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

FLOOD CONSEQUENCES ASSESSMENT

Final Report v1.1
March 2022

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Margam Green Energy Plant, Longlands Lane, Margam, SA13 2SU
Flood Consequences Assessment



Report Title	Margam Green Energy Plant, Longlands Lane, Margam, SA13 2SU Flood Consequences Assessment Final Report v1.1
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).

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.

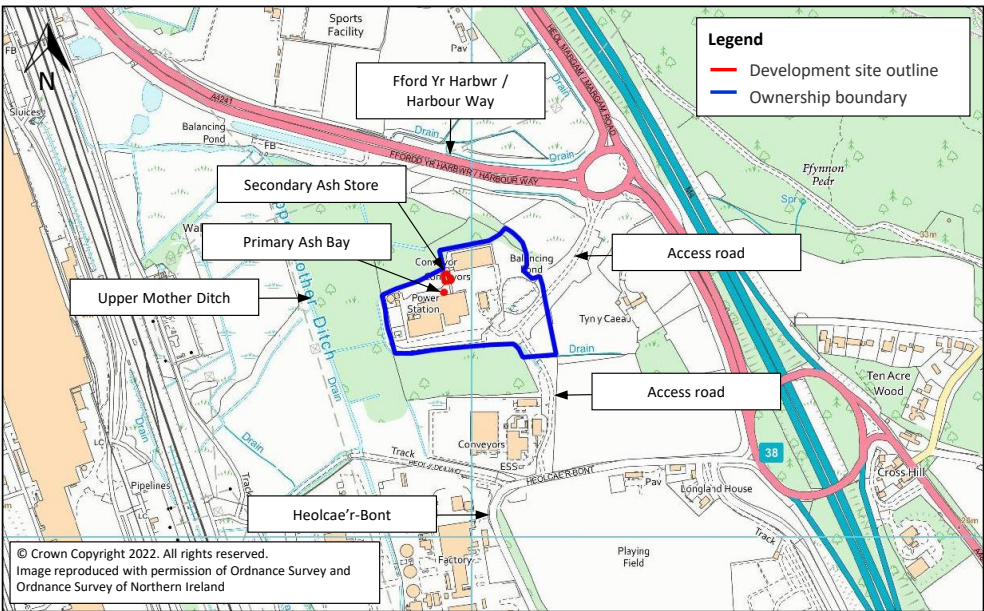


Figure 1: Site Location

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, oufaling 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’.

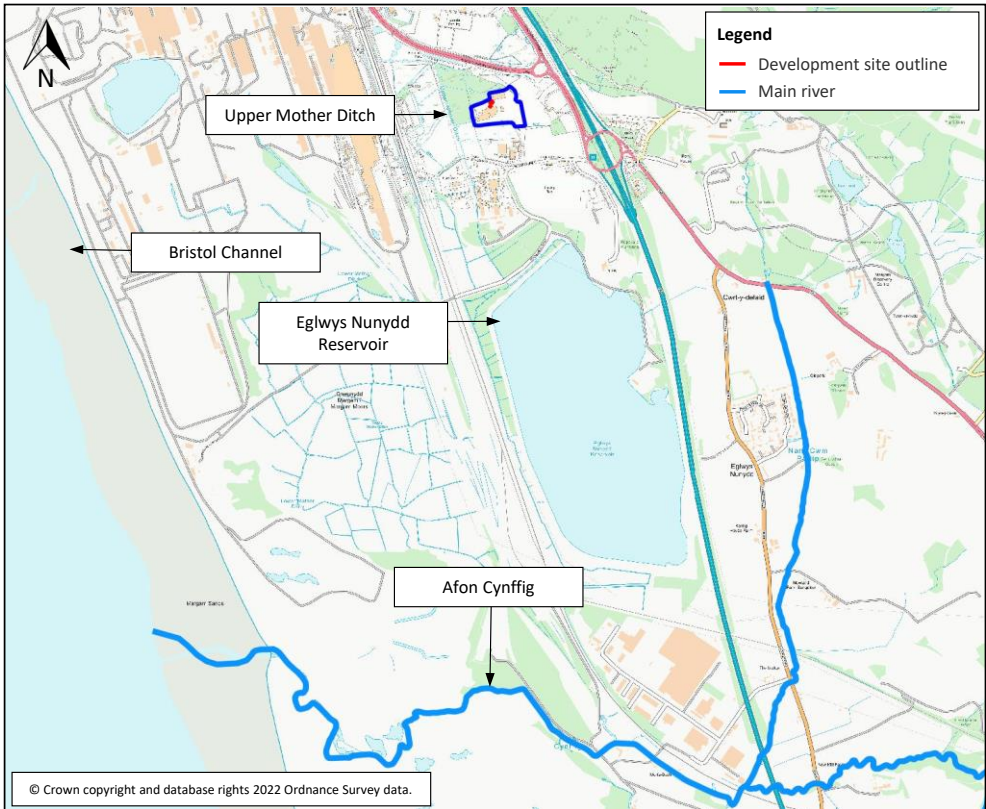


Figure 2: Location and Designation of Waterbodies
Source: Natural Resources Wales website; Accessed: March 2022

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 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 Soilscares 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/soilscares/

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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.

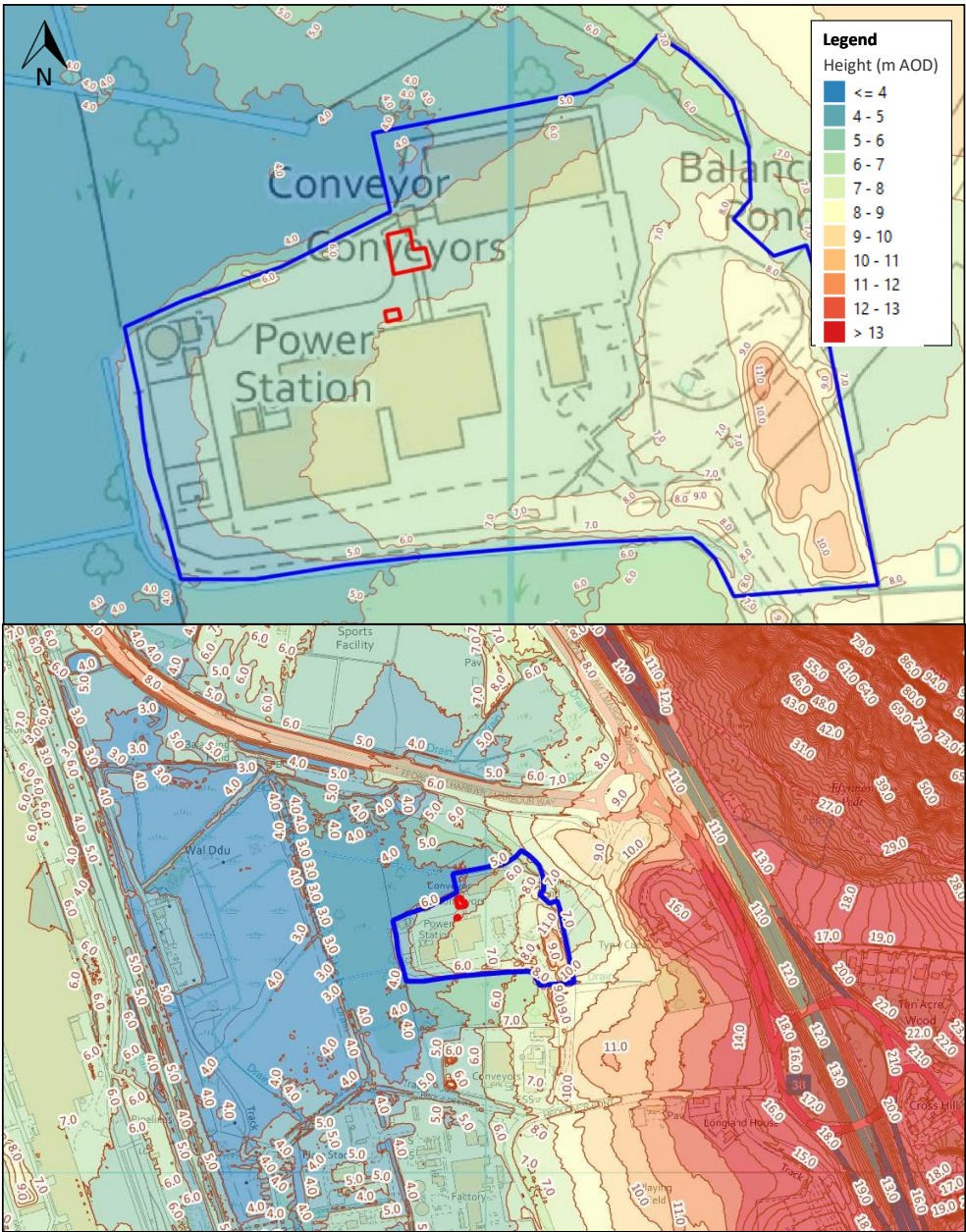


Figure 3: Digital Terrain Model from LiDAR Data

² <http://mapapps2.bgs.ac.uk/geoindex/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 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) annual exceedance probability (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.

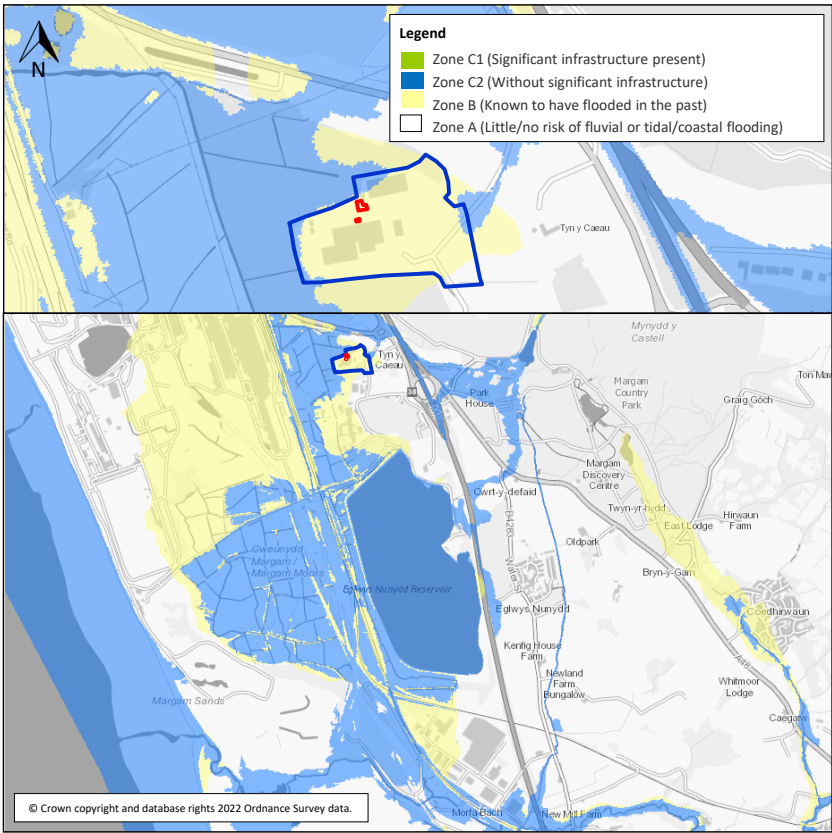


Figure 4: Development Advice Map
Source: Natural Resources Wales website; Accessed: March 2022

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 stie is not directly from the Bristol Channel but from the Afon Cynffig, which is tidally dominated in the vicinity of the site.

A request for flood risk information has been submitted to Natural Resources Wales¹⁰, however a response is awaited on issue of this report. Therefore, a still water projection of the peak tidal levels from the Bristol Channel has been utilised. The site is located 3.0 km from the Afon Cynffig and it is therefore likely that the intervening infrastructure and areas of raised land would impede floodwaters and reduce flood levels at the site in comparison with peak tidal levels from the coastline. Therefore, considering that the site’s flooding mechanism is not directly from the Bristol Channel itself and the intervening infrastructure, as detailed above, this is expected to be a very conservative estimate of flood risk to the site.

According to the Environment Agency’s Coastal Flood Boundary Conditions for the UK: 2018 Update¹¹, the following modelled peak still tidal levels are expected adjacent to the site¹²:

- 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 guidance¹³ and a development lifetime of 75 years, this allowance has been calculated as 772.5 mm (Table 1). The peak still tidal level for the 1 in 200 plus climate change (2097) AEP event is therefore estimated to be 7.15 m AOD, whilst the 1 in 1,000 plus climate change (2097) AEP event is 7.47 m AOD.

Table 1: Climate Change Allowance

Period	Net Sea Level Rise (mm/yr)	No. of years	Total Sea Level Rise (mm)
2018 - 2025	3.5	8	28
2026 - 2055	8.0	30	240
2056 - 2085	11.5	30	345
2086 - 2097	14.5	11	159.5
Cumulative rise to 2097			772.5

The existing development platform is set at a level of 6.55 m AOD. Given the peak tidal levels stipulated above, the development would be expected to remain dry during the present day 1 in 200 AEP event. Maximum flood depths of 0.15, 0.36 and 0.68 m may be expected in the vicinity of the proposed development during the present day 1 in 1,000 AEP event and the 1 in 200 plus climate change (2097) and 1 in 1,000 plus climate change (2097) AEP events respectively; however, as detailed above, this is likely to be a very conservative assumption.

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 (2097) AEP event. A maximum flood depth of 0.15 m may be expected along the aforementioned access road during the 1 in 1,000 plus climate change (2097) AEP event.

⁹ Email from Natural Resources Wales to Weetwood, 3 July 2014 (Ref: ATI 04856a)
¹⁰ Email from Weetwood to Natural Resources Wales 3 March 2022 (Ref: ATI-23030a)
¹¹ <https://data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>
¹² Coastal node 1546
¹³ Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales (<https://gov.wales/sites/default/files/publications/2019-06/adapting-to-climate-change-guidance-for-flood-and-coastal-erosion-risk-management-authorities-in-wales.pdf>)

Maximum flood depths along the access road leading towards Harbour Way may be 0.05 and 0.37 m during the present day 1 in 200 and 1 in 1,000 AEP events respectively and 0.82 and 1.14 m during the 1 in 200 plus climate change (2097) and 1 in 1,000 plus climate change (2097) AEP events respectively.

4.4 Flood Risk from Rivers (Fluvial)

Upper Mother Ditch is located approximately 0.2 km west of the site.

The Flood Risk from Surface Water and Small Watercourses map (Figure 5) 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.

4.5 Flood Risk from Surface Water and Small Watercourses

The Flood Risk from Surface Water and Small Watercourses map (Figure 5) 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.

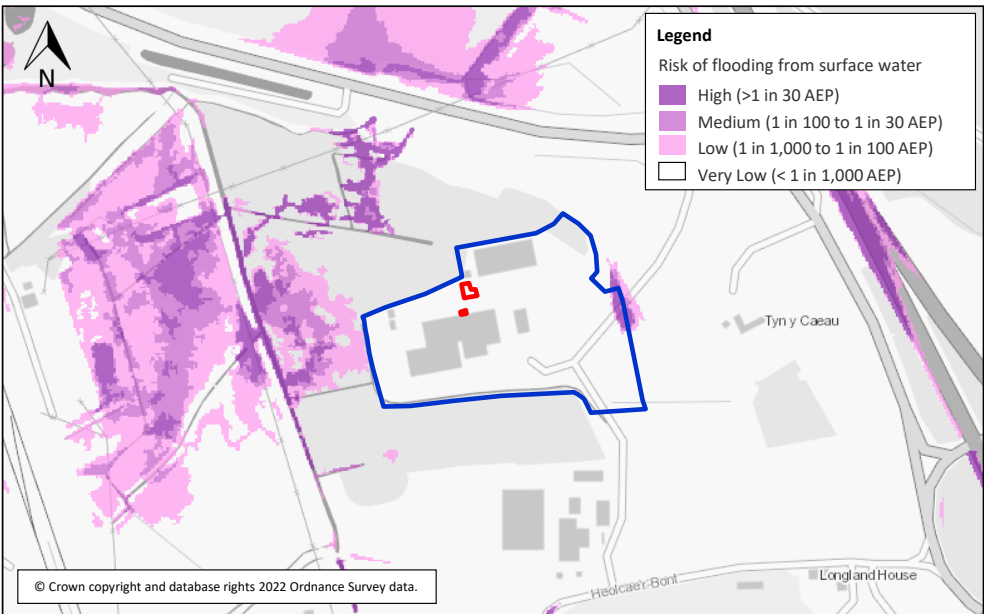


Figure 5: Flood Risk from Surface Water and Small Watercourses
Source: Natural Resources Wales website; Accessed: March 2022

4.6 Flood Risk from Reservoirs, Canals and Other Artificial Sources

The Reservoir Flood Risk map (Figure 6) 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 therefore extremely unlikely to occur. There are no other canals or other impounded waterbodies located within the immediate vicinity of the site.

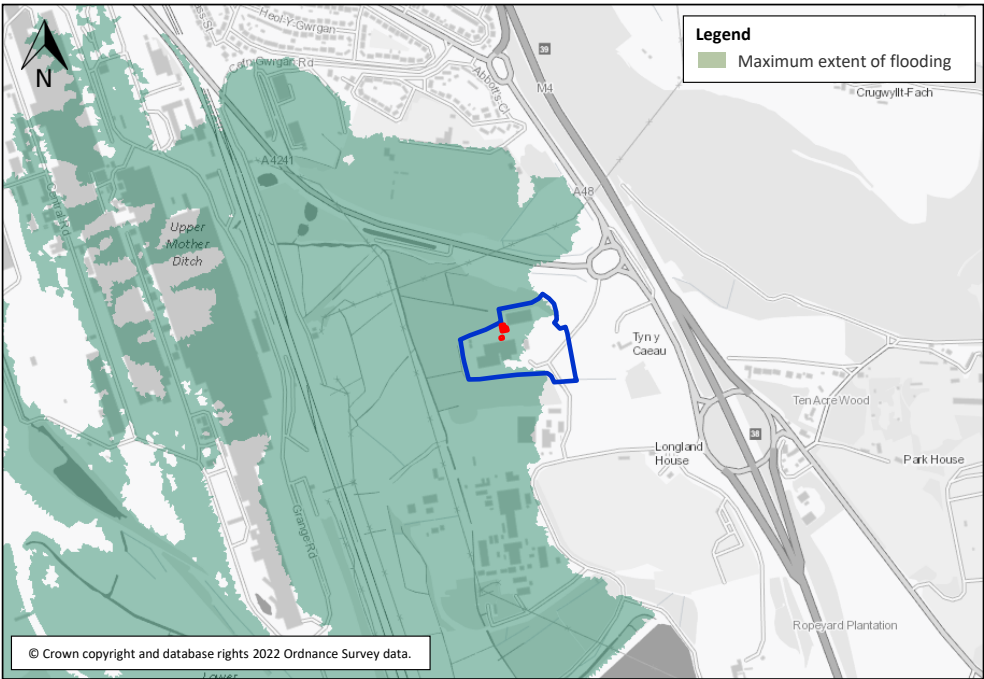


Figure 6: Reservoir Flood Risk
Source: Natural Resources Wales website; Accessed: March 2022

4.7 Flood Risk from Groundwater

The JBA Groundwater Flood Risk Indicator map (Figure 7) indicates that the site is at a negligible risk of groundwater flooding in a 1 in 100 AEP event.

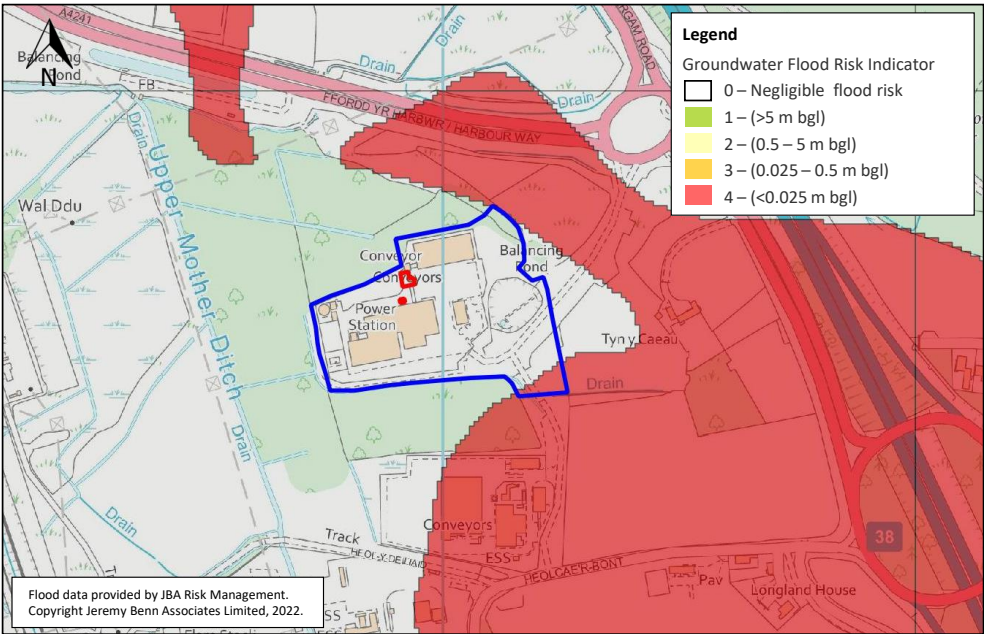


Figure 7: JBA Groundwater Flood Risk Indicator Map
Source: Blue Sky Maps; Accessed: March 2022

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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.

5 FLOOD RISK MITIGATION MEASURES

The risk of flooding to the proposed development from tidal sources will be mitigated through the implementation of the measures proposed within the following section of this report.

5.1 Finished Floor Levels

As detailed previously the development platform is set at 6.55 m AOD, providing a freeboard of 0.17 m above the present day 1 in 200 AEP peak tidal level adjacent to the site. Although this level is slightly below the present day 1 in 1,000 AEP peak tidal level (6.70 m AOD) and the 1 in 200 plus climate change AEP peak tidal level (7.15 m AOD) from the coastline, given the mechanism of flooding to the site from this source it is reasonable to conclude that flood levels at the site during this event would be significantly lower.

The proposed secondary ash store will be operationally linked to the existing use of the site and the requires for level access to be provided, it will therefore not be feasible to raise the finished floor level.

This measure will, subject to the implementation of an appropriately designed surface water drainage scheme (detailed elsewhere in the planning submission), enable any potential overland flows to be conveyed safely across the site without affecting property

5.2 Flood Risk Elsewhere

Any proposal to modify ground levels should demonstrate that there is no increase in flood risk to the development itself, or to any existing buildings which are known to, or are likely to flood.

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 primary ash store is located in the same position and of a similar scale to the ash skip, which was previously located on site. Therefore, there is not considered to be an increase in flood risk elsewhere related to the primary ash store.

Table 2 presents an assessment of the potential volume of floodwater displaced by the proposed new Secondary Ash Store. As detailed in **Section 4.2**, given the mechanism of flooding to the site and the intervening infrastructure, the volume of displaced floodwater is expected to be much lower. Notwithstanding this, the volumes of floodwaters outlined below are anticipated to be retained within the ownership boundary and not impact flood risk elsewhere.

Table 2: Displaced Flood Volumes - Secondary Ash Store

AEP event	Ground level (m AOD)	Flood level (m AOD)	Flood depth (m)	Development footprint (m²)	Displaced flood volume (m³)
Present day 1 in 1,000	6.55	6.70	0.15	50	7.5
1 in 200 plus climate change (2097)		7.15	0.60		30.0
1 in 1,000 plus climate change (2097)		7.47	0.92		46.0

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6 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. Based on still water projections of the peak tidal levels from the Bristol Channel, the site is expected to remain dry during the present day 1 in 200 AEP event. Maximum flood depths of 0.15, 0.36 and 0.68 m may be expected at the site during the present day 1 in 1,000 AEP event and 1 in 200 plus climate change (2097) and 1 in 1,000 plus climate change (2097) AEP events respectively. However, given the mechanism of flooding is from the Afon Cynffig and the intervening infrastructure between the Afon Cynffig and the site, this is likely to be a very conservative assumption.

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 (2097) AEP event and during all surface water flood events.

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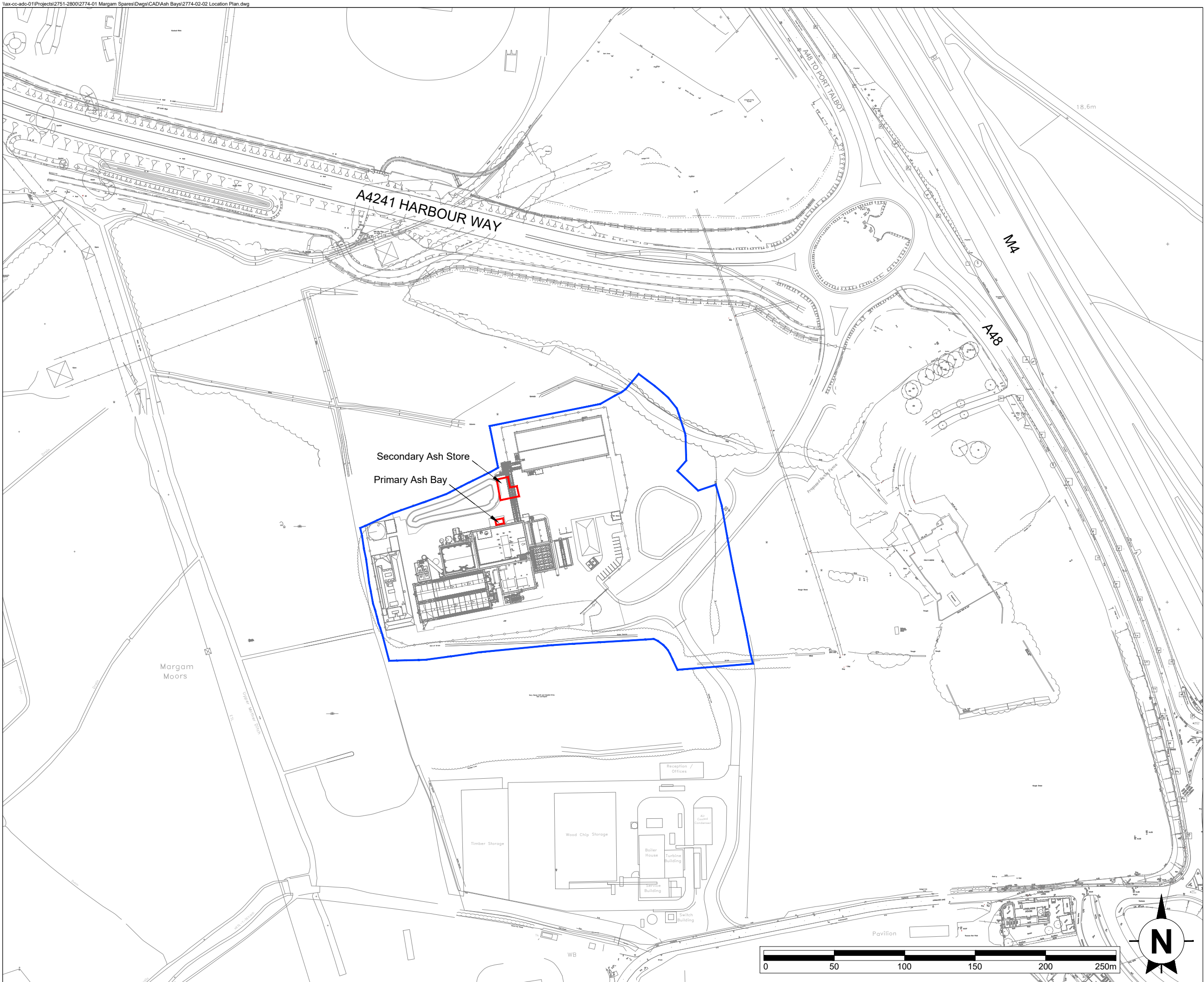
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APPENDIX A

Development Proposals

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Revision History	Date

Ownership Boundary

Application Boundary

Client Office: Wall House Farm Bretton Chester CH4 8DN		South Manchester Office: Canville House 76 Water Lane Worsley M30 5BS		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				

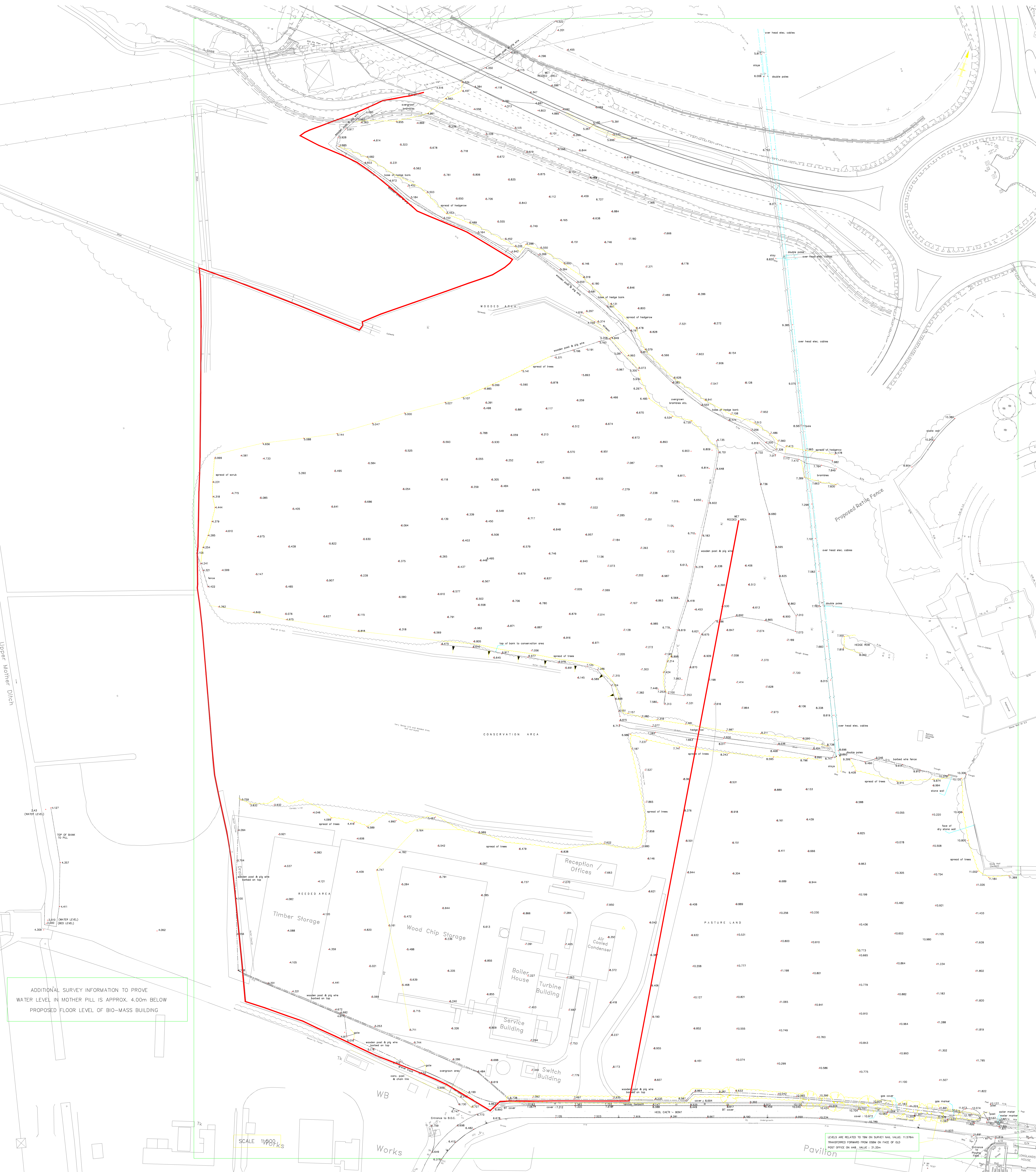
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APPENDIX B

Topographic Survey



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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