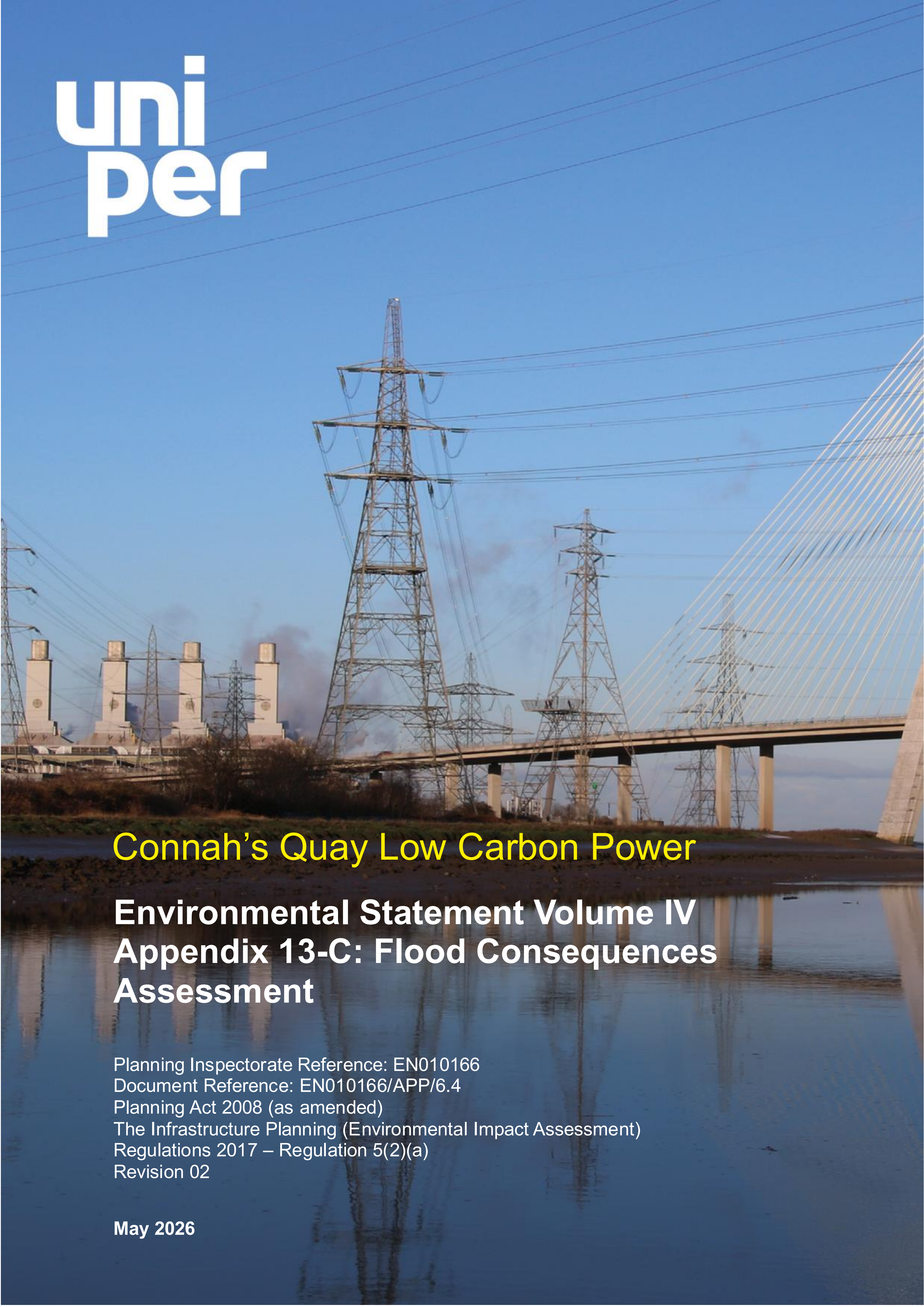

Connah's Quay Low Carbon Power

Environmental Statement Volume IV Appendix 13-C: Flood Consequences Assessment

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Prepared for:
Uniper UK Limited

Prepared by:
AECOM Limited

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1. Flood Consequence Assessment

1.1 Introduction

1.1.1 AECOM Limited (AECOM) has been commissioned by Uniper UK Ltd, (hereafter referred to as the 'Applicant') to undertake a Flood Consequence Assessment (FCA) for the development of the Connah's Quay Low Carbon Power project (the 'Proposed Development'). The Study Area considered as part of this FCA is the Order Limits for the Proposed Development, as seen in **Chapter 4: The Proposed Development [CR1-020]**.

1.1.2 In accordance with the Overarching National Policy Statement (NPS) for Energy (EN-1) (Ref 1), applications for all energy projects in Flood Zones 2 and 3 are to be accompanied by a site-specific flood risk assessment (paragraph 5.8.13).

1.1.3 This FCA considers the flood risk to and from the Proposed Development from all sources (based on freely available data), potential mitigation options (where required) and associated constraints. AECOM's approach to this FCA has involved a desk-based review of publicly available information to establish the likely flooding sources and mechanisms for the Proposed Development and has been prepared in accordance with NPS EN-1 (Ref 1), the NPS for Natural Gas Electricity Generating Infrastructure (EN-2) (Ref 2), the NPS for Natural Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Ref 3), the NPS for Electricity Networks Infrastructure (EN-5) (Ref 4), Planning Policy Wales (PPW) (Ref 5) and the associated Technical Advice Note (TAN) 15: development, flooding and coastal erosion (Ref 6).

Proposed Development

1.1.4 The Proposed Development comprises the demolition of an existing gas treatment plant (GTP) and above-ground installation (AGI), store buildings, and contractors' facilities associated within the existing Connah's Quay Power Station and the construction, operation (including maintenance) and decommissioning of a proposed low carbon Combined Cycle Gas Turbine (CCGT) Generating Plant fitted with Carbon Capture Plant (CCP) (hereafter referred to as the 'Connah's Quay Low Carbon Power (CQLCP) Abated Generating Station') and supporting infrastructure (including a Proposed CO2 AGI). Further details on the Proposed Development are available in **Chapter 4: The Proposed Development** [CR1-020].

1.1.5 The Proposed Development is expected to have a design life of approximately 30 years.

Policy Context

1.1.6 **Table 1** and **Figure 13-7: Flood Map for Planning (Rivers and Seas) [APP-138]** displays the Natural Resources Wales (NRW) Flood Map for Planning (Detailed Map) (Ref 7) designation across the permanent Proposed Development features. The Order limits also include temporary Abnormal Indivisible Load (AIL) routes to enable construction of the Proposed Development. No permanent development is planned within the

Accommodation Work Areas and therefore they have not been considered as part of the FCA.

1.1.7 TAN15 states that planning authorities need to exercise caution when allocating sites for new development and considering applications where the Flood Map for Planning clearly shows areas at risk. The level of caution increases with the level of vulnerability and likelihood. The fundamental principles of TAN15 are to restrict new development in Zone 3 subject to limited exceptions and to ensure that decision makers have taken flood risk matters into considerations in all other zones. The Flood Zones are defined within TAN15 as follows:

- *Flood Zone 1*: Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding from rivers or the sea in a given year;
- *Flood Zone 2*: Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of river flooding or less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of sea flooding in a given year including climate change;
- *Flood Zone 3*: A greater than 1 in 100 (1%) chance of river flooding or a greater than 1 in 200 (0.5%) chance of sea flooding in a given year, including climate change; and
- *TAN15 Defended Zones*: Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1 in 100 (1%) and/or flooding from the sea of 1 in 200 (0.5%) (plus climate change and freeboard).

Table 1: Proposed Development Flood Zones

Parts of the Proposed Development	Flood Zone
Main Development Area	Sea Flood Zone 3, Rivers Flood Zone 1
Repurposed CO_2 Connection Corridor	Rivers Flood Zone 1 and Sea Flood Zone 1 (majority), areas to the north in Rivers Flood Zone 3 and Sea Flood Zone 3
Proposed CO_2 Connection Corridor	Rivers Flood Zone 1 and Sea Flood Zone 1
Electrical Connection Corridor	Sea Flood Zone 3
Construction and Indicative Enhancement Area	Sea Flood Zone 3, Rivers Flood Zone 1

Parts of the Proposed Development	Flood Zone
Water Connection Corridor	Sea Flood Zone 3, Rivers Flood Zone 3

Aims and Objectives

1.1.8 The aim of this FCA is to consider the flood risk posed to, and arising from, the Proposed Development. To achieve this, the following objectives are required to be met:

- collect and review online NRW flood risk data, topographic data, scheme proposals and available planning policy documents (i.e. Strategic Flood Consequence Assessments and Preliminary Flood Consequence Assessments);
- assess and interpret available information to identify potential sources of flood risk including rivers, sea, groundwater, sewer, surface water, infrastructure failure and artificial sources;
- summarise how surface water would be managed from the Proposed Development;
- propose recommendations for appropriate flood risk mitigation measures (where applicable); and
- produce an FCA report in accordance with NPS EN-1 and PPW to support the Environmental Statement (ES).

1.2 Site Description

Location

1.2.1 The existing Connah's Quay Power Station is located on the northern side of Connah's Quay (**Figure 3-3: Areas Described in the Environmental Statement [REP4-025]**, approximately 4.5 km south-east of Flint. Historic mapping indicates that the Main Development Area of the Proposed Development consists of land that was previously lower-level marshland that has been reclaimed by land raising as part of the wider power station development.

1.2.2 All elements of the Order limits, excluding the temporary AIL routes, are located on the south bank of the River Dee, at the entry to the Dee Estuary. The A548 passes over the River Dee between the Electrical Connection Corridor and Construction and Indicative Enhancement Area (C&IEA). The Water Connection Corridor is located on the south bank of the River Dee.

1.2.3 The Repurposed CO_2 Connection Corridor extends from the Main Development Area rising upslope towards the Proposed CO_2 Connection Corridor.

1.2.4 The land use in the south-east of the Main Development Area is predominantly industrial, containing the existing Connah's Quay Power Station, with arable/grasslands surrounding the Proposed Development to the west, and the River Dee to the north. The C&IEA is constrained by the River Dee to the north and east, with the remainder surrounded by built up land, with the power station to the north-west and the residential areas of Kelsterton and Golftyn to the south-west.

Local Water Features

1.2.5 The River Dee is a designated Main River and flows south-east to north-west along the Order limits. The river is defined as part of the Dee Estuary at this location. There is a continuous area of low-lying marshland and tidal mudflats between the Main Development Area, Electrical Connection Corridor and C&IEA boundaries, and the main river channel. The Water Connection Corridor extends into the main river channel including intertidal and sub-tidal areas that are below Mean High Water Spring Tide (MHWST).

1.2.6 Whilst the River Dee is the dominant water feature in the vicinity of the Proposed Development, online Ordnance Survey mapping indicates the following surface watercourses within the Proposed Development as seen on **Figure 13-1: Surface Water Features [REP4-025]**:

- *Lead Brook* – an ordinary watercourse that flows south to north along the western boundary of the Main Development Area before discharging into the River Dee. Upstream of Oakenholt, the watercourse is impounded to form a local reservoir. The Repurposed CO_2 Connection Corridor intersects Lead Brook in a culverted section (NGR SJ 26271 71670);
- *Kelsterton Brook* – an ordinary watercourse which is a tributary of the River Dee. It rises south of the Proposed Development at Mole Road and flows in a northerly direction towards the Main Development Area. It is culverted beneath the existing Connah's Quay Power Station site and receives surface water discharge from the existing site and this would remain the case from the Proposed Development;
- *Old Rockliffe Brook* – an ordinary watercourse which originates 1.6 km south of the Main Development Area. The watercourse flows in a northerly direction to Chester Road, where it enters a culvert. North of the road there is a confluence with Kelsterton Brook and a small tributary, following which the three are culverted beneath the existing Connah's Quay Power Station site as described above for Kelsterton Brook;
- *Lead Brook/Northop Brook including Oakenholt Reservoir* – Lead Brook is an ordinary watercourse that flows south to north through the Proposed Development and is a tributary of the River Dee. The brook rises as Northop Brook to the south of Northop and flows in a northerly direction to become Lead Brook. Upstream of Oakenholt, the watercourse is impounded to form a small reservoir, called Oakenholt Reservoir which supplies water for commercial purposes as well as supporting angling. Downstream of the reservoir, the watercourse is culverted beneath Oakenholt Mills and the railway line before discharging to a wide-open channel that extends along the full length of the western boundary of the Main Development Area, before eventually discharging to the River Dee through a tidal reach. The Repurposed CO_2 Connection Corridor intersects Lead Brook in the culverted section (NGR SJ 26271 71670)

adjacent to the Main Development Area boundary upstream of the A548 culvert;

- *Pentre Brook* – an ordinary watercourse that rises in Flint Mountain and flows in a generally north-easterly direction. The brook flows approximately 480 m west of the Proposed CO_2 Connection Corridor, through Pentre Ffwrndan, prior to discharging to the Dee estuary. Tributaries of Pentre Brook are crossed by the Repurposed CO_2 Connection Corridor;
- *Oakenholt Brook* – an unnamed ordinary watercourse drains the area between Lead Brook and Pentre Brook, which flows in a northerly direction prior to being culverted beneath Chester Road and the railway line. This watercourse has been named Oakenholt Brook for the purposes of the assessment as it is culverted beneath Oakenholt Lane;
- *Allt-Goch Brook and tributary* – two unnamed ordinary watercourses of Pentre Brook are crossed by the Repurposed and Proposed CO_2 Connection Corridors. These drain the catchment between Lead Brook and Pentre Brook, and eventually discharge to Pentre Brook on the coastal floodplain. These watercourses flow through a new housing development, including a park, and are culverted beneath many roads and the railway line. The main channel has been named Allt-Goch Brook due to its vicinity to Allt-Goch Lane;
- *Unnamed ordinary watercourse* – an unnamed ordinary watercourse rises approximately 2 km to the south of the Proposed Development and flows north towards the Proposed Development. The watercourse becomes culverted as it flows beneath the A548 and beneath the existing Connah's Quay Power Station. The watercourse becomes open channel before discharging into the Dee estuary; and
- *Open water bodies* – there are three ponds that have formed in shallow lined depressions to the west of the Main Development Area, between the Main Development Area and Lead Brook.

1.2.7 It is noted that the existing Connah's Quay Power Station located within the south-east of the Main Development Area has an extensive surface water drainage system that conveys surface water to the River Dee upstream of the Main Development Area.

Geology and Hydrogeology

1.2.8 The British Geological Survey (BGS) Geology Viewer (Ref 8) shows that the predominant bedrock geology underlying the Proposed Development is the Pennine Lower Coal Measures Formation (mudstone, siltstone and sandstone). Other bedrock geologies underlaying the Proposed Development include Etruria Formation (mudstone, sandstone and conglomerate), Gwespyr Sandstone (sandstone and argillaceous rocks) and Pennine Lower Coal Measures Formation (sandstone).

1.2.9 The BGS Geology Viewer shows that Tidal Flat superficial deposits (clay, silt and sand) are present across the majority of the Proposed Development. Till superficial deposits are present across the Repurposed CO_2 Connection Corridor and Proposed CO_2 Connection Corridor. Glaciofluvial deposits are also crossed by the Proposed CO_2 Connection Corridor.

1.2.10 The Tidal Flat and Till deposits are classified as Secondary Undifferentiated Aquifers defined as *'aquifers where it is not possible to apply either Secondary A or B definition because of the variable characteristics of the rock type'.*

1.2.11 The Glaciofluvial Deposits are classified as Secondary A Aquifers defined as *'aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers'.*

Topography

1.2.12 Light Detection and Ranging (LiDAR) data (Ref 9) shows that the Main Development Area, Electrical Connection Corridor and C&IEA are characterised by flat, low-lying coastal topography with typical ground levels of approximately 6 m – 8 metres Above Ordnance Datum (m AOD). The Water Connection Corridor is similar, with the northern portion extending out into the lower marshland and River Dee channel to the north (3 m – 4 m AOD). Ground levels rise south along the Repurposed CO_2 Connection Corridor with levels reaching approximately 32 m – 40 m AOD at the Proposed CO_2 Connection Corridor.

1.3 Legislation, Planning Policy and Guidance

1.3.1 Legislation, planning policy and guidance relating to flood risk and pertinent to the Proposed Development is set out below.

Overarching National Policy Statement (NPS) for Energy (EN-1)

1.3.2 NPS EN-1 (Ref 1) sets out the Government's policy for the development of nationally significant infrastructure projects (NSIPs) which must be authorised by a Development Consent Order (DCO). NPS EN-1 was published prior to the updated TAN15 (2025) and refers to the now outdated Development Advice Map (DAM) Zones. The DAM Zones have been replaced by the Wales Flood Map for Planning (Ref 7) which classifies Flood Zones similar to that in England.

1.3.3 The objectives of this FCA are in line with paragraph 5.8.15 of NPS EN-1.

1.3.4 Paragraph 5.8.18 of NPS EN-1 recommends that applicants should arrange pre-application discussions with the NRW, and, where relevant, other bodies such as Lead Local Flood Authorities (LLFA), Internal Drainage Boards (IDB), sewerage undertakers, navigation authorities, highways authorities and reservoir owners and operators. Paragraph 5.18.19 states that discussions should identify the likelihood and possible extent and nature of the flood risk, help scope the FCA and identify the information that will be required by the Secretary of State to reach decision on the application when it is submitted.

1.3.5 NPS EN-1 states at paragraph 5.8.6 to 5.8.8 that the '*[5.8.6] aims of planning policy on development and flood risk are to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to steer new development to areas with the lowest risk of flooding. [5.8.7] Where new energy infrastructure is, exceptionally, necessary in flood risk areas (for example where there are no reasonably available sites in areas at lower risk),* *policy aims to make it safe for its lifetime without increasing flood risk elsewhere and, where possible, by reducing flood risk overall. It should also be designed and constructed to remain operational in times of flood. [5.8.8] Proposals that aim to facilitate the relocation of existing energy infrastructure from unsustainable locations which are or will be at unacceptable risk of flooding, should be supported where it would result in climate-resilient infrastructure.*'

1.3.6 NPS EN-1 states at paragraph 5.8.9 that *'If, following application of the Sequential Test, it is not possible, (taking into account wider sustainable development objectives), for the project to be located in areas of lower flood risk the Exception Test can be applied as defined in https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2. The test provides a method of allowing necessary development to go ahead situations where suitable sites at lower risk of flooding are not available.'*

1.3.7 NPS EN-1 states at paragraph 5.8.10 that *'The Exception Test is only appropriate for use where the Sequential Test alone cannot deliver an acceptable site. It would only be appropriate to move onto the Exception Test when the Sequential Test has identified reasonably available, lower risk sites appropriate for the proposed development where, accounting for wider sustainable development objectives, application of relevant policies would provide a clear reason for refusing development in any alternative locations identified. Examples could include alternative site(s) that are subject to national designations such as landscape, heritage and nature conservation designations, for example Areas of Outstanding Natural Beauty (AONBs), SSSIs and World Heritage Sites (WHS) which would not usually be considered appropriate.'*

1.3.8 Paragraph 5.8.11 of NPS EN-1 states that *'Both elements of the Exception Test will have to be satisfied for development to be consented. To pass the Exception Test it should be demonstrated that:*

- *the project would provide wider sustainability benefits to the community that outweigh flood risk; and*
- *the project will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.'*

1.3.9 Paragraph 5.8.12 of NPS EN-1 states that '*Development should be designed to ensure there is no increase in flood risk elsewhere, accounting for the predicted impacts of climate change throughout the lifetime of the development. There should be no net loss of floodplain storage and any deflection or constriction of flood flow routes should be safely managed within the site. Mitigation measures should make as much use as possible of natural flood management techniques.'*

1.3.10 Paragraph 5.8.29 of NPS EN-1 requires a sequential approach to be applied to the layout and design of the project with more vulnerable uses being located on parts of the site at lower probability and residual risk of flooding by using SuDS.

1.3.11 Paragraphs 5.8.41 of NPS EN-1 states that energy projects should not normally be consented within Flood Zone 3b or on land expected to fall within this zone within its predicted lifetime. However, it clarifies that where essential energy infrastructure has to be located in such areas, for operational reasons, they should only be consented if the development will not result in a net loss of floodplain storage and will not impede water flows.

1.3.12 Paragraph 5.8.27 of NPS EN-1 states that *'The surface water drainage arrangements for any project should, accounting for the predicted impacts of climate change throughout the development's lifetime, be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project, unless specific off-site arrangements are made and result in the same net effect'.*

1.3.13 Paragraph 5.8.28 of NPS EN-1 also states that it '*may be necessary to provide surface water storage and infiltration to limit and reduce both the peak rate of discharge from the site and the total volume discharged from the site. There may be circumstances where it is appropriate for infiltration facilities or attenuation storage to be provided outside the project site, if necessary through the use of a planning obligation*'.

National Policy Statement for Natural Gas Electricity Generating Infrastructure EN-2

1.3.14 National Policy Statement for Natural Gas Electricity Generating Infrastructure EN-2 (Ref 2) principally concerns onshore natural gas-fired electricity generating infrastructure.

1.3.15 Paragraph 2.3.3 of NPS EN-2 explains that as natural gas generating stations are likely to be proposed for coastal or estuarine sites or inland rivers and climate change is likely to increase risks from flooding or rising sea level applicants should *'set out how the proposal would be resilient to:*

- *coastal changes, and increased risk from storm surge, coastal flooding and erosion;*
- *for inland projects, increased risk of flash flooding from surface water or rivers;*
- *effects of higher temperatures, including higher temperatures of cooling water, and*
- *increased risk of drought leading to a lack of available cooling water.'*

National Policy Statement for Natural Gas Supply Infrastructure and Gas and Oil Pipelines EN-4

1.3.16 National Policy Statement for Natural Gas Supply Infrastructure and Gas and Oil Pipelines EN-4 (Ref 3) principally concerns nationally significant natural gas and oil infrastructure.

1.3.17 Paragraph 2.3.4 of NPS EN-4 explains that as climate change is likely to increase risks to some of this infrastructure, applicants should *'set out how the proposal would be resilient to:*

- *increased risk of flooding;*
- *effects of rising sea levels and increased risk of storm surge;*

- *higher temperatures;*
- *increased risk of earth movement, coastal erosion, or subsidence from increased risk of flooding and drought; and*
- *any other increased risks identified in the applicant's assessment.'*

National Policy Statement for Electricity Networks Infrastructure EN-5

1.3.18 National Policy Statement for Electricity Networks Infrastructure EN-5 (NPS EN-5) (Ref 4) principally concerns high voltage transmission systems and distribution systems in addition to associated infrastructure.

1.3.19 Paragraph 2.3.2 of NPS EN-5 explains that as climate change is likely to increase risks to the resilience of electrical infrastructure it requires applicants to '*set out to what extent the proposed development is expected to be vulnerable, and, as appropriate, how it has been designed to be resilient to:*

- *flooding, particularly for substations that are vital to the network; and especially in light of changes to groundwater levels resulting from climate change;*
- *the effects of wind and storms on overhead lines;*
- *higher average temperatures leading to increased transmission losses;*
- *earth movement or subsidence caused by flooding or drought (for underground cables);*
- *coastal erosion – for the landfall of offshore transmission cables and their associated substations in the inshore and coastal locations respectively*."

Planning Policy Wales

1.3.20 Section 6.6 of PPW provides the current guidance for planning with respect to flood risk. PPW advocates that planning authorities should take a strategic approach to flood risk and consider the catchment as a whole by providing a preliminary representation of flood risks. It is stated that development should reduce, and must not increase, flood risk arising from rivers and/or sea flooding on and off the development site itself. The priority should be to protect the undeveloped or unobstructed floodplain from development and to prevent the cumulative effects of incremental development.

Technical Advice Note 15

1.3.21 TAN15 provides guidance which supplements the policy set out in PPW in relation to development and flooding. A precautionary framework is set out which advises caution in respect of new development in areas at high risk of flooding and this is used as a guide for planning decisions. The overall aim of the precautionary framework is to direct new development away from those areas that have a high risk of flooding; and development will only be justified in these areas if it meets the criteria and tests specified in this guidance.

1.3.22 TAN15 provides technical guidance which supplements the policies set out in PPW in relation to flooding and coastal erosion. It provides a framework within which the flood risks arising from rivers, the sea and surface water, and the risk of coastal erosion can be assessed. It also provides advice on the consequences of the risks and adapting to and living with flood risk.

1.3.23 TAN15 identifies the vulnerability of different land uses to flooding and classifies proposed uses accordingly as detailed in **Table 2**. This is because certain flooding consequences may not be acceptable for particular development types.

Table 2: Development Categories

Vulnerability Category	Types
Highly vulnerable development	All residential premises (including hotels, Gypsy and Traveller sites, caravan parks and camping sites), schools and childcare establishments, colleges and universities, hospitals and GP surgeries, especially vulnerable industrial development (e.g. power generating and distribution elements of power stations, transformers, chemical plants, incinerators), and waste disposal sites, emergency services, including: ambulance stations, fire stations, police stations, command centres, emergency depots. Buildings used to provide emergency shelter in time of flood.
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). Public buildings including libraries, community centres and leisure centres (excluding those identified as being in the highly vulnerable category and emergency shelters), places of worship, cemeteries, equipped play areas, renewable energy generation facilities (excluding hydro generation).
Water Compatible	Boatyards, marinas and essential works required at mooring basins, development associated with canals. Flood defences and management infrastructure, open spaces (excluding equipped play areas). Hydro renewable energy generation.

1.3.1 TAN15 states that allocations for new highly vulnerable development must not be made in Zone 3 as the consequences of flooding are not considered acceptable for highly vulnerable development. Allocations for redevelopment in Zone 3 should be avoided and may only be made in exceptional circumstances where it is essential to the strategy of a Local Development Plan or where it addresses national security or energy security needs, or public health or it mitigates the impact of climate change.

1.3.2 As the Proposed Development is for a new power station (ultimately replacing the existing one) which would contribute to achieving energy security and mitigate the impact of climate change by capturing carbon, the highly vulnerable development is considered appropriate in Flood Zone 3. Further details are available in **Chapter 7: Planning Policy and Need [APP-045]**.

Local Development Plan

1.3.3 The Flintshire Local Development Plan (Ref 10) was adopted in 2023 and covers the period 2015 – 2030. The plan provides policies and guidance relating to development and use of land in Flintshire. The policies relating to flood risk are:

Policy EN14: Flood Risk

1.3.4 In order to avoid the risk of flooding, development will not be permitted:

a. *'in areas at risk of fluvial, pluvial, coastal and reservoir flooding, unless it can be demonstrated that the development can be justified in line with national guidance and is supported by a technical assessment that verifies that the new development is designed to alleviate the threat and consequences of flooding;*

b. *where it would lead to an increase in the risk of flooding on the site or elsewhere from fluvial, pluvial, coastal or increased surface water run-off from the site;*

c. *where it would have a detrimental effect on the integrity of existing flood risk management assets: or*

d. *where it would impede access to existing and proposed flood risk management assets for maintenance and emergency purposes.'*

PC3: Design

1.3.5 This policy details general design requirements for all new development including the requirement to incorporate '*Sustainable Urban Drainage Schemes to bring about multiple benefits as an integral part of the development.'*

Strategic Flood Consequence Assessment

1.3.6 Strategic Flood Consequence Assessments (SFCA) are used by Local Planning Authorities (LPAs) to support their Local Plan and assist in making planning decisions.

1.3.7 The Flintshire SFCA was published in 2018 (Ref 11) and identifies the strategic flood risks to key communities in Flintshire. The SFCA assesses the risk of flooding now and in the future considering the predicted effects of climate change. Where applicable, information has been extracted from the SFCA to inform the assessment of risk within this FCA, as documented in Section 1.4.

Climate Change Guidance

1.3.8 TAN15 stipulates that it is necessary to account for the potential impacts of climate change on flood risk over the lifetime of a development. The most recent guidance on the application of climate change allowances is the Welsh Government's 'Flood Consequences Assessments: Climate change allowances' document (Ref 12).

1.3.9 The guidance document provides allowances for peak river flows in areas impacted by river flooding, and for peak rainfall intensity in smaller catchments. Revised sea level rise projections based on UK Climate Projections (UKCP18) are also provided for locations at risk of coastal flooding.

Peak River Flow

1.3.10 Peak river flow allowances are provided for the three river basin districts in Wales. The allowances are based on percentage increases relative to the 1961-1990 baseline and are provided for the 10th (lower end estimate), 50th (central estimate), and 90th (upper end estimate) percentiles. The peak river flow allowances for the Dee river basin district where the Proposed Development is located are outlined in **Table 3**.

Table 3: Peak river flow allowances in the Dee river basin district

Dee	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Upper end estimate	20%	30%	45%
Central estimate	10%	15%	20%
Lower end estimate	5%	5%	5%

1.3.11 The Proposed Development has an anticipated lifetime of 30 years and construction is anticipated to begin in the 2030s. In consultation with NRW as part of the hydraulic modelling undertaken for the Proposed Development, the FCA assesses the upper end estimate for the 2080s (45% allowance) as a conservative approach. This takes account of the 30-year design life of the Proposed Development, construction and decommissioning phases and contingency in case project timelines change. Further details on the hydraulic modelling are available in **Appendix 13-F: Hydraulic Modelling Report** [**APP-215]**.

Sea Level Rise

1.3.12 **Table 4** sets out the estimates of cumulative sea level rise for the Flintshire local authority area to 2100 and 2120. The guidance document indicates that development proposals should be assessed against the 70th percentile as a minimum to inform design levels, whilst the 95th percentile should be utilised to inform the design of mitigation measures, access and egress routes and emergency evacuation plans.

Table 4: Estimated mean sea level rise (in metres) for Flintshire local authority area by 2100 and 2120

Local Authority Area	Allowance (percentile)	Mean sea level rise (metres) by 2100 (UKCP18 baseline 1981 – 2000)	Mean sea level rise (metres) by 2120 (UKCP18 baseline 1981 – 2000)
Flintshire	70th	0.76	0.91
	95th	1.03	1.23

1.3.13 In consultation with NRW as part of the hydraulic modelling undertaken for the Proposed Development, the FCA assesses the 1 in 200 year (0.5% Annual Exceedance Probability (AEP)) plus 2074 70th percentile climate change as the design event. This takes account of the 30-year design life of the Proposed Development, construction and decommissioning phases and contingency in case project timelines change. Further details on the hydraulic modelling are available in **Appendix 13-F** [**APP-215]**.

1.4 Assessment of Flood Risk Criteria

1.4.1 The criteria used to assess the flood risk is detailed below:

a. **Very Low**: where very little risk is identified or any theoretical risk identified is classified as very low within Local Authority SFCAs and/or NRW flood risk mapping extents, with very low probability of flooding occurring;

b. **Low**: where little risk is identified or any theoretical risk identified is classified as low within Local Authority SFCAs and/or NRW flood risk mapping extents, with low probability of flooding occurring;

c. **Medium**: where risk is identified within Local Authority SFCA and/or NRW flood risk mapping extents indicating a medium probability, but manageable flood risk with little to no mitigation required; and

d. **High**: where modelled levels within Local Authority SFCA and/or NRW flood risk mapping extents show risk to the Proposed Development as a high probability of flood risk and where mitigation needs to be considered and residual risks controlled.

1.5 Flood Risk – To Development

1.5.1 PPW requires that all potential sources of flooding that could affect the Proposed Development are considered. This section of the FCA assesses the flood risk posed to the Proposed Development from: rivers and the sea, directly from rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, from reservoirs, canals, lakes and other artificial flood sources.

Tidal

1.5.2 Tidal sources include the sea and estuaries.

1.5.3 As discussed in Section 1.1, the NRW Flood Map for Planning **(Figure 13-7: Flood Map for Planning (Rivers and Seas) [APP-138]** shows that parts of the Proposed Development are located within areas of tidal Flood Zone 3. **Table 5** provides the definitions of NRW's tidal flood zones.

Table 5: NRW Flood Zone Definitions – flooding from the sea

Flood Zone	Flooding from the sea (including tidal estuaries)
1	Areas with less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.
2	Areas with less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	Areas with greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.

1.5.4 To inform the FCA and provide the basis for the hydraulic modelling undertaken, NRW provided a hydraulic model for the River Dee originally produced in 2011 and subsequently updated in 2020 and 2022. This model did not include the Proposed Development location in the 1D-2D model extent and therefore the River Dee model was extended to include the Proposed Development location and the following model updates completed:

- 1D cross sections within the Dee Estuary downstream of Flintshire Bridge have been georeferenced;
- Interpolates have been added downstream of Flintshire Bridge to increase 1D cross section frequency;
- Panel markers have been added to all cross sections to improve conveyance;
- 1D-2D linking has been updated throughout the model extent, to ensure it aligns with the locations of cross sections;
- 1D and 2D bank levels have been updated to ensure they are consistent throughout the model;
- The 1D timestep has been updated;
- Incorporated the latest Light Detection and Ranging (LiDAR) data flown in 2022; and
- The representation of all floodplain culverts, bridges and underpasses within NRW's received model have been retained. Two additional flowpaths, representing the road under Flintshire Bridge and the adjacent railway, have also been represented within the floodplain, represented as rectangular culverts.

1.5.5 It was agreed with NRW (meeting May 2025) that the undefended scenario undertaken as part of the hydraulic modelling represents the worst-case scenario for the Proposed Development. Therefore, no breach analysis was undertaken as part of the hydraulic modelling assessment. For all simulations the model was simulated in the partially undefended scenario (undefended at the Main Development Area, defended throughout the wider model) which removes the private defences and screening mound along the frontage of the existing Connah's Quay Power Station.

1.5.6 The flood defences in NRW's received model are based on North Wales Tidal Defence Survey which were added to the model in 2020. It is understood from NRW that the sea defences were surveyed in 2016. The sea defences have been retained from the NRW 2020 River Dee Model on the left and right bank of the River Dee upstream of the existing Connah's Quay Power Station site. Defences on the left bank of the River Dee along the boundary of the existing Connah's Quay Power Station site are private defences and there is little information about the current condition, standard of protection or the maintenance / management regime of the defences. The site walkover identified the defences at the existing Connah's Quay Power Station site are generally raised ground along the Dee Estuary frontage with a setback partial gabion wall which has access openings to the existing Connah's Quay Power Station site. Construction information provided by the Applicant shows that the observed gabion wall is an earthwork embankment built as a screening mound with one side having a gabion construction. It was agreed with NRW in May 2025 that the private defences at the existing Connah's Quay Power Station site would be removed from the baseline model to create a partially undefended model and a conservative estimate of flood risk at the Main Development Area.

1.5.7 Further information in relation to this can be found within **Appendix 13-F: Hydraulic Modelling Report [APP-215]**.

1.5.8 The scope of the hydraulic modelling was agreed with NRW, and the model was simulated for the following tidal events:

- 1 in 50 year (2% AEP);
- 1 in 200 year (0.5% AEP);
- 1 in 200 year (0.5% AEP) plus 2074 70th percentile climate change;
- 1 in 1000 year (0.1% AEP); and
- 1 in 1000 year (0.1% AEP) plus 2074 70th percentile climate change.

1.5.9 The model was also run for the following fluvial events:

- 1 in 100 year (1% AEP) plus 45% climate change; and
- 1 in 1000 year (0.1% AEP) plus 45% climate change.

1.5.10 Further future resilience scenarios were simulated using the following tidal events:

- 1 in 200 year (0.5% AEP) plus 2074 95th percentile climate change;
- 1 in 1000 year (0.1% AEP) plus 2074 95th percentile climate change;
- 1 in 200 year (0.5% AEP) plus 2100 70th percentile climate change;
- 1 in 1000 year (0.1% AEP) plus 2100 70th percentile climate change.

1.5.11 Further details on the hydraulic modelling are available in **Appendix 13-F: Hydraulic Modelling Report [APP-215]** .

1.5.12 In addition, a sensitivity test was undertaken to consider the 0.5% AEP plus 2074, H++ climate change event. Further details of this sensitivity test are included in **Appendix A**.

1.5.13 **Figure 13C-1** of this appendix displays the maximum modelled flood extent during the 1 in 200 year (0.5% AEP) plus 2074 climate change event which shows that flooding is generally confined to the river channel and little out of bank flooding is present. No inundation is present for the Main Development Area. A small area of the northern section of the Repurposed CO_2 Connection Corridor is shown to be inundated with depths reaching up to 1.1m. However, the infrastructure associated with this corridor will be buried and therefore would not be impacted by above ground flood sources. Small areas of inundation are also present in the C&IEA with depths reaching up to 0.6m. However, during operation this area will be an ecological enhancement area with planting and will therefore be suitable to be in an area where flooding could occur. The Water Connection Corridor encroaches upon the River Dee and is located within the flood extent, however work in the Water Connection Corridor would comprise the removal of one existing 3 mm screen and the installation of one new 2 mm screen on each of the existing 28 intakes to mitigate impacts on aquatic ecology and to comply with the Eels Regulations, in addition to minor repairs to surface concrete, metalwork, and timbers. Works within the Water Connection Corridor would not require physical interaction with the riverbed.

1.5.14 The construction laydown areas are shown on **Figure 13C-1** of this appendix. The eastern construction laydown area is partially located within the 1 in 200 year (0.5% AEP) plus 2074 climate change flood extent, however the welfare facilities and staff car park proposed in this area would be located outside of the 1 in 200 year (0.5% AEP) plus 2074 climate change flood extent. During the 0.5% AEP (H++) 2074 baseline scenario initially floodwater overtops to the west (outside of the Order limits) and to the east (near the existing Connah's Quay Power Station) and propagates towards the Operational Footprint. Floodwater then overtops directly to the north of the Operational Footprint which inundates the Main Development Area. Flood depths within the Operational Footprint reach a maximum of approximately 1.3m (7.8m AOD). Flood depths within the C&IEA range between 0.0m and 2.0m. Further details on mitigation during construction are provided within Section 1.7.

1.5.15 TAN15 states that during extreme flood events there is recognition that it may not be possible to keep all development flood free. However, it is imperative that in these circumstances flooding does not endanger life, therefore it needs to be demonstrated that conditions within the development during an extreme event (1 in 1000 year (0.1% AEP) plus climate change) will be tolerable. TAN15 notes that the tolerable conditions for highly vulnerable development during the 1 in 1000 year (0.1% AEP) plus climate change event includes a maximum flood depth of 600 mm and a maximum velocity of flood waters of 0.15 m/s. Although flood extents encroach onto small parts of the Main Development Area during the 1 in 1000 year (0.1% AEP) plus 2074 climate change event, there is no new development proposed within these areas and therefore the Proposed Development meets the tolerable conditions.

1.5.16 Based on available information, the tidal flood risk to the Proposed Development is considered to be low during operation as the Main Development Area is located outside of the modelled design flood event extent, and medium during construction and decommissioning, as the eastern construction laydown area is shown to be partially located within the modelled design flood event extent.

Climate Change

1.5.17 A total of four future scenarios were simulated to assess the resilience of the Proposed Development to future sea level rise, to identify the risk over a longer design life, and to account for uncertainty in the tide level estimations.

1.5.18 The 1 in 200 year (0.5% AEP) 2074 plus 95th percentile scenario shows a maximum increase in flood depth within the channel adjacent to the Main Development Area of +0.11 m when compared to the 70th percentile scenario. The proposed area for permanent development is not shown to be inundated during this event (**Figure 13F-31 Appendix 13-F: Hydraulic Modelling Report [APP-215]**).

1.5.19 The 1 in 200 year (0.5% AEP) 2100 plus 70th percentile scenario event shows the proposed area for permanent development not to be flooded within this scenario (**Figure 13F-33 Appendix 13-F: Hydraulic Modelling Report [APP-215]**).

1.5.20 The 1 in 1000 year (0.1% AEP) 2074 plus 70th percentile scenario event shows the proposed area for permanent development to be inundated with floodwater to a maximum flood depth of 0.43 m during this event (**Figure 13F-34 Appendix 13-F: Hydraulic Modelling Report [APP-215]**).

1.5.21 The 1 in 1000 year (0.1% AEP) 2074 plus 95th percentile scenario event shows a maximum increase in flood depth within the channel adjacent to the Main Development Area of +0.17 m when compared to the 70th percentile scenario. There is a small section of the proposed area for permanent development near the frontage that is shown to flood as the maximum water level rises c.0.1 m above the raised ground levels. The area of inundation is small and remains at a depth of less than 0.15 m (**Figure 13F-32 Appendix 13-F: Hydraulic Modelling Report [APP-215]**).

1.5.22 These changes are generally proportionate to the increase in tidal boundary which has been applied. The proposed area for permanent development is only inundated during the 0.1% AEP, 2074, 95th percentile event (maximum depth of 0.15m) and the 0.1% AEP 2100, 70th percentile event (maximum depth of 0.43m). These are both extreme events and this indicates resilience to future sea level rise.

1.5.23 As stated above, during the baseline 0.5% AEP H++ 2074 event floodwater initially overtops to the west (outside of the Order limits) and to the east (near the existing Connah's Quay Power Station) and propagates towards the Operational Footprint. Floodwater then overtops directly to the north of the Operational Footprint, which inundates the Main Development Area. Flood depths within the Operational Footprint reach a maximum of approximately 1.3m (7.8m AOD).

Fluvial

1.5.24 Fluvial flooding occurs when a river exceeds its capacity following sustained or intensive rainfall.

1.5.25 As discussed in Section 1.1, the NRW Flood Map for Planning (**Figure 13-7: Flood Map for Planning (Rivers and Seas)** [APP-138], the majority of the Proposed Development is in fluvial Flood Zone 1. However, part of the Water Connection Corridor and Repurposed CO_2 Connection Corridor are located within fluvial Flood Zone 3. **Table 6** provides the definitions of NRW's fluvial flood zones.

Table 6: NRW Flood Zone Definitions – flooding from rivers

Flood Zone	Flooding from rivers
1	Areas with less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.
2	Areas with less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	Areas with a greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.

1.5.26 **Figure 13C-2** of this appendix displays the maximum modelled flood extent during the 1 in 100 year (1% AEP) plus 45% climate change event which shows that the only element of the Proposed Development located within the flood extent is the Water Connection Corridor. However no new development is proposed in this area and the works being undertaken would be to upgrade existing infrastructure.

1.5.27 Based on available information, the fluvial flood risk to the Proposed Development is considered to be low during operation as elements of the Proposed Development located within the modelled design flood event extent will be buried and therefore not impacted by above ground flood sources. The risk is considered to be medium during construction and decommissioning due to the temporary works proposed within the Water Connection Corridor during the construction/decommissioning phase.

Surface Water

1.5.28 Overland flow routes form when the infiltration capacity of the ground surface is exceeded during rainfall events and surface water runoff is generated. This is exacerbated when low permeability soils and/or geology are experienced or where there are large areas of impermeable surfacing.

1.5.29 According to the NRW Flood Map for Planning, the majority of the Proposed Development is shown to be in Flood Zone 1 for surface water flooding as shown in **Figure 13-8: Flood Map for Planning (Rivers and Sea) [APP-139]**. The existing internal roadways at the Connah's Quay Power Station are shown to be located within Flood Zones 2 and 3 from surface water flooding. There are other small, isolated areas of Flood Zones 2 and 3 within the Main Development Area. **Table 7** provides the definitions of NRW's surface water flood zones.

Table 7: NRW Surface Water Flood Zone Definitions

Surface Water Flood Zone	Definition
1	Areas with less than 1 in 1000 (0.1%) chance of flooding from surface water in a given year, including the effects of climate change.
2	Areas with 1 in 1000 (0.1%) to 1 in 100 (1%) chance of flooding from surface water in a given year, including the effects of climate change.
3	Areas with more than 1 in 100 (1%) chance of flooding from surface water in a given year, including the effects of climate change

1.5.30 Based on this information, the surface water flood risk to the Proposed Development is considered to be medium during construction, operation and decommissioning due to parts of the Proposed Development being located within surface water flood extents.

Groundwater

1.5.31 Groundwater flooding occurs when water levels in the ground rise above the ground surface. The geology dictates where this type of flooding takes place; it is most likely to occur in low-lying areas underlain by permeable rocks (aquifers).

1.5.32 According to the Soilscapes (Ref 13), soils at the Main Development Area, the C&IEA, the Electrical Connection Corridor and the onshore section of the Water Connection Corridor are indicated to be *'Loamy and clayey soils of coastal flats with naturally high groundwater'*.

1.5.33 Soils at the Repurposed and Proposed CO_2 Connection Corridors are indicated to be *'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils,'* with the exception of the north-west to north-east portion of the Repurposed CO_2 Connection Corridor which is mapped as *'Loamy and clayey soils of coastal flats with naturally high groundwater'*. *'Freely draining slightly acid loamy soils'* are also mapped immediately south-east of the Repurposed CO_2 Connection Corridor.

1.5.34 The BGS Borehole Records Viewer (Ref 14) has been examined to interrogate groundwater levels at the Proposed Development location. Five available borehole records within the Order limits or within close proximity to the Proposed Development have been examined. **Table 8** displays depths at which the groundwater was struck. Groundwater was struck at least 1 m below ground level (mbgl).

Table 8: BGS Borehole Records

Borehole ID	Borehole depth (m)	Groundwater struck (mbgl)
SJ27SE300	36.00	4.00

Borehole ID	Borehole depth (m)	Groundwater struck (mbgl)
SJ27SE301	30.00	3.00
SJ27SE302	26.00	2.15
SJ27SE16	55.78	3.50
SJ27SE23	71.32	1.00

1.5.35 A Preliminary Ground Investigation Report was produced in April 2025 (Ref 15) which details groundwater levels recorded on five visits between January and March 2025. **Table 9** shows the groundwater levels recorded across the Proposed Development and indicates that there was shallow groundwater present in the Main Development Area, near to the Repurposed CO_2 Connection Corridor and near to the Electrical Connection Corridor.

Table 9: Groundwater Monitoring Results

Parts of the Proposed Development	Groundwater levels recorded (mbgl)
Main Development Area	0.13 – 3.00
Repurposed CO_2 Connection Corridor	No boreholes in this area – nearest borehole located 0.2 km to the north-west recorded a groundwater strike at 0.5 mbgl
Proposed CO_2 Connection Corridor	No boreholes in this area and no boreholes in vicinity
Electrical Connection Corridor	No boreholes in this area – nearest borehole located 0.1 km to the south recorded a groundwater strike at 1.03 mbgl.
Construction and Indicative Enhancement Area	1.2
Water Connection Corridor	No boreholes in this area – nearest borehole located 0.3 km to the west recorded a groundwater strike at 6 mbgl (this may not be representative of the Water Connection Corridor location which is in close proximity to the Dee Estuary).

1.5.36 Based on the available information, the groundwater flood risk to the Proposed Development is considered to be medium during construction, operation and decommissioning due to shallow groundwater identified during the preliminary ground investigations.

Sewers

1.5.37 Sewer flooding can occur because of infrastructure failure, for example blocked sewers or failed pumping stations. It can also occur when combined sewer systems surcharge due to the volume or intensity of rainfall exceeding the capacity of the sewer, or if the system becomes blocked by debris or sediment.

1.5.38 According to the Flintshire SFCA, there have been no sewer flooding incidents at the Proposed Development location from 1990 to 2016. Based on this information and as a drainage strategy is being produced for the Proposed Development which will manage surface water so that there is no increase in flood risk to the Proposed Development or third-party land, the sewer flood risk to the Proposed Development is considered to be low during construction, operation and decommissioning.

Artificial Sources

1.5.39 Artificial sources include raised channels such as canals, or storage features such as ponds and reservoirs.

1.5.40 The NRW Flood Map for Planning has been reviewed and shows a small part of the western side of the Main Development Area, the Water Connection Corridor and the northern part of the Repurposed CO_2 Connection Corridor to be at risk of flooding from reservoirs.

1.5.41 The consequences from a reservoir failure could be severe, however, NRW note that this is a worst case prediction; reservoirs are maintained to a very high standard and are extremely unlikely to fail (Ref 16). Based on this information, the flood risk from artificial sources is considered to be low due to the low likelihood during construction, operation and decommissioning.

Flood Risk Summary

1.5.42 The flood risk to the Proposed Development is summarised in **Table 10**.

Table 10: Summary of flood risk to the Proposed Development

Flood Mechanism	Source	Flood risk to the development	Mitigation required?
Tidal	Dee Estuary	Low (during operation), medium (during construction and decommissioning)	Yes
Fluvial	Main River / Ordinary Watercourse	Low (during operation), medium (during construction and decommissioning)	Yes
Surface Water	Runoff from surrounding land and hard surfaces	Medium	Yes (surface water drainage strategy)
Groundwater	Rising groundwater levels in the	Medium	Yes

Flood Mechanism	Source	Flood risk to the development	Mitigation required?
	underlying geology		
Sewers	Surrounding public / private drainage systems	Low	No
Artificial Sources	Reservoirs	Low	No

1.6 Flood Risk – From Development

Fluvial/Tidal

1.6.1 Although the Main Development Area is located within Tidal Flood Zone 3, the hydraulic modelling shows that it is not located within the design flood event extent (1 in 200 year (0.5% AEP) plus 2074 climate change). Therefore, no displacement of floodplain will occur because of the proposed land raising which could consequently increase flood risk to third parties. On decommissioning, the ground levels of the Main Development Area will be reinstated to existing levels as secured in the **Design Principles Document [REP4-060]**.

1.6.2 A hydraulic model was created including the proposed land raising to assess off site impacts during extreme events. During the 2100 0.1% AEP 70th percentile scenario all flooding is removed from the proposed permanent development area due to land raising. Small increase in flood depths up to 0.15 m are present on the access road along the Dee Estuary, however this is contained within the Order limits. Small areas approximately 2 km upstream of the Main Development Area show impacts as a result of land raising mainly centered around Wepre Brook. However, this increase in flood risk is small and is likely associated with representation of a culvert connecting River Dee to Wepre Brook within the hydraulic model, rather than due to the proposed land raising. Further details can be found within **Appendix 13-F: Hydraulic Modelling Report [APP-215]**.

1.6.3 During the proposed 0.5% AEP (H++) 2074 scenario, initially floodwater overtops to the west (outside of the Order limits) and to the east (near the existing Connah's Quay Power Station) and propagates towards the Operational Footprint. However, during the proposed scenario, the Operational Footprint is raised which alters the local flowpaths and reduces the amount of overtopping onto the Main Development Area. During the peak of the event, floodwater does overtop on to the raised Operational Footprint with maximum flood depths reaching approximately 0.4 m. However, at the location of the buildings where the critical infrastructure is proposed (which are raised a further 300mm), maximum flood depths remain below 0.1 m.

Surface Water Management

1.6.4 Development can lead to an increased risk of flooding by increasing surface water runoff as development often increases the area of impermeable surfaces thereby promoting rapid runoff to surface water sewers or watercourses rather than percolation into the ground. The effect can be to increase both total and peak water flows, contributing to flooding. An **Outline Surface Water Drainage Strategy** has been produced (see **Appendix 13-D [REP4-038]**) to manage any increases in surface water runoff or volume which is summarised in paragraph 1.7.8.

Groundwater

1.6.5 Permanent subsurface structures such as foundations, piles and pipelines could potentially have an impact on groundwater flows and groundwater flooding. However, the volume of groundwater which could be displaced because of the subsurface structures would be minimal in comparison to the large expansive groundwater table. Therefore, there is not considered to be any increase in groundwater flood risk because of the Proposed Development.

1.7 Flood Risk Mitigation

Fluvial/Tidal

Construction/Decommissioning

1.7.1 A **Framework Construction Environmental Management Plan (CEMP)** (**EN010166/APP/6.5**) has been produced which includes measures to help manage fluvial and tidal flood risk during the construction phase as part of embedded mitigation. A Decommissioning Environmental Management Plan (DEMP) will be produced at the time of decommissioning to manage fluvial and tidal flood risk during the decommissioning phase. Examples of flood control measures which will be implemented in the CEMP/DEMP include:

- construction materials will be stored outside of the 1 in 200 year (0.5% AEP) extent for areas at tidal flood risk and outside of the 1 in 100 year (1% AEP) extent for areas at fluvial flood risk. If areas located within Flood Zone 3 are to be utilised for the storage of construction materials, this will be done in accordance with the applicable flood risk activity regulations, if required;
- the welfare facilities and staff car park will be located outside of the modelled tidal 1 in 200 year (0.5% AEP) extent plus 2074 climate change extent;
- connectivity would be maintained between the floodplain and the adjacent watercourses;
- during the construction phase, the Contractor will monitor the weather forecasts daily, and review the weekly and monthly weather forecasts each week, and plan works accordingly. For example, works in the channel of any watercourses will be avoided or halted were there to be a significant risk of high flows or flooding; and
- the construction laydown area site office and supervisor will be notified of any potential flood occurring by use of the Floodline Warning Service or equivalent service.

1.7.2 The contractor will be required to produce an Emergency Response Plan as part of the CEMP which will provide detail of the response to an impending flood and include:

- a 24-hour availability and ability to mobilise staff in the event of a flood warning;
- the removal of all plant, machinery and material capable of being mobilised in a flood for the duration of any holiday close down period where there is a forecast risk that the Proposed Development may be flooded;
- details of the evacuation and site closedown procedures. Small parts of the B5129 experience flooding during the 1 in 200 year (0.5% AEP) plus 2074 climate change event where the road crosses the Dee Estuary, therefore, evacuation should be via Church Street through Connah's Quay;
- arrangements for removing any potentially hazardous material and implementing more stringent protection measures;
- if water is encountered during below ground construction, suitable de-watering methods would be used. Any groundwater dewatering required in excess of the exemption thresholds would be undertaken in line with the requirements of NRW (under the Water Resources Act 1991 (Ref 17)) and the Environmental Permitting (England and Wales) Regulations 2016 (Ref 18); and
- safe egress and exits are to be maintained at all times when working in excavations. When working in excavations a banksman is to be present at all times.

Operation

1.7.3 Although the hydraulic modeling results show that during the 1 in 200 year (0.5% AEP) plus 2074 climate change event the Main Development Area is free from flooding, in consultation with NRW it has been agreed to raise the Main Development Area 600 mm above the maximum water level in the Dee Estuary during the design flood event level as a conservative approach. The level in the Dee Estuary during the 1 in 200 year (0.5% AEP) plus 2074 climate change event is 6.8 m AOD and therefore the levels of the Main Development Area will be 7.4 m AOD as secured in the **Design Principles Document** [REP4-060]. To provide additional resilience, critical infrastructure within the Main Development Area buildings will be raised to 7.7m AOD which is 600 mm above the 1 in 200 year (0.5% AEP) plus 2100 climate change event level in the Dee Estuary as secured in the **Design Principles Document** [REP4-060].

1.7.4 A Flood Emergency Response Plan will be developed to ensure the safety of the Main Development Area is maintained in the event of a flood event. This will include details of evacuation, and safe refuge areas. This is particularly important given areas of the Operational Footprint which are not raised buildings, could potentially flood to depths of 0.40 m during the H++ scenario.

Groundwater

Construction/Decommissioning

1.7.5 Groundwater investigations have identified that there is potential for shallow groundwater across the Proposed Development, and therefore potential for groundwater ingress during construction. This will be managed following standard construction techniques detailed within the **Framework CEMP** (**EN010166/APP/6.5**) including dewatering where required. A DEMP will be produced at the time of decommissioning and will include details on how the potential risk from groundwater will be mitigated.

Operation

1.7.6 To mitigate the risk of groundwater flooding during operation, any vulnerable equipment will be raised 300 mm above proposed ground levels and any infrastructure within the Repurposed CO_2 Connection Corridor and Electrical Connection Corridor will be designed to prevent water ingress as secured in the **Design Principles Document** [REP4-060].

Surface Water Management

Construction/Decommissioning

1.7.7 The **Framework CEMP** (**EN010166/APP/6.5**) includes examples of measures to prevent an increase in surface water flood risk during the construction works including a temporary drainage system. A DEMP will be produced at the time of decommissioning and will include details on how surface water flood risk will be mitigated during decommissioning.

1.7.8 The detailed CEMP, which must be in general accordance with the **Framework CEMP** (**EN010166/APP/6.5**), will be prepared prior to the commencement of the construction, as secured through the requirements in the **Draft DCO** (**EN010166/APP/3.1**).

Operation

1.7.9 An **Outline Surface Water Drainage Strategy** has been prepared (refer to **Appendix 13-D** [REP4-038]) which sets out the drainage system for the Proposed Development. A summary of the main embedded mitigation measures to manage surface water flood risk is provided below:

- site-wide rainwater runoff will be collected through a series of SuDS features, e.g. localised filter drains, swales, tree pits and/or permeable pavements which will provide initial interception and treatment of runoff.
- the attenuation strategy is to use a grassed swale and attenuation tank(s).
- a new outfall (the Proposed Surface Water Outfall) will be formed directly adjacent to the Old Rockcliffe Brook alongside the existing outfall (the Existing Surface Water Outfall) on the north-eastern boundary. Unrestricted flow rates to the Old Rockcliffe Brook are permitted for both free draining and tide lock conditions.

- the attenuation will contain the majority of storm events during tide lock conditions, with more extreme events being permitted to overtop and flood flow managed away from infrastructure.

1.7.10 To mitigate the risk of surface water flooding during operation, any vulnerable equipment will be raised 300 mm above proposed ground levels as secured in the **Design Principles Document [REP4-060]**.

1.8 Conclusions

Overview

1.8.1 This FCA has appraised the risk of flooding to and from the Proposed Development. The Proposed Development is classified as 'highly vulnerable' in line with TAN15 as it is a power station. Some elements of the Proposed Development are located within Flood Zone 3 including parts of the Main Development Area, parts of the Repurposed CO_2 Connection Corridor, the Electrical Connection Corridor, the Water Connection Corridor and parts of the Construction and Indicative Enhancement Area.

1.8.2 NPS EN-1 states that *'Where new energy infrastructure is, exceptionally, necessary in flood risk areas (for example where there are no reasonably available sites in areas at lower risk), policy aims to make it safe for its lifetime without increasing flood risk elsewhere and, where possible, by reducing flood risk overall. It should also be designed and constructed to remain operational in times of flood.'*

1.8.3 TAN15 states that allocations for new highly vulnerable development must not be made in Zone 3 as the consequences of flooding are not considered acceptable for highly vulnerable development, and allocations for redevelopment in Zone 3 should be avoided and may only be made in exceptional circumstances where it is essential to the strategy of a Local Development Plan or where it addresses national security or energy security needs, or public health or it mitigates the impact of climate change.

1.8.4 As the Proposed Development at Connah's Quay is for the construction of a new power station (ultimately replacing an existing power station) which would contribute to achieving energy security and mitigate the impact of climate change by capturing carbon, the highly vulnerable development is considered appropriate in Flood Zone 3. The Proposed Development has been designed to remain operational in times of flood.

Flood Risk – To Development

1.8.5 The following potential sources of flooding which could affect the Proposed Development have been considered and assessed as follows:

- the flood risk due to tidal sources is considered to be low during operation and medium during construction and decommissioning based on the hydraulic modelling results;
- the flood risk due to fluvial sources is considered to be low during operation and medium during construction and decommissioning based on the hydraulic modelling results;

- the flood risk due to surface water is considered to be medium during construction, operation and decommissioning based on a review of the NRW Flood Map for Planning;
- the flood risk due to groundwater is considered to be medium during construction, operation and decommissioning, based on a review of the underlying geology and an assessment of borehole records;
- the flood risk due to sewers is considered to be low during construction, operation and decommissioning, due to a lack of historic sewer flooding incidents and the drainage strategy prepared for the Proposed Development will manage surface water with a view to there being no increase in flood risk to the Proposed Development; and
- the flood risk due to artificial sources is considered to be low during construction, operation and decommissioning, based on a review of the NRW Flood Map for Planning.

Flood Risk – From Development

1.8.6 An **Outline Surface Water Drainage Strategy** has been produced (**Appendix 13-D [REP4-038]**) to manage any increases in surface water runoff or volume.

1.8.7 Shallow groundwater has been identified and therefore subsurface features have the potential to impact upon groundwater flows and groundwater flooding. However, the volume of groundwater which could be displaced as a result of the subsurface structures would be minimal in comparison to the large expansive groundwater table. Therefore, there is not considered to be any increase in groundwater flood risk as a result of the Proposed Development

1.8.8 A **Framework CEMP** (**EN010166/APP/6.5**) has been produced to manage fluvial, tidal, groundwater and surface water flooding during the construction phase so that there is no increase in flood risk to the Proposed Development or third-party land.

1.8.9 A DEMP will be produced at the time of decommissioning and will include measures to mitigate any flood risks pursuant to a requirement of the **Draft DCO** (**EN010166/APP/3.1**).

References

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Appendix A – Hydraulic Modelling H++

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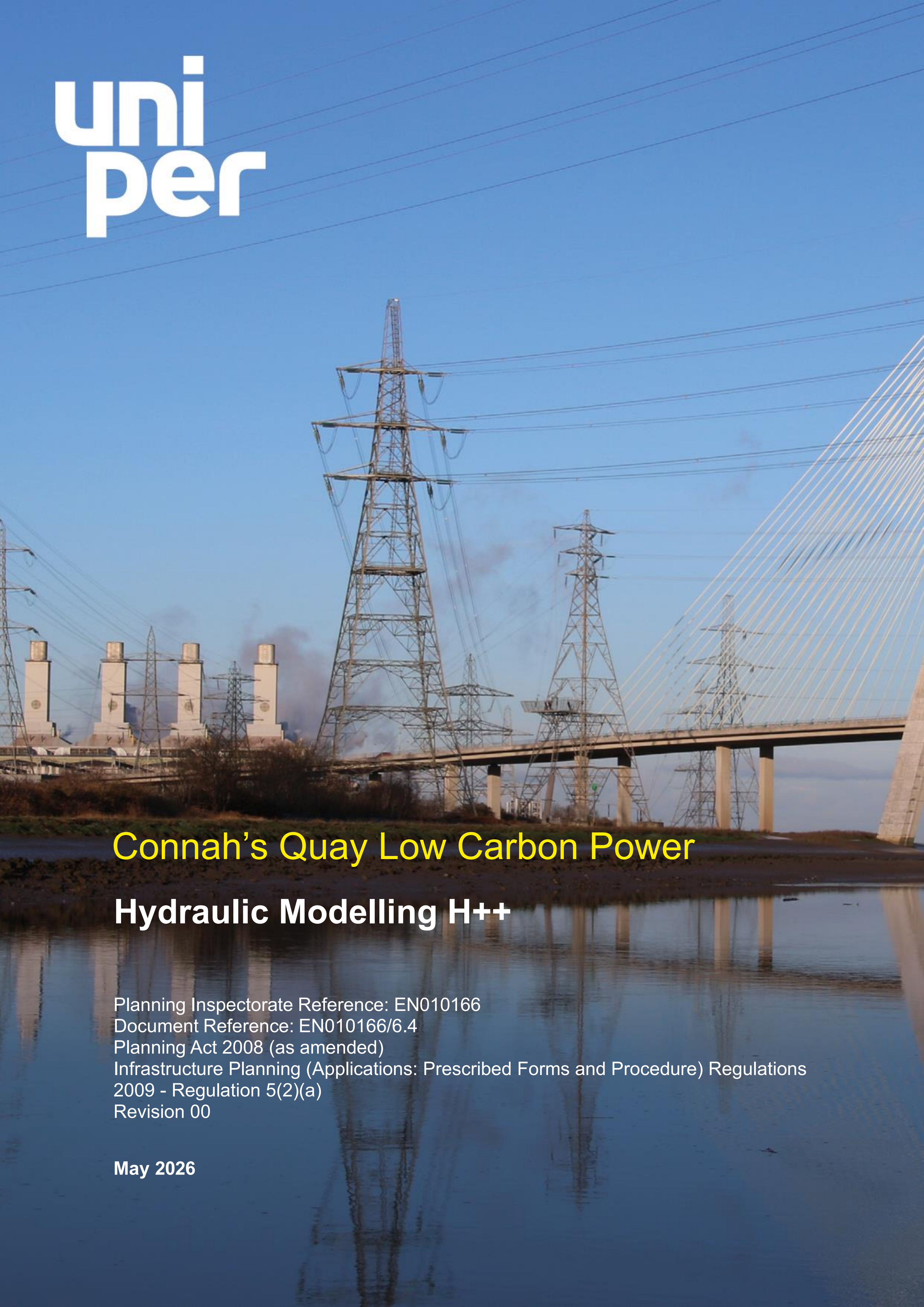

Connah's Quay Low Carbon Power

Hydraulic Modelling H++

Planning Inspectorate Reference: EN010166
Document Reference: EN010166/6.4
Planning Act 2008 (as amended)
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)
Revision 00

May 2026

Prepared for:
Uniper UK Limited

Prepared by:
AECOM Limited

Table of Contents

1. Introduction

1.1 Overview

1.1.1 The Connah's Quay Low Carbon Power Development Consent Order (DCO) Application was submitted by the Applicant, Uniper UK Limited, to the Secretary of State (the SoS) for the Department for Energy Security and Net Zero (DESNZ) on 5th August 2025 under Section 37 of the Planning Act 2008 (the PA 2008). The DCO Application was accepted for examination on 28th August 2025.

1.1.2 The Applicant is seeking a DCO for the construction, operation (including maintenance) and decommissioning of a proposed low carbon Combined Cycle Gas Turbine (CCGT) Generating Station fitted with Carbon Capture Plant (CCP) (the 'Connah's Quay Low Carbon Power (CQLCP) Abated Generating Station') and supporting infrastructure (collectively the 'Proposed Development') on land at, and in the vicinity of, the existing Connah's Quay Power Station (Kelsterton Road, Connah's Quay, Flintshire, CH6 5SJ), North Wales (the 'Proposed Development Site'). The term 'Order limits' is used to describe the geographical boundaries within which the Proposed Development and associated powers would be exercised.

1.1.3 The Proposed Development would comprise up to two CCGT with CCP units (and supporting infrastructure) achieving a net electrical output capacity of more than 350 megawatts (MW; referred to as MWe for electrical output) and up to a likely maximum of 1,380 MWe (with CCP operational) onto the national electricity transmission network.

1.1.4 Through a carbon dioxide (CO_2) pipeline, comprising existing elements to be repurposed and new elements, the Proposed Development would make use of the CO_2 transport and storage network that will be owned and operated by Liverpool Bay CCS Limited, the onshore pipeline for which is currently under development as part of the HyNet Carbon Dioxide Pipeline project (referred to as the 'HyNet CO_2 Pipeline Project'). The CO_2 transport and storage network will transport CO_2 captured from existing and new industries in North Wales and North-West England to be permanently stored in depleted offshore gas reservoirs in Liverpool Bay.

1.2 Purpose of this Report

1.2.1 During the examination phase, the Examining Authority (ExA) raised queries regarding the credible maximum scenario (also referred to as H++) and its implications for tidal flood risk at the Operational Footprint (area being raised as part of the Proposed Development) within the **ExA's Written Questions 2 (ExQ2) [PD-017]**. In response, the hydraulic model used to assess tidal flood risk as part of **Appendix 13-C: Flood Consequences Assessment (FCA) (EN010166/APP/6.4)** was updated to incorporate the H++ scenario. The results of this updated assessment are presented in this Report.

1.3 Credible Maximum Scenario

1.3.1 Credible maximum scenarios are plausible, high end scenarios of climate change, albeit with a low probability. As stated in Natural Resources Wales (NRW) 'Flood Consequence Assessments: Climate Change Allowances' document (Ref. 2), it is not possible to say how likely this scenario is, however, it is useful in understanding potential climate related risks and impacts for development that is potentially sensitive to flood risk and have a lifetime beyond the end of the century. This includes critical infrastructure projects, or where new settlements, or significant urban extensions are proposed.

1.3.2 As part of this Report, the H++ scenario (2074) has been simulated for tidal sources as a sensitivity scenario (i.e. not as the design flood event) in line with NRW's Climate Change Allowances (Ref. 2).

1.4 Model Updates

1.4.1 As part of the hydraulic modelling undertaken to inform **Appendix 13-C: FCA (EN010166/APP/6.4)** for the Proposed Development, new tidal boundary conditions were created to include storm surge and sea level rise to achieve the extreme water levels predicted by the Coastal Flood Boundaries (CFB) data. Through liaison with NRW, they stated that they are not aware of historic wave overtopping issues and that it was unlikely that wave overtopping is a significant risk at the Operational Footprint and that overtopping risk (and associated defence breach) from still water level is likely to be the dominant risk. Consequently, it was agreed with NRW that there was no requirement to account for wave action within the estuary.

1.4.2 The water levels for five epochs were determined: 2024, 2044, 2074, 2100 and 2124, for Annual Exceedance Probability (AEP) events of 50%, 10%, 5%, 4%, 2%, 1%, 0.5% and 0.1%. Levels for Mean High Water Spring (MHWS) for each epoch were also calculated. When considering climate change, the higher central (70th percentile from UKCP18 RCP 8.5), upper end allowance (95th percentile from UKCP18 RCP 8.5) and H++ scenarios were considered. More information is presented in **Appendix 13-F: Hydraulic Modelling Report (EN010166/APP/6.4)** which was produced to support **Appendix 13-C: FCA (EN010166/APP/6.4)**.

1.4.3 As detailed within **Appendix 13-C: FCA (EN010166/APP/6.4)** and **Appendix 13-F: Hydraulic Modelling Report (EN010166/APP/6.4)**, the 0.5% AEP higher central (70th percentile) climate change allowance for the future 2074 epoch has been used as the design flood event in agreement with NRW. This is based on the Proposed Development's design lifetime of 30 years. The 0.5% AEP upper end allowance (95th percentile) for the future 2074 epoch was used as part of a sensitivity test. The 0.1% AEP event was also simulated for the same scenarios as part of the sensitivity tests on the model.

1.4.4 When considering the H++ scenario as part of this Report, to maintain consistency with the modelling completed to date and the design flood event, the boundaries of the model were updated to reflect the 0.5% AEP H++ for the future 2074 epoch. A comparison of the tidal boundary applied for the 0.5% AEP higher central (70th percentile) climate change allowance and the respective H++ scenario are shown in **Plate 1**. This shows the peak tidal level to increase from 6.33m Above Ordnance Datum (AOD) (0.5% AEP Higher Central 2074) to 7.32m AOD (0.5% AEP H++ 2074).

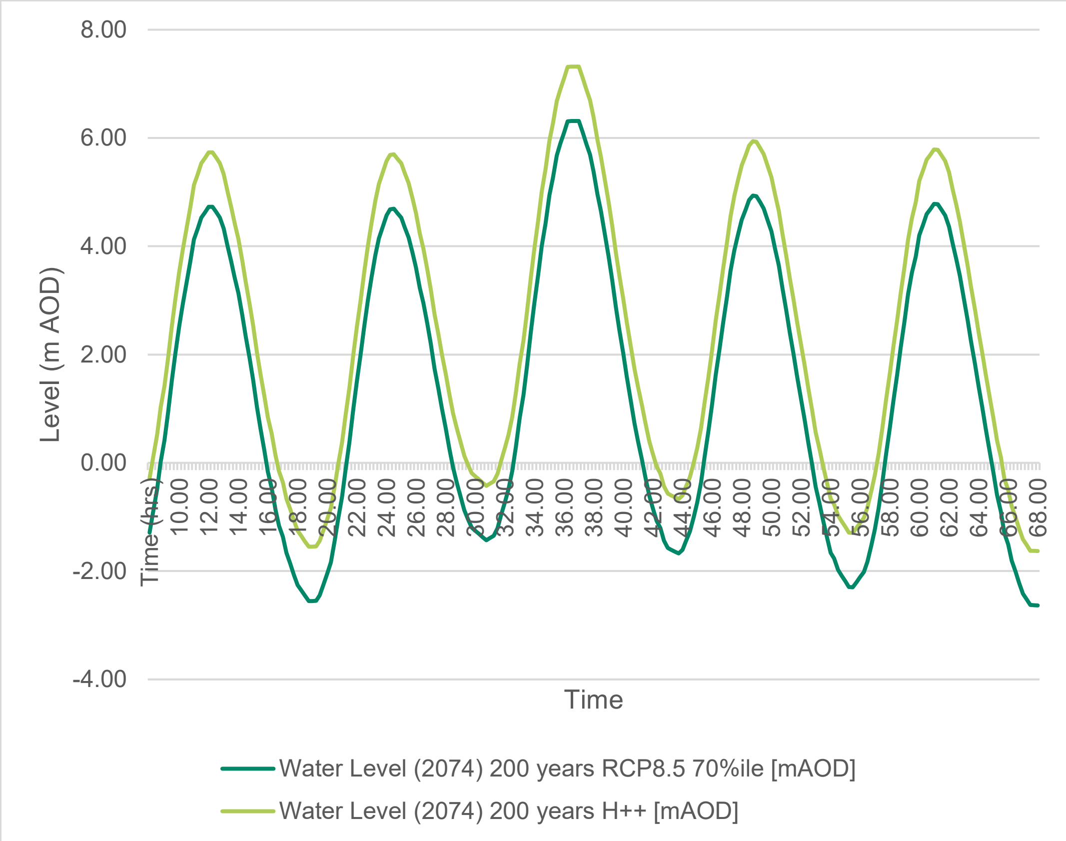

Plate 1: Tide Level Comparison for the 0.5% AEP Event

1.4.5 It should be noted that only the tidal boundaries of the model were updated as part of the H++ simulations. No other updates were made to the model and therefore the overall model build and representation (i.e. partially undefended) has been retained from the initial modelling undertaken in 2025. Assumptions and limitations as discussed in Section 9 of **Appendix 13-F: Hydraulic Modelling Report (EN010166/APP/6.4)** should also be considered for these H++ simulations.

1.4.6 The hydraulic model was simulated in the same version of software as the previous modelling (2023-03-AF-iSP-w64) and was simulated for the baseline and proposed scenarios.

2. Baseline Scenario Model Results

2.1 Overview

2.1.1 In this section, the results from the baseline hydraulic model are described for the 0.5% AEP H++ 2074 scenario and the mechanism of flooding within and the vicinity of the Operational Footprint are discussed. A maximum flood depth map (**Figure 1**) is also presented.

2.2 0.5% AEP (H++) 2074 Scenario

2.2.1 At the Operational Footprint, the flooding mechanism is tidally dominated. **Figure 1** displays the maximum flood depths for the baseline 0.5% AEP H++ 2074 event which shows the entire Operational Footprint to flood. Initially floodwater overtops to the west (outside of the Order limits) and to the east (near the existing Connah's Quay Power Station) and propagates towards the Operational Footprint. Floodwater then overtops directly to the north of the Operational Footprint which inundates the Main Development Area. Flood depths within the Operational Footprint reach a maximum of approximately 1.30m (7.80m AOD).

3. Proposed Scenario Model Results

3.1 Overview

3.1.1 In this section, the results from the proposed hydraulic model are described for the 0.5% AEP H++ 2074 scenario and the mechanism of flooding within the vicinity of the Operational Footprint are discussed. A maximum flood depth map (**Figure 2**) and depth difference map (**Figure 3**) (comparing the baseline and proposed) are also presented.

3.1.2 For the proposed scenario the model was set up with the same private defences removed as per the baseline scenario (partially undefended). In line with the previously modelled proposed scenarios, the Operational Footprint was raised to a constant level of 7.40m AOD. The buildings finished floor levels (FFLs) within the proposed land raising area have all been raised to a constant level of 7.70m AOD.

3.2 0.5% AEP (H++) 2074 Scenario

3.2.1 Similar to the baseline scenario, initially floodwater overtops to the west (outside of the Order limits) and to the east (near the existing Connah's Quay Power Station) and propagates towards the Operational Footprint. However, during the proposed scenario, the Operational Footprint is raised which alters the local flowpaths and reduces the amount of overtopping.

3.2.2 During the peak of the event, floodwater does overtop on to the raised Operational Footprint with maximum flood depths reaching approximately 0.40m. However, at the location of the buildings where the critical infrastructure is proposed (which are raised a further 300mm), maximum flood depths remain below 0.10m. **Figure 2** displays the maximum flood depths for the proposed 0.5% AEP H++ 2074 event.

3.2.3 **Figure 3** shows a depth difference map which compares the 0.5% AEP H++ 2074 baseline and proposed scenarios. It should be highlighted that this map does not show the entire flood extent, instead it shows areas where there has been a change in flood depth (greater than 0.01m or less than -0.01m) as a result of the Proposed Development. Areas shown in green depict areas where there has been a reduction in flood depth while areas shown in yellow/orange/red depict areas where there is an increase in flood depth. This map shows the majority of the Operational Footprint to experience a reduction in flood depth, which is expected due to land raising out of the flood extent. There are small, isolated areas where flood depths increase as a result of the land raising but these generally remain within the Order limits. The lack of impact elsewhere is likely due to land raising preventing overtopping from the Dee Estuary and removing flow paths.

3.2.4 It should be noted that there is a small area upstream of the Order limits which show impacts as a result of the land raising (flood depth increase of less than 0.02m) (not shown on the figures presented due to distance from the Order limits). Similar to what has already been reported in Section 8.2.3 in **Appendix 13-F: Hydraulic Modelling Report (EN010166/APP/6.4)**, this is likely due to model instability, rather than any real impact of the land raising. Given the distance of these upstream changes from the Construction and Operation Area (c.4.5 km), the small magnitude of change and the reasons presented above, these small areas of increases in flood depth are not considered to be significant.

4. Conclusion

4.1.1 As part of this Report the H++ scenario (high end scenario of climate change, albeit low probability) has been simulated to understand potential climate related risks during an extreme tidal event. This is an additional sensitivity scenario beyond what has already been undertaken in **Appendix 13-F: Hydraulic Modelling Report (EN010166/APP/6.4).**

4.1.2 Results from the 0.5% AEP H++ 2074 scenario show that when the Operational Footprint and buildings are raised, these areas are still inundated with floodwater during this event (depths of approximately 0.40m). However, flood depths at the buildings where critical infrastructure is proposed, remain below 0.10m. As shown in **Figure 3**, there are no significant off-site impacts as a result of the land raising.

4.1.3 When it comes to the safety of those within the Construction and Operation Area, a Flood Emergency Response Plan would be developed. During construction, this is secured through the **Framework Construction Environmental Management Plan (EN010166/APP/6.5)** and during operation this is secured through **Appendix 4-A: Operation and Maintenance Mitigation Register (EN010166/APP/6.4)**. These Plans would include details of evacuation, and safe refuge areas.

4.1.4 In conclusion, when land raising to 7.40m AOD across the Operational Footprint and further elevated FFLs are taken into consideration, the Proposed Development's critical infrastructure is considered to be sufficiently resilient to the 0.5% AEP H++ 2074 scenario and the safety of staff would be managed through a Flood Emergency Response Plan applicable to the relevant stage of the Proposed Development.

References

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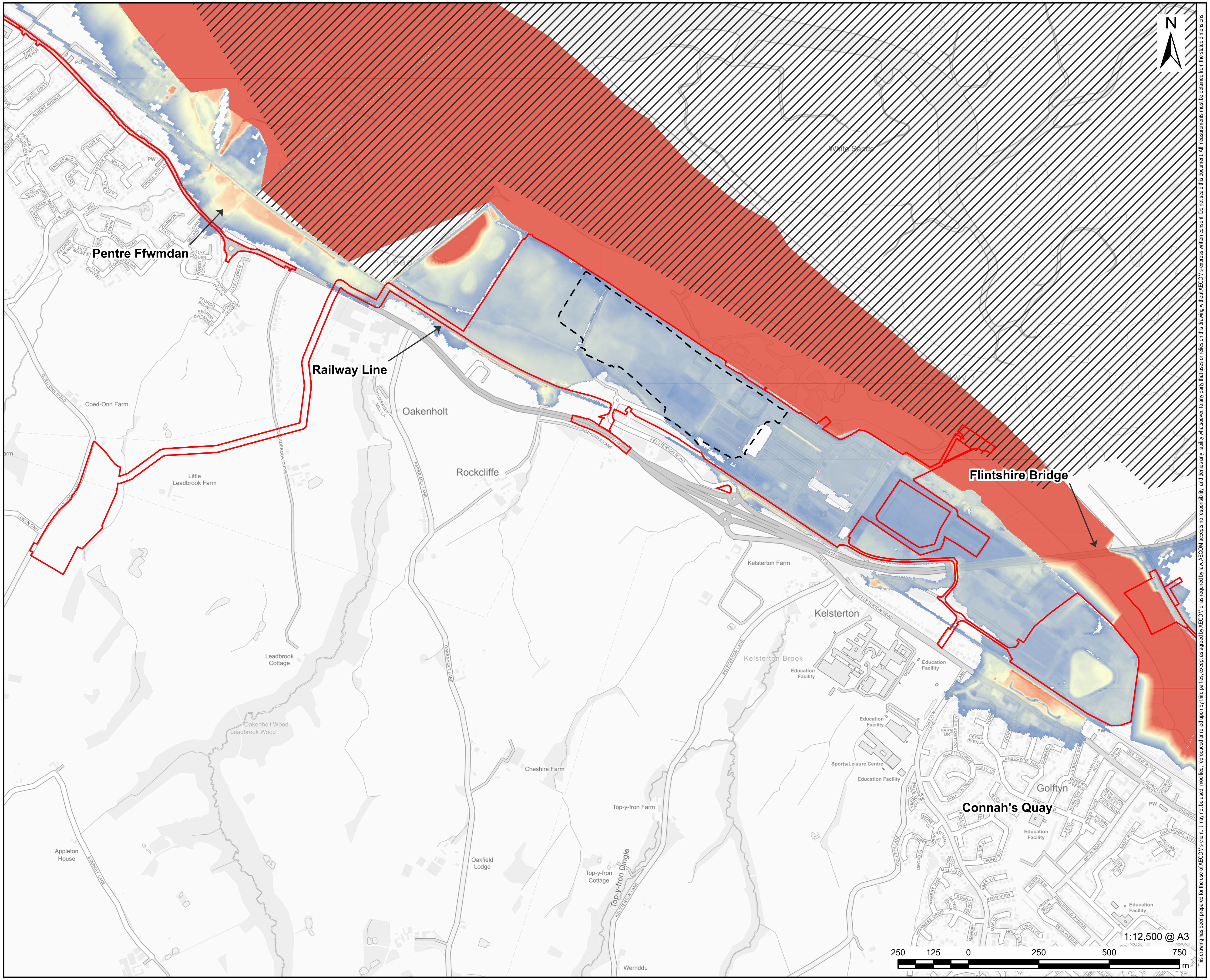

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PROJECT

Connah's Quay Low Carbon Power

CONSULTANT

AECOM Limited
The Colmore Building
Colmore Circus, Queensway
Birmingham, B4 6AT
www.aecom.com

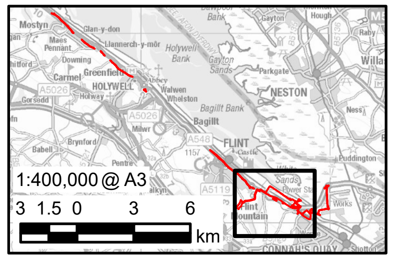
LEGEND

- Order limits
- Operational Footprint
- Dee Estuary (1D Only)

Maximum Depth (m)

>4

0



NOTES

ISSUE PURPOSE

H++ Additional Hydraulic Modelling Scenario

DATE

May 2026

PROJECT NUMBER

60768754

FIGURE TITLE

Tidal Scenario 0.5% AEP (2074) H++ Baseline Maximum Flood Depth

FIGURE NUMBER

Figure 1

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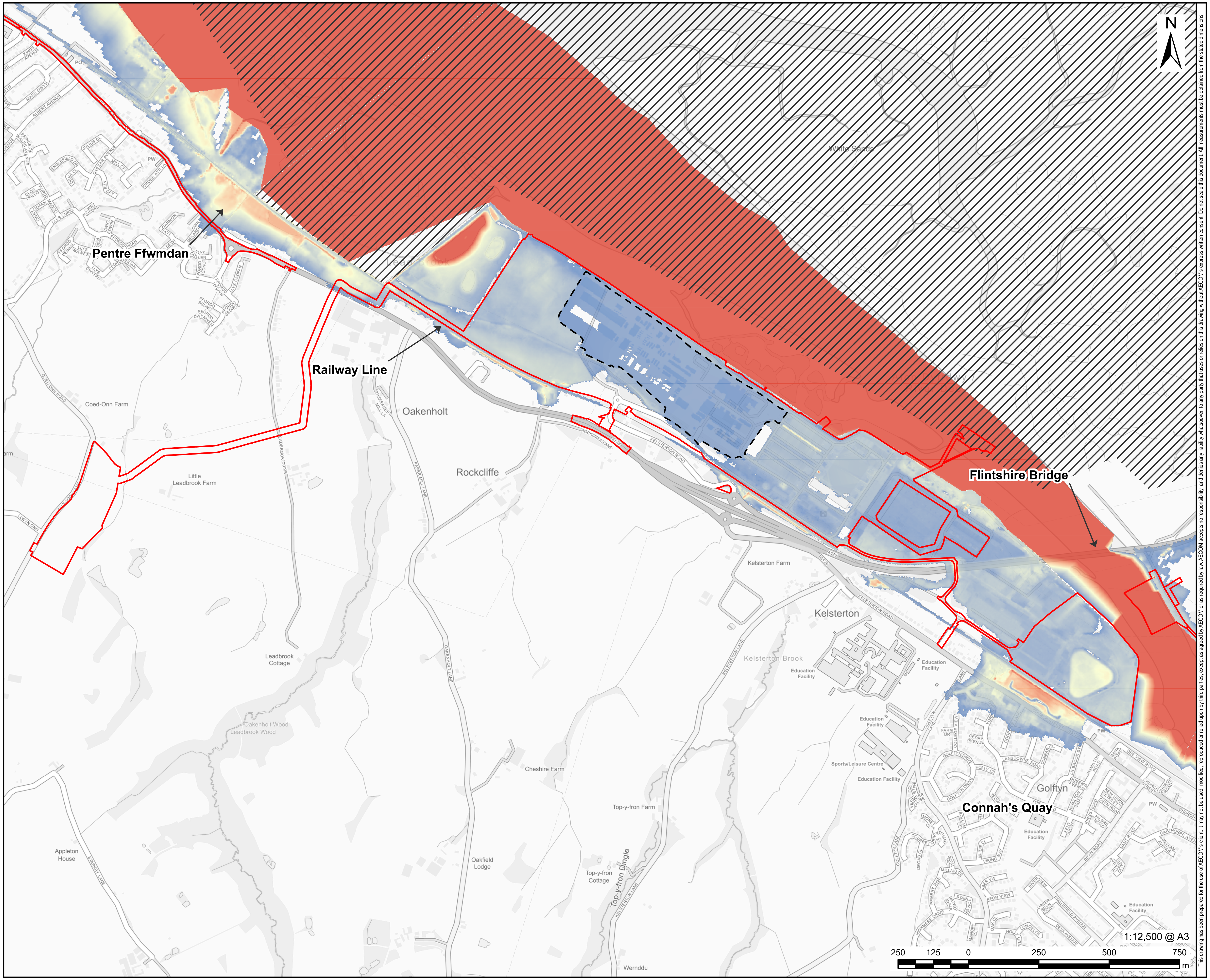

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PROJECT

Connah's Quay Low Carbon Power

CONSULTANT

AECOM Limited
The Colmore Building
Colmore Circus, Queensway
Birmingham, B4 6AT
www.aecom.com

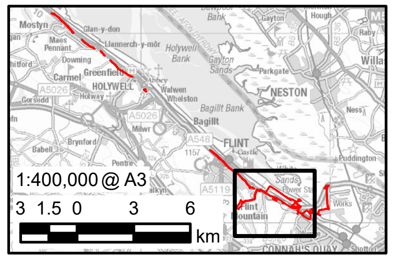
LEGEND

- Order limits
- Operational Footprint
- Dee Estuary (1D Only)

Maximum Depth (m)

>4

0



NOTES

ISSUE PURPOSE

H++ Additional Hydraulic Modelling Scenario

DATE

May 2026

PROJECT NUMBER

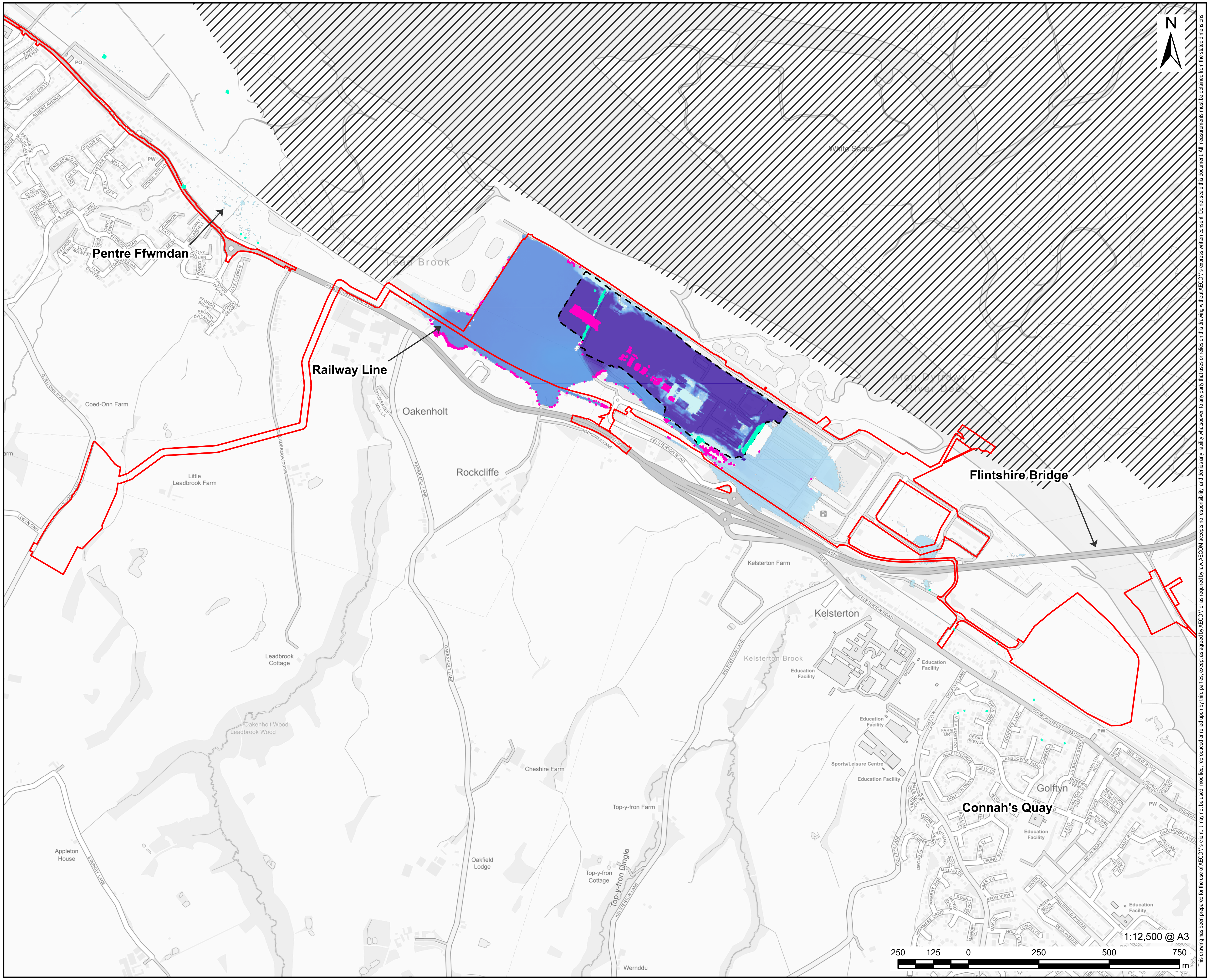
60768754

FIGURE TITLE

Tidal Scenario 0.5% AEP (2074) H++ Proposed Maximum Flood Depth

FIGURE NUMBER

Figure 2



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CONSULTANT

AECOM Limited
The Colmore Building
Colmore Circus, Queensway
Birmingham, B4 6AT
www.aecom.com

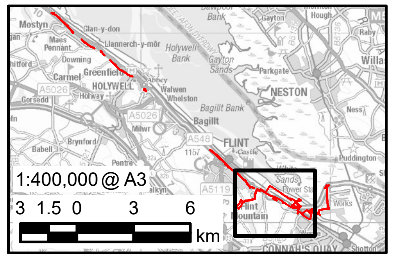
LEGEND

- Order limits
- Operational Footprint
- Dee Estuary (1D Only)
- Was Wet, Now Dry
- Was Dry, Now Wet

Depth Difference (mm)

0.25

-0.25



NOTES

ISSUE PURPOSE

H++ Additional Hydraulic Modelling Scenario

DATE

May 2026

PROJECT NUMBER

60768754

FIGURE TITLE

Tidal Scenario 0.5% AEP (2074) H++ Baseline Vs Proposed Depth Difference

FIGURE NUMBER

Figure 3

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