

MARGAM GREEN ENERGY PLANT, LONGLANDS LANE,
MARGAM, SA13 2SU

FLOOD CONSEQUENCES ASSESSMENT

Final Report v2.2
November 2022

Report Title	Margam Green Energy Plant, Longlands Lane, Margam, SA13 2SU Flood Consequences Assessment Final Report v2.2
Client	Axis PED
Date of issue	11 November 2022

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1 INTRODUCTION

1.1 Purpose of Report

Weetwood Services Ltd ('Weetwood') has been instructed by Axis PED to prepare a Flood Consequences Assessment (FCA) report to accompany two full planning applications for proposed development at Margam Green Energy Plant for industrial use.

The assessment has been undertaken in accordance with the requirements of Technical Advice Note 15 (TAN15) dated July 2004.

1.2 Structure of the Report

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Provides background information relating to the development site
- Section 3** Presents national and local flood risk planning policy
- Section 4** Assesses the potential risk of flooding to the development site
- Section 5** Presents a summary of key findings and the recommendations

1.3 Relevant Documents

The assessment has been informed by the following documents:

- Strategic Flood Consequences Assessment Stage 1 and 2, Neath Port Talbot County Borough Council, September 2014
- Preliminary Flood Risk Assessment, Neath Port Talbot County Borough Council, March 2011
- Neath Port Talbot County Borough Council Local Development Plan 2011-2026, January 2016

2 SITE DETAILS AND PROPOSED DEVELOPMENT

2.1 Site Location

The approximately 3.7 ha Margam Green Energy Plant site is located south of Harbour Way and north of Heolcae'r-Bont at Ordnance Survey National Grid Reference SS 789 863, as shown in **Figure 1**.

The application boundaries equate to two much smaller areas (hereafter referred to as “the site”) as follows:

- Administration building development = 1426.6 m²
- Site entrance development = 99.8 m²

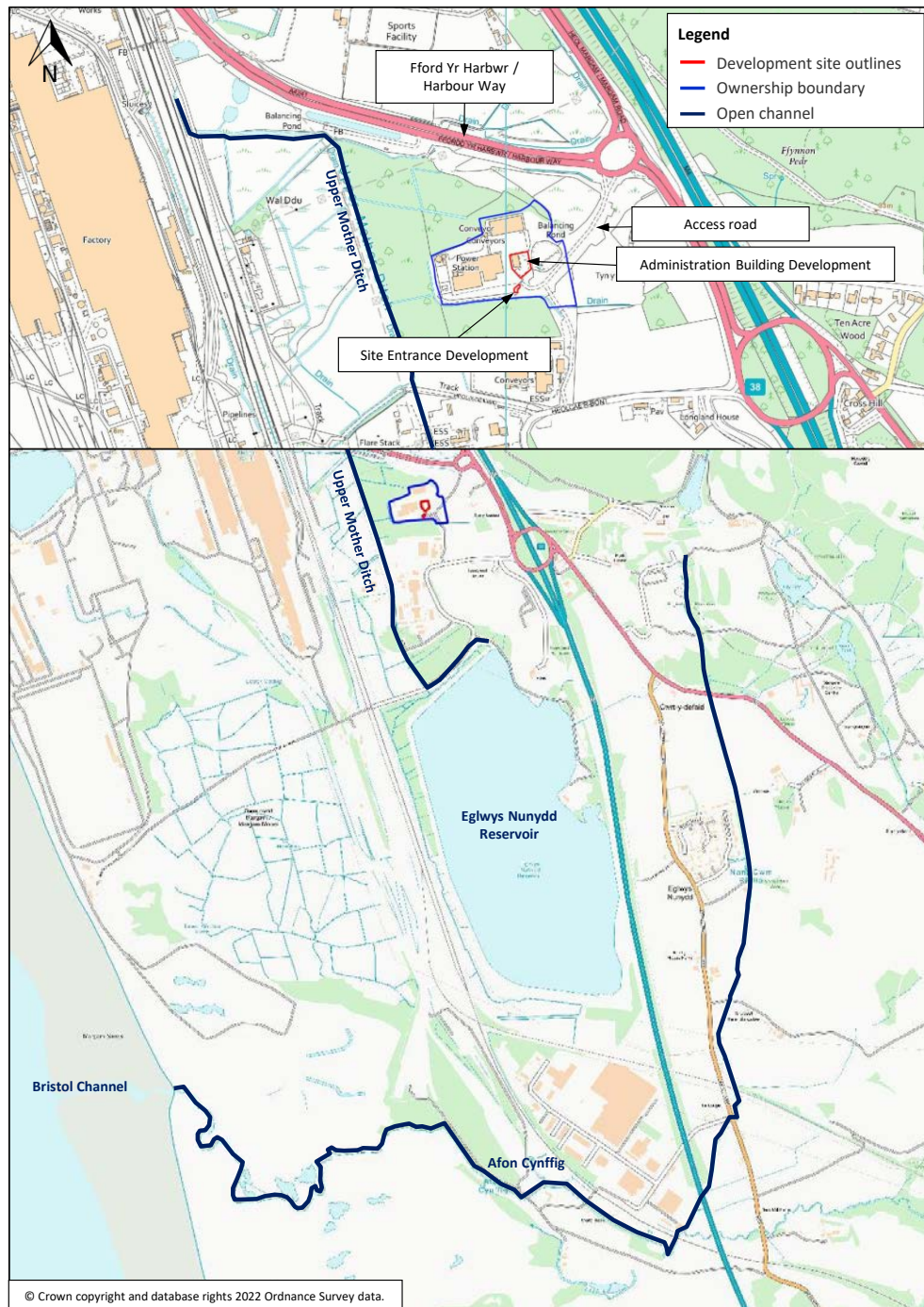


Figure 1: Site Location and Location of Surface Waterbodies

2.2 Existing and Proposed Development

The site currently comprises of the Margam Green Energy Plant.

The proposals comprise of two separate developments at the site as follows:

- Administration building development - The expansion of the car parking area and provision of additional office floor space at the existing office building.
- Site entrance development - The development of a modular office building, smoking shelter, barriers, a site sign and hardstanding areas.

Vehicular access will continue to be provided via the access roads to the east leading to Harbour Way. The proposed site plan is provided in **Appendix A**.

TAN15 classifies general industry development as Less Vulnerable to flood risk.

2.3 Surface Waterbodies in the Vicinity of the Site

The Upper Mother Ditch flows predominantly in a northerly direction approximately 0.2 km west of the site.

The Eglwys Nunydd Reservoir is located approximately 0.7 km south of the site.

The Afon Cynffig is located approximately 3.0 km south of the site and flows in a predominantly westerly direction, outfalling into the Bristol Channel.

The Bristol Channel is located approximately 2.25 km west of the site.

The Upper Mother Ditch is classified as an ordinary watercourse and Afon Cynffig is classified as a main river.

2.4 Topographic Levels

A topographic survey of the site was undertaken in 2014 prior to the development of the Margam Green Energy Plant (**Appendix B**) and LiDAR data has been used to develop a digital terrain model of the site and surrounding area as illustrated in **Figure 2**.

Ground levels within the vicinity of the administration building development are shown to range between 6.6 to 7.0 m AOD, with levels at the site entrance development ranging between 6.8 to 7.1 m AOD.

Ground levels on the access road leading towards Harbour Way range between 6.3 to 9.4 m AOD.

2.5 Ground Conditions

According to the Soilscape soils dataset produced by the Cranfield Soil and AgriFood Institute¹, soil conditions at the site and within the area west of the site are loamy and clayey soils of coastal flats with naturally high groundwater. Soils conditions east of the site are freely draining slightly acid loamy soils.

British Geological Survey mapping of surface geology² indicates the underlying bedrock formation comprises mudstone, siltstone and sandstone (South Wales Middle Coal Measures Formation), overlain by clay, silt and sand (Tidal Flat Deposits).

According to the British Geological Survey and Natural Resources Wales aquifer designation dataset³ the Tidal Flat superficial deposits at the site are classified as a Secondary (undifferentiated) aquifer whilst the underlying South Wales Middle Coal Measures bedrock is classified as a Secondary A aquifer. The site is not shown to be located within a designated groundwater source protection zone⁴.

¹ www.landis.org.uk/soilscape/

² <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>

³ <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>

⁴ <https://lle.gov.wales/catalogue/item/SourceProtectionZonesSPZMerged/?lang=en>

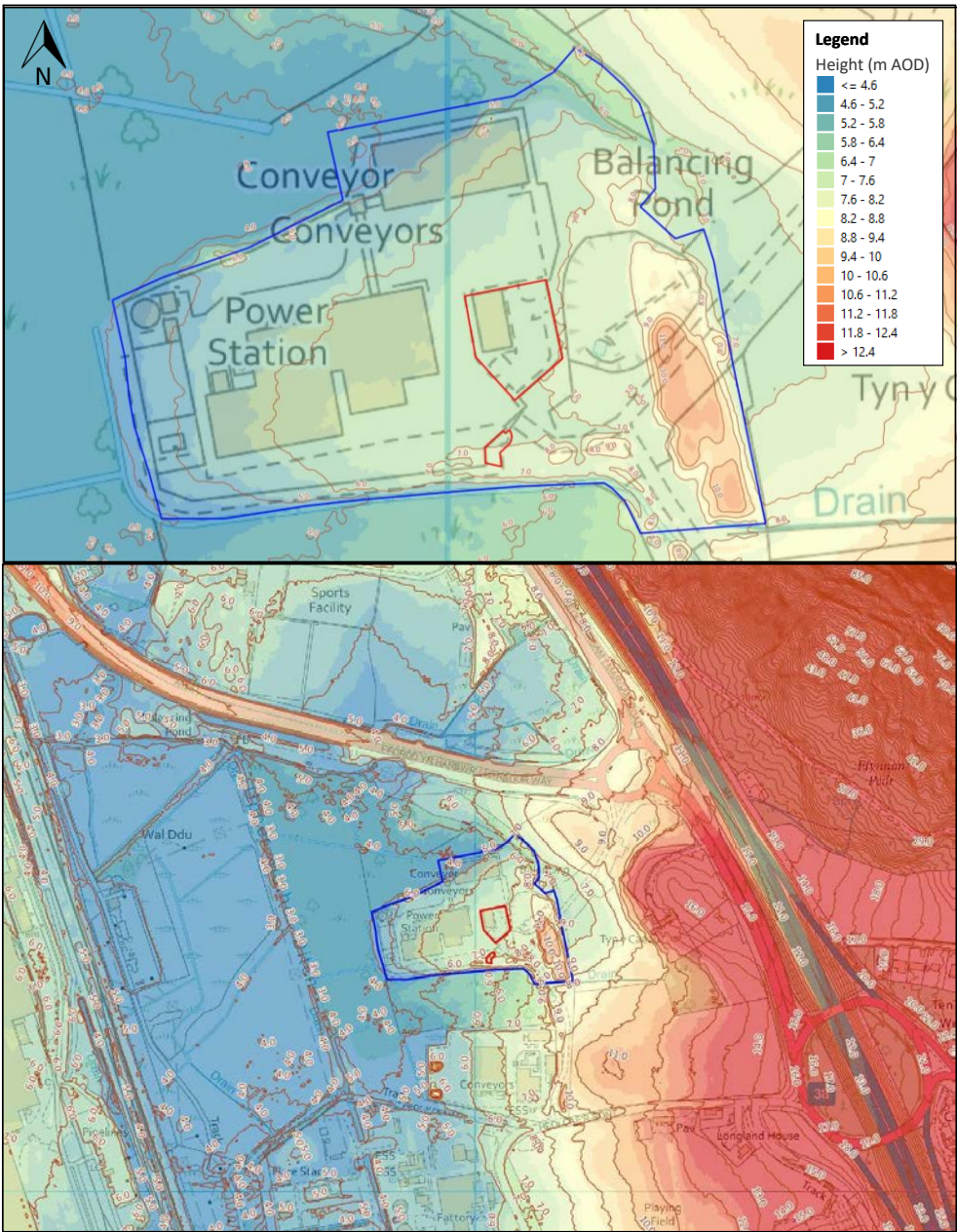


Figure 2: Digital Terrain Model from LiDAR Data

3 PLANNING POLICY AND GUIDANCE

3.1 National Planning Policy and Policy Guidance

Planning Policy Wales (PPW) sets out government's planning policies for Wales and how these are expected to be applied. TAN15 provides technical guidance which supplements the policy within PPW and seeks to ensure that flood risk is taken into account at all stages in the planning process and is appropriately addressed.

The general approach of TAN15 is to set out a precautionary framework to guide planning decisions in areas at high risk of flooding. The overarching aim of the framework is, in order of preference, to:

- Direct new development away from those areas which are at a high risk of flooding.
- Where development has to be considered in high risk areas (i.e. zone C) only those developments which can be justified should be located in such areas.

In accordance with paragraph 6 of TAN15, development will only be justified if it can be demonstrated that:

- i. 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**,
- ii. Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and,

- iii. It concurs with the aims of PPW and meets the definition of previously developed land (PPW Figure 2.1); and,
- iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable.

3.2 Local Planning Policy

The Neath Port Talbot Local Development Plan 2011-2026 was adopted by Neath Port Talbot Council in January 2016. The following policy is relevant in respect of flood risk:

Policy SP1; Climate Change

In relation to consequences of climate change:

1. *Likely increased flood risk will be taken into account and addressed by ensuring that there is greater resilience by avoiding development on land that is at risk from flooding in the first instance in accordance with the sequential approach set out in national guidance or in locations that could increase the risk of flooding elsewhere.*

3.3 Water Framework Directive

The Water Framework Directive (WFD) provides a legal framework for the protection, improvement and sustainable use of inland surface waters, groundwater, transitional waters, and coastal waters across England, and seeks to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters
- Achieve at least 'good' status for all waterbodies by 2015
- Promote the sustainable use of water as a natural resource
- Conserve habitats and species that depend directly on water
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Contribute to mitigating the effects of floods and droughts.

The WFD applies to any proposed development which has the potential to impact on a waterbody. Where this is the case, the Natural Resources Wales may require evidence demonstrating that the proposed development does not compromise the aims of the WFD.

3.4 Environmental Permitting and Land Drainage Consent

Under the Environmental Permitting (England and Wales) Regulations 2016 an Environmental Permit for Flood Risk Activities⁵ is required from the Natural Resources Wales for any permanent or temporary works, including works:

- In, over or under a designated main river
- Within 8 m of the top of bank of a designated main river or of the landward toe of a flood defence (16 m if it is a tidal main river or a sea defence).

In addition, any permanent or temporary works within the floodplain of a designated main river may also require an Environmental Permit for Flood Risk Activities. A permit is separate to and in addition to any planning permission granted.

If the location of an activity is on an ordinary watercourse that lies within an Internal Drainage District, land drainage consent may be required from Natural Resources Wales.

Undertaking activities controlled by local byelaws also requires the relevant consent.

⁵ <https://naturalresources.wales/permits-and-permissions/environmental-permits/?lang=en>

4 REVIEW OF FLOOD RISK

4.1 Historical Records of Flooding

The Flood Map for Planning - Recorded Flood Extents and associated database⁶ (not shown), and Map 3.9 and 3.10 of the 2014 Strategic Flood Consequences Assessment (“Historic Flooding - Neath Port Talbot” and “Main (Recent) Historical Flooding Events (April to December 2010)” respectively) indicate that there are no records of flooding at or within the immediate vicinity of the site.

4.2 Flood Risk from the Sea (Tidal / Coastal) and Rivers (Fluvial)

Figure 1 of TAN15 defines three development advice zones as follows:

- Zone A: Considered to be at little or no risk of fluvial or tidal/coastal flooding
- Zone B: Areas known to have been flooded in the past evidenced by sedimentary deposits
- Zone C: Based on the Natural Resources Wales flood outline, equal to or greater than 0.1% (river, tidal or coastal). Zone C is subdivided into the following two zones:
 - Zone C1: Areas of the floodplain which are developed and served by significant infrastructure, including flood defences
 - Zone C2: Areas of the floodplain without significant flood defence infrastructure

The development advice zones are shown on the Development Advice Map⁷ and are defined by the predicted extent of the 1 in 1,000 (sea and rivers) annual exceedance probability (AEP) event (zone C) and British Geological Survey drift data (zone B). The zones do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

The Development Advice Map (**Figure 3**) indicates the site to be located in zone B. This is reiterated on Map 3.1 of the 2014 Strategic Flood Consequences Assessment (“Development Advice Map”).

4.2.1 Flood Risk from the Sea (Tidal / Coastal)

Natural Resources Wales was consulted to determine the mechanism of flood risk to the site and subsequently advised⁸ that “the flood extent outline shown for the area of interest is based on tidal inundation”. The Development Advice Map (**Figure 3**) indicates that the tidal flood risk to the site is not directly from the Bristol Channel but from the Afon Cynffig, which is tidally dominated in the vicinity of the site.

According to the Environment Agency’s Coastal Flood Boundary Conditions for the UK: 2018 Update⁹, the following modelled peak still tidal levels are expected adjacent to the site¹⁰:

- | | |
|-------------------------------|------------|
| • 1 in 200 (2017) AEP event | 6.38 m AOD |
| • 1 in 1,000 (2017) AEP event | 6.70 m AOD |

TAN15 requires an allowance for climate change to be made. Using the allowance set out in Welsh Government guidance¹¹ and a development lifetime of 75 years, this allowance has been calculated as 0.73 m (70th Percentile; 70P) and 0.97 m (95th Percentile; 95P). The peak still tidal level for the 1 in 200 AEP event plus climate change (2097) is therefore estimated to be 7.11 m AOD (70P) and 7.35 m AOD (95P), whilst the 1 in 1,000 AEP event plus climate change (2097) is 7.43 m AOD (70P) and 7.67 m AOD (95P). However, recognising the mechanism of flooding at the site, these flood levels are unlikely to be fully realised at the site.

⁶ <http://lle.gov.wales/catalogue/item/HistoricFI/?lang=en>

⁷ <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>

⁸ Email from Natural Resources Wales to Weetwood, 3 July 2014 (Ref: ATI 04856a)

⁹ <https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>

¹⁰ Coastal node 1546

¹¹ Flood Consequences Assessments: Climate Change Allowances - https://gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf

The Welsh Government climate change guidance is based on UK Climate Projections (UKCP18) data and states “as a minimum, development proposals should be assessed against the relevant regional 70th percentile... to inform design levels. An assessment should also be made against the 95th percentile to inform mitigation measures, access and egress routes and emergency evacuation plans”.

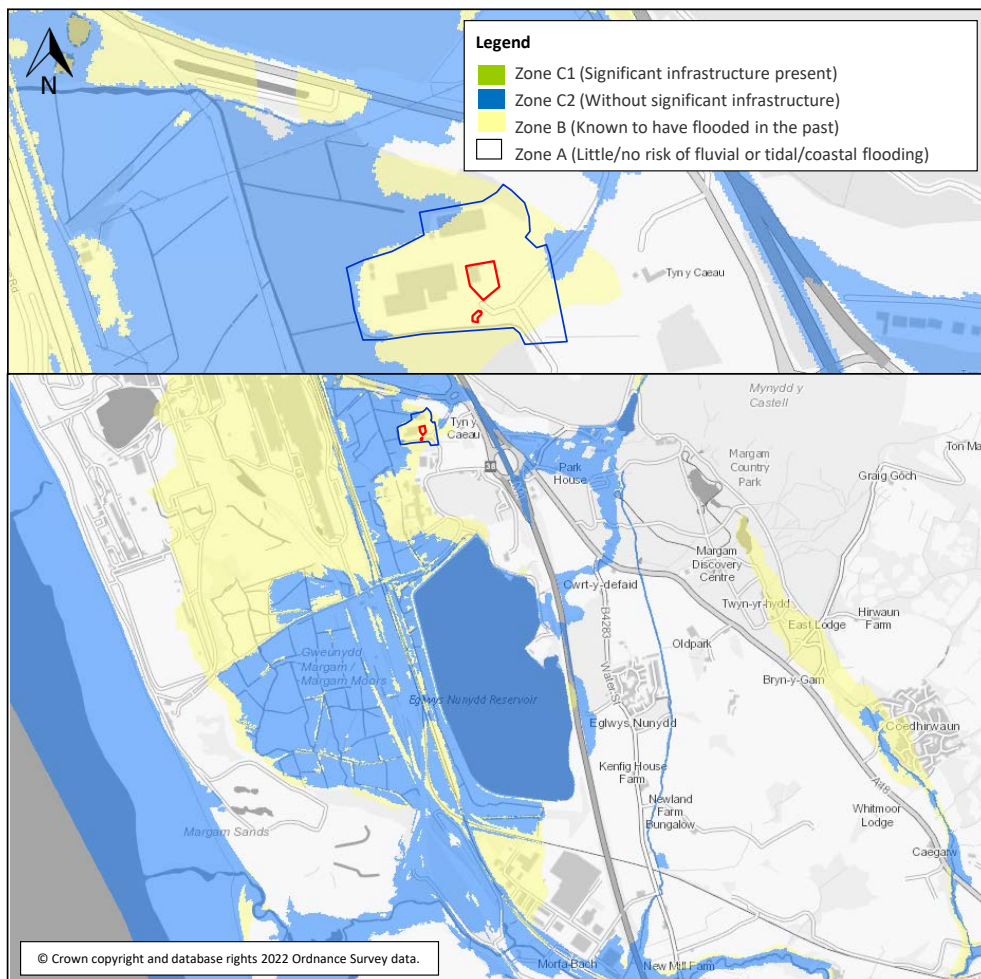


Figure 3: Development Advice Map

Source: Natural Resources Wales website; Accessed: October 2022

A 1D-2D ESTRY-TUFLOW hydraulic model of the Afon Cynffig was developed by Capita on behalf of Natural Resources Wales as part of the Margam: Flood Risk Modelling Study, March 2015, for the present day 1 in 200 and 1 in 1,000 AEP tidal events and 1 in 200 AEP tidal event plus climate change (including a 1 in 2 AEP event fluvial inflow).

Within the modelling study, climate change was assessed by increasing the downstream boundary by 1.062 m based on incremental sea level rise over 100 years described within Table 4-1 of the Technical Guidance to the Nation Planning Policy Framework (2012), however no mention of the year this pertains to is made within the modelling report. In accordance with the latest Welsh Government guidance¹¹ climate change allowances of 0.743 m (70P) and 0.987 m (95P) have been calculated between the years of 2015 to 2097. As such, the study provides a conservative assessment of the flood consequences associated with climate change.

The modelled outputs are provided in **Figure 4** and indicate that the site and access routes are expected to remain dry during all aforementioned events.

However, the Flood Map for Planning (**Figure 5**) indicates that the site is located within flood zone 3 (sea). The Flood Map for Planning currently has no official status for planning purposes until June 2023; however, Natural Resources Wales may use the mapping to inform its response to planning applications as the ‘best available information’ on flood risk.

Natural Resources Wales was therefore further consulted¹² to determine the methods used to derive the flood outlines presented on the Flood Map for Planning (Sea) and the Margam: Flood Risk Modelling Study. Natural Resources Wales subsequently advised that “*present day (2020) Extreme Sea Levels, were taken from the new Coastal Flood Boundary (CFBD) 2018 dataset around the coast of Wales and projected across the Digital Terrain Model*”, and includes an allowance for climate change, to determine the flood extent within the Flood Map for Planning. The Margam: Flood Risk Modelling study is based on “*three tidal curve boundary and flood flow routing overland*” causing differences in the flood extents.

Considering that the site’s flooding mechanism is not directly from the Bristol Channel the outputs provided from the Margam: Flood Risk Modelling Study (**Figure 4**) are considered more accurate to assess tidal flood risk to the site.

The 1 in 1,000 AEP tidal event plus climate change was not considered as part of the Margam: Flood Risk Modelling Study. Furthermore, given the time since the modelling study was undertaken it is unlikely that this was undertaken in line with the latest tidal guidance. However, considering the distance between the modelled flood extents and the site (approximately 2.5 km), it is unlikely that the latest tidal levels for the 1 in 1,000 AEP event including an allowance for climate change would cause flooding to the site during either the 70P or 95P scenario.

It is concluded that the site is not at risk of flooding from the sea (tidal/coastal).

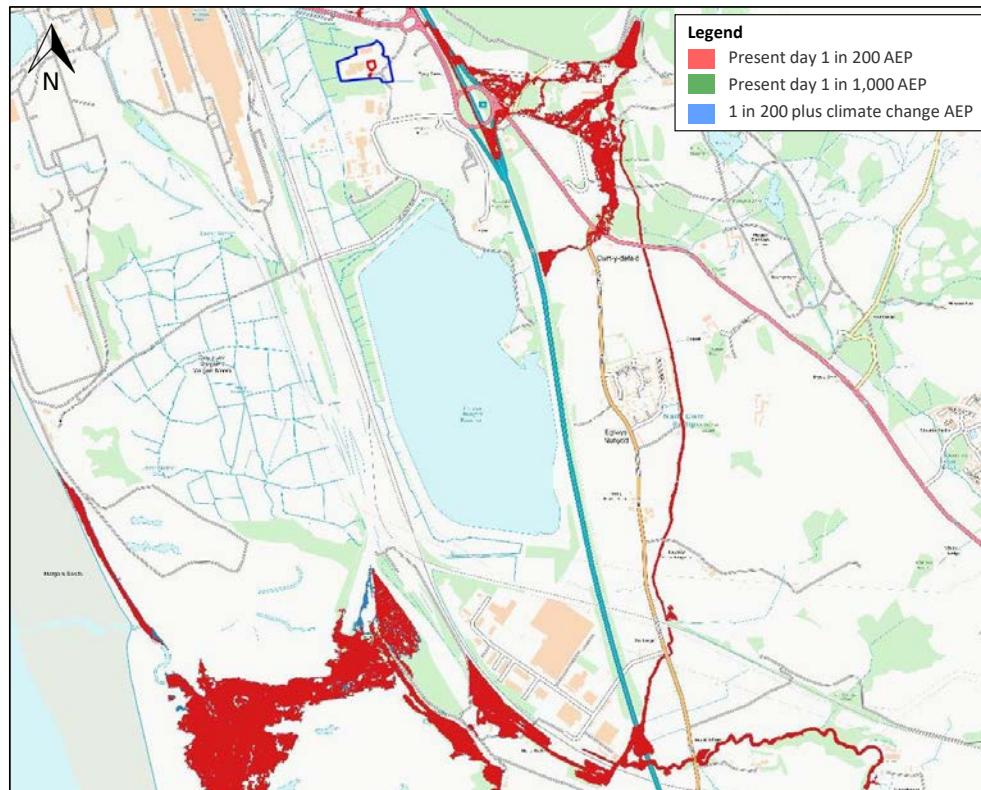


Figure 4: Afon Cynffig Modelled Tidal Flood Extents

Source: Margam: Flood Risk Modelling, Capita, March 2015

¹² Email from Natural Resources Wales to Weetwood 21 March 2022 (Ref: ATI-23030a)

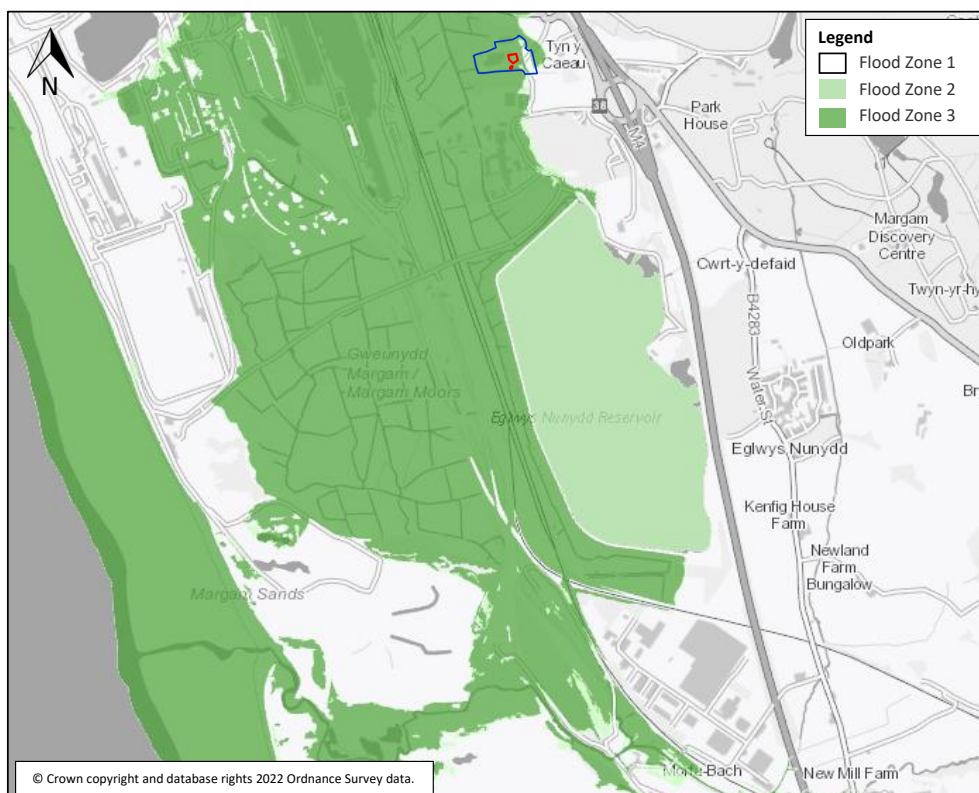


Figure 5: Flood Map for Planning - Sea

Source: Natural Resources Wales website; Accessed: October 2022

4.2.2 Flood Risk from Rivers (Fluvial)

The Margam: Flood Risk Modelling Study, March 2015 also assessed the risk of flooding from the Afon Cynffig for the present day 1 in 100 and 1 in 1,000 AEP fluvial events and the 1 in 100 AEP fluvial event +20% climate change.

The modelled outputs are provided in **Figure 6** and indicate that the site is not at risk of flooding from this source. Maximum flood depths of 0.19, 0.22 and 0.28 m may be expected along the access road leading towards Harbour Way during the present day 1 in 100, 1 in 100 plus climate change (+20%) and present day 1 in 1,000 AEP fluvial events respectively.

In accordance with Welsh Government guidance¹¹, a +30% increase in peak river flow must also be considered over the lifetime of the development to take account of the likely impacts of climate change.

An assessment of floodwaters within the floodplain indicates that flows during a present day 1 in 1,000 AEP event are significantly larger than those in a present day 1 in 100 and 1 in 100 plus climate change (+20%) AEP event. Therefore, the 1 in 1,000 AEP event is likely to present a worst-case scenario for the site (when compared with a +30% climate change allowance).

Irrespective, Section 2.2 of the Margam: Food Risk Modelling Study report states “[Natural Resources Wales] have indicated to Capita and URS that they do not think that the flood waters would overtop the M4 and are unlikely to flow across to the west”.

It is concluded that the site is not at risk of flooding from rivers (fluvial).

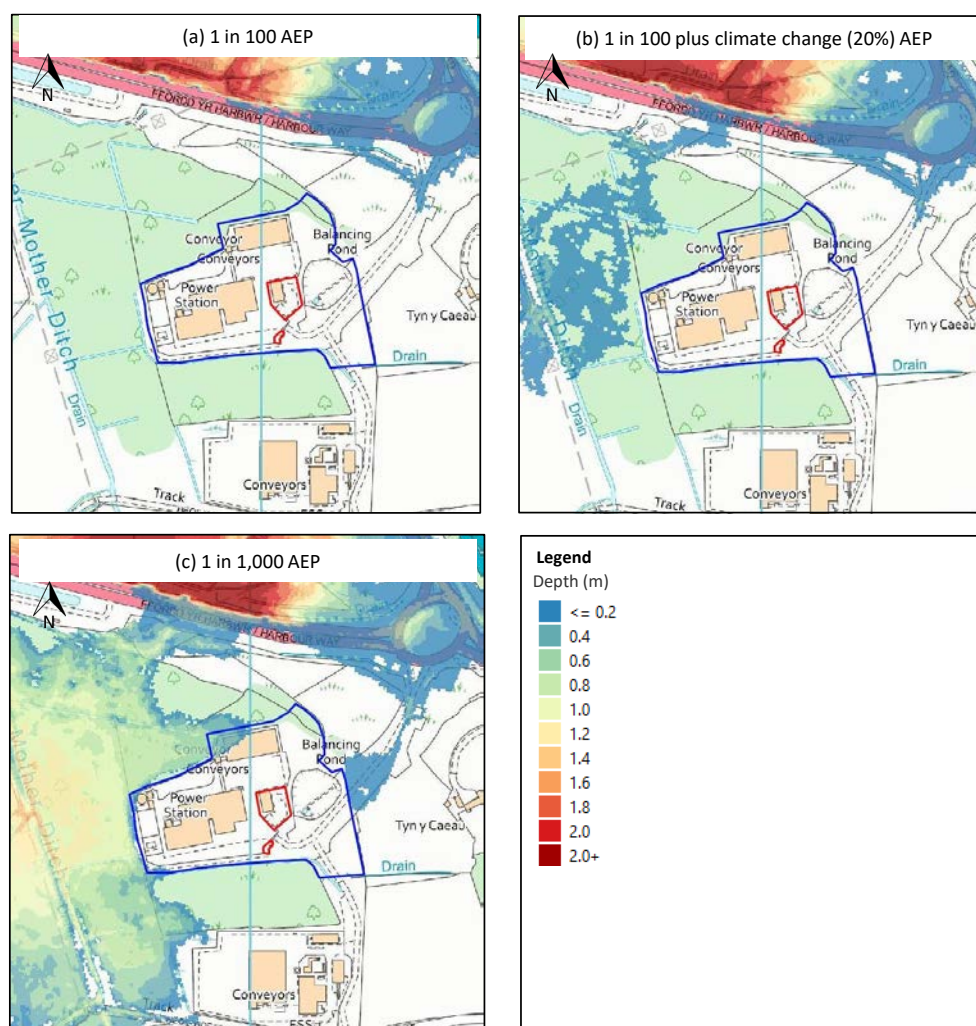


Figure 6: Afon Cynffig Modelled Fluvial Flood Depths

Source: Margam: Flood Risk Modelling, Capita, March 2015

4.3 Flood Risk from Small Watercourses and Surface Water (Pluvial)

As detailed in **Section 2.3**, Upper Mother Ditch is located approximately 0.2 km west of the site. No modelled information is available for this watercourse. The Flood Map for Planning - Surface Water and Small Watercourses (**Figure 7**) has therefore been utilised to assess the risk of flooding from this source. This mapping indicates that no flooding of the site or access route is expected from Upper Mother Ditch in up to a 1 in 1,000 AEP event including an allowance for climate change.

The Flood Map for Planning - Surface Water and Small Watercourses indicates that the site is at a Very Low risk of pluvial surface water flooding. A Low to High risk of flooding is indicated on the access road at the entrance to the wider Margam Green Energy Plant site from Harbour Way; however, this is relatively confined.

It is concluded that the site is not at risk of flooding from small watercourses and is at a Very Low risk of pluvial surface water flooding.

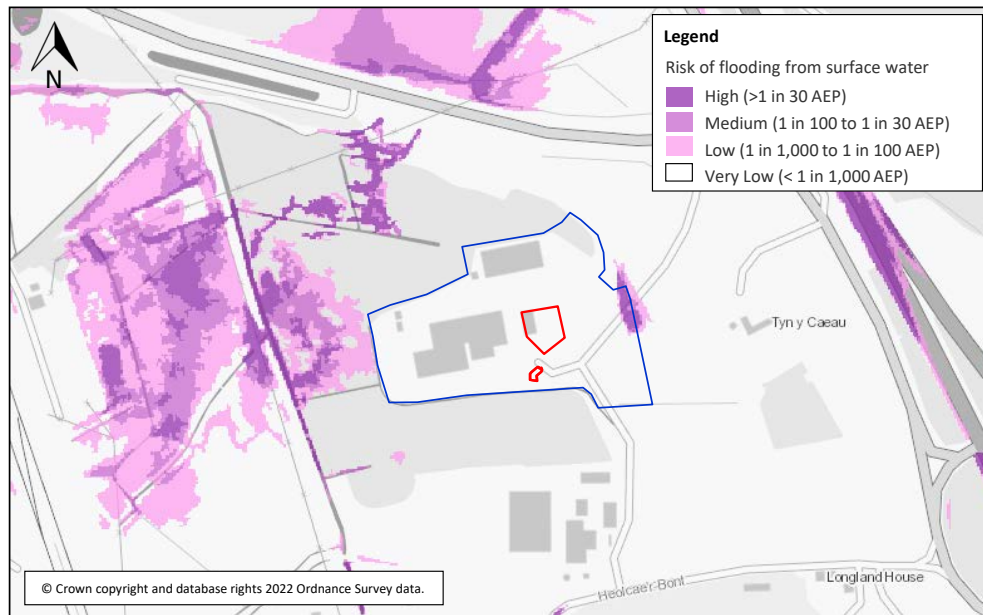


Figure 7: Flood Map for Planning - Surface Water and Small Watercourses

Source: Natural Resources Wales website; Accessed: October 2022

4.4 Flood Risk from Reservoirs, Canals and Other Water Impounding Structures

The Flood Map for Planning - Flood Risk from Reservoirs (**Figure 8**) indicates that the site is located in close proximity to an area which may be at risk from Eglwys Nunydd Reservoir located approximately 0.7 km south of the site. However, all large reservoirs are regularly inspected by reservoir panel engineers with essential safety work carried out as required. As such, reservoir flooding is extremely unlikely to occur.

There are no canals or other impounded waterbodies located within the immediate vicinity of the site.

It is concluded that the site is at a Low risk of flooding from reservoirs and is not at risk of flooding from canals or other water impounding structures.

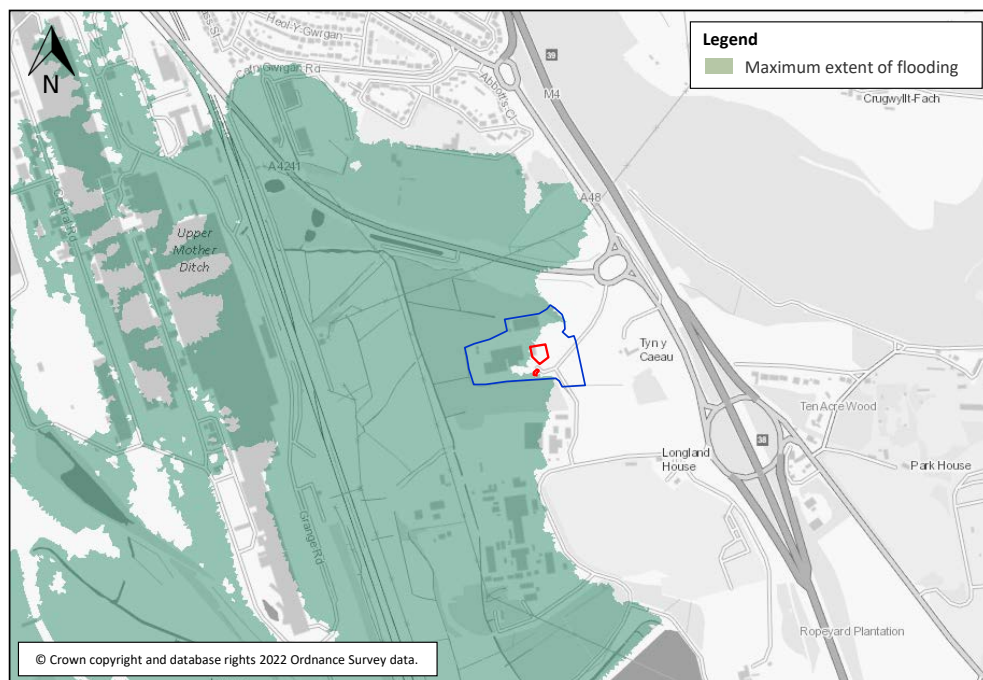


Figure 8: Flood Map for Planning - Flood Risk from Reservoirs

Source: Natural Resources Wales website; Accessed: October 2022

4.5 Flood Risk from Groundwater

The JBA Groundwater Flood Risk Indicator map (**Figure 9**) indicates that the site is at a Negligible risk during a 1 in 100 AEP groundwater flood event.

It is concluded that the site is at a Low risk of flooding from groundwater.

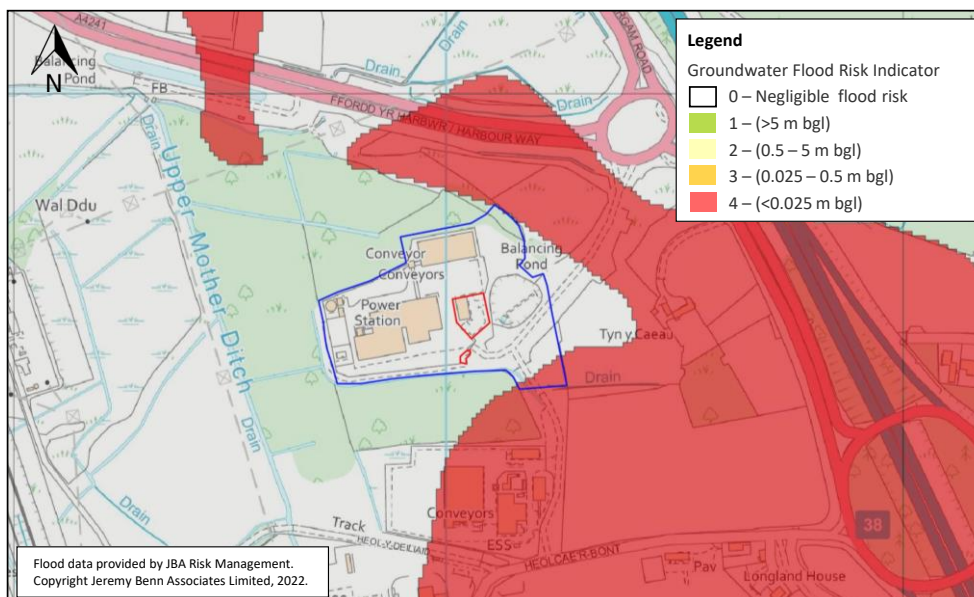


Figure 9: JBA Groundwater Flood Risk Indicator Map

Source: Blue Sky Maps; Accessed: October 2022

4.6 Flood Risk Mitigation

The risk of flooding to the proposed development from all identified sources is assessed to be low. As such no specific flood risk mitigation measures are proposed. Notwithstanding this, finished floor levels should be at least 0.15 m above adjacent ground levels following any reprofiling of the site, with ground levels sloping down from the buildings.

This measure will enable any potential overland flows to be conveyed safely across the site without affecting property.

4.7 Flood Risk Elsewhere

In accordance with A1.2 of TAN15 developers must ensure there will be no loss of flood flow or flood storage capacity for floods up to the severity of the 1 in 1,000 AEP event. Whilst not specified by TAN15, Natural Resources Wales generally recommends that this should be the case over the lifetime of development (i.e. should take into account climate change) and should consider breach and blockage where necessary.

The site is not at risk of flooding in up to a 1 in 1,000 AEP fluvial and tidal event including an allowance for climate change. As such the proposals would not be expected to impact flood risk elsewhere and no compensatory flood storage would need be provided on site.

4.8 Justification Test

In accordance with Section 6 of TAN15, the application of the justification test is not required for new development within zone B.

Notwithstanding the above, the proposed development is operationally linked to the existing Margam Green Energy Plant. The proposals will help sustain the existing development and will be situated on previously developed land thus meeting part ii and iii of the justification test. This report addresses part iv of the test.

4.9 Surface water management

4.9.1 Site Entrance Development

Surface water runoff is expected to be directed towards the drainage ditch located along the southern boundary of the ownership site.

4.9.2 Administration Building Development

Surface water runoff from the administration building development is expected to be directed towards the existing on-site drainage system. Further details will be addressed in a separate Drainage Statement report.

5 SUMMARY AND RECOMMENDATIONS

This report has been prepared on behalf of Axis PED and relates to proposed development at Margam Green Energy Plant.

The Development Advice Map indicates the site to be located in zone B.

The risk of flooding to the proposed development from all identified sources is assessed to be low.

In accordance with Section 6 of TAN15, the application of the justification test is not required for new development within zone B.

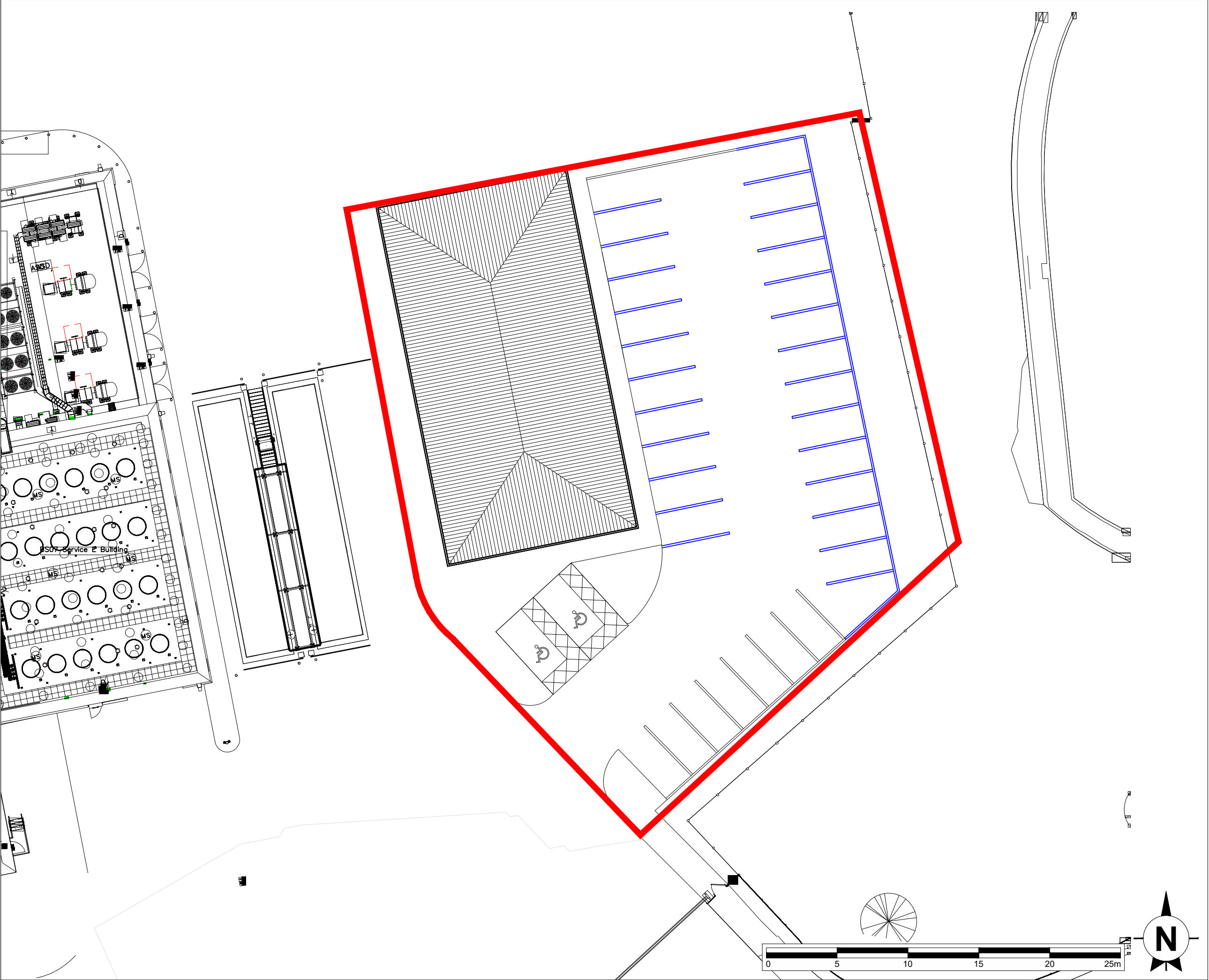
Based on the assessment of flood risk, it is concluded that no specific measures need be implemented to mitigate flood risk, although finished floor levels should be at least 0.15 m above adjacent ground levels with ground levels sloping down from the buildings, in accordance with best practice.

The proposals are not expected to have a detrimental impact on flood risk elsewhere.

In conclusion, this report demonstrates that the proposed development may be completed in accordance with the requirements of planning policy.

APPENDIX A

Proposed Site Plan

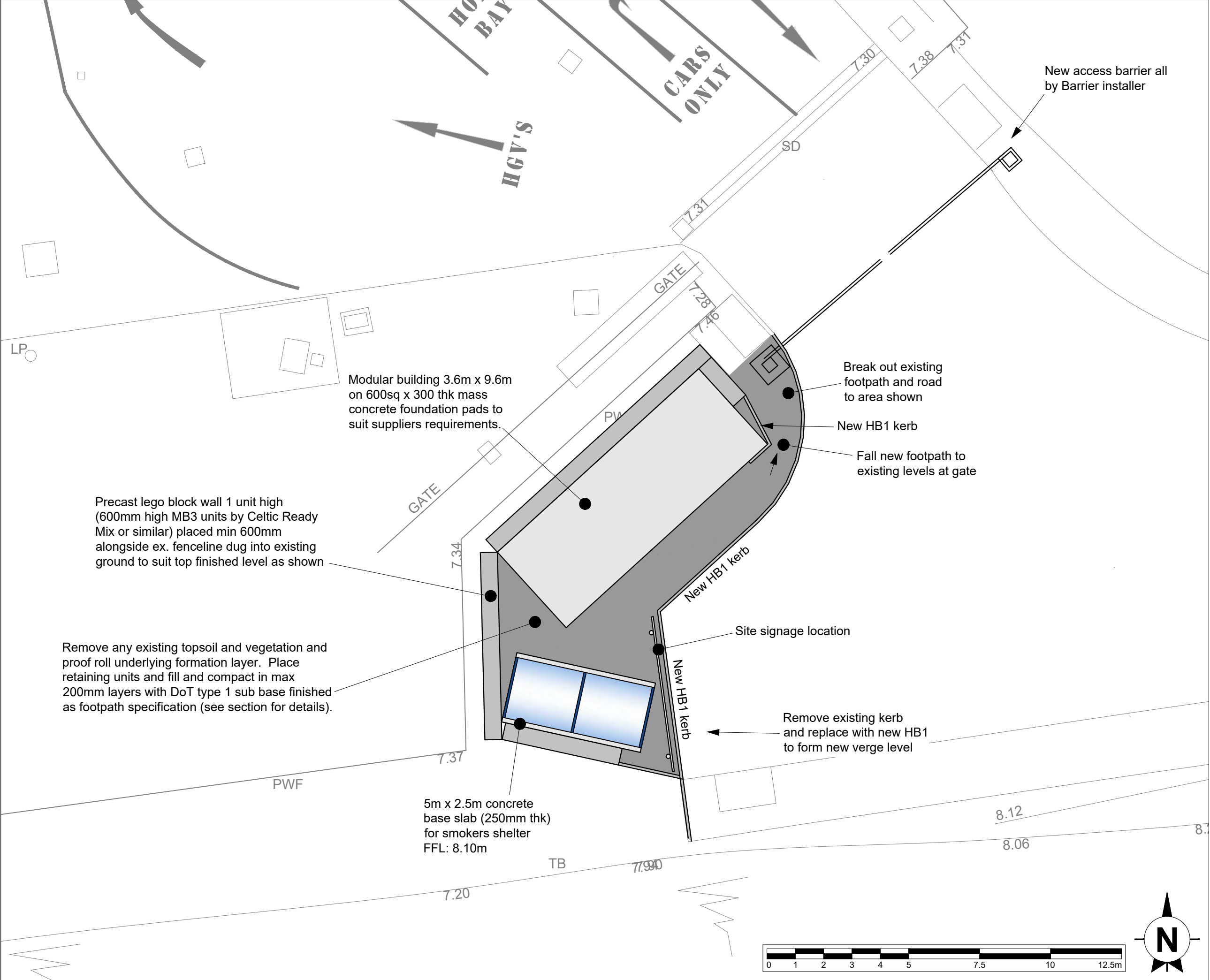


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client: ECO2		
project: MARGAM ADMIN BUILDING		
drawing title: ADMIN BUILDING - REVISED SITE PLAN		
date: September 2022	drawn by: SM	checked: AR
drawing number: 2774-01-09	status: --	
scale(s): 1:250@A3	rev: --	
planning environment design		



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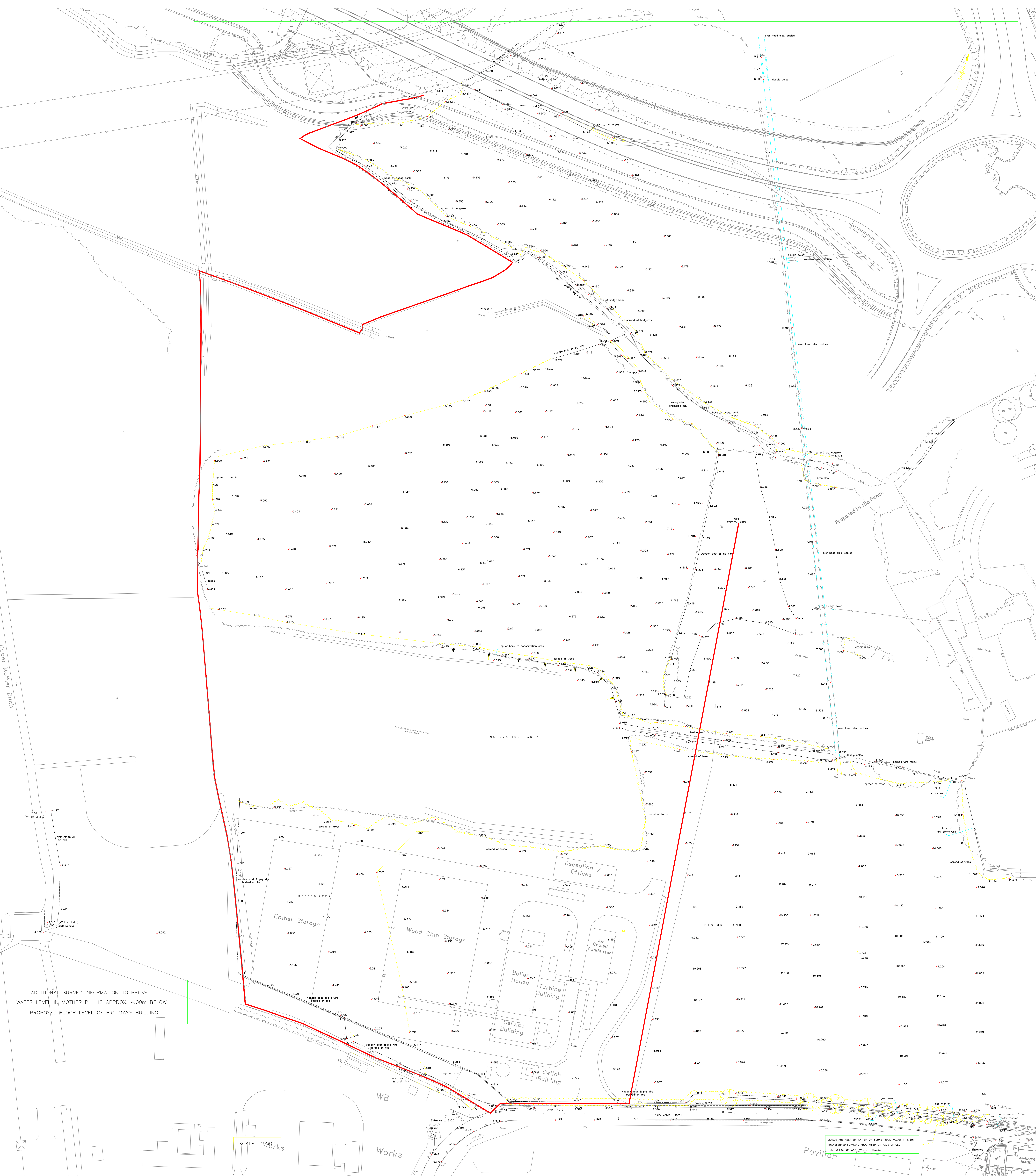
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Client Office: Well House Barrs Cheshire CH4 8DH	South Manchester Office: Canville House 76 Water Lane Wilmslow SK9 5BB	axis
0844 8700 007 - www.axisped.co.uk		
client: ECO2		
project: MARGAM		
drawing title: SITE ENTRANCE - LAYOUT PLAN		
date: September 2022	drawn by: SM	checked: AR
drawing number: 2774-01-10	status: --	
scale(s): 1:125@A3	rev: --	
planning environment design		

APPENDIX B

Topographic Survey



Delivering client focussed services nationally

Flood Risk Assessments
Flood Consequences Assessments
Surface Water Drainage
Foul Water Drainage
Environmental Impact Assessments
River Realignment and Restoration
Water Framework Directive Assessments
Environmental Permit and Land Drainage Applications
Sequential, Justification and Exception Tests
Utility Assessments
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