.0000	0.0000	OK
120 minute winter	Pitch Area 1	90	11.690	0.050	52.5	31.6612	0.0000	OK
180 minute winter	Swale 1	176	11.314	0.064	7.7	20.6755	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	3	1.002	4	12.7	0.765	1.020	0.1581	
240 minute winter	4	1.003	6	12.8	0.834	1.021	0.5949	
240 minute winter	Pitch Area 3	Pitch Area 3 Dummy Link	6	13.5	0.818	1.082	0.5579	
240 minute winter	Pitch Area 3	Infiltration		7.6				
360 minute winter	6	1.004	7	24.6	0.789	0.753	2.3879	
480 minute winter	8	1.006	10	24.0	0.668	0.733	0.5214	
480 minute winter	10	1.007	13	32.4	0.815	0.991	2.3496	
360 minute winter	Pitch Area 4	Pitch Area 4 Dummy Link	10	11.7	0.807	0.934	0.5240	
360 minute winter	Pitch Area 4	Infiltration		2.2				
600 minute winter	13	1.008	Swale 2 Inlet 2	31.5	0.791	0.963	0.2731	
600 minute winter	Swale 2 Inlet 2	Flow through pond	Swale 2 Outlet	29.5	0.036	0.108	309.8406	
120 minute winter	Pitch Area 1	2.000	15	3.0	0.504	0.240	1.2163	
120 minute winter	Pitch Area 1	Infiltration		43.5				
180 minute winter	Swale 1	3.000	15	2.1	0.118	0.041	0.5028	
180 minute winter	Swale 1	Infiltration		1.7				

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	15	176	11.314	0.264	4.4	0.2981	0.0000	SURCHARGED
180 minute winter	School Area	140	11.598	0.129	18.0	31.5355	0.0000	OK
240 minute winter	17	192	11.285	0.279	13.7	0.3153	0.0000	SURCHARGED
720 minute winter	Swale 2 Inlet 1	630	11.257	0.422	10.0	0.4775	0.0000	OK
720 minute winter	Swale 2 Outlet	645	11.254	0.419	29.1	0.4742	0.0000	SURCHARGED
720 minute winter	Swale 2 Flow Control	645	11.249	0.429	24.6	0.4855	0.0000	SURCHARGED
720 minute winter	Site Outfall	645	10.922	0.131	24.6	0.0000	0.0000	OK
240 minute winter	2	232	12.002	0.240	12.9	0.0000	0.0000	SURCHARGED
240 minute winter	Pitch Area 2	232	12.100	0.236	38.4	141.1199	0.0000	FLOOD RISK
480 minute winter	7	416	11.546	0.367	24.1	0.0000	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	15	Orifice	17	2.9				
180 minute winter	School Area	School Area Dummy Link	17	12.4	0.849	0.997	0.2089	
240 minute winter	17	2.002	Swale 2 Inlet 1	13.7	0.790	1.095	0.5017	
720 minute winter	Swale 2 Inlet 1	Flow through pond	Swale 2 Outlet	29.1	0.031	0.106	309.8647	
720 minute winter	Swale 2 Outlet	1.009	Swale 2 Flow Control	24.6	0.350	0.352	0.2590	
720 minute winter	Swale 2 Flow Control	1.010	Site Outfall	24.6	0.929	0.754	0.1900	888.6
240 minute winter	2	1.001	3	12.7	0.753	1.021	0.4556	
240 minute winter	Pitch Area 2	1.000	2	12.9	0.782	1.031	0.3585	
480 minute winter	7	1.005	8	24.0	0.716	0.734	0.2856	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	3	312	11.971	0.338	12.7	0.0000	0.0000	SURCHARGED
360 minute winter	4	320	11.918	0.330	12.7	0.0000	0.0000	SURCHARGED
240 minute winter	Pitch Area 3	228	11.890	0.278	57.9	197.8480	0.0000	FLOOD RISK
360 minute winter	6	320	11.749	0.330	25.1	0.0000	0.0000	SURCHARGED
480 minute winter	8	408	11.610	0.460	24.2	0.5200	0.0000	FLOOD RISK
480 minute winter	10	416	11.579	0.481	32.8	0.0000	0.0000	FLOOD RISK
360 minute winter	Pitch Area 4	312	11.653	0.330	38.2	188.9976	0.0000	FLOOD RISK
600 minute winter	13	570	11.395	0.533	32.0	0.6023	0.0000	FLOOD RISK
720 minute winter	Swale 2 Inlet 2	660	11.366	0.531	31.0	0.0000	0.0000	OK
120 minute winter	Pitch Area 1	98	11.719	0.079	66.5	50.4286	0.0000	OK
180 minute winter	Swale 1	192	11.372	0.122	11.6	42.6347	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	3	1.002	4	12.7	0.760	1.021	0.1581	
360 minute winter	4	1.003	6	12.7	0.855	1.020	0.5949	
240 minute winter	Pitch Area 3	Pitch Area 3 Dummy Link	6	13.6	0.820	1.090	0.5579	
240 minute winter	Pitch Area 3	Infiltration		7.6				
360 minute winter	6	1.004	7	24.8	0.790	0.757	2.3879	
480 minute winter	8	1.006	10	24.2	0.662	0.740	0.5214	
480 minute winter	10	1.007	13	32.8	0.824	1.002	2.3496	
360 minute winter	Pitch Area 4	Pitch Area 4 Dummy Link	10	12.0	0.805	0.958	0.5240	
360 minute winter	Pitch Area 4	Infiltration		2.2				
600 minute winter	13	1.008	Swale 2 Inlet 2	32.0	0.804	0.978	0.2731	
720 minute winter	Swale 2 Inlet 2	Flow through pond	Swale 2 Outlet	30.8	0.029	0.113	359.7696	
120 minute winter	Pitch Area 1	2.000	15	6.9	0.521	0.555	1.4490	
120 minute winter	Pitch Area 1	Infiltration		43.7				
180 minute winter	Swale 1	3.000	15	-4.7	-0.151	-0.092	0.6348	
180 minute winter	Swale 1	Infiltration		1.9				

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	15	192	11.372	0.322	5.4	0.3646	0.0000	SURCHARGED
120 minute winter	School Area	114	11.638	0.169	26.0	41.4247	0.0000	FLOOD RISK
180 minute winter	17	180	11.371	0.365	15.5	0.4123	0.0000	SURCHARGED
720 minute winter	Swale 2 Inlet 1	675	11.312	0.477	11.1	0.5399	0.0000	OK
720 minute winter	Swale 2 Outlet	690	11.311	0.476	30.8	0.5384	0.0000	SURCHARGED
720 minute winter	Swale 2 Flow Control	690	11.305	0.485	26.7	0.5487	0.0000	SURCHARGED
720 minute winter	Site Outfall	690	10.927	0.136	26.7	0.0000	0.0000	OK
360 minute winter	2	312	12.104	0.342	12.7	0.0000	0.0000	FLOOD RISK
360 minute winter	Pitch Area 2	312	12.205	0.341	39.7	203.5728	0.0000	FLOOD RISK
480 minute winter	7	408	11.630	0.451	24.4	0.0000	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	15	Orifice	17	2.8				
120 minute winter	School Area	School Area Dummy Link	17	15.1	0.886	1.211	0.2295	
180 minute winter	17	2.002	Swale 2 Inlet 1	15.4	0.875	1.234	0.5017	
720 minute winter	Swale 2 Inlet 1	Flow through pond	Swale 2 Outlet	30.8	0.029	0.113	359.7696	
720 minute winter	Swale 2 Outlet	1.009	Swale 2 Flow Control	26.7	0.379	0.381	0.2590	
720 minute winter	Swale 2 Flow Control	1.010	Site Outfall	26.7	0.954	0.816	0.2004	1175.3
360 minute winter	2	1.001	3	12.7	0.750	1.021	0.4556	
360 minute winter	Pitch Area 2	1.000	2	12.7	0.779	1.019	0.3585	
480 minute winter	7	1.005	8	24.2	0.712	0.742	0.2856	

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Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	3	336	12.116	0.483	12.8	0.0000	0.0000	SURCHARGED
360 minute winter	4	336	12.059	0.471	12.7	0.0000	0.0000	FLOOD RISK
240 minute winter	Pitch Area 3	236	12.034	0.422	75.3	300.8738	0.0000	FLOOD RISK
360 minute winter	6	344	11.878	0.459	25.2	0.0000	0.0000	FLOOD RISK
600 minute winter	8	495	11.725	0.575	24.0	0.6505	0.0000	FLOOD RISK
600 minute winter	10	510	11.692	0.594	32.8	0.0000	0.0000	FLOOD RISK
480 minute winter	Pitch Area 4	344	11.773	0.450	42.6	257.6250	20.5854	FLOOD
720 minute winter	13	660	11.483	0.621	31.9	0.7024	0.0000	FLOOD RISK
720 minute winter	Swale 2 Inlet 2	675	11.450	0.615	31.8	0.0000	0.0000	OK
120 minute winter	Pitch Area 1	110	11.782	0.142	86.6	90.5461	0.0000	OK
180 minute winter	Swale 1	204	11.489	0.239	21.7	94.2914	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	3	1.002	4	12.7	0.759	1.021	0.1581	
360 minute winter	4	1.003	6	12.7	0.865	1.020	0.5949	
240 minute winter	Pitch Area 3	Pitch Area 3 Dummy Link	6	13.6	0.823	1.086	0.5579	
240 minute winter	Pitch Area 3	Infiltration		7.6				
360 minute winter	6	1.004	7	24.9	0.794	0.761	2.3879	
600 minute winter	8	1.006	10	23.9	0.668	0.732	0.5214	
600 minute winter	10	1.007	13	32.7	0.823	1.001	2.3496	
480 minute winter	Pitch Area 4	Pitch Area 4 Dummy Link	10	11.8	0.814	0.942	0.5240	
480 minute winter	Pitch Area 4	Infiltration		2.2				
720 minute winter	13	1.008	Swale 2 Inlet 2	31.8	0.800	0.974	0.2731	
720 minute winter	Swale 2 Inlet 2	Flow through pond	Swale 2 Outlet	33.9	0.029	0.124	427.9895	
120 minute winter	Pitch Area 1	2.000	15	11.7	0.686	0.940	1.8682	
120 minute winter	Pitch Area 1	Infiltration		43.7				
180 minute winter	Swale 1	3.000	15	-12.1	-0.347	-0.235	0.8166	
180 minute winter	Swale 1	Infiltration		2.5				

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Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	15	204	11.489	0.439	12.2	0.4966	0.0000	SURCHARGED
120 minute winter	School Area	116	11.705	0.236	33.8	58.0620	0.0000	FLOOD RISK
180 minute winter	17	176	11.507	0.501	18.5	0.5669	0.0000	SURCHARGED
720 minute winter	Swale 2 Inlet 1	690	11.388	0.553	11.8	0.6252	0.0000	OK
720 minute winter	Swale 2 Outlet	705	11.386	0.551	33.9	0.6227	0.0000	SURCHARGED
720 minute winter	Swale 2 Flow Control	705	11.379	0.559	29.2	0.6317	0.0000	SURCHARGED
720 minute winter	Site Outfall	705	10.934	0.143	29.2	0.0000	0.0000	OK
360 minute winter	2	336	12.257	0.495	12.8	0.0000	0.0000	FLOOD RISK
360 minute winter	Pitch Area 2	320	12.365	0.501	51.6	299.3475	1.1245	FLOOD
480 minute winter	7	424	11.747	0.568	24.5	0.0000	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	15	Orifice	17	2.8				
120 minute winter	School Area	School Area Dummy Link	17	18.6	1.066	1.489	0.2393	
180 minute winter	17	2.002	Swale 2 Inlet 1	17.0	0.965	1.359	0.5017	
720 minute winter	Swale 2 Inlet 1	Flow through pond	Swale 2 Outlet	33.9	0.029	0.124	427.9895	
720 minute winter	Swale 2 Outlet	1.009	Swale 2 Flow Control	29.2	0.414	0.417	0.2590	
720 minute winter	Swale 2 Flow Control	1.010	Site Outfall	29.2	0.982	0.893	0.2127	1567.3
360 minute winter	2	1.001	3	12.8	0.749	1.021	0.4556	
360 minute winter	Pitch Area 2	1.000	2	12.8	0.778	1.021	0.3585	
480 minute winter	7	1.005	8	24.3	0.717	0.744	0.2856	

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Appendix G – Flood Map for Planning Service Maps

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Cyfoeth Naturiol Cymru
Natural Resources Wales

)ORRG 0DS IRU 3ODQQLQ
'DUODQG 7UDLQLQJ *URXQGV

/HJHQG

Lavister Brook
Llyndir Hall Hotel
Rossett Park
Chester Rd
B5445
Darland Close
Darland
Broadoaks
Llyndir La
Waverley Crescent
Cromar Crescent
Chapel La
The Limes
Rossett
Fford Holt / Holt Rd
Trevalyn Way
West Way
Alyn Dr
Gun St
Campbell Close
Grosvenor Crescent
Manor La
B5102
Gamford House
Gamford La
Darland La
Rossett Rd

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'DWH

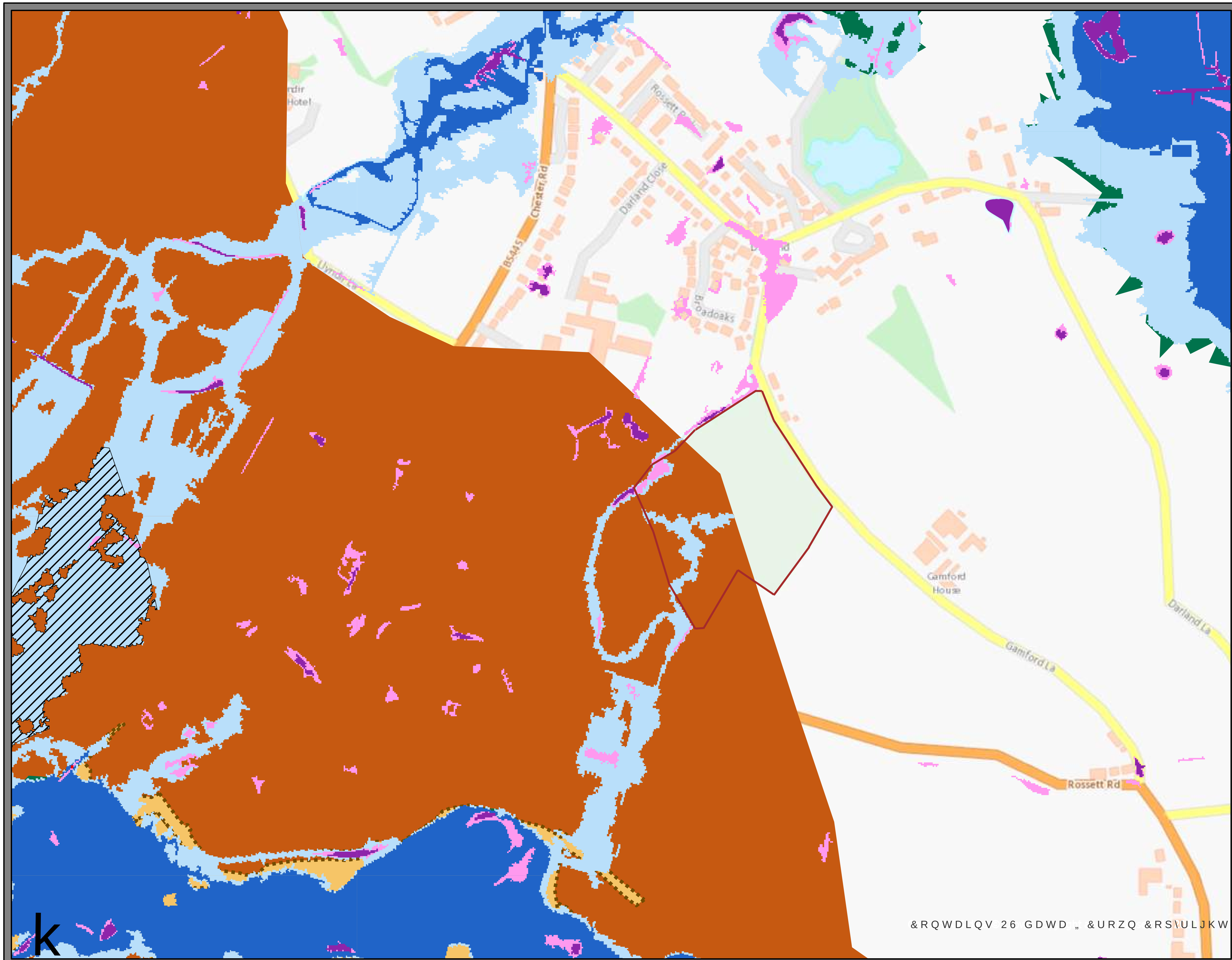
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8 &(WKH (QYLURQPHQW $JHQF\ ‰ ($ DQG *HWPDSSLQJ
/LPLWHG 'HIUD ‰ 0HW 2IILFH DQG '$5' 5LYHUV $JHQF\ ‰
+XWWRQ ,QVWLWXWH ‰ 2UGQDQFH 6XUYH\ ‰ /DQG 3UR

Cyfoeth Naturiol Cymru
Natural Resources Wales

)ORRG 0DS IRU 3ODQQLQJ
'DUODQG 7UDLQLQJ *URXQGV



/HJHQG

)ORRG 'HIHQFH /RFDWLRQV
7$1 ˘ 'HIHQGHG =RQHV
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6HD
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6KRUW WHUP ˘ ˘
0HGLXP WHUP ˘ ˘˘
/RQJ WHUP ˘ ˘
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0DLQ 5LYHUV
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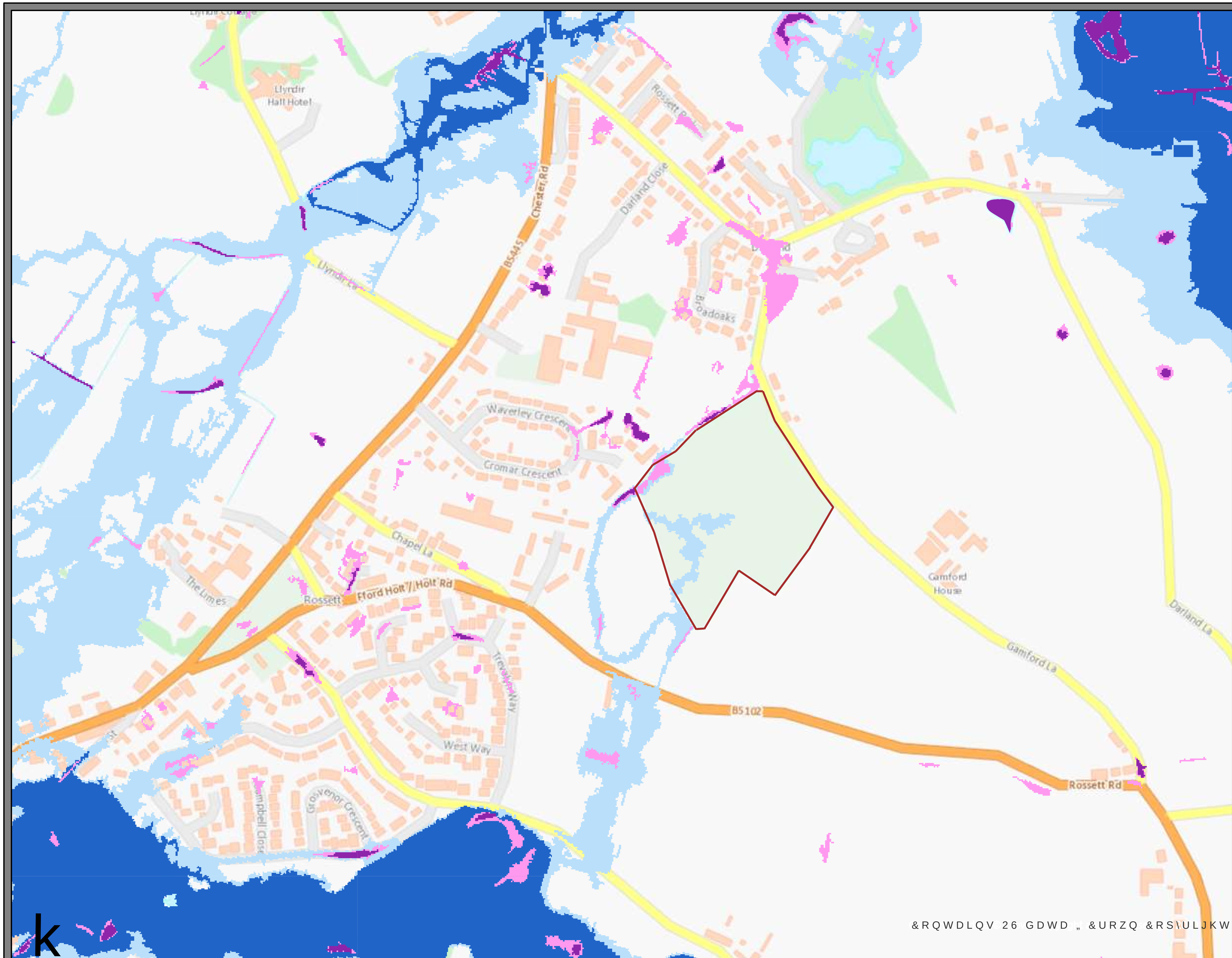
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'DWH˛ ˝ ˘

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'LVFODLPHU
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Cyfoeth Naturiol Cymru
Natural Resources Wales

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/HJHQG

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)ORRG =RQH

)ORRG =RQH

5LYHUV

)ORRG =RQH

)ORRG =RQH

&RQWDLQV 26 GDWD „ &URZQ &RS\ULJKW DQG GDWDEDVH ULJKW

6FDOH DW $

'DWH

k

NP

%ULWLVK 1DWLRQDO *ULG

'LVFODLPHU

KWWSV QDWXUDOUHVRXUFHV ZDOHV IORRGLQJ GLVFODLPHU IRU RXU IORRG DQG FRDVWDO HURVLRQ ULVN PDSV "ODQJ HQ

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+XWWRQ ,QVWLWXWH ‰ 2UGQDQFH 6XUYH\ ‰ /DQG 3UR



Cyfoeth Naturiol Cymru
Natural Resources Wales

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'DUODQG 7UDLQLQJ *URXQGV

/HJHQG
5LYHUV
)ORRG =RQH
)ORRG =RQH

6FDOH DW $ ¸ULJ˛W
'DWH˛ ˝ ˘

NP
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FRDVWDO HURVLRQ ULVN PDSV "ODQJ HQ

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+XWWRQ ,QVWLWXWH ‰ 2UGQDQFH 6XUYH\ ‰ /DQG 3UR

Cyfoeth Naturiol Cymru
Natural Resources Wales

)ORRG 0DS IRU 3ODQQLQ
'DUODQG 7UDLQLQJ *URXQGV

/HJHQG

6XUIDFH :DWHU DQG 6PDOO :DWHUF

)ORRG =RQH

)ORRG =RQH

Llyndir Hall Hotel
Llyndir La
Chester Rd
B5445
Lavister Brook
Rossett Rd
Darland Close
Broadoaks
Waverley Crescent
Cromar Crescent
Chapel La
The Limes
Rossett
Ffordd Holt / Holt Rd
Trevalyn Way
West Way
Alyn Dr
Gun St
Campbell Close
Grosvenor Crescent
Manor La
Gamford House
Gamford La
Darland La
B5102
Rossett Rd

k

&RQWDLQV 26 GDWD „ &URZQ &RS\ULJKW DQG GDWDEDVH ULJKW

6FDOH DW $ ULJKW

'DWH

NP

%ULWLVK 1DWLRQDO *ULG

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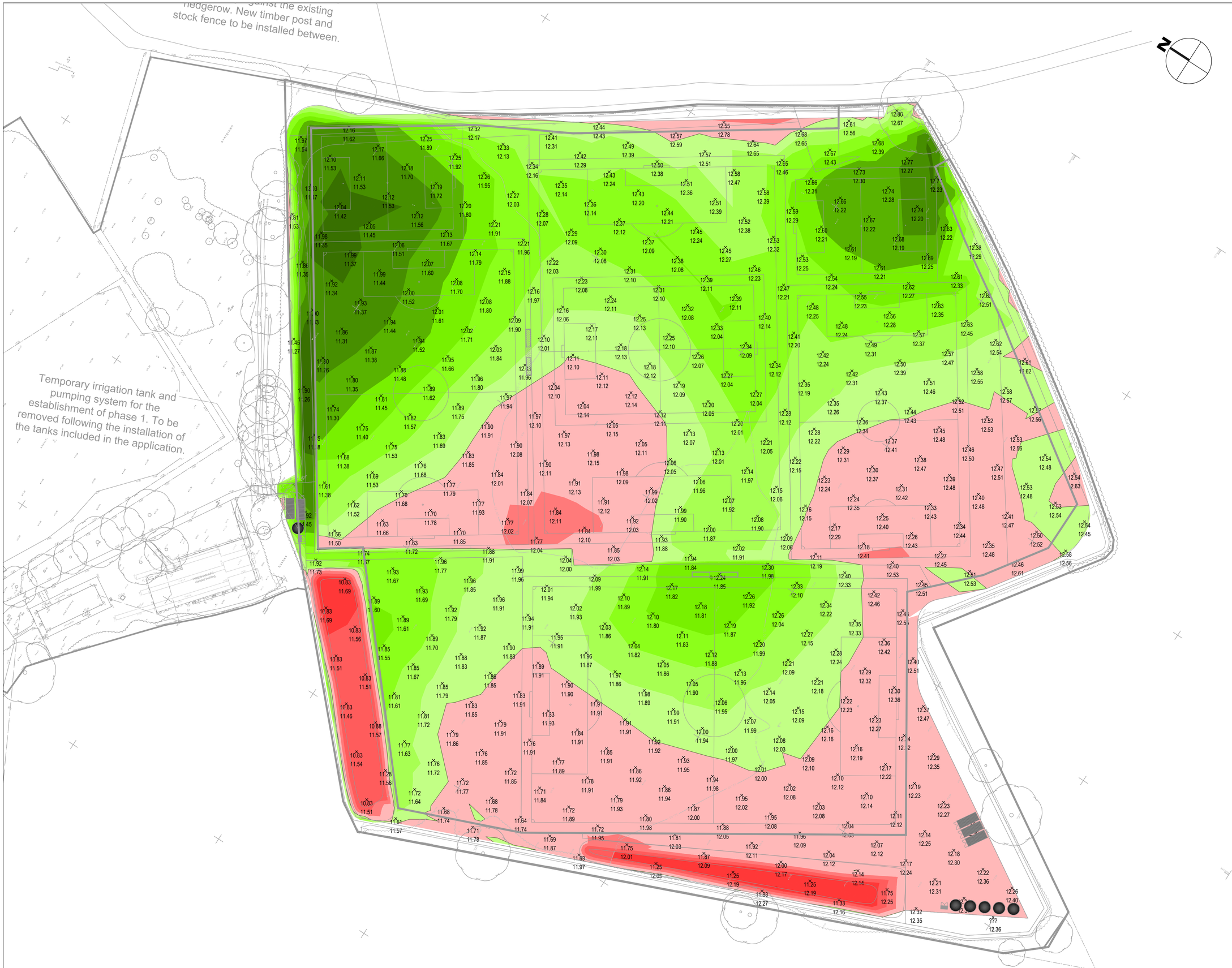
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+XWWRQ ,QVWLWXWH ‰ 2UGQDQFH 6XUYH\ ‰ /DQG 3UF

Appendix H – Cut and Fill; Existing Ground to Proposed

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DO NOT SCALE THIS DRAWING.

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION
COMPLETION OF GPR SURVEY TO IDENTIFY SERVICES.

MAINTENANCE/CLEANING/OPERATION
NO UNUSUAL HAZARDS, TO BE REVIEWED AS DESIGN PROGRESSES.

DECOMMISSIONING/DEMOLITION
NO UNUSUAL HAZARDS, TO BE REVIEWED AS DESIGN PROGRESSES.

KEY

1. ALL DIMENSIONS ARE IN METERS UNLESS STATED OTHERWISE.
2. ALL LEVELS ARE TO ORDNANCE SURVEY DATUM UNLESS STATED OTHERWISE.

Cut/Fill Table

Number	Range From [m]	Range To [m]	Colour
1	-1.044	-1.000	
2	-1.000	-0.750	
3	-0.750	-0.500	
4	-0.500	-0.250	
5	-0.250	0.000	
6	0.000	0.100	
7	0.100	0.200	
8	0.200	0.300	
9	0.300	0.400	
10	0.400	0.500	
11	0.500	0.600	
12	0.600	0.681	

Rev	Description	Date	Iss'd	Rev'd	App'd
P03	FOR INFORMATION	23.10.2025	SBH	NJH	NJH
P02	FOR INFORMATION	16.10.2025	SBH	GW	NJH
P01	FOR INFORMATION	11.07.2025	SBH	AD	NJH

PLANNING

Project Stage

INFORMATION

Status of Drawing

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Web: www.burohappold.com

Client: *WREXHAM AFC LIMITED / MCLAREN CONSTRUCTION LTD.*
Architect: *POPULOUS*
Project: **WREXHAM AFC KOP STAND**
Drg Title: CUT AND FILL EXISTING GROUND TO PROPOSED LEVELS

Job No.: 067784
Scale@A1: 1:500
Drawn/Designed By.: SH
Checked By.: NJH
Approved By.: NJH
Drawing No.: WRX-BHE-DAR-ZZZ-DR-CI-001001
Revision: P03

Nick Hall C:\Users\nhall1\DOCUMENTS\Buro Happold (non-USA)\ALL\1 Project Files\05 Cities - Ireland\3 - Sheets\3_DAR\WRX-BHE-DAR-ZZZ-DR-CI-001001.dwg

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