

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

FLOOD CONSEQUENCES ASSESSMENT

Final Report v1.2
March 2022

Report Title	Margam Green Energy Plant, Longlands Lane, Margam, SA13 2SU Flood Consequences Assessment Final Report v1.2
Client	Axis PED
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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 a full planning application for the proposed development of a secondary ash store and retention of the existing primary ash bay at Margam Green Energy Plant.

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

Weetwood previously prepared a FCA (ref: 4756/FCA/Final/v1.1/2022-03-11) prior to receiving flood risk information from Natural Resources Wales. The FCA has been updated to reflect the information now received from Natural Resources Wales and therefore, this report supersedes the previous FCA for this development.

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 and drainage planning policy
Section 4	Assesses the potential sources of flooding to the development site
Section 5	Presents flood risk mitigation measures based on the findings of the assessment
Section 6	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 (SFCA) Stage 1 & 2, Neath Port Talbot County Borough Council, September 2014
- Preliminary Flood Risk Assessment (PFRA), Neath Port Talbot County Borough Council, March 2011

2 SITE DETAILS AND PROPOSED DEVELOPMENT

2.1 Site Location

The approximately 3.7 hectare (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 boundary (hereafter referred to as “the site”) equates to a much smaller area of approximately 0.02 ha.

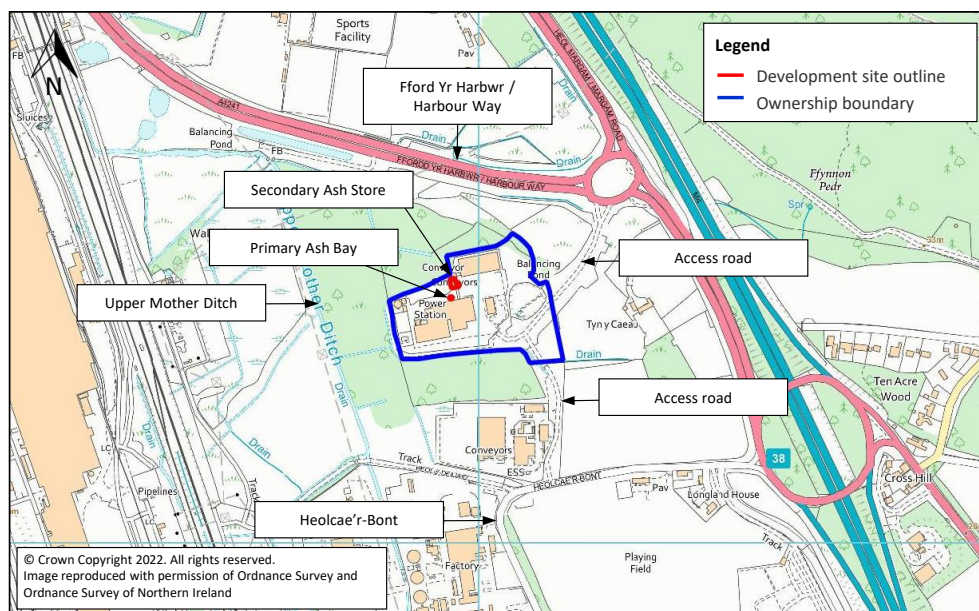


Figure 1: Site Location

2.2 Existing and Proposed Development

The site currently comprises of the Margam Green Energy Plant. Proposals are for the development of a secondary ash store and the retention of the existing primary ash bay (**Appendix A**).

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

2.3 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.

According to the main river map (**Figure 2**) the Upper Mother Ditch is classified as an ‘ordinary watercourse’ and Afon Cynffig is classified as a ‘main river’.

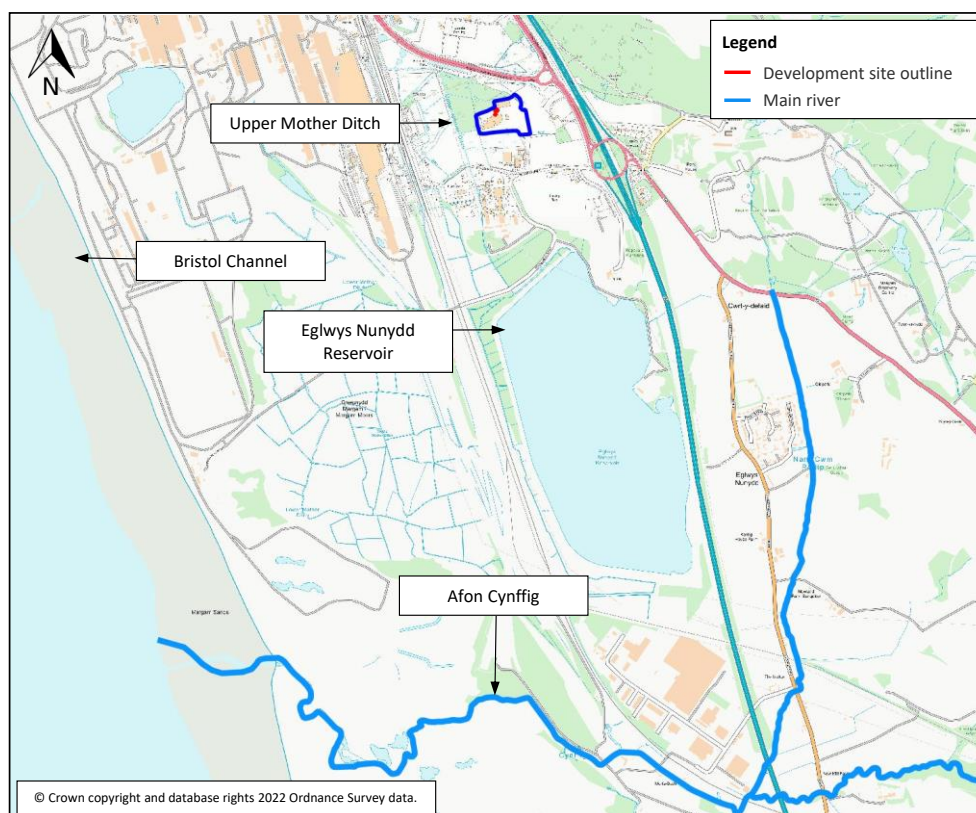


Figure 2: Location and Designation of Waterbodies

Source: Natural Resources Wales website; Accessed: March 2022

2.4 Site Levels

A topographic survey of the site was undertaken in 2014 prior to the development of the Margam Green Energy Plant and is provided in **Appendix B**.

LiDAR data has been used to develop a digital terrain model of the site and surrounding area as illustrated in **Figure 3**. This indicates that the Primary Ash Bay is located at a level of 5.83 to 6.02 m AOD, and the Secondary Ash Store is located at a level of 5.12 to 5.74 m AOD.

The development platform of the Biomass Fired Power Station, including the location of the proposed development, is set at 6.55 m AOD.

2.5 Access and Egress

Access and egress is provided via the access roads to the east and south leading to Harbour Way and Heolcae'r-Bont respectively. Levels range between 6.33 to 9.44 m AOD on the access road leading towards Harbour Way and 7.32 to 9.44 m AOD on the access road leading towards Heolcae'r-Bont.

2.6 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.

¹ www.landis.org.uk/soilscape/

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).

The British Geological Survey and Natural Resources Wales aquifer designation dataset³ classifies the Tidal Flat superficial deposits at the site as a Secondary (undifferentiated) aquifer whilst the underlying South Wales Middle Coal Measures bedrock is classified as a Secondary A aquifer.

According to the Natural Resources Wales database⁴ the site is not shown to be located within a designated groundwater source protection zone.

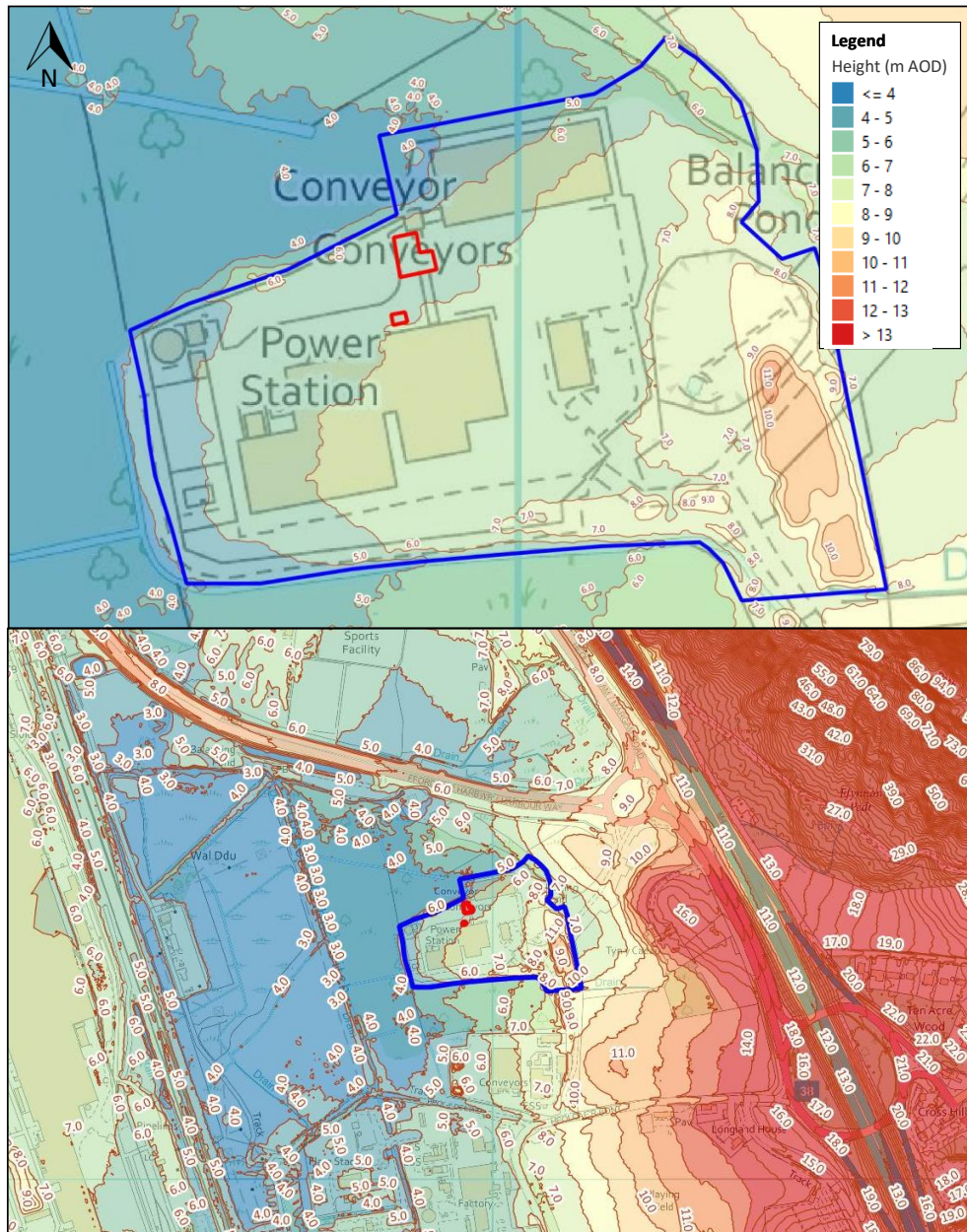


Figure 3: Digital Terrain Model from LiDAR Data

² <http://mapapps2.bgs.ac.uk/geindex/home.html>

³ Footnote 2

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

3 PLANNING POLICY AND GUIDANCE

3.1 Legislation Originating from the European Union

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 Wales, 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, Natural Resources Wales may require evidence demonstrating that the proposed development does not compromise the aims of the WFD.

3.2 National Planning Policy and 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.

National policy requires that planning applications for new development proposals should incorporate sustainable drainage systems (SuDS) to appropriate operational standards and with maintenance arrangements in place unless there is clear evidence that this would be inappropriate.

Statutory standards for sustainable drainage were published by Welsh Government in October 2018⁵ in relation to the design, construction, operation and maintenance of sustainable drainage systems serving new developments of more than one house or where the construction area is equal to or greater than 100 square metres (m²). These standards set out how surface water runoff generated during the present day 1 in 1, 1 in 30 and 1 in 100 annual exceedance probability (AEP) rainfall events and for events exceeding the present day 1 in 100 AEP event should be managed, how peak runoff rates should be restricted and how runoff volumes should be controlled. Approval is subsequently required from the SuDS Approval Body (SAB) before construction can commence.

3.3 Local Planning Policy and Guidance

3.3.1 Local Development Plan, Neath Port Talbot County Borough Council, January 2016

Neath Port Talbot County Borough Council Local Development Plan was adopted on 27 January 2016 providing a clear vision for the County Borough setting out where, when and how much new development up to the year 2026.

The following policies are 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.*

3.4 Environmental Permitting and Land Drainage Consent

Under the Environmental Permitting (England and Wales) Regulations 2016 an Environmental Permit for Flood Risk Activities⁶ is required from Natural Resources Wales for any permanent or temporary 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.

Land drainage consent may be required from the lead local flood authority for work to an ordinary watercourse.

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 Statutory Standards for Sustainable Drainage Systems – designing, constructing, operating and maintaining surface water drainage systems (<https://gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf>)

⁶ <https://naturalresources.wales/permits-and-permissions/environmental-permits/?lang=en>

4 REVIEW OF FLOOD RISK

4.1 Historical Records of Flooding

The Natural Resources Wales historic flood outlines database⁷ indicates that the site has not been impacted by historic flood events.

4.2 Flood Zone Designation

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 Map⁸ and are defined by the predicted extent of the 1 in 1,000 (rivers and sea) AEP event (zone C) and British Geological Survey drift data (zone B). The Development Advice Map (**Figure 4**) indicates that the site is located in zone B.

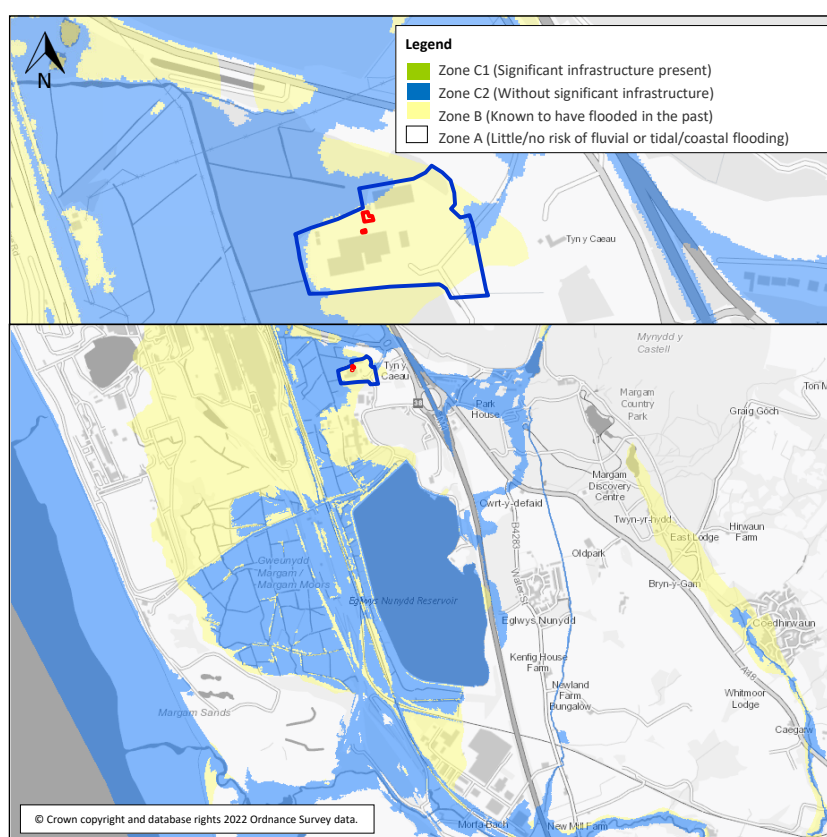


Figure 4: Development Advice Map
Source: Natural Resources Wales website; Accessed: March 2022

⁷ <http://lle.gov.wales/catalogue/item/HistoricFI/?lang=en>

⁸ <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>

4.3 Flood Risk from the Sea (Tidal / Coastal)

Natural Resources Wales was consulted to determine the mechanism of flood risk to the site and subsequently advised⁹ that “the flood extent outline shown for the area of interest is based on tidal inundation”. The Development Advice Map (**Figure 4**) 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 Update*¹⁰, the following modelled peak still tidal levels are expected adjacent to the site¹¹:

- | | |
|-------------------------------|------------|
| • 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 allowances set out in Welsh Government guidance¹² and a development lifetime of 75 years, this allowance has been calculated as 728.0 mm (from 2017 to 2097). The peak still tidal level for the 1 in 200 plus climate change (2097) AEP event is therefore estimated to be 7.11 m AOD, whilst the 1 in 1,000 plus climate change (2097) AEP event is 7.43 m AOD.

However, recognising the mechanism of flooding at the site, these flood levels are unlikely to be realised within the site.

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 plus climate change AEP tidal event (including a 1 in 2 AEP event fluvial inflow).

Within the flood risk modelling study, climate change has been 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 guidance¹³ a climate change allowance of 743.0 mm has 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 model outputs are provided in **Figure 5** and indicate that the site and access routes are expected to remain dry during all aforementioned events.

However, the Flood Map for Planning (**Figure 6**) 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 consulted¹⁴ to determine the methods used to derive the flood outlines presented on the Flood Map for Planning (Sea) (**Figure 6**) and the Margam: Flood Risk Modelling study, March 2015 (**Figure 5**). 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

⁹ Email from Natural Resources Wales to Weetwood, 3 July 2014 (Ref: ATI 04856a)

¹⁰ <https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>

¹¹ Coastal node 1546

¹² Flood Consequences Assessments: Climate change allowances (https://gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf)

¹³ Footnote 12

¹⁴ Email from Natural Resources Wales to Weetwood 21 March 2022 (Ref: ATI-23030a)

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 5**) are considered more accurate to assess tidal flood risk to the site.

It is noted that the 1 in 1,000 plus climate change AEP event has not been modelled and given the time since the Margam: Flood Risk Modelling study was undertaken it is unlikely that the modelling was undertaken in line with the latest tidal guidance. However, considering the distance between the modelled flood extent and site (approximately 2.5 km), it is unlikely that the updated tidal guidance of the 1 in 1,000 plus climate change AEP event will cause flooding to the site.

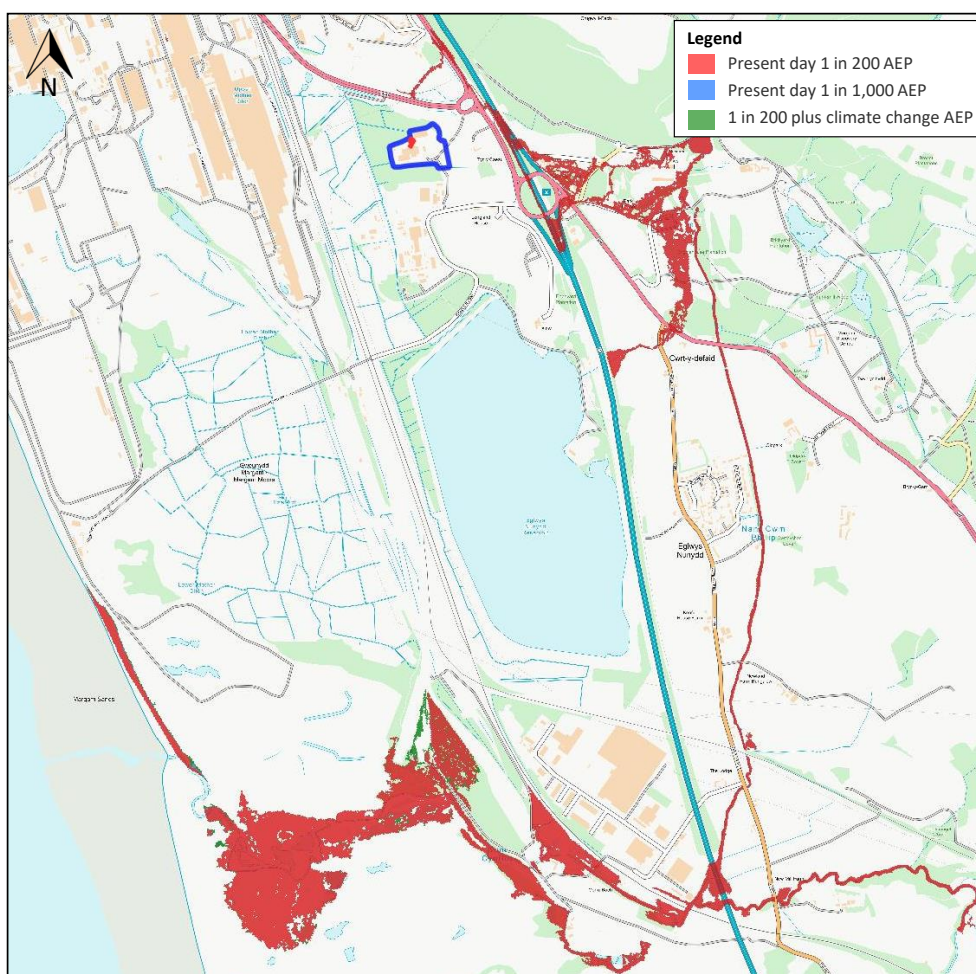


Figure 5: Afon Cynffig Tidal Flood Extents
Source: Margam: Flood Risk Modelling, Capita, March 2015

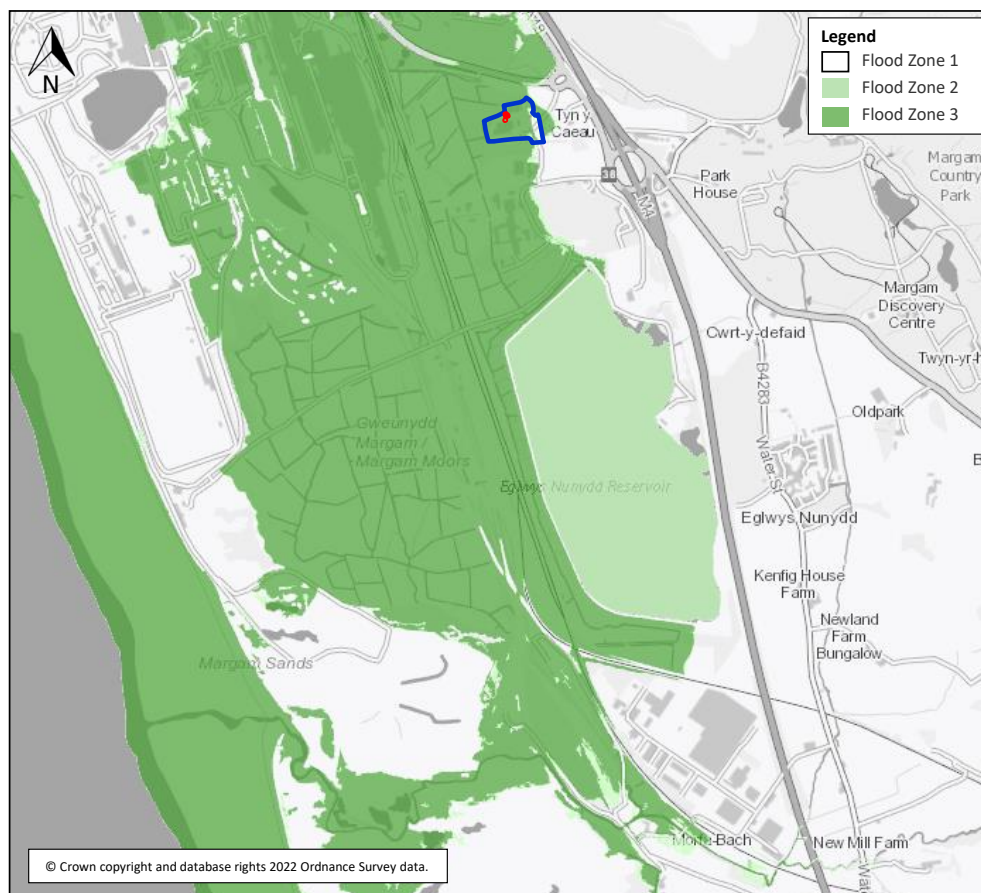


Figure 6: Natural Resources Wales Flood Map for Planning (Sea)

Source: Natural Resources Wales website; Accessed: March 2022

4.4 Flood Risk from Rivers (Fluvial)

The Flood Risk from Surface Water and Small Watercourses map (**Figure 8**) indicates that the site is not at risk of flooding from Upper Mother Ditch. As well as this, Natural Resources Wales has previously confirmed that the dominant flood risk to the site is from tidal sources, and it is therefore assumed that the site is at negligible risk of fluvial flooding.

The Margam: Flood Risk Modelling study, March 2015, has been used to assess the risk of flooding to the site from the Afon Cynffig during the 1 in 100, 1 in 100 plus climate change (20%) and 1 in 1,000 AEP fluvial events.

The model outputs are presented in **Figure 7** and indicate that the neither the site or access road leading towards Heolcae'r-Bont are 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 1 in 100, 1 in 100 plus climate change (20%) and 1 in 1,000 AEP fluvial events respectively.

In accordance with Welsh Government guidance¹⁵, 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 indicate that flows within the 1 in 1,000 AEP event are significantly larger than those within the 1 in 100 and 1 in 100 plus climate change (20%) AEP events. 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).

¹⁵ Flood Consequences Assessments: Climate change allowances (https://gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf)

Irrespective, Section 2.2 of the Margam: Flood Risk Modelling report states “NRW [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”.

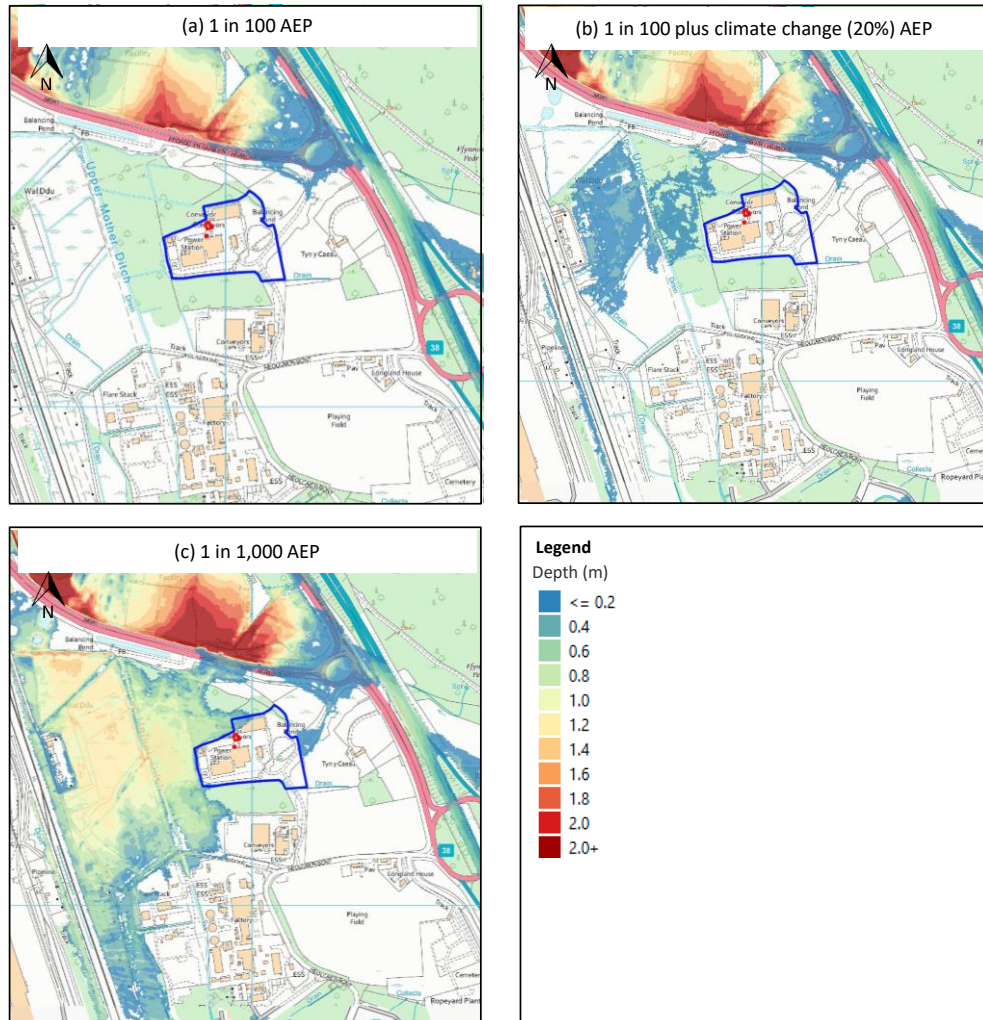


Figure 7: Afon Cynffig Fluvial Flood Depths

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

4.5 Flood Risk from Surface Water and Small Watercourses

The Flood Risk from Surface Water and Small Watercourses map (**Figure 8**) indicates that the site is not at risk of flooding from surface water.

The access roads are generally shown to be located at a very low risk of flooding from surface water, with an isolated area along the access road leading towards Harbour Way located at a low to high risk. Flood depths and velocities for this area are shown to remain below 0.9 m and 1 m/s respectively.

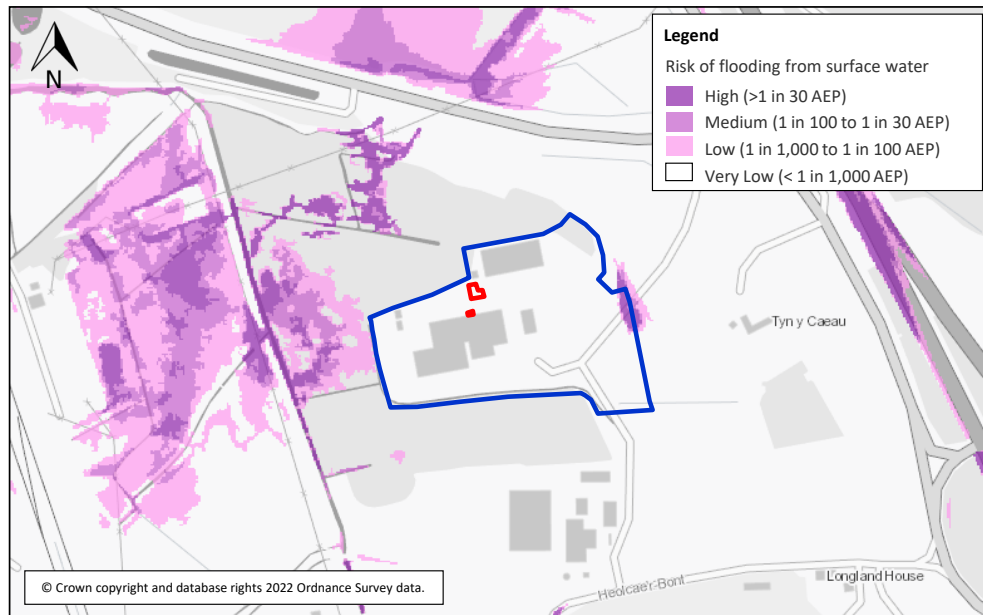


Figure 8: Flood Risk from Surface Water and Small Watercourses

Source: Natural Resources Wales website; Accessed: March 2022

4.6 Flood Risk from Reservoirs, Canals and Other Artificial Sources

The Reservoir Flood Risk map (**Figure 9**) indicates that the site 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 other canals or other impounded waterbodies located within the immediate vicinity of the site.

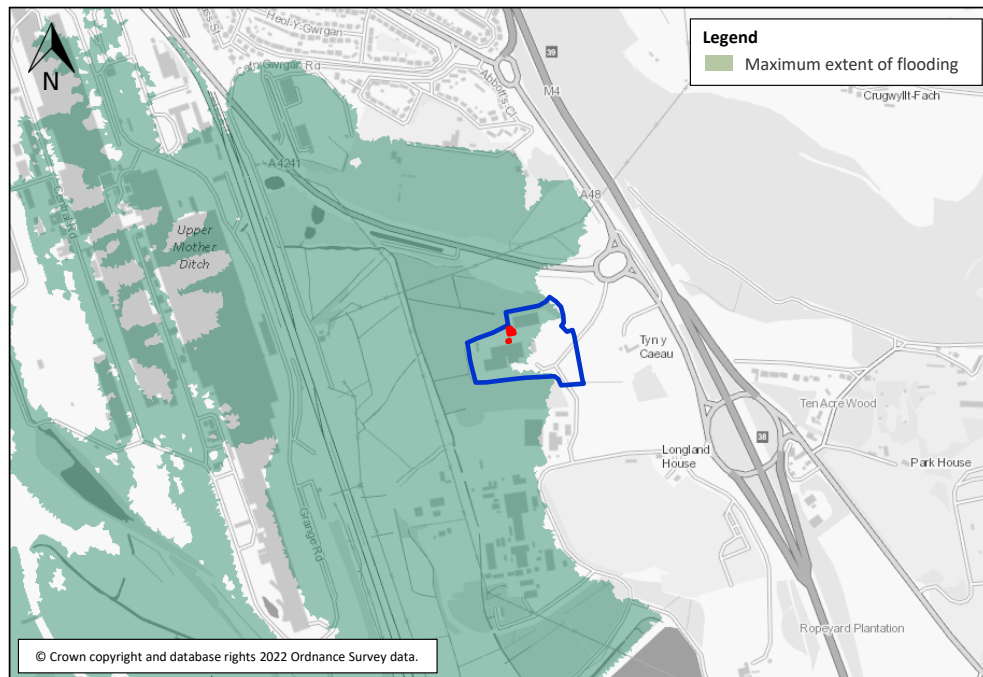


Figure 9: Reservoir Flood Risk

Source: Natural Resources Wales website; Accessed: March 2022

4.7 Flood Risk from Groundwater

The JBA Groundwater Flood Risk Indicator map (**Figure 10**) indicates that the site is at a negligible risk of groundwater flooding in a 1 in 100 AEP event.

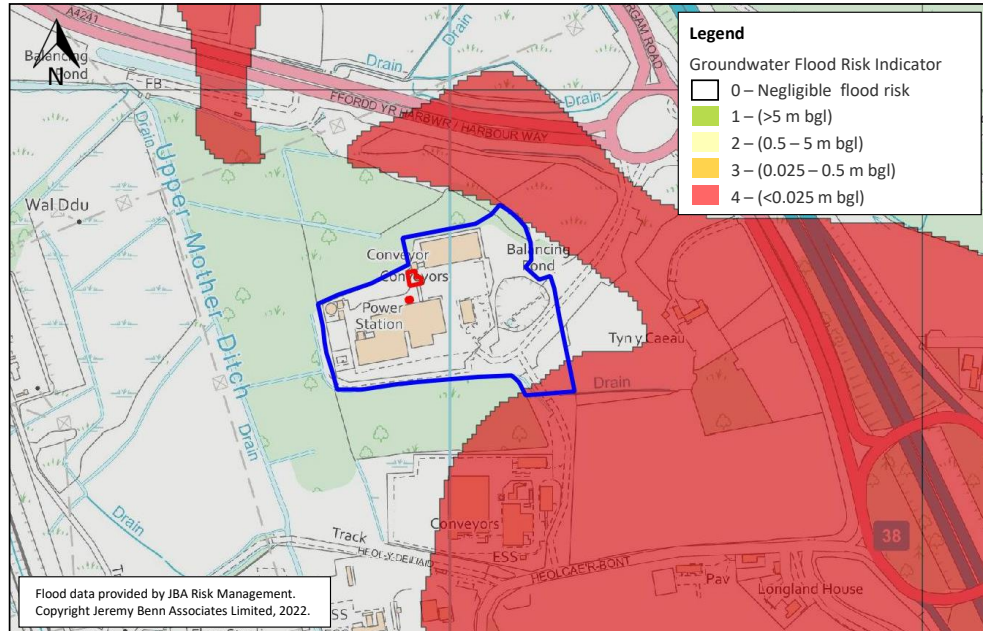


Figure 10: JBA Groundwater Flood Risk Indicator Map

Source: Blue Sky Maps; Accessed: March 2022

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.

Furthermore, the proposed development is operationally linked to the existing Margam Green Energy Plant. The proposals will clearly help sustain the existing development and will be situated on previously developed land (points i and iii, respectively, of the justification test). Given the nature of the proposals it will be impractical to locate the development elsewhere.

This report addresses part iv of the test.

4.9 Flood Risk Mitigation Measures

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.

4.10 Flood Risk Elsewhere

Proposals should not increase flood risk elsewhere for the lifetime of the development.

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.

As detailed in **Sections 4.3** and **Section 4.4**, the site is not shown to be at tidal or fluvial flood risk. Therefore, the proposed development would not be expected to impact on flood risk elsewhere.

5 SUMMARY AND RECOMMENDATIONS

This report has been prepared on behalf of Axis PED and relates to the proposed development of a secondary ash store and retention of the existing primary ash bay at Margam Green Energy Plant.

According to the Development Advice Map the proposed development site is located within zone B.

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

Tidal flood risk to the site is not directly from the Bristol Channel but from the Afon Cynffig to the south of the site, which is tidally dominated in this location. The Margam: Flood Risk Modelling study has been provided by Natural Resources Wales and indicates that neither the site or access routes are at risk of flooding in up to the 1 in 200 plus climate change AEP tidal event.

The Margam: Flood Risk Modelling study has also assessed the risk of flooding during the 1 in 100, 1 in 100 plus climate change and 1 in 1,000 AEP fluvial events from the Afon Cynffig. The model outputs indicate that the site is not at risk of flooding during any of the aforementioned events.

The Flood Risk from Surface Water and Small Watercourses indicates that the site is not at risk of flooding from the Upper Mother Ditch and is at a very low risk of flooding from surface water.

The Reservoir Flood Risk map indicates that the site may be at risk from Eglwys Nunydd Reservoir. However, all large reservoirs are regularly inspected by reservoir panel engineers with essential safety work carried out as required. As such, reservoir flooding is therefore extremely unlikely to occur.

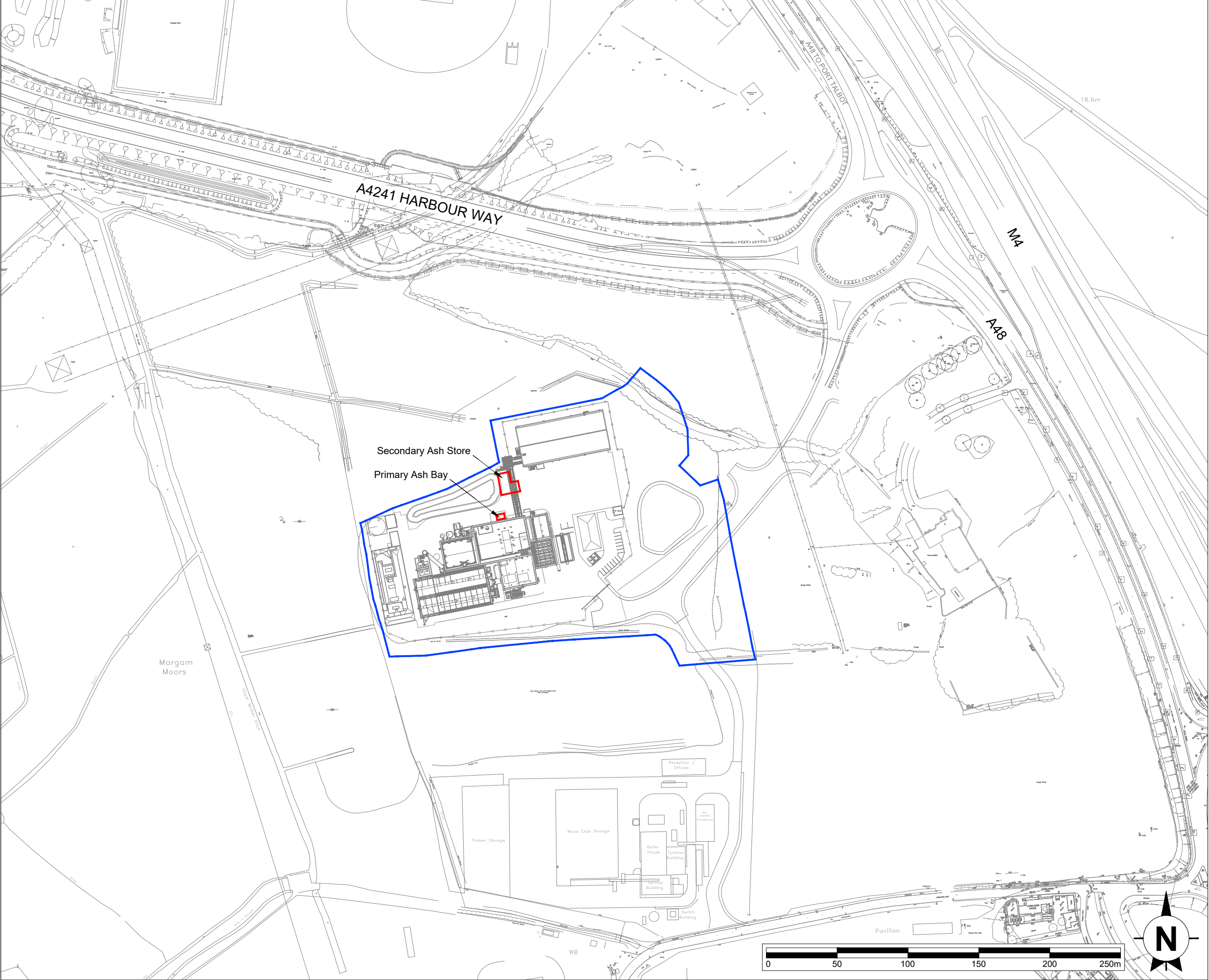
There is a negligible susceptibility to groundwater flooding at the site in a 1 in 100 AEP event.

The proposal is not expected to impact flood risk elsewhere.

Dry access and egress can be provided via the access road leading towards Heolcae'r-Bont in up to the 1 in 200 plus climate change AEP tidal event, 1 in 1,000 AEP fluvial event and during all surface water flood events.

APPENDIX A

Development Proposals



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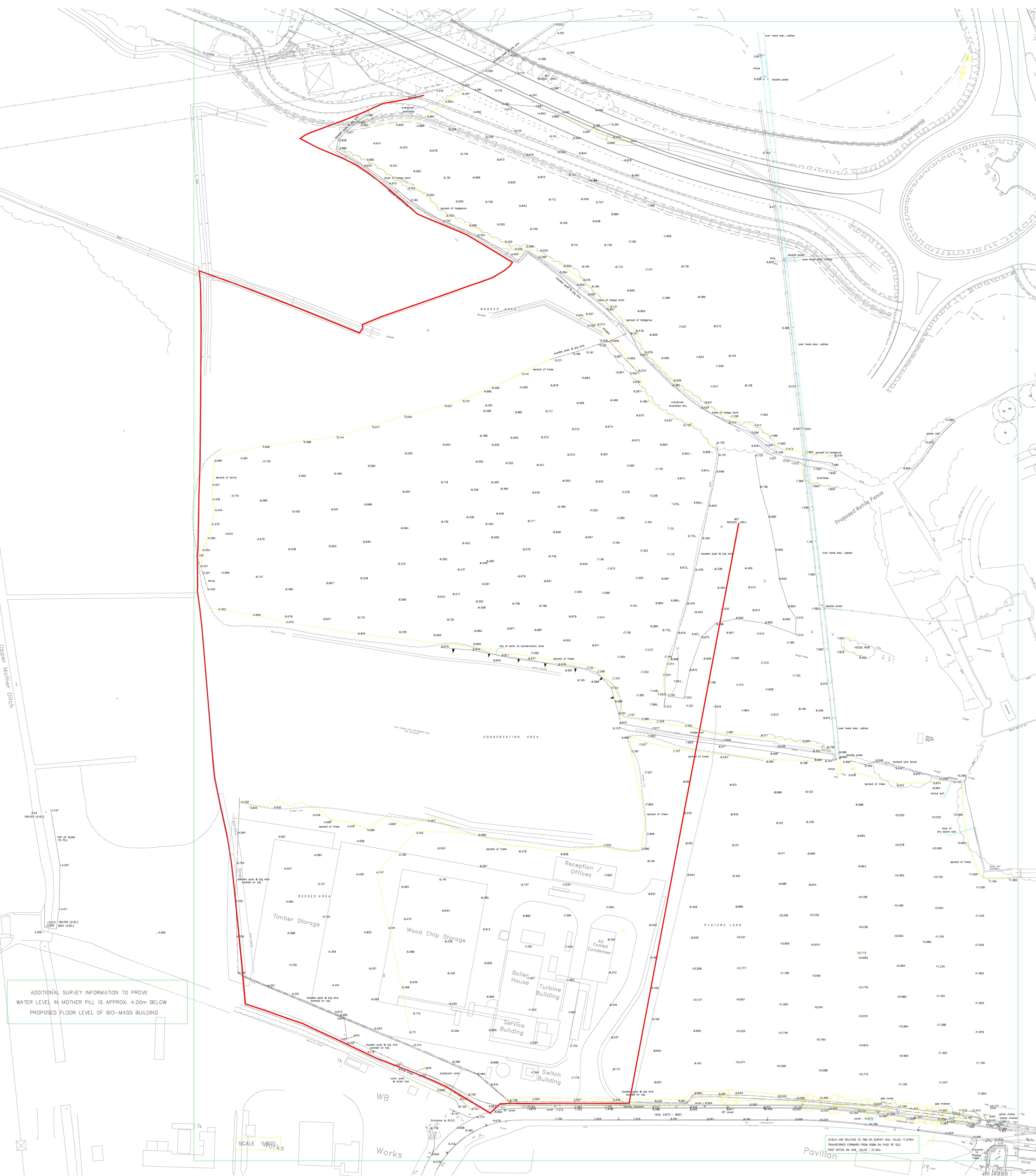
• Revision History • Date

- Ownership Boundary
- Application Boundary

Chester Office: Well House Barns Bretton Chester 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 GREEN ENERGY PLANT ASH BAYS				
drawing title: LOCATION PLAN				
date: January 2022		drawn by: checked:		
drawing number: 2774-02-02		SM AR		
scale(s): 1:2500@A3		status: --		
		rev:		
planning environment design				

APPENDIX B

Topographic Survey



Delivering client focussed services from offices 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
Expert Witness and Planning Appeals
Discharge of Planning Conditions

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