THE OAKS SITE

Flood Consequence Assessment Report

Wrexham Industrial Estate, Wrexham, LL13 9PW

TOS-BML-XX-XX-RP-C-0500

Tuesday, 20th May 2025

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P03	Drainage details updated	Indira Withana	A. Mavhunga	2025-05-20
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1. Introduction

1.1 Project Background

Barnsley Marshall Ltd was appointed by FI Real Estate Management to provide a Flood Consequences Assessment for the proposed green eco-heritage park and single employment unit with integral offices (for HIAB), new vehicular access, car and HGV parking, servicing and storage, landscaping, heritage and ecology mitigation and ancillary development on 5.86Ha of land off The Oaks Road, Wrexham Industrial Estate, Wrexham, postcode LL13 9PW.

The report provides an assessment of flood risk from various sources on the proposed development based on Government and local authority guidance with regard to flood risk assessments.

The report is based on currently available information and preliminary discussions.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Barnsley Marshall shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Barnsley Marshall.

1.2 Scope of Flood Risk Assessment

The assessment is to be undertaken in accordance with the standing advice and requirements of the Planning Policy Wales – Technical Advice Note - 15 (TAN 15) Development and Flood Risk as outlined in the Communities and Local Government Planning Policy Guidance to the Planning Policy Wales and Sustainable Drainage (SuDS) Statutory Guidance - Wales.

The development site is off The Oaks Road in Wrexham Industrial Estate, and approximately 5.86Ha. Following scrutiny of the Natural Resources Wales Flood Maps it has been identified that the existing site lies within an area classified as Flood Zone A in accordance with TAN15 (Flood Zone 1 in accordance with Environment Agency Flood Maps) indicating that the risk of flooding from rivers and sea is low, with an Annual Exceedance Probability of flooding of less than 0.1%, refer to **Figure 1**. The areas around Redwither Brook are shown to be in Zone B and Zone C2 demonstrating a risk of flood. However, the proposed building is located approximately 100m to the North of Redwither Brook with 10m of maintenance easement where no infrastructures allowed, provided along the brook.

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A Flood Consequences Assessment Report (equivalent to a Flood Risk Assessment Report) is therefore not required as a deliverable for planning submission.

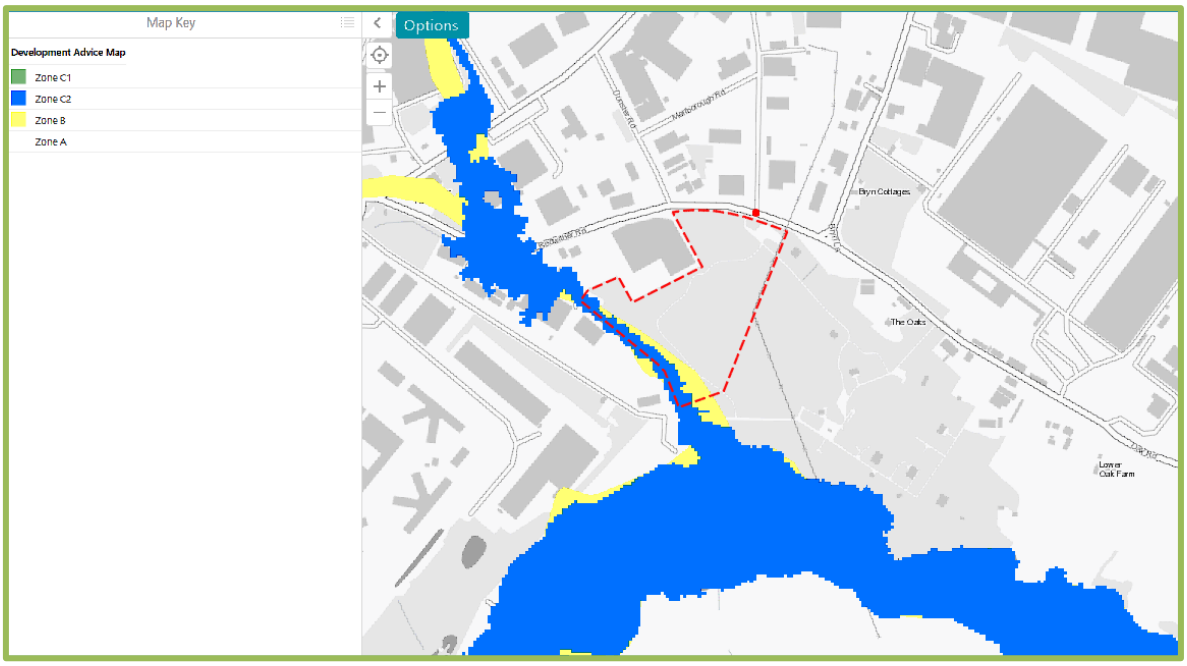


Figure 1: Development Advice Map with Flood Zones

(Source: Natural Resources Wales Flood Maps, Accessed on 2024-04-24, 0900hrs)

The assessment has:

- Investigated all potential risks of current or future flooding to the site
- Considered the impact the development may have elsewhere with regards to flooding risk
- Considered design proposals to mitigate any potential risk of flooding determined to be present
- Determine any constraints to be imposed on the development layout or drainage systems

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2. Existing Site Details

2.1 Location and Description

The proposed development is located off The Oaks Road, Wrexham Industrial Estate, Wrexham, postcode LL13 9PW. The site is approximately 6.0km east of Wrexham city centre and is located in the South East area of Wrexham Industrial Estate. The site is bounded by Redwither Brook along the south western side of the site, which then flows in a south-easterly direction to join River Clywedog which is approximately 0.5km from the site. The site is surrounded by industrial units to the North Western and North Eastern sides and with the greenfield land to the East. It is bounded by Oak Road to the North, as shown in ***Figure 2.***

For a site location plan refer to ***Appendix A.***



Figure 2: Development Site shown with red border

(Source: Google Maps, Accessed on 2024-04-22, 1000hrs)

2.2 Topography

The site slopes down to the southwest from the northeast corner with levels approximately 30.100mAOD to the northeast corner and 25.200mAOD to the southwest corner, refer to ***Appendix B*** for site topography.

The Ordnance Survey extract from Bing Maps below illustrates that the site slopes from the northeast to the southwest over a distance of approximately 200 meters towards Redwither Brook, with an average gradient of 1 in 40 (see **Figure 3**).

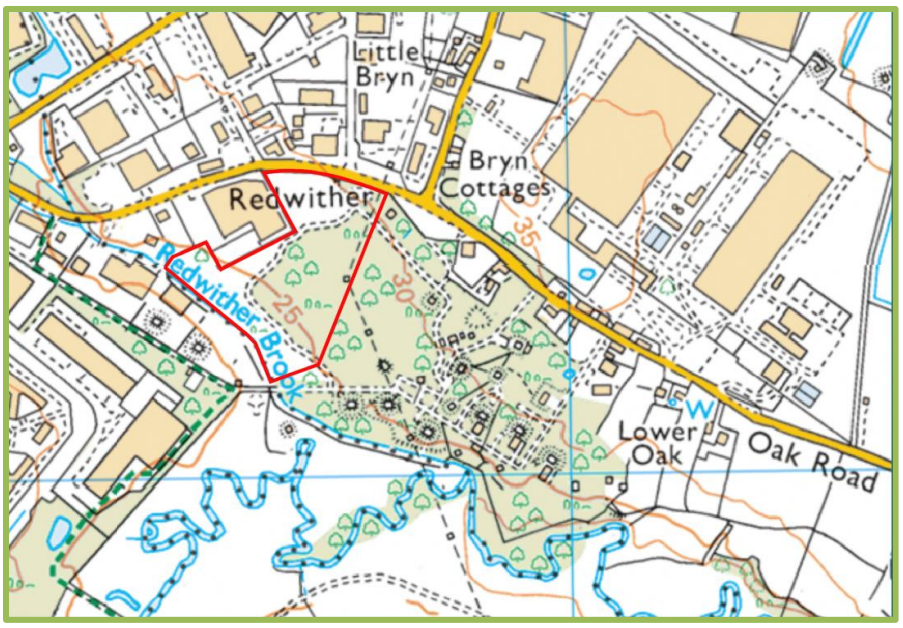


Figure 3: Extract from Ordnance Survey showing formation of existing ground

(Source: Bing Maps, Accessed on 2024-04-23, 1200hrs)

2.3 Existing Watercourses

The site is bounded by existing conveyance ditch/watercourse – Redwither Brook along the south western side of the site, which then flows in a south-easterly direction to join River Clywedog which is approximately 0.5km from the site. (refer to ***Figure 4***).

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Figure 4: Rivers and Ponds within Site Extents

(Source: Google Maps, Accessed on 2024-04-22 1030hrs)

2.4 Existing Public Drainage

There is an existing Welsh Water Combined Water Sewer running from South West to North of the site along the Western border.

Refer to ***Appendix D*** for Site Constraints Drawing.

2.5 Existing Private Drainage

There is no existing private drainage on site. A detailed CCTV & Drainage Survey shall be commissioned to determine whether sewers are on site, and propose remedial works if required to ensure continuity of the sewers during and after construction.

2.6 Site Geology

No Ground Investigation Survey had been carried out at the time this report was compiled. A search on British Geological Survey online showed that there is only one borehole within the site boundary and is listed in ***Table 1***, with their grid references and the ID number used within ***Appendix C***. The borehole location is shown in ***Figure 5***.

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Table 1: Borehole within the site and relevant information

ID	Eastings	Northings	ID within Appendix C
SJ34NE25	338600	349430	S1

A copy of the borehole results is contained in ***Appendix C.***

The soil profile from the borehole indicate that the soil is predominantly clay for depths of 18m from the surface and would not support drainage via infiltration. However, due to the dated nature of the boreholes, BRE Digest 365 Soakaway Tests shall be conducted at a number of locations across the site, and if infiltration is found to be possible, the proposed Pond and swales shall be designed as infiltration features, and the controlled outflows to the existing ditch shall be reduced, or if infiltration is good enough, there shall be no outfall from the pond to the existing ditch.

However, a BRE 365 Soakaway Test carried out at Site 1 – Bridgeway Centre located approximately 500m to the East of The Oaks site demonstrated that the soil infiltration at the site is very low and test has been abandoned due to very low infiltration & ground water ingress into the test pit. A copy of soakaway test result is contained in ***Appendix C*** with the ID **S2.**

Hence, The Oaks site is likely to have the same ground formation which would not support drainage via infiltration.



Figure 5: Historic Borehole Locations

(Source: British Geological Survey, Accessed on 2024-04-22, 1130hrs)

3. Policy and Guidance

3.1 Planning Policy Wales (PWW), Welsh Assembly Government (WAG), March 2002

Land use planning policies of the Welsh Assembly Government are set out in Planning Policy Wales (PPW). The main purpose of PPW is to reconcile the needs of development and conservation, securing economy, efficiency, and amenity in the use of land, protecting natural resources and the historic environment, thereby contributing to sustainable development.

In relation to flood risk, PPW aims to minimise the risks posed by, or to, development on, or adjacent to land liable to flooding. PPW recognises that the impacts of future climate change effects should be considered when planning development in flood prone coastal areas and floodplains. The likely impact to frequency and severity of floods expected during the lifetime of development must be addressed. More detailed guidance relating to development and flood risk is provided in Technical Advice Note 15: Development and Flood Risk (TAN15).

3.2 Flood Zone Classification

TAN 15 Figure 1 describes the composition and use of flood zones to control and manage development. The figure enables identification of the amount of effort required to conduct flood risk assessment based on the flood zone in which the development falls. ***Table 2*** is a copy of TAN 15 Figure 1.

The 5.86Ha development site is off The Oaks Road, Wrexham Industrial Estate, in Wrexham with industrial units to the North Western and North Eastern sides and greenfield land to the East and South. Following scrutiny of the Natural Resources Wales Flood Maps it has been identified that the existing site lies within an area classified as Flood Zone A or B in accordance with TAN15 (Flood Zone 1 in accordance with Environment Agency Flood Maps) indicating that the risk of flooding from rivers and sea is low, with an Annual Exceedance Probability of flooding of less than 0.1%. The areas around Redwither Brook are shown to be in Zone B and Zone C2 demonstrating a risk of flood. However, the proposed building is located approximately 100m to the North of Redwither Brook with 10m of maintenance easement where no infrastructures allowed, provided along the brook.

Therefore, in accordance with TAN15, a Flood Consequences Assessment (Flood Risk Assessment) is not mandatory for this proposed development, but has been carried out as part of due diligence.

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Table 2: Flood Zone Classification

Description of Zone		Use within the precautionary framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal).	C	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences.
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

(Source: TAN 15 Figure 1)

3.3 Technical Advice Note 15: Development and Flood Risk (TAN15), Welsh Assembly Government (WAG), July 2004

The guidance in TAN 15 aims to direct new development away from areas of high flood risk. Where development in these areas can be justified, the guidance states that the risk of and consequences of flooding should be managed to an acceptable level.

TAN 15 guidance requires the assessment of consequence based on the consideration of whether flooding would be acceptable for the particular type of development under consideration. The justification test, as outlined in Section 6 of TAN 15, indicates that development can be justified if it can be demonstrated that:

- Its location in Zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement, or,

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- Its location in Zone C is necessary to contribute to key employment objectives supported by local authority and other key partners, to sustain an existing settlement or region; and,
- It concurs with the aims of PPW and meets the definition of previously developed land; and
- The potential consequences of a flooding event for the particular type of development have been considered and in terms of the criteria contained in Section 5 and 7 and Appendix 1 (TAN15) found to be acceptable.

TAN 15 states that any new development on the floodplain will generally result in additional flood risk. The guidance indicates that the main criteria for determining whether such a development is acceptable will depend on whether additional flood risk can be effectively managed. The guidance states that the objectives of the Flood Consequence Assessment are to develop a full appraisal of:

- The consequences of flooding on development;
- The consequences (i.e. overall impacts) of the development on flood risk elsewhere within the catchment for a range of potential flooding scenarios up to that flood having a probability of 0.1% and,
- The assessment can be used to establish whether appropriate mitigation measures can be incorporated within the design of the development to ensure that the development minimises risk to life, damage to property and disruption to people living and working on the site or elsewhere in the floodplain.

3.4 Flood Risk Vulnerability Classification

In accordance with TAN 15, particular flooding consequences may not be acceptable for particular types of development. For example, allowing residential development in areas which are subject to high risks of flooding can result in a traumatic impact on people's lives. The precautionary framework identifies the vulnerability of different land uses to flooding, and for this purpose, development has been subdivided into three categories in Figure 2. ***Table 3*** is a copy of TAN 15 Figure 2.

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Table 3: Flood Vulnerability Classification

Development Category	Types
Emergency Services	Hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood.
Highly vulnerable development	All residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development (e.g. power stations, chemical plants, incinerators), and waste disposal sites.
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites.

(Source: TAN 15 Figure 2)

3.5 Justifying the Development Location

In accordance with TAN 15, new developments should be directed away from Zone C and towards suitable land in Zone A, then towards Zone B. Table 4 outlines the planning requirements for developments within each zone. Specifically, Table 4 details that Zone A and Zone B developments do not requirement a Flood Consequence Assessment.

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Table 4: Development Acceptability Criteria

DAM	Development Type (Section 5)	Planning Requirements (Section 4)	Acceptability Criteria (Section 7 & Appendix 1)	Development Advice (Section 5, 6, 7 & Appendix 1)
A	Emergency services Highly vulnerable development Less vulnerable development Other	• Justification test not applicable • Refer to surface water requirements	• No increase in flooding elsewhere	No constraints relating to river or coastal flooding, other than to avoid increasing risk elsewhere.
B	Emergency services	• If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further. • Refer to surface water requirements	• Acceptable consequences for nature of use • Occupiers aware of flood risk • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures • Flood resistant design • No increase in flooding elsewhere	Generally suitable for most forms of development. Assessments, where required, are unlikely to identify consequences that cannot be overcome or managed to an acceptable level. It is unlikely, therefore, that these would result in a refusal of planning consent on the grounds of flooding.
	Highly vulnerable development		• Acceptable consequences for nature of use • Occupiers aware of flood risk • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures • No increase in flooding elsewhere	
	Less vulnerable development		• Occupiers aware of flood risk • No increase in flooding elsewhere	
	Other	• Refer to surface water requirements	• No increase in flooding elsewhere	
C1	Emergency services Highly vulnerable development Less vulnerable development	• Application of justification test (section 6) , including acceptability of consequences (section 7 and appendix 1) • Refer to surface water requirements	• Acceptable consequences for nature of use • Flood defences adequate • Agreement for construction and maintenance costs secured • Occupiers aware of flood risk • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures • Flood resistant design • No increase in flooding elsewhere	Plan allocations and applications for all development can only proceed subject to justification in accordance with section 6 and acceptability of consequences in accordance with section 7 and Appendix 1.
	Other	• Application of acceptability of consequences (section 7 and appendix 1) • Refer to surface water requirements	• Acceptable consequences for nature of use • Occupiers aware of flood risk • Desirable if effective flood warning and evacuation routes/procedure provided depending on nature of proposal • No increase in flooding elsewhere	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix 1.

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DAM	Development Type (Section 5)	Planning Requirements (Section 4)	Acceptability Criteria (Section 7 & Appendix 1)	Development Advice (Section 5, 6, 7 & Appendix 1)
C2	Emergency services Highly vulnerable development	The flooding consequences associated with Emergency Services and highly vulnerable development are not considered to be acceptable. Plan allocations should not be made for such development and planning applications not proposed.		
	Less vulnerable development	• Application of justification test (section 6) , including acceptability of consequences (section 7 and appendix 1) • Refer to surface water requirements	• Acceptable consequences for nature of use • Flood defences adequate • Agreement for construction and maintenance costs secured • Occupiers aware of flood risk • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures	Plan allocations or applications for less vulnerable development can only proceed subject to justification in accordance with section 6 and acceptability of consequences in accordance with section 7 and Appendix 1.
	Other	• Application of acceptability of consequences (section 7 and appendix 1) • Refer to surface water requirements	• Flood resistant design • No increase in flooding elsewhere • Acceptable consequences for nature of use • Occupiers aware of flood risk • Effective flood warning provided • No increase in flooding elsewhere	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix

(Source: TAN15 – Development and Flood Risk, accessed 2022/07/26 at 1720 hrs)

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4. Development and Flood Risk

4.1 Proposed Development Vulnerability Classification

The 5.86Ha development site is off The Oaks Road, Wrexham Industrial Estate, Wrexham with industrial units to the North Western and North Eastern sides and greenfield land to the East and South. Following scrutiny of the Natural Resources Wales Flood Maps it has been identified that the existing site lies within an area classified as Flood Zone A or B in accordance with TAN15 (Flood Zone 1 in accordance with Environment Agency Flood Maps) indicating that the risk of flooding from rivers and sea is low, with an Annual Exceedance Probability of flooding of less than 0.1%. The areas around Redwither Brook are shown to be in Zone B and Zone C2 demonstrating a risk of flood. However, the proposed building is located approximately 100m to the North of Redwither Brook with 10m of maintenance easement where no infrastructures allowed, provided along the brook. The site is however

In accordance with TAN 15 Figure 2 (***Table 3*** in this report), The Oaks, Wrexham is a ***Less Vulnerable Development.***

In accordance with TAN 15 Chapter 9: *Summary of Policy Requirements* (***refer to section 3.5****)*, a Less Vulnerable Development in Flood Zone A is ***acceptable with no constraints*** relating to river or coastal flooding, other than to avoid increasing risk elsewhere, and the Justification Test is not applicable.

The following sections investigate the probability of flooding from various sources as a precautionary measure.

4.2 Flood Risk from Rivers and the Sea

The Natural Resources Wales Long Term Flood Map provides basic flood mapping data as a general guide to whether a site is at risk of flooding from various sources including rivers and seas for Flood Zoning classification.

This mapping indicates that the site is wholly located within an area with an undefended risk of flooding from rivers and the sea of less than 0.1% (or the 1 in 1000-year event), classified as Flood Zone 1 (Zone A in accordance to TAN 15). The development site is therefore at ***Very Low Risk*** of flooding from rivers and the sea.

Figure 6 shows the extents of the risk of river flooding from the River Clywedog.

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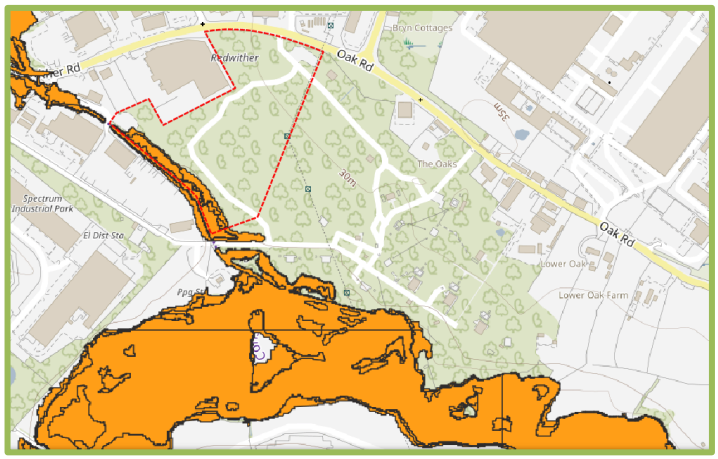


Figure 6: Flood Risk from River Clywedog – Flood Extents

(Source: https://datamap.gov.wales/maps/new?layer=inspire-nrw:FloodRiskAssessmentWales#/, *Accessed on 2024-04-24, 1430hrs)*

4.3 Historic Flooding

There is no evidence or data to report any historic flooding within the site bounds. The site is bounded by existing Redwither Brook along the South Western side of the site, which then flows in a South-Easterly direction to River Clywedog approximately 0.5km from the site. The site is generally flat between North West to South East but falls approximately 5.0m from North East to South West over a distance of 200m towards Redwither Brook, giving an average gradient of 1 in 40.

4.4 Flood Defences

There are no formal flood defences recorded on the Natural Resources Wales Flood Map in the immediate vicinity of the site. The site is also not indicated as being used for flood storage, therefore, the flood risk to the development from failed or breached flood defences is considered to be ***Low Risk***.

4.5 Flooding induced by Climate Change

The nearest Flood Zone C (Flood Zone 2 in accordance with Natural Resources Wales Long Term Flood Map) is approximately 50m to the south of the site and is associated with the maximum flood extents of Redwither Brook. The ground levels at the flood extents caused by Redwither Brook (23.000mAOD) are approximately 3.5m lower than southwest most tip of the site which has an existing level of

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26.5mAOD. The 3.5m level buffer should provide significant flood resilience of the site against flooding effects due to climate change. Flood risk to the development due to climate change effects is therefore considered to be ***Low Risk***.

4.6 Flooding from Groundwater

There is only one historical borehole within the site on British Geological Survey maps. Both boreholes indicate a no groundwater to a depth of 18mbgl. The soil stratum shows clays down to a depth of 18mbgl without any detail on the underlying soil, refer to ***section 2.6*** of this report. This soil stratum, together with the existing ground slope towards the South West, implies that any groundwater will be prevented from rising to the surface by the clay layer and forced to flow below ground towards the existing Redwither Brook and onwards to the river Clywedog. It is therefore unlikely that any seasonal rise in water table would result in surface flooding of the site, therefore the flood risk due to groundwater is ***Low***.

4.7 Flooding from Adopted Sewers

There is a recorded adopted Welsh Water Combined Sewer running from the North to South across the western boundary of the site. A Developer Enquiry has already been made to Welsh Water to acquire further information about the sewer line. However, given the fact that the sewer flows from North to South following the existing ground slope, flood risk due to the adopted sewer can be considered **Low**.

4.8 Flooding from Private Drainage

There is no existing private drainage on site. A detailed CCTV & Drainage Survey shall be commissioned to determine whether sewers are on site, and propose remedial works if required to ensure continuity of the sewers during and after construction.

4.9 Flooding from Surface Water and Small Watercourses

The Natural Resources Wales Flood Map was consulted to check the risk of site flooding from surface water and small watercourses; an extract from the map is presented in ***Figure 7***. The figure indicates that after severe or prolonged storms especially during the wet season, runoff turns to accumulate within the conveyance ditches that run along the western, northern and eastern edges of the site, with the ditches running full for short periods, while the site may experience small amounts of flooding around the existing pools of surface water. Nevertheless, all finished floor

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levels shall be at ***least 150mm above surrounding ground levels.*** Flood risk to the development due to surface water is therefore considered to be ***Low Risk***.

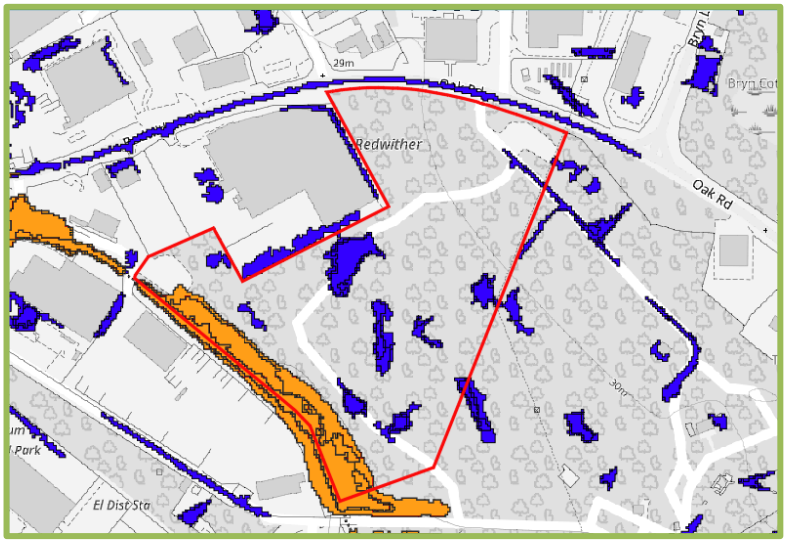


Figure 7: Flood Risk from Surface Water – Flood Extents

(Source: https://datamap.gov.wales/maps/new?layer=inspire-nrw:FloodRiskAssessmentWales#/*, Accessed on 2024-04-24, 1430hrs)*

4.10 Flooding from Reservoirs, Canals and Artificial Sources

The Natural Resources Wales Long Term Flood Map was consulted to check the risk of site flooding from reservoirs and it was found to be safe from such flooding effects since the nearest reservoir, Marchweil Reservoir is located almost 5km to south west of The Oaks Site. The development site is therefore at ***Very Low Risk*** of flooding from reservoirs and canals.

4.11 Overall Flood Risk

In accordance with TAN 15 Chapter 9: *Summary of Policy Requirements*, a Less Vulnerable Development in Flood Zone A is ***acceptable*** with *'no constraints relating to river or coastal flooding, other than to avoid increasing risk elsewhere'*, and the Justification Test is not applicable.

The site is therefore suitable for the type of development proposed.

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5. Drainage Strategy

5.1 Recommended Surface Water Drainage Strategy

The proposed development has a plan area of 5.86Ha, with approximately 3.65Ha being impermeable, and 2.15Ha being reserved for an ecological zone. The IH124 method was used to estimate the greenfield runoff rates from the site since the site is less than 200Ha. *Because the site is also less than 50ha, the ICP SUDS tool in Micro-drainage Source Control module was used to calculate the greenfield runoff rates*. The tool uses the IH124 approach to calculate the greenfield runoff for 50ha, then linearly interpolate to get the flows for smaller catchments. The 1-year, 30-year, and 100-year Greenfield runoff rates were found to be 15.6 l/s, 36.7 l/s, and 48.2 l/s respectively, refer to ***Appendix E*.**

Qbar is 18.7 l/s for both rural and urban.

It is recommended that, to prevent increased flows post-development and offer an improvement to existing downstream flash flooding, runoff from the development shall be controlled to 15.0 l/s maximum for all storm events up to and including the 100-year + 40% CC storm event. It is to be noted that, the runoff rate is limited to 15.0 l/s which is less than calculated 1-year Greenfield Runoff Rate of the site.

Details of proposed SuDS-based drainage layout for the development are given in ***TOS-BML-XX-XX-RP-C-0502 Drainage Strategy Report***.

5.2 Exceedance Flows

Exceedance flows are those flows generated by flooding of part or all of the drainage scheme due to storm events in excess of the design storm event [100-year + 40% CC storm event].

Exceedance flood water will find its way to existing ditch running along South Western to South Eastern edges of the site.

Refer to ***Appendix F*** for Flood Flow Analysis Plan Layout.

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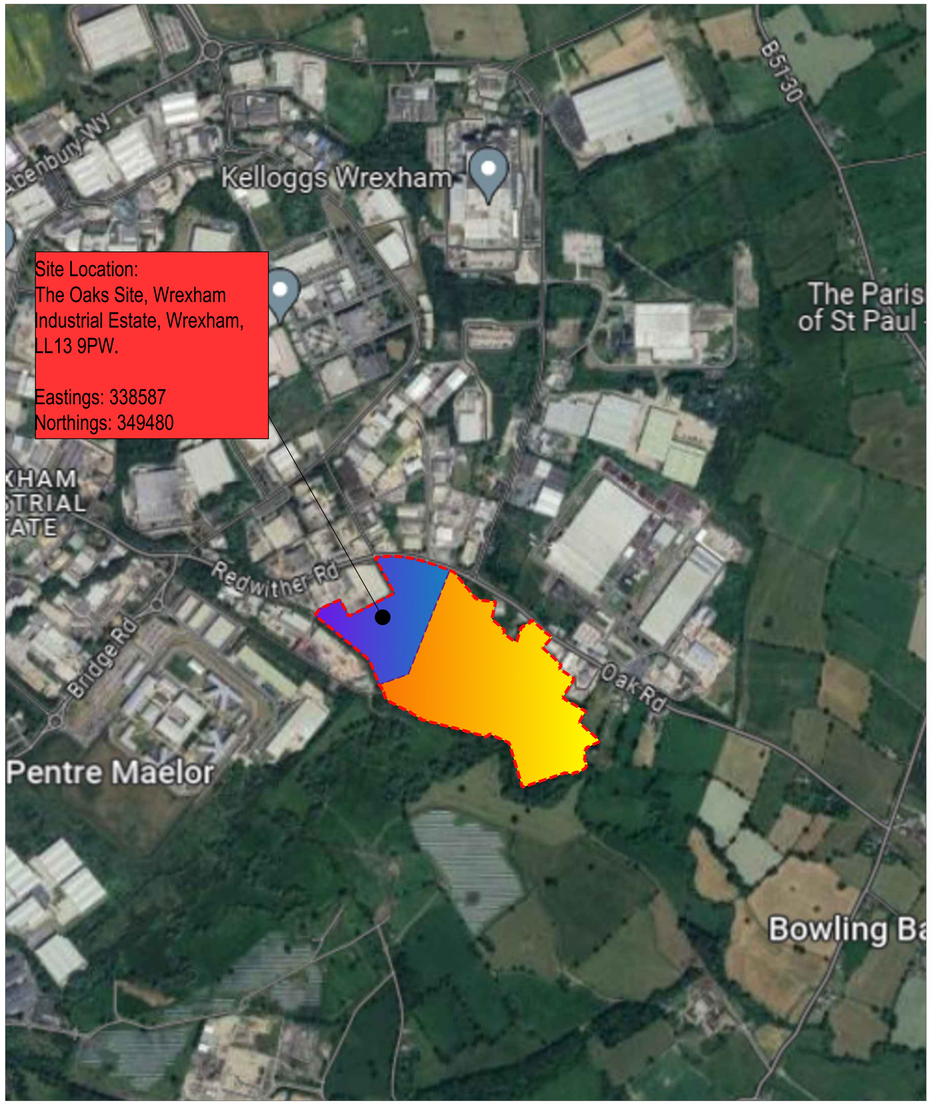
APPENDICES

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Appendix A

Site Location Plan

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KEY:

Scheme Location

Site Extents not covered by proposed works

Site (Private Ownership) Boundary

N
W E
S

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing:

General Notes:

1. Do not scale from this drawing.
2. All dimensions are in millimetres (mm), all levels in metres (m) unless noted otherwise.
3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.
5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.
7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

Rev	By / Chk'd	Date	Description
P01	IW/AM	06/03/2024	First Issue for Construction

PRELIMINARY DRAWING
This drawing is not to be used for construction

Client
FI REAL ESTATE MANAGEMENT

BarnsleyMarshall Limited
4&5 Prior Wharf
Harris Business Park, Hanbury Rd
Stoke Prior, Bromsgrove
B604FG
Tel: 01905 330550
Email: design@barnsleymarshall.co.uk
Web: www.barnsleymarshall.co.uk

BarnsleyMarshall

Project
The Oaks Site
Wrexham Industrial Estate

Drawing
Scheme Location

By ?? Date 00/00/0000

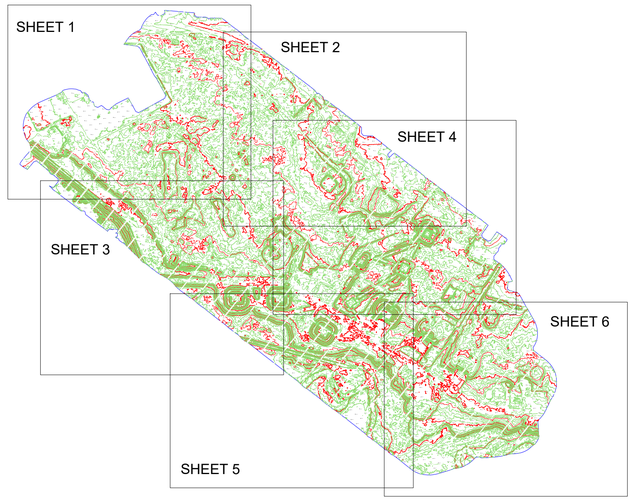
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Revision P01
BML Job No. 1000-06
Status -
Drawing Scale at A1: -
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Appendix B

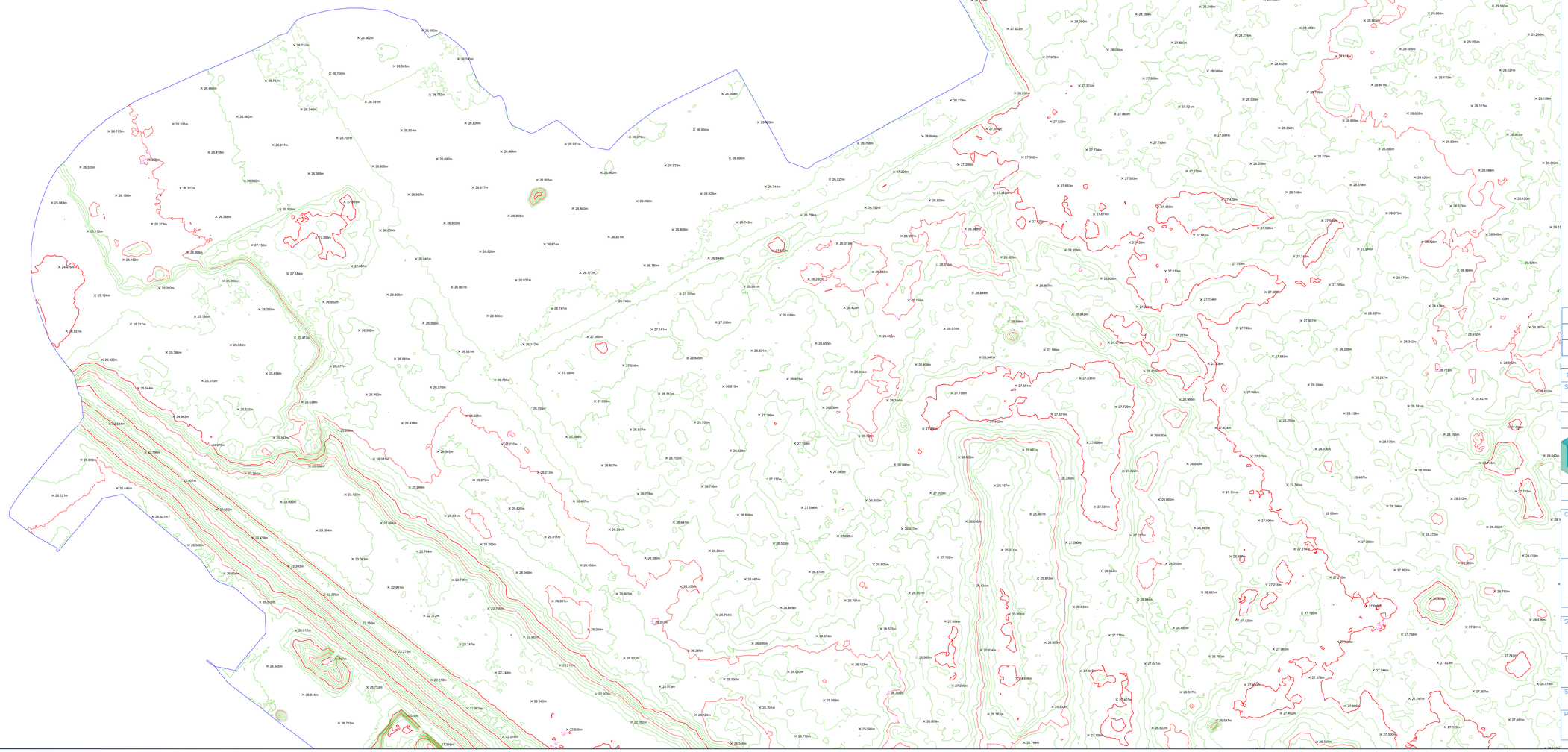
Site Topography

© Barnsley Marshall Limited 2025

SHEET KEY nts



0 25 50 Meters



Notes:

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4. Any discrepancies between drawings of different scales, and between drawings and specification where appropriate to be notified to gwscivils for decision.
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REV:	DESCRIPTION:	BY:	DATE:

STATUS: INFORMATION ONLY

FI CONSTRUCTION

CLIENT: FI Construction Limited
Botany Brow
Chorley
Lancashire, PR69AF

SITE: THE OAKES

TITLE: AS-BUILT DRONE SURVEY 21.02.2025
SHEET 1 of 6

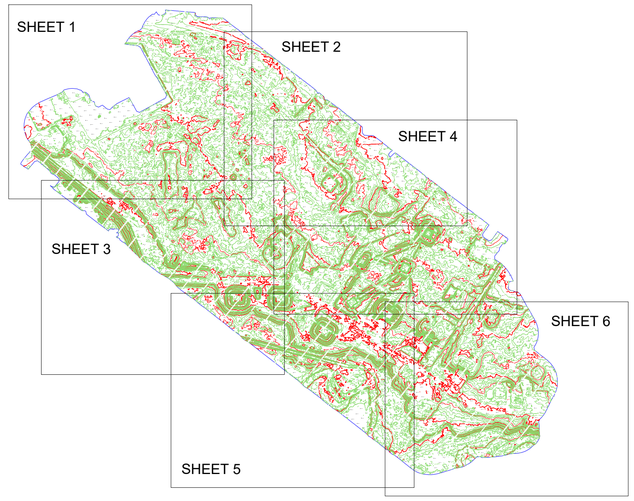
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:500	25/02/2025	CD	TD

PROJECT NO:	DRAWING NO:	REVISION:
00301	C4D/00301/100	

0 25 50

Meters

SHEET KEY nts



N

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REV:	DESCRIPTION:	BY:	DATE:

STATUS: INFORMATION ONLY

FI CONSTRUCTION

CLIENT: FI Construction Limited
Botany Brow
Chorley
Lancashire, PR69AF

SITE: THE OAKES

TITLE: AS-BUILT DRONE SURVEY 21.02.2025
SHEET 2 of 6

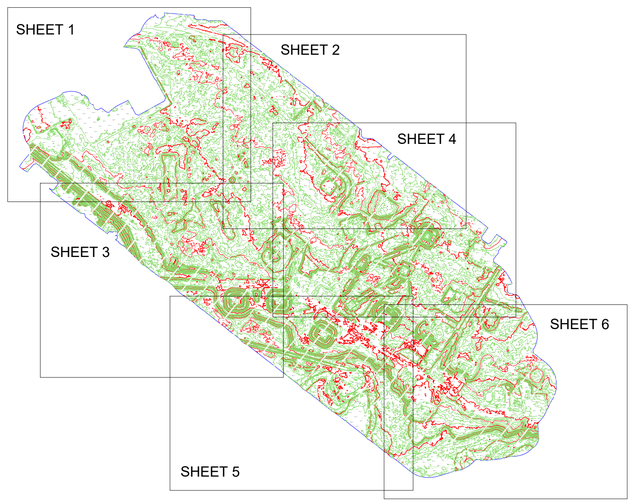
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1:500	25/02/2025	CD	TD

PROJECT NO:	DRAWING NO:	REVISION:
00301	C4D/00301/101	

Notes:

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SHEET KEY nts



0 25 50 Meters

REV:	DESCRIPTION:	BY:	DATE:

STATUS: INFORMATION ONLY

FI CONSTRUCTION

CLIENT:
FI Construction Limited
Botany Brow
Chorley
Lancashire, PR69AF

SITE: THE OAKES

TITLE: AS-BUILT DRONE SURVEY 21.02.2025
SHEET 3 of 6

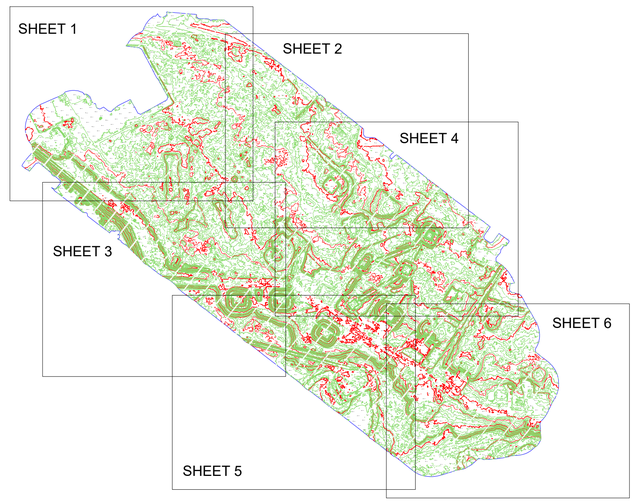
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:500	25/02/2025	CD	TD

PROJECT NO:	DRAWING NO:	REVISION:
00301	C4D/00301/102	

0 25 50
Meters

N

SHEET KEY nts



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REV:	DESCRIPTION:	BY:	DATE:
STATUS:	INFORMATION ONLY		

FI CONSTRUCTION

CLIENT: FI Construction Limited
Botany Brow
Chorley
Lancashire, PR69AF

SITE: THE OAKES

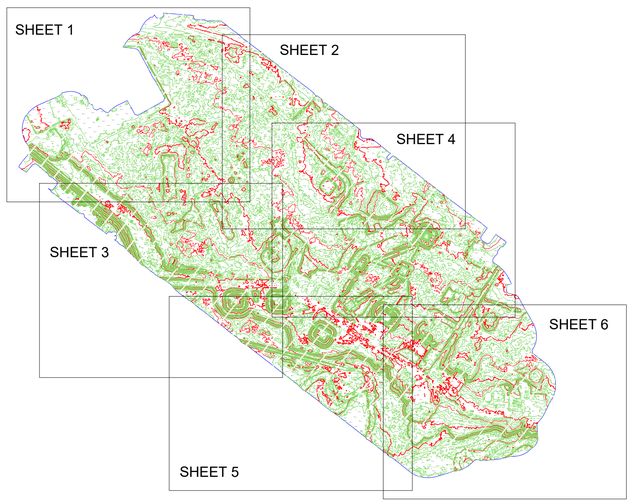
TITLE: AS-BUILT DRONE SURVEY 21.02.2025
SHEET 4 of 6

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:500	25/02/2025	CD	TD
PROJECT NO:	DRAWING NO:		REVISION:
00301	C4D/00301/103		

Notes:

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SHEET KEY nts



0 25 50 Meters

REV:	DESCRIPTION:	BY:	DATE:
STATUS:	INFORMATION ONLY		

FI CONSTRUCTION

CLIENT:
FI Construction Limited
Botany Brow
Chorley
Lancashire, PR69AF

SITE: THE OAKES

TITLE: AS-BUILT DRONE SURVEY 21.02.2025
SHEET 5 of 6

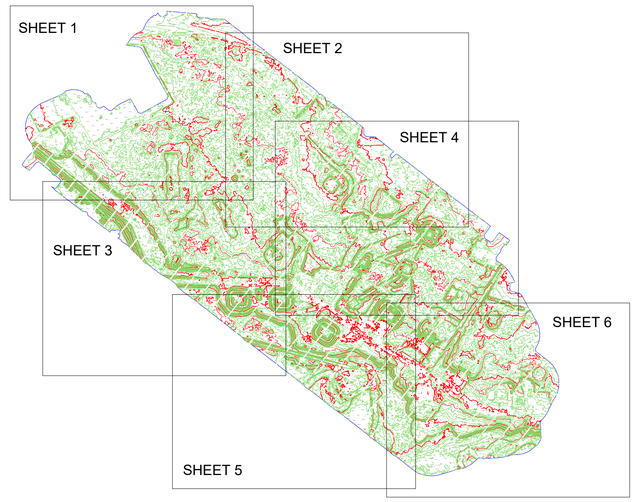
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
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PROJECT NO:	DRAWING NO:		REVISION:
00301	C4D/00301/104		

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0 25 50 Meters

SHEET KEY nts



REV:	DESCRIPTION:	BY:	DATE:

STATUS: INFORMATION ONLY

FI CONSTRUCTION

CLIENT: FI Construction Limited
Botany Brow
Chorley
Lancashire, PR69AF

SITE: THE OAKES

TITLE: AS-BUILT DRONE SURVEY 21.02.2025
SHEET 6 of 6

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:500	25/02/2025	CD	TD

PROJECT NO:	DRAWING NO:	REVISION:
00301	C4D/00301/105	

Appendix C

Site Geology

S1

© Barnsley Marshall Limited 2025

British Geological Survey

SJ 34 NE 25 **3860 4943** **Redwither, Abenbury** **Block C**

Surface level +28.8 m
Water not encountered
Shell and auger 152 mm diameter
September 1977

Waste 18.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.0	1.0
Boulder Clay	Clay, silty, dark brown, soft to 6 m stiff below; scattered stones	17.0+	18.0

British Geological Survey

BGS ID: 153131 : BGS Reference: SJ34NE25
British National Grid (27700) : 338600,349430

Institute of Geological Sciences
IMAU Sand and Gravel Borehole Log Form

SJ 34 NE/25

SJ 34 NE 25	3860 4943	REDWITHER ABENBURY	

Surface level	+28·8 m
Water not struck	
Shell and auger 152 mm diameter	
September 1977	

Waste	18·0+	

LOG

Geological Classification	Lithology	Thickness m	Thickness ft	Depth m	Depth ft
	Made ground	1·0		1·0	
Boulder clay	Clay, soft, becoming stiff at 6m, dark brown, rare stones, silty.	17·0+		18·0	

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 153131 : BGS Reference: SJ34NE25
British National Grid (27700) : 338600,349430

...strial Minerals Assessment Unit

BOREHOLE RECORD SHEET

Registration Number

6 in.quarter sheet | Accn. No. | Suffix

SJ34NE | | 25 | |

Temp No. SJ 34 NE 7

Borehole diam. 152 mm

Water struck N/S

Remarks:

Classification	Thickness (m)	Lithology
~~Overburden~~ Waste	18·0	MADE GROUND

Lithostrat. Code	Description	Thickn (m)	Depth to base(m)	Sample No.
SOIL	MADE GROUND — SOFT MOIST CLAY	1·0	1·0	
GLLD	SILTY CLAY. GREY/BROWN. VERY SOFT. NO PEBBLES OR LAMINATIONS	5·0	6·0	
GLLD	CLAY BROWN V. STIFF. ~~NO~~ LAMS. NO PEBBLES. LAKE CLAY. HOMOGENEOUS. TORVISOE VEINING PRESENT	2·0	8·0	WSSG 7·0
GLLD	CLAY BECOMING STIFFER WITH GREEN SILTY LAMS OCCASIONAL BUNTER SSTN PEBBLE.	4·0	12·0	
GLLD	CLAY BECOMING SOFTER AND SILTIER DARK CHOCOLATE BROWN. NO LAMS. OR PEBBLES	6·0	18·0	
	T.D. 18m 14/9/71			

Contact BGS: ngdc@bgs.ac.uk

Appendix C

Site Geology

S2

© Barnsley Marshall Limited 2025

SP ASSOCIATES
SOAKAWAY TEST

1 Market Place, Warwick, CV34 4SA
Tel: 01926 494271

Site: Bridgeway Centre, Wrexham Industrial Estate
Job No: S1802
Test Date: 12/01/2023 Report date: 19/01/2023
Test Method: BRE 365 (2015)

Trial Pit Number: ST2
Depth: 1.8m, Length 1.0m Width 0.4m

Start Water Depth for Analysis – Datum (mbgl): **0.96**
75% Effective Depth (mbgl): - Elapsed Time (Mins):
50% Effective Depth (mbgl): -
25% Effective Depth (mbgl): - Elapsed Time (Mins):
Base of Soakage Zone (mbgl): **1.8**

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m 2):
Time for outflow between 75% and 25% effective depth (mins):

Elapsed Time (minutes)	Water Depth (m below datum)	Elapsed Time (minutes)	Water Depth (m below datum)
0	0.96	90	0.94
1	0.96	100	0.94
2	0.96	110	0.94
3	0.96	120	0.93
4	0.96	130	0.93
5	0.96	140	0.93
6	0.96	150	0.93
7	0.96	160	0.93
8	0.96	170	0.93
9	0.96	180	0.92
10	0.96	190	0.92
15	0.96	200	0.92
20	0.96	210	0.92
25	0.95	220	0.91
30	0.95	230	0.91
40	0.95	240	0.91
50	0.95	250	-
60	0.95	260	-
70	0.94	270	-
80	0.94	280	-

Soil Infiltration Rate (m/s): Test abandoned due to very low rate of infiltration and groundwater ingress into test pit.

SP ASSOCIATES
SOAKAWAY TEST

1 Market Place, Warwick, CV34 4SA
Tel: 01926 494271

Site: Bridgeway Centre, Wrexham Industrial Estate
Job No: S1802
Test Date: 18/11/2022 Report date: 15/11/22
Test Method: BRE 365 (2007)

Trial Pit Number: ST1
Depth: 1.7m, Length 1.1m Width 0.4m

Start Water Depth for Analysis – Datum (mbgl): **0.98**
75% Effective Depth (mbgl): -
50% Effective Depth (mbgl): -
25% Effective Depth (mbgl): -
Base of Soakage Zone (mbgl): **1.7**

Elapsed Time (Mins):
Elapsed Time (Mins):

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m 2):
Time for outflow between 75% and 25% effective depth (mins):

Elapsed Time (minutes)	Water Depth (m below datum)	Elapsed Time (minutes)	Water Depth (m below datum)
0	0.98	90	0.98
1	0.98	100	0.98
2	0.98	110	0.98
3	0.98	120	0.97
4	0.98	130	0.97
5	0.98	140	0.97
6	0.98	150	0.97
7	0.98	160	0.96
8	0.98	170	0.96
9	0.98	180	0.96
10	0.98	190	0.96
15	0.98	200	0.95
20	0.98	210	0.95
25	0.98	220	0.95
30	0.98	230	0.95
40	0.98	240	0.95
50	0.98	250	-
60	0.98	260	-
70	0.98	270	-
80	0.98	280	-

Soil Infiltration Rate (m/s): Test abandoned due to very low rate of infiltration and groundwater ingress into test pit.

Appendix D

Site Constraints

© Barnsley Marshall Limited 2025

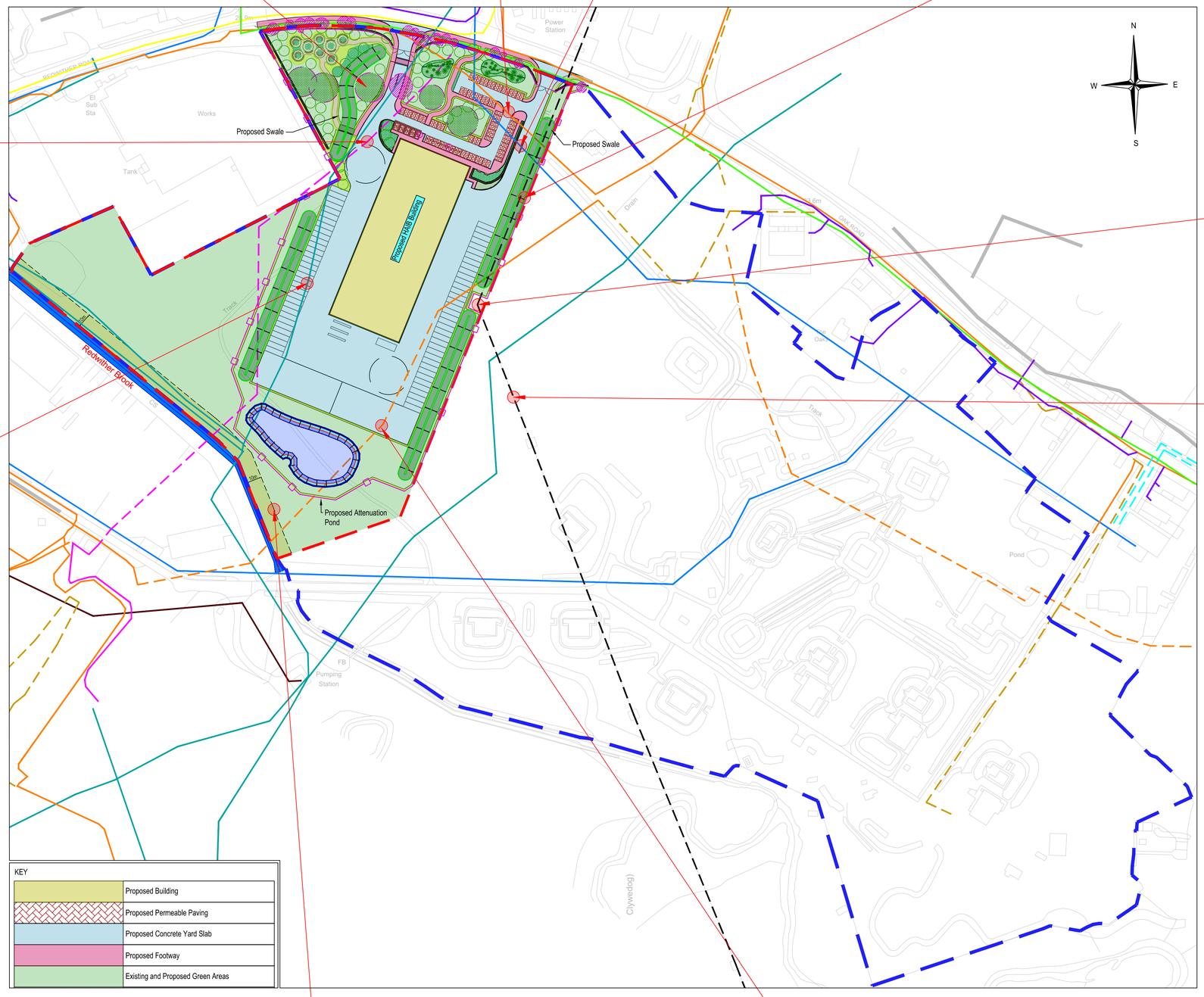
Existing Oak Trees/Root Protection Area
Deep construction to be avoided within Root Protection Zone.
Ideally Main Access Road to be re-aligned to avoid Root Protection Zone or permission required to cut down some trees.

High Voltage Underground Power Line
Detailed utility survey to be conducted.
Utility to be deepened or diverted depending on site conditions.

Existing Dee-Valley Public Water Mains
Detailed utility survey to be conducted.
Utility to be deepened or diverted depending on site conditions.

Application Boundary
Application boundary to be extended to include 9m wide swales.

Existing 33kV Power Line
Vertical clearance to be checked and confirmed.



Electric Pylon
Consultation to be required with SP Energy to confirm the required clearance.

Existing Welsh Water Combined Water Sewer
Detailed utility survey to be conducted.
CCTV survey required to determine the invert levels.
Assume needs to be diverted and easement agreed/provided.

Existing 132kV Power Line
Consultation to be required with SP Energy to confirm the required clearance.

KEY

	Proposed Building
	Proposed Permeable Paving
	Proposed Concrete Yard Slab
	Proposed Footway
	Existing and Proposed Green Areas

Redwither Brook
No infrastructure to be constructed 10m within the river boundary.

High Voltage Overhead Power Line
Detailed utility survey to be conducted.
Vertical clearance to be checked and utility to be possibly diverted.

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

⚠ INDICATES A RESIDUAL RISK AS A WARNING

ⓘ INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition
Refer to Drawing:

General Notes:

1. Do not scale from this drawing.
2. All dimensions are in millimetres (mm), all levels in metres (m) unless noted otherwise.
3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
4. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
5. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

	Dee Valley Public Water Mains
	Welsh Water Combined
	Welsh Water Foul
SP Energy Overhead Line Voltage	
	132 kV
	33 kV
	High Voltage
SP Energy In Use - Underground Voltage	
	132 kV
	33 kV
	High Voltage
	Low Voltage
SP Energy Out Of Use - Underground Voltage	
	High Voltage
	Dee Valley Private Water Mains
	Fibre Optic Cable
	Root Protection Area (No Dig Zone)
	Trees to be removed

Rev	By / Chk'd	Date	Description
P02	IW/AM	20/05/2025	Masterplan updated
P01	IW/AM	04/03/2025	First Issue for Construction

PRELIMINARY DRAWING
This drawing is not to be used for construction

Client
FI REAL ESTATE MANAGEMENT

BarnsleyMarshall Limited
4&5 Prior Whard
Harris Business Park, Hanbury Rd
Stoke Prior, Bromsgrove
B604FG
Tel: 01905 330550
Email: design@barnsleymarshall.co.uk
Web: www.barnsleymarshall.co.uk

Project
The Oaks Site
Wrexham Industrial Estate

Drawing
Site Constraints

By ?? Date 00/00/0000

Drawing No. TOS-BML-XX-XX-DR-C-0101
Revision P02

BML Job No. 1000-06
Status -

Drawing Scale at A1: Nts

CAD Filename: Y:\Projects\1000-06 The Oaks Site, Wrexham Ind Est\Information - Working\DWG\TOS-BML-XX-XX-DR-C-0101 P01 - Site Constraints.dwg

Appendix E

Greenfield Runoff Rates

© Barnsley Marshall Limited 2025

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 800 Urban 0.000
Area (ha) 3.650 Soil 0.450 Region Number Region 4

Results l/s

QBAR Rural 18.7
QBAR Urban 18.7

Q100 years 48.2

Q1 year 15.6
Q30 years 36.7
Q100 years 48.2

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Appendix F

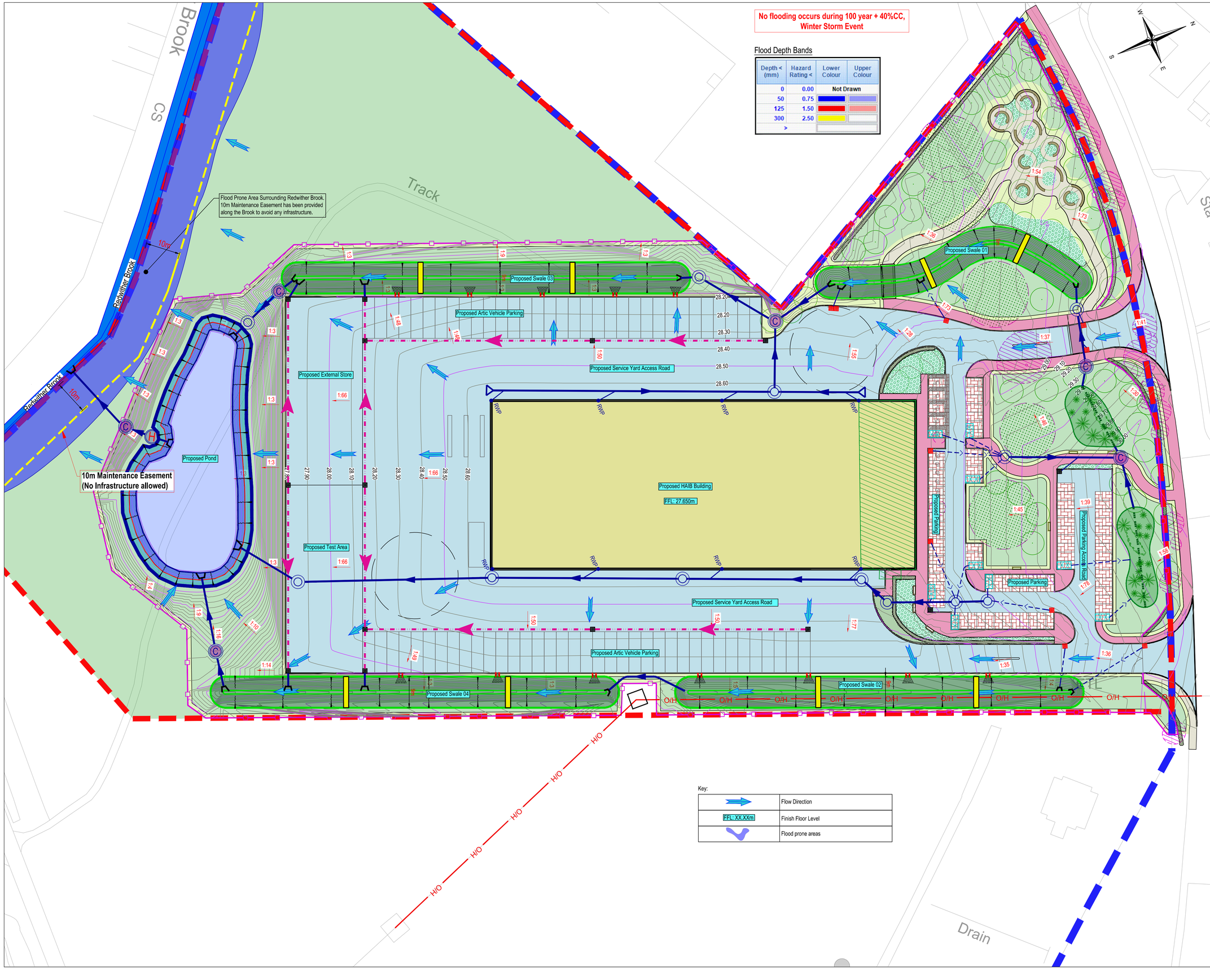
Flood Flow Analysis

© Barnsley Marshall Limited 2025

No flooding occurs during 100 year + 40%CC, Winter Storm Event

Flood Depth Bands

Depth < (mm)	Hazard Rating <	Lower Colour	Upper Colour
0	0.00	Not Drawn	
50	0.75		
125	1.50		
300	2.50		
>			



Key:

	Flow Direction
FFL: XX.XXm	Finish Floor Level
	Flood prone areas

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing:

General Notes:

1. Do not scale from this drawing.
2. All dimensions are in millimetres (mm), all levels in metres (m) unless noted otherwise.
3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.
5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.
7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

Note:

1. For Drainage Plan Layout refer to drawing: TOS-BML-XX-XX-DR-C-0500
2. For External Surfaces refer to drawing: TOS-BML-XX-XX-DR-C-0700
3. For Drainage Details refer to drawings: TOS-BML-XX-XX-DR-C-0505 to 0508
4. For Stormwater Chamber & Pipe Schedules refer to drawing: TOS-BML-XX-XX-DR-C-0502

Rev	By / Chk'd	Date	Description
P02	IW/AM	20/05/2025	Drainage details updated
P01	IW/AM	04/03/2025	Preliminary issue for client comments

PRELIMINARY DRAWING
This drawing is not to be used for construction

Client

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Project

The Oaks Site
Wrexham Industrial Estate

Drawing

Flood Flow Analysis

By IW/AM Date 18/02/2025

Drawing No. TOS-BML-XX-XX-DR-C-0520 (Prefix: TOS; Originator: BML; Volume: XX; Level: XX; Type: DR; Role: C; Number: 0520)

Revision P02

BML Job No. 1000-06

Status -

Drawing Scale at A1: -

CAD Filename: Y:\Projects\1000-06 The Oaks Site, Wrexham Ind Est\Information - Working\DWG\TOS-BML-XX-XX-DR-C-0520 P01 - Flood Flow Analysis.dwg