HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

# Wylfa Newydd Project

## 6.8.16 ES Volume H - Logistics Centre App H8-1 - Logistics Centre - Flood Consequence Assessment

PINS Reference Number: EN010007

Application Reference Number: 6.8.16

June 2018

Revision 1.0

Regulation Number: 5(2)(a) and (e)

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Horizon Internal DCRM Number: WN0902-JAC-PAC-APP-00053

[This page is intentionally blank]

# Contents

# 1 Introduction

## 1.1 Overview

1.1.1 This Flood Consequence Assessment (FCA) describes the assessment of flood risk from all local sources resulting from the operation and decommissioning of the Logistics Centre at Parc Cybi. The FCA has assessed the flood risk posed to the Logistics Centre as well as any changes to flood risk arising from the Logistics Centre.

1.1.2 The hydrological baseline is outlined in section 8.3 of chapter H8 (Logistics Centre - Surface water and groundwater) (Application Reference Number: 6.8.8) of the Environmental Statement, information from which is used in this FCA. This FCA should be read in conjunction with chapter H8 (Application Reference Number: 6.8.8).

1.1.3 Consultation with relevant statutory bodies has taken place during the production of this FCA. A record of consultation can be found in section 8.3 of chapter B8 (Introduction to the topic - Surface water and groundwater) (Application Reference Number: 6.2.8) of the Environmental Statement.

## 1.2 Site location and study area

1.2.1 The proposed Logistics Centre Boundary is shown in figure H8-1-1. The proposed Logistics Centre site is adjacent to the A55, outside of Holyhead town, to the south and south-west of existing industrial and retail developments. The Logistics Centre site is bounded by the A55 to the north, the existing Parc Cybi service road to the south, a substation to the west, and pastoral land to the east. The Parc Cybi Employment Area extends to approximately 56.5ha. The footprint of the proposed Logistics Centre is just over 3ha.

1.2.2 In general, the surface water study area is 500m in all directions around the Logistics Centre (figure H8-1-1). However, for the purpose of this FCA, the study area extends to 1km downstream to Holyhead Bay.

1.2.3 Environmental/heritage features in the vicinity of the site are a pond (approximately 100m x 20m), sandwiched between the north-east site boundary and A55 road, and the Trefignath Burial Chambers ancient heritage monument, which is approximately 30m south of the Logistics Centre.

## 1.3 Technical Advice Note (TAN) 15 Development Advice Map

1.3.1 There are two initial reference maps for assessing the level of fluvial and tidal flood risk associated with land: the TAN15 Development Advice Map [RD1] and the Natural Resources Wales (NRW) flood map of fluvial flood risk [RD2]. These are broadly similar, although the NRW flood map provides additional detail in relation to flood probability. The TAN15 Development Advice Map,

which shows the fluvial and coastal flood zones as issued by the Welsh Government, is primarily used in this assessment as the TAN 15 Development Advice Maps form the basis of assessment of flood risk in accordance with planning policy.

1.3.2 The TAN15 flood zones are defined as follows:

- Zone A: Considered to be at little or no risk of fluvial or coastal/tidal flooding;
- Zone B: An area known to have been flooded in the past evidenced by sedimentary deposits;
- Zone C1: An area with an annual probability of flooding from river, tidal or coastal sources equal to or greater than 0.1%, but which are developed and served by significant infrastructure including flood defences; and
- Zone C2: An area with an annual probability of flooding from river, tidal or coastal sources equal to or greater than 0.1% and without significant flood defence infrastructure.

## 1.4 Planning guidance for a FCA

1.4.1 In Wales, *Planning Policy Wales* (PPW) [RD3] and *TAN 15: Development and Flood Risk* [RD4] provide the national policy framework for the assessment and management of flood risk for new developments. Taken together, they establish a presumption against development in areas at the highest risk of flooding, setting a framework for the sequential assessment of the suitability of sites for development. They also set out an assessment methodology (the FCA methodology) for the systematic evaluation of flood risk and the need to integrate mitigation and flood resilience in the design of new development.

1.4.2 This FCA has been written to address the planning policy requirements for the Logistics Centre, in association with TAN 15 guidance.

## 1.5 Report objectives

1.5.1 The objectives of this FCA are to:

- identify possible mechanisms by which the Logistics Centre could flood;
- identify any aspects of the design that could exacerbate flooding elsewhere;
- undertake a formal assessment of the risks posed to the Logistics Centre from all identified flood risk sources and mechanisms;
- confirm that the Logistics Centre would not exacerbate flooding elsewhere;
- consider the level and acceptability of any residual flood risk; and
- produce an FCA compliant with TAN 15 and PPW.

# 2 Policy and planning

## 2.1 Planning context

2.1.1 The context for planning policy in Wales is set out within PPW [RD3]. This provides the national policy framework for the assessment and management of flood risk for new developments and references a range of European and national legislation that relates to the flood risk. This is supplemented by TAN 15 [RD4] and local planning policy. Although there is other legislation and guidance relevant to flood risk (including National Policy Statement for Energy (EN-1) (NPS EN-1) and National Policy Statement for Nuclear Power Generation (EN-6) (NPS EN-6), this is discussed in chapter B8 (Application Reference Number: 6.2.8) of the Environmental Statement and is not repeated in this FCA.

## 2.2 PPW

2.2.1 The objective of PPW is to avoid the construction of new development within areas defined as being at flood risk, with planning authorities adopting a precautionary approach when formulating development plan policies, including the principle that climate change will likely increase the risk of coastal and river flooding. A strategic approach to flood risk that considers the catchment as a whole is encouraged.

2.2.2 PPW states that new development should not be at risk of flooding itself and should not increase the risk of flooding elsewhere. Additionally, hard-engineered flood defences should be considered likely to be unsustainable in the long term, and new development should avoid development in flood hazard zones.

2.2.3 Only essential transport and utilities infrastructure is considered acceptable within unobstructed floodplains, and then only when such infrastructure is designed to remain operational during times of flooding and with no net loss of floodplain storage or increase in flood risk elsewhere.

## 2.3 TAN 15

2.3.1 TAN 15 provides technical guidance that supplements the policy set out in PPW in relation to development and flooding. It advises on development and flood risk relating to sustainability principles and provides a framework within which risks arising from both river and coastal flooding, and from additional runoff from development in any location, can be assessed. This incorporates climate change scenarios.

2.3.2 TAN 15 provides guidance on flood consequences that may not be acceptable for particular types of development. The location of the development needs to be justified in line with TAN 15 and flood risk areas, and the consequence needs to be acceptable given the vulnerability and use of the receptor.

2.3.3 Development should be directed towards Flood Zones A and B and will only be acceptable in Flood Zones C1 and C2 if it is necessary as part of a local regeneration scheme or to sustain an existing settlement or if key to support employment objectives.

2.3.4 The guidance defines a threshold for the frequency of flooding below which development should not be allowed. This threshold for General Infrastructure is equivalent to the 1% Annual Exceedance Probability (AEP) event, or an event with a 1 in 100 chance of occurring in any given year for fluvial flooding; and it is equivalent to the 0.5% AEP event, or an event with a 1 in 200 chance of occurring in any given year, for tidal flooding. Additionally, the depth of flooding, regardless of development type, should not be greater than 1m for any return period. These thresholds automatically apply to all developments in Flood Zone A and B and to those in Flood Zone C once the justification test has been passed. A justification test is a set of criteria only applicable to developments located in Flood Zone C, which must be considered for the development to take place.

2.3.5 It is also a requirement of TAN 15 that future users and occupiers of all types of development are adequately aware of the flood risk and consequences, that effective flood warning is provided, that emergency flood plans are available and that safe access and egress are available. There is also a requirement that the site is designed to facilitate movement of goods/possessions away from flooding, to minimise structural damage and to facilitate recovery.

2.3.6 TAN 15 also states that new development should not increase flooding elsewhere; however, it acknowledges that there may be practical difficulties in achieving this aim.

2.3.7 TAN 15 states that consideration must be given to the impacts climate change may have on the risk of flooding over the lifetime of a development, to ensure that development does not take place where flooding would be unacceptable either now or in the future. The Welsh Government has provided guidance (CL-03-16) [RD5] on how the UK climate changes projections (UKCP09) [RD6] for increases in river flows should be used to determine the future flood consequences for developments in Wales; they must be incorporated in all FCAs produced after December 2016.

## 2.4 Local planning policy

2.4.1 The Anglesey and Gwynedd Joint Local Development Plan forms the basis for land use planning in the Anglesey and Gwynedd areas. The Written Statement was published in 2017 [RD7] and is the main source of local planning policy. Within the Plan, the strategic objectives in relation to flood risk are the following.

- Strategic Objective 6 (SO6): "*Minimise, adapt and mitigate the impacts of climate change. This will be achieved by: ensuring that highly vulnerable development is directed away from areas of flood risk wherever possible;……*".

- Strategic Objective 8 (SO8): "*Ensure that settlements are sustainable, accessible and meet all the needs of their communities in accordance with their role in the settlement hierarchy: .....new developments that are vulnerable to harm will not be located in areas at risk from flooding*".

2.4.2 In order to adapt to the effects of climate change Policy PS 6 (Alleviating and adapting to the effects of climate change) requires proposals to take account and respond to a number of concerns, including: "*Locating* (developments) *away from flood risk areas, and aim to reduce the overall risk of flooding within the Plan area and areas outside it, taking account of a 100 years and 75 years of flood risk in terms of the lifetime of residential and non-residential development, respectively, unless it can be clearly demonstrated that there is no risk or that the risk can be managed" and to: "Aim for the highest possible standard in terms of water efficiency and implement other measures to withstand drought, maintain the flow of water and maintain or improve the quality of water, including using sustainable drainage systems*".

2.4.3 The Anglesey and Gwynedd Joint Local Development Plan Stage 1 Strategic Flood Consequence Assessment [RD8] forms a key part of the evidence base for planning with respect to review of FCAs. The document helps to determine appropriate development policies and land allocations that avoid or minimise flood risk from all sources, and helps to assess any future development proposals in line with the precautionary framework in PPW and TAN 15. This document and the IACC's *Preliminary Flood Risk Assessment* [RD9] include information on surface water, groundwater, ordinary watercourses and small reservoir flooding. Information on the IACC flood strategy and the Council's objectives in managing flood risk is provided in the *Anglesey Local Flood Risk Management Strategy* [RD10].

## 2.5 River Basin Management Plan

2.5.1 The Logistics Centre is wholly located within the Western Wales River Basin. The Western Wales River Basin Management Plan for 2015 – 2021 (see [RD11] for the summary document) provides an overview of NRW's approach to managing flood risk within the Western Wales River Basin and details measures designed to reduce the potential flooding, such as use of sustainable drainage systems and improvements and maintenance of flood defence schemes. In addition, the plan proposes improving the understanding of flood risk through the application of mapping and modelling.

# 3 Baseline site context

## 3.1 Climate

3.1.1 The UK Meteorological Office rainfall data available online for the period 1981 to 2010 show an average annual rainfall at Valley (7km to the south-east of the Logistics Centre) of 841mm/year, which is below the UK average of 1,154mm/year.

3.1.2 Long-term data indicate rainfall is typically higher in the late autumn/early winter and lowest in late spring/early summer.

3.1.3 These two sources of data provide meteorological context of the area. Details of the meteorological data used further in this assessment are contained in appendix H8-01.3.

## 3.2 Landscape

3.2.1 The majority of the site is covered by grassland. However, there are also areas of dense shrub, mixed plantation woodland, rocky outcrops, marshy grassland, and spoil within the Logistics Centre boundary.

## 3.3 Topography

3.3.1 The land at the proposed Logistics Centre site has a slight gradient falling from south to north, with the highest point being 19.7m AOD at the most southerly point, dropping to 6.1m AOD in the north (refer to appendix H8-01.2). Rock outcrops are present within the central and south-eastern areas of the site.

## 3.4 Off-site receptors

3.4.1 The Logistics Centre would be located to the southeast of Holyhead just on the edge of the built up area of the town. Immediately adjacent to the Logistics Centre site, to the west, is an SP Energy Networks facility and mast. This comprises a small single storey building and dry stone walls surround the electrical infrastructure.

3.4.2 To the northwest along the Parc Cybi Service Road there is a truck stop on the south side of the road. There is a parking area for commercial heavy goods vehicles, a café and accommodation for overnight stops.

3.4.3 The A55 passes the site to the north. The road is raised slightly above the surrounding land. On the other side of the road there is an industrial area with a closed aluminium works immediately adjacent and a retail park further north. Further into Holyhead, past the A5153 junction, there are two schools, one on either side of the road.

3.4.4 All off-site buildings and infrastructure are classed as highly sensitive by TAN15 [RD4]. Undeveloped land is classed as having a medium sensitivity.

## 3.5 Surface water features

3.5.1 All local surface water features are shown in figure H8-1-1. There is a small pond 10m north-east of the proposed Logistics Centre site. This is an attenuation pond which provides mitigation for the runoff from the A55.

3.5.2 A drain approaches the proposed Logistics Centre site from the south-west and is culverted beneath Park Cybi Road and land immediately to the west of the site, outfalling from two 600mm circular concrete culverts immediately to the west, before continuing as an open ditch. A small watercourse originates to the north of the proposed Logistics Centre site and converges with the culverted drain before flowing along the A55 towards the pond, and being culverted beneath the A55.

3.5.3 A further watercourse is located a short distance to the south-east along a field boundary. After passing under the Parc Cybi Road in a culvert, it flows in a north-easterly direction and under the A55.

## 3.6 Geology and hydrogeology

3.6.1 The superficial geology beneath the proposed Logistics Centre site includes glacial till (defined as Secondary (undifferentiated) aquifer by NRW) and glaciofluvial sand and gravel (defined as a Secondary (A) aquifer).

3.6.2 The bedrock at the proposed Logistics Centre site is the New Harbour Group (mica schist and psammite) and some South Stack Formation beneath the most westerly part. Both of these bedrock types are classified by NRW as Secondary (B) aquifers.

3.6.3 Groundwater flow is anticipated to follow the topography and flow to the north towards the coast.

3.6.4 A walkover survey was completed in May 2017. It was noted that there was a wet and boggy area along the northern and north-western borders of the proposed Logistics Centre site (figure H8-1-1), showing that water levels at this point were high.

3.6.5 The proposed Logistics Centre site is on a low-productivity aquifer and it is considered that the risk of flooding from groundwater is low.

## 3.7 Water services

3.7.1 There are some existing water services from previous development and an existing foul sewer and pumping station are available to the northwest of the proposed Logistics Centre site.

## 3.8 Reservoirs

3.8.1 There are no reservoirs on Holy Island and therefore the Logistics Centre would not be at risk of flooding from reservoirs.

# 4 Logistics Centre

## 4.1 Timescales

4.1.1 The Logistics Centre would be used during the construction phase of the Power Station to control the flow of traffic along the A5025. It is anticipated that construction of the Logistics Centre would last for approximately 15 months. It is anticipated that the Logistics Centre would have an operational life of approximately ten years. It is understood that the site will not be decommissioned but would be available for further use after this date. Further planning permission will be required if external changes are required or if there is to be a change of use. For the purposes of this FCA a design life of ten years has been assumed.

## 4.2 Site layout

4.2.1 The proposed layout for the Logistics Centre is provided in detail on figure H1-3 (Application Reference Number: 6.8.29) of this Environmental Statement, and in outline on figure H8-1-1. The Logistics Centre would provide parking for 100 Heavy Goods Vehicles at absolute peak and 45 Heavy Goods Vehicles as an average daily peak. The Logistics Centre would only be functional during the construction of the Power Station.

4.2.2 The approach adopted for the design of the Logistics Centre has been to utilise a parameter approach to the development. Parameters have been set for the five main buildings: the Covered Inspection Bay in Parameter Zone 7-1; the Welfare / Security Building in Parameter Zone 7-2; the Scanner in Parameter Zone 7-3; the Driver Instruction Kiosk in Parameter Zone 7-4; and the Security entry / exit kiosk in Parameter Zone 7-5. The location and extent of these zones is shown on the parameter plans (figure H1-5 (Application Reference Number: 6.8.29)), and the relevant maximum parameters for the buildings are detailed in table H1-1 in chapter H1 (proposed development) (Application Reference Number: 6.8.1).

4.2.3 The parameters listed in chapter H1 (Application Reference Number: 6.8.1) only allow the size of the buildings to be changed and so have no substantial effect on the FCA. Although making a building smaller would reduce the amount of runoff from that building, as the surrounding area would remain as hardstanding the total rainfall moving to drain and the rainfall / runoff relationship would remain the same. This FCA has therefore been completed on the basis that building sizes and exact location within Zones 7-1 to 7-5 could change, but the rainfall / runoff relationship would not. Within these parameters, and based on the assumptions in this FCA, the assessment therefore provides a worst case scenario.

## 4.3 Drainage strategy

4.3.1 The drainage scheme has been designed to be consistent with the Parc Cybi, Anglesey: Plot Drainage Statement prepared by Atkins on behalf of Welsh

Assembly Government in 2008 [RD12]. The Plot Drainage Statement was part of the evidence base that supported an application for outline planning consent for the Parc Cybi Employment Area that was subsequently granted. The Plot Drainage Statement indicates that a Parc Cybi Business Park wide drainage system has been agreed with NRW and the IACC that provides attenuation to pre-development levels with attenuation for events up to the 1% AEP storm with a 20% allowance for climate change. The pond to the north-west of the site forms part of this drainage strategy, providing attenuation for the plots that drain into the pond and the watercourse to the west that is culverted beneath Parc Cybi Road.

4.3.2 The original strategy for plot drainage of the Parc Cybi Employment Area was to provide free drainage of clean roof runoff with runoff from hard standing to be restricted to greenfield runoff rates. The agreed drainage allowance for Plot 10, within which the Logistics Centre is located, was free drainage from 8,000m$^2$ of roof area and 28.91l/s from a remaining 5.78ha of hard standing. The Logistics Centre does not provide the same build-up of buildings and hard standing, however, consistency with the agreed volume and rates from the build-up that is proposed, results in an equivalent discharge rate of 367l/s. Discharge will be to the pond.

4.3.3 A drainage scheme (shown on figure H1-4 (Application Reference Number: 6.8.29)) of the Environmental Statement) incorporating Sustainable Drainage Systems (SuDS) has been developed to manage surface water runoff associated with the Logistics Centre. The vehicle hard standing would be constructed using impermeable paving and surface runoff would be routed to a below-ground geo-cellular storage system. All surface water flows from the site will be passed through Class 1 Full Retention Oil Separator before discharge into an existing pond to the north-west. Water from the pond discharges into an open watercourse and flows north-eastwards under the A55.

4.3.4 The drainage network has been designed so that:

- pipes accommodate a flow from a 20% AEP (1 in 5 year) rainfall event plus 20% climate change allowance with no surcharging above the soffit;
- there is no flooding from manholes or above ground for a 3.3% AEP rainfall event plus 20% climate change allowance; and
- there is no significant ponding from a 1% AEP rainfall event plus 20% climate change allowance.

4.3.5 Given consistency with the Parc Cybi Employment Area plot drainage, and the additional attenuation proposed within the Logistics Centre site, the latter site is considered to accommodate runoff for all events up to the 1% AEP event, with a 20% allowance for climate change. The proposed outfall to the pond may require an ordinary watercourse consent from the IACC.

## 4.4 Water services

4.4.1 Building drainage would only be designed to cater for foul water discharge from the welfare facilities. Detailed drainage proposals would be made by the Designer. The drainage proposals would be subject to review by Dŵr Cymru Welsh Water with regard to existing network capacity and discharge consent (including possible discharge points and flow rates).

4.4.2 It is highly likely that the foul drainage will be connected to the local sewer, but if a connection to the existing utilities is not possible a package treatment plant (for sewage and foul water treatment) may be required. Any package treatment plant would be sized on population equivalents based on the design brief for the Logistics Centre and may be subject to an environmental permit.

# 5 Flood modelling

## 5.1 Sources of modelling data

5.1.1 The sources of flood modelling data and flood mapping described below have been considered within the preparation of this FCA.

- **NRW river, tidal and surface water flood mapping [RD2]:** This mapping, delivered as part of a national programme, delineates indicative areas of elevated flood risk into four flood zones and includes major fluvial (catchment area >3km$^2$), tidal sources and surface water runoff.
- **TAN15 Development Advice Map, [RD1]:** This mapping, which is primarily based on the NRW flood map, defines indicative areas where the annual probability of inundation from fluvial and tidal sources is greater than 0.1% (Zone C). It also identifies areas where there are geological indicators of elevated flood risk (Zone B) with low risk areas classified as Flood Zone A.

5.1.2 These maps have been reviewed and do not identify any flood risk to the proposed Logistics Centre site, although the constraints of such mapping to small catchments is recognised. The site location, layout, topography and location of watercourses have also been reviewed and, combined with the review of the flood risk maps, the preliminary assessment concluded that bespoke flood risk modelling was not required.

## 5.2 NRW and TAN 15 flood maps

5.2.1 While the NRW flood map [RD2] does provide some additional detail in relation to flood probabilities over and above the TAN 15 Development Advice Map, the two are broadly comparable. The TAN 15 Development Advice Map, which shows the fluvial and coastal flood zones, as issued by the Welsh Government, is mainly discussed here, as the classifications from this better relate to planning policy.

5.2.2 The TAN 15 Development Advice Map categorises locations from A to C based on their perceived flood risk as detailed in section 1.3. The maps are based on the best currently available data. They use the Environment Agency's extreme flood outlines to inform Zone C and the British Geological Survey's drift data to inform Zone B.

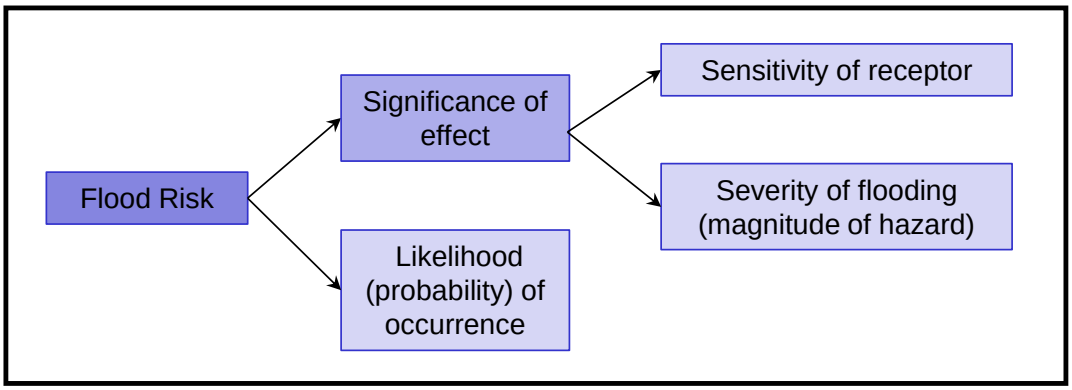
5.2.3 A detailed explanation of the risk shown in the TAN 15 and NRW flood map is given in section 6.2.

# 6 Flood risk assessment

## 6.1 FCA methodology

6.1.1 The risk assessment takes into account the embedded and good practice mitigation detailed in section 8.4 of chapter H8 (Application Reference Number: 6.8.8) of the Environmental Statement. The assessment methodology used within this FCA is set out in appendix H8-1-3 and is based on PPW [RD3] and associated guidance [RD4]. The guidance recommends that flood risk be assessed through consideration of both the significance of potential effects and the likelihood of occurrence. The significance of effect is then dependent on two factors: the sensitivity of potential receptors and the severity of the flooding. Thus, the three criteria on which flood risk is assessed are:

- sensitivity of the receptor;
- severity of flooding (i.e. the magnitude of the hazard); and
- likelihood (i.e. probability) of occurrence.




### *Sensitivity of receptors*

6.1.2 The sensitivity of receptors is defined according to the method outlined in appendix F8-1-3 with a range of sensitivities from very high through high, medium and low, to very low being defined. TAN15 guidance [RD4] outlines the vulnerability of different types of on-site development and also classes all off-site receptors as highly sensitive to flooding. The sensitivity of the receptors at and around the Logistics Centre are defined in section 6.3.

### *Severity of flooding*

6.1.3 Appendix 1 of TAN15 identifies acceptable thresholds of flooding for different types of development and also presents indicative consequences of flooding that may be acceptable subject to adequate warnings and preparation. The TAN 15 guidance has been used to define consequences of flooding that fall within the categories negligible, low, medium, high and very high hazard.

Further information on the typical criteria against which the category is defined, is presented in appendix H8-1-3.

### *Likelihood of occurrence*

6.1.4 The likelihood of occurrence is used to give an understanding of how regularly a given event or outcome will occur. This is fully defined within appendix H8-1-3, and the classification of these criteria is discussed for the different flood sources in the sections below.

### *Consideration of seasonality*

6.1.5 Flooding can occur at any time of year, although it can exhibit quite different seasonal characteristics. Summer flooding is generally associated with localised, high intensity, convective rainfall events, resulting in rapid runoff response in which the peak flow is the main driver of flood risk. This can be a particular issue in urban catchments where significant areas of impermeable surfaces result in rapid runoff. Winter events are generally associated with slower moving frontal systems, they are often prolonged and less intensive and they occur on typically wetter catchments, resulting in longer hydrographs with lower peaks but substantially more volume.

6.1.6 The catchments of concern in this study are essentially rural, they are generally small in size and have shallow low permeability soils meaning that they are likely to be more susceptible to high intensity summer storms than to winter frontal events. Presentation of the results for a summer event only is therefore based on the source of key flood risks to the Logistics Centre.

## 6.2 FCA screening

6.2.1 Industry guidance [RD13] recommends that an FCA should consider all possible sources of flooding for a given site. This is also reflected in the TAN 15 guidance on flood risk. Table H8-1-1 summarises a range of potential flood sources and whether these are relevant to the Logistics Centre site.

**Table H8-1-1 Screening of potential flood sources**

| Flood type | Source | Pathway | Receptor | Consider further? |
|---|---|---|---|---|
| Tidal | Irish Sea flooding | The Logistics Centre would be situated away from the Irish Sea and is not within a tidal flood zone so there is no pathway | Logistics Centre | No |
| Fluvial and pluvial | Baseline fluvial flooding of the Logistics Centre | Flooding from small watercourses near the Logistics Centre | Logistics Centre | Yes |
| | Baseline pluvial flooding of the Application Site | Surface water flooding due to intense rainfall | Logistics Centre | Yes |
| | Pluvial runoff as a result of the Logistics Centre site development | Increases to impermeable areas would increase runoff from the Logistics Centre | Off-site receptors | Yes |
| Groundwater | Groundwater | Movement through the aquifer | Logistics Centre | Yes |
| Services | Sewerage network | Surface water flows from existing sewer systems onto the Logistics Centre | Logistics Centre | Yes |
| | Water mains | Overland flows from failure of existing water supply infrastructure | Logistics Centre | Yes |
| | Logistics Centre drainage system | Failure of the Logistics Centre drainage system | Off-site receptors | Yes |
| Reservoir flooding | Failure of reservoir walls | There are no reservoirs in the vicinity of the Logistics Centre | Logistics Centre | No |

## 6.3 Sensitivity of receptors

6.3.1 The receptors have been divided into two groups, the first being the on-site receptors in the form of the Logistics Centre, and the second being all off-site receptors. The Logistics Centre is primarily a parking and holding area for Heavy Goods Vehicles. It is a place of employment and the TAN15 guidance

[RD4] classes the sensitivity of this development category as less vulnerable. Following the methodology in appendix H8-1-3, this is assessed as having medium sensitivity within this assessment. This assessment has also taken consideration of the fact that the facility will be operational 24 hours a day and drivers may spend nights sleeping in their vehicles. This does not constitute a residential area and as the vehicles can be moved it is still classed as a place of employment.

6.3.2 Following TAN 15 guidance all off-site buildings and infrastructure are considered to be highly sensitive to flooding, whilst undeveloped / agricultural land has a medium sensitivity.

## 6.4 Fluvial and pluvial flooding

6.4.1 Fluvial and pluvial flood risk has been assessed using the flood mapping available on the NRW website [RD2].

### *Fluvial flood risk*

6.4.2 The Logistics Centre is located in Flood Zone A of the TAN15 Development Advice Map (figure H8-1-2). Flood Zone A is indicated as all land on the figure that is not in Flood Zone B or C2. These are areas that are considered to be at little or no risk of fluvial flooding. There is a small watercourse culverted under Parc Cybi Road to the west of the proposed Logistics Centre site, which returns to the surface a small distance to the north (figure H8-1-1) and discharges into a pond. The catchment area of this watercourse is approximately 0.62km$^2$ the majority of which lies to the south-west of Parc Cybi Road. Being a small catchment of less than 3km$^2$, the risk of flooding from this watercourse is not included in the modelling used to produce the TAN15 of NRW's flood risk maps.

6.4.3 It should also be noted that the catchment of this watercourse contains a large part of the consented Parc Cybi Employment Area, for which a plot drainage strategy was developed on behalf of Welsh Assembly Government [RD12]. That drainage strategy manages runoff from the catchment and provides a site-wide system that restricts runoff to greenfield rates and provides attenuation for the 1% AEP storm event with a 20% allowance for climate change. The flood risk from this small catchment will therefore be managed by this strategic drainage system.

6.4.4 Despite not being included in the TAN15 flood risk maps, and until such time as the whole of Parc Cybi has been constructed, the risk from this small watercourse will be driven by the same mechanisms as those modelled for the pluvial flood risk extents that are presented in NRW's maps of surface water flood risk. That dataset has been used to indicate the existing risk of flooding at this location and it indicates that there is a low probability of flooding at the emergence of the watercourse to the west of the site where it comes out of culvert (figures H8-1-2 and H8-1-3). There have been no recorded flood events at the proposed Logistics Centre site.

6.4.5 Over the operational lifetime the probability of flooding from fluvial sources, based on the NRW maps of surface water flood risk, is classed as low. This less vulnerable development is classed as having a medium sensitivity, and the magnitude of the potential hazard is very low as the location of flooding is controlled by the site-wide drainage strategy. It is therefore considered that the risk of fluvial flooding is very low.

### *Pluvial flood risk*

6.4.6 A study of the NRW maps of surface water flood risk [RD2] has identified an area at risk of surface water flooding in the southernmost part of the proposed Logistics Centre site (figure H8-1-3), south of the rock outcrop. The flood risk is defined as medium so each year this part of the site is at risk of between a 1% and 3.33% AEP flood event.

6.4.7 This area of surface water flood risk corresponds to a lower lying area to the south-east of the current site entrance in an area that will form part of the vehicular exit route from the site. Based on a review of topographical data the risk in this area is from water collecting in this low spot, there are no apparent water flow routes on the NRW maps of surface water flood risk (figure H8-1-3) so this risk is considered to be very localised.

6.4.8 The design for the development (provided in the Design Access Statement (Application Reference Number: 8.2.3)) includes some levelling of the site, including in the lower-lying area where ponding is shown, in order to facilitate site access and egress. This levelling will reduce the existing risk of ponding in this area and the runoff that collects will be dealt with via the drainage system.

6.4.9 Over the operational phase the probability of pluvial flooding is low. Given the effect of the development on surface water ponding, the potential magnitude of the hazard of flooding is classed as very low and the significance of the potential effects is also classed as very low. The overall flood risk is therefore classed as very low.

### *Increased pluvial flooding off-site*

6.4.10 The Logistics Centre could increase runoff and therefore the risk of flooding to surrounding receptors due to an increase in impermeable areas. These off-site receptors include the Scottish Power Energy Network facility and the mast to the west of the Logistics Centre. There is also the Road King truck stop located to the south-west and the A55 to the north. On the northern side of the A55 there is a closed aluminium works and a retail park. Development of the Logistics Centre takes place within the context of a Parc Cybi site-wide drainage strategy that manages the runoff from the site as a whole. Runoff from the site as a whole is therefore managed by the attenuation provided in the pond to the north-west and via the additional surface water attenuation provided via a below ground geo-cellular storage system within the site.

6.4.11 As discharge rates from the site as a whole are restricted to pre-development rates, there will be no increased runoff that could affect the off-site receptors or surrounding agricultural / undeveloped land. In light of the above the significance of effect is very low as is the magnitude of the hazard, the likelihood of occurrence is low and the flood risk is considered very low.

## 6.5 Groundwater

### *Groundwater emergence at surface*

6.5.2 The Logistics Centre would be located on a low-productivity aquifer. The highly indurated bedrock strata have limited groundwater in the near-surface weathered zone and secondary fractures and as such is unlikely to be a source of groundwater flooding.

6.5.3 Localised low spots to the south-west of Parc Cybi Road and to the north-west and north mean that any localised and small-scale emergence of groundwater would likely occur outside of the proposed Logistics Centre site boundary. Further, in the event of localised and small-scale emergence within the Logistics Centre, the proposed drainage system for the Logistics Centre would manage it such that it posed no risk.

6.5.4 Over the design life the risk of flooding is considered to be low. With the magnitude of the hazard classified as very low, the significance of effect is also classed as very low. The overall flood risk at the site is therefore considered very low.

## 6.6 Services

### *Sewerage systems*

6.6.2 Sewer systems exist off-site to the west. The topography of the area dictates that any flooding from the existing network will drain away from the site (appendix H8-1-2).

6.6.3 It is highly likely that the foul drainage from the Logistics Centre would be connected to the local sewer, but if a connection to the existing utilities is not possible a package treatment plant (for sewage and foul water treatment) would be required.

6.6.4 The sewage facilities at the Logistics Centre would be located at the north-western edge of the site at its lowest point. Any failure of the sewer system or package treatment plant would cause effluent to drain away from the site towards the pond and watercourses. The volume and flow rate of failure would be small given the scale of the development and this would not be expected to affect off-site receptors.

6.6.5 The low chance of flooding of the Logistics Centre from this source, with a very low magnitude of hazard and significance of effect, suggests a negligible flood risk overall to the Logistics Centre and off-site receptors.

### *Water supply systems*

6.6.6 Existing water supply systems are located to the northwest of the proposed Logistics Centre site. These are downhill from the site and therefore do not constitute a source of flood risk. The location of the office / welfare building at the Logistics Centre would be at the northwest of the site. Any failures of the water supply would drain off-site to the north-west, as described in the section above, and would not constitute a risk to the site. The volume and flow rate of failure would be small given the scale of the development and this would not be expected to affect off-site receptors.

6.6.7 The low chance of flooding from this source, with very low magnitude of hazard and significance of effect, suggests a negligible flood risk to the Logistics Centre and off-site receptors.

### *Site drainage systems*

6.6.8 The Logistics Centre design has incorporated a drainage design able to attenuate the additional runoff from impermeable surfaces discharging to an existing pond and then into a local watercourse off-site. The design (detailed in section 4.3) includes attenuation of 1,100m$^3$ to accommodate the runoff from all events up to and including the 1% AEP event with a 20% allowance for climate change. This is based on allowable discharge rates that would be restricted to the greenfield runoff rate for the 50% AEP event, equivalent to 9.14l/s. The magnitude of hazard is considered to be very low as is the significance of effect, resulting in a negligible flood risk overall to the Logistics Centre.

## 6.7 Decommissioning

6.7.1 Decommissioning would involve removal of temporary facilities from the site, but the hardstanding, drainage and other infrastructure would remain. There would therefore be no changes in runoff compared to the operational state and the flood risk would remain very low to negligible.

## 6.8 Flood risks

6.8.1 The flood risk from the sources outlined above, to the receptors identified in section 3, are summarised in table H8-1-2. This is based on the methodology detailed in appendix H8-1-3.

**Table H8-1-2 Flood risks**

| Flood type | Source | Pathway | Receptor | Sensitivity | Magnitude of hazard | Significance of effect | Likelihood of occurrence | Flood risk | With-development Flood risk |
|---|---|---|---|---|---|---|---|---|---|
| Fluvial and pluvial | Fluvial | Risk of flooding from neighbouring watercourses | Logistics Centre | Medium | Very low | Very low | Low | Very low | Very low |
| | Pluvial | Ponding in the south of the Logistics Centre at the vehicle exit | Logistics Centre | Medium | Very low | Very low | Low | Very low | Very low |
| | Site development | Increased runoff from site | Off-site receptors | High | Very low | Very low | Low | Very Low | Very low |
| Groundwater | Groundwater | Risk of flooding due to groundwater emergence at surface | Logistics Centre | Medium | Very low | Very low | Low | Very Low | Very low |
| Services | Sewerage network | Sewerage network flooding | Logistics Centre | Medium | Very low | Very low | Very low | Negligible | Negligible |
| | | | Off-site receptors | High | Very low | Very low | Very low | Negligible | Negligible |
| | Mains supply | Failing of mains supply | Logistics Centre | Medium | Very low | Very low | Very low | Negligible | Negligible |
| | | | Off-site receptors | High | Very low | Very low | Very low | Negligible | Negligible |

| Flood type | Source | Pathway | Receptor | Sensitivity | Magnitude of hazard | Significance of effect | Likelihood of occurrence | Flood risk | With-development Flood risk |
|---|---|---|---|---|---|---|---|---|---|
| | Site drainage system | Flooding from the site drainage system | Logistics Centre | Medium | Very low | Very low | Very low | Negligible | Negligible |

# 7 Conclusions

7.1.1 Based upon this FCA there is a very low risk of flooding to the Logistics Centre from all sources.

7.1.2 The Logistics Centre forms part of a wider development, Parc Cybi Employment Area, for which a plot drainage strategy is in place. That system would manage runoff, including from the Logistics Centre, and the catchment of the small watercourse that is culverted to the west and those that lie to the north of the proposed Logistics Centre site. The system in place was agreed with NRW and the IACC and provides strategic management of runoff and, because the drainage area covers the catchments of these small watercourses, flood risk for events up to and including the 1% AEP event with a 20% allowance for climate change.

7.1.3 As a result of the business park wide drainage system, the Logistics Centre is considered to have a very low risk of fluvial flooding and also, by virtue of the similar mechanisms of flooding in small catchments, a very low risk of pluvial flooding. This conclusion is supported by NRW's surface water flood map. The design for the Logistics Centre includes levelling of the site and a drainage system incorporating a below ground geo-cellular storage system that will attenuate rainwater runoff. These systems will ensure that there is a very low residual risk of localised surface water flooding.

7.1.4 The risk of flooding from groundwater is considered negligible, and the risk of flooding from underground services such as sewers or mains water is also considered negligible.

7.1.5 As a result of the business park wide drainage system, the impact of the Logistics Centre on the flood risk to off-site receptors is considered to be negligible.

# 8 References

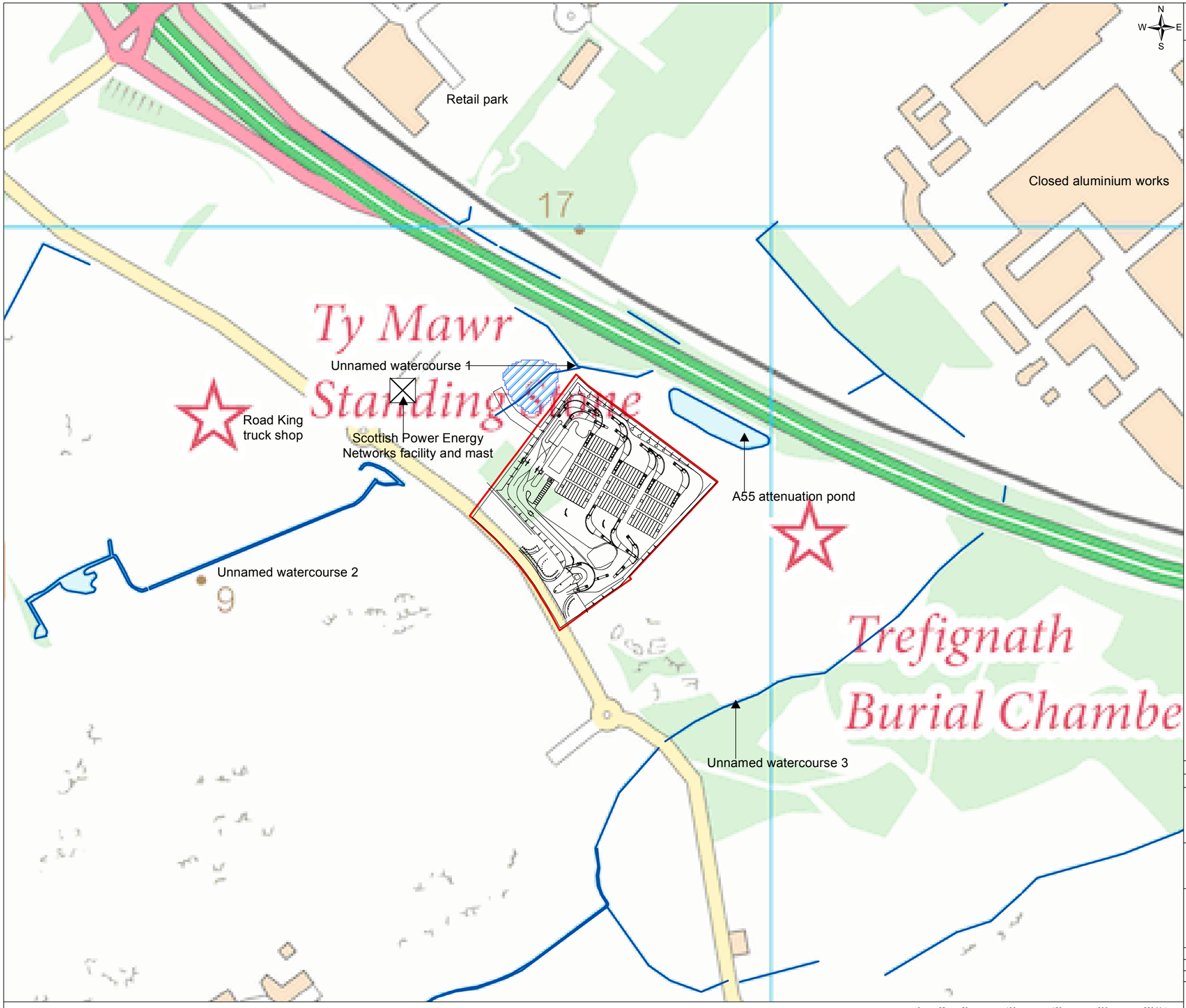
**Table H8-1-3 Schedule of references**

| ID | Reference |
|---|---|
| RD1 | Welsh Government. 2017. TAN15 Development Advice Map. [Accessed May 2017]. Available from: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default |
| RD2 | Natural Resources Wales (NRW). 2016. Flood Risk Map. [Online] [Accessed: April 2017] Available from: https://naturalresources.wales/our-evidence-and-reports/maps/flood-risk-map/?lang=en. |
| RD3 | Welsh Government. 2016. *Planning Policy Wales* (PPW). Edition 9 [Online] [Accessed: April 2017] Available from: http://gov.wales/topics/planning/policy/ppw/?lang=en |
| RD4 | Welsh Government. 2004. *Technical Advice Note (TAN) 15: Development and Flood Risk*. [Online] [Accessed: October 2016]. Available from: http://wales.gov.uk/docs/desh/publications/040701tan15en.pdf. |
| RD5 | Welsh Government. 2016. *CL-03-16 Climate Change Allowances for Planning Purposes*. [Online] [Accessed: April 2017] Available from: http://gov.wales/topics/planning/policy/policyclarificationletters/2016/cl-03-16-climate-change-allowances-for-planning-purposes/?lang=en |
| RD6 | Meteorological Office. 2009. *UK Climate Projections*. [Online] [Accessed: April 2017] Available from: http://ukclimateprojections.metoffice.gov.uk/22530 |
| RD7 | Isle of Anglesey County Council (IACC) and Gwynedd Council. 2017. *Anglesey and Gwynedd Joint Local Development Plan 2011-2026, Written Statement.* [Online] [Accessed: September 2017] Available from: http://www.anglesey.gov.uk/planning-and-waste/planning-policy/joint-local-development-plan-anglesey-and-gwynedd/ |
| RD8 | Isle of Anglesey County Council (IACC) and Gwynedd Council. 2013. *Anglesey and Gwynedd Joint Local Development Plan, Topic Paper 8: Strategic Flood Consequence Assessment (Level 1)*. [Online] [Accessed: October 2016] Available from: http://www.anglesey.gov.uk/download/31094 |
| RD9 | Isle of Anglesey County Council (IACC). undated. *Preliminary Flood Risk Assessment*. [Online] [Accessed: October 2016] Available from: |

| ID | Reference |
|---|---|
| | http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/flho1111bvfk-e-e.pdf. |
| RD10 | Isle of Anglesey County Council (IACC). 2013. *Anglesey Local Flood Risk Management Strategy*. [Online] [Accessed: October 2016] Available from: http://www.anglesey.gov.uk/download/32358 |
| RD11 | Natural Resources Wales. 2015. *Western Wales River Basin Management Plan 2015-2021.* [Online] [Accessed: April 2017] Available from: https://naturalresources.wales/media/676165/wwrbdsummary.pdf. |
| RD12 | Atkins. 2008. *Parc Cybi, Anglesey: Plot Drainage Statement*. Doc Ref: 5035112/62/DG/ZT/01 |
| RD13 | Lancaster, J.W., Preene, M. and Marshall, C.T. 2004. *Development and flood risk – guidance for the construction industry*. Report C624. Construction Industry Research and Information Association |

# Appendix H8-1-1 Figures

# FIGURE H8-1-1




Legend

- Logistics Centre
- Logistics Centre masterplan
- Surface water features
- Wet and boggy area

| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 0 | AUG 17 | Initial Issue | BW | AJ | SH | RB |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
FLOOD CONSEQUENCE ASSESSMENT

Drawing Title

FLOOD RISK STUDY AREA
AND SURFACE WATER FEATURES

| | | |
|---|---|---|
| Scale @ A3 | 1:4,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

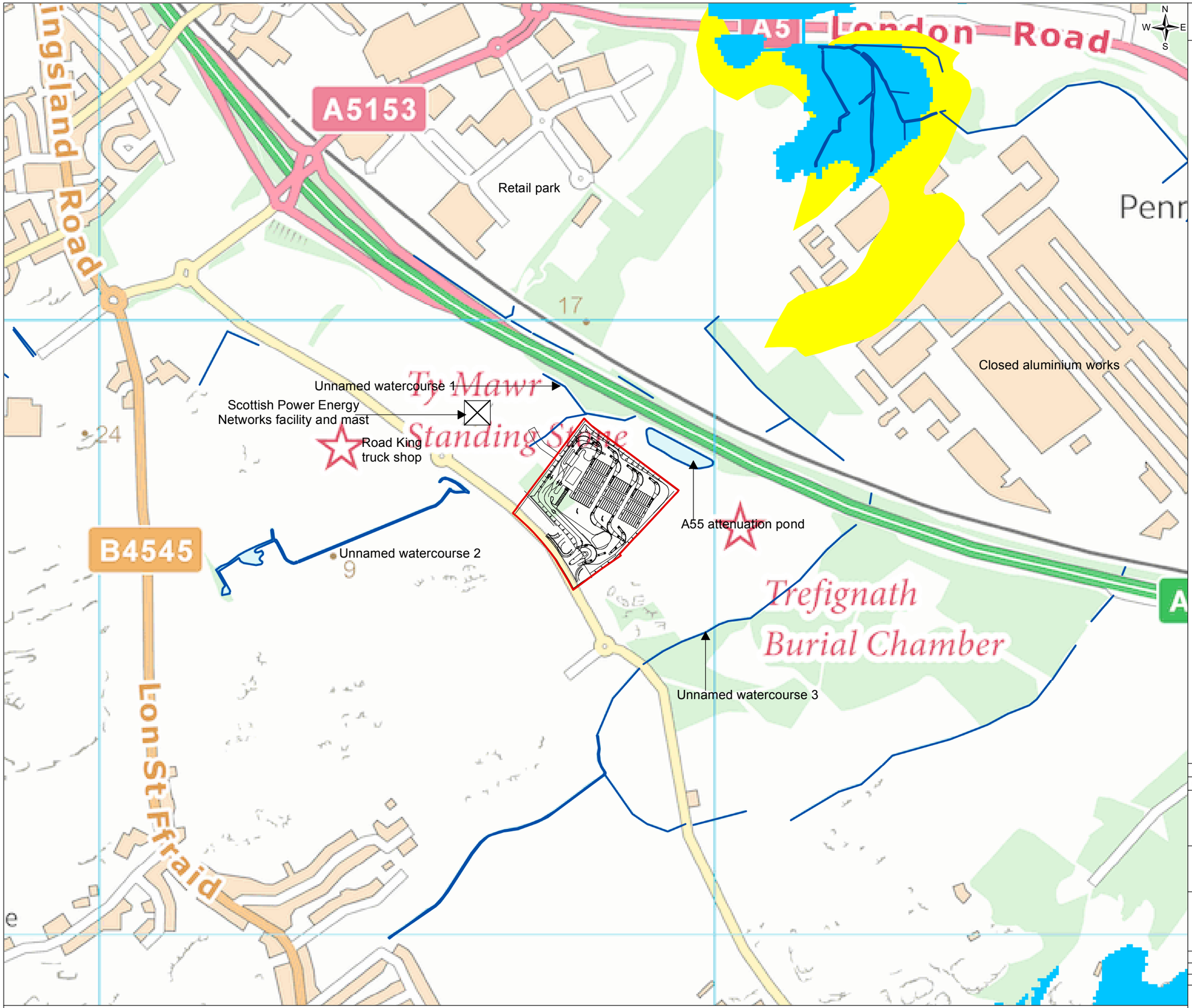
60PO8077_DCO_VOL_H_08_01_01_01





0 25 50 100 150 200 250 Metres

# FIGURE H8-1-2




Legend

- Logistics Centre
- Logistics Centre
- Surface water
- Flood Zone B
- Flood Zone C2

| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 0 | AUG 17 | Initial Issue | HT | AJ | SH | RB |

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
FLOOD CONSEQUENCE ASSESSMENT

Drawing Title: RISK OF FLOODING
FROM RIVERS AND SEA

| | | |
|---|---|---|
| Scale @ A3 | 1:6,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

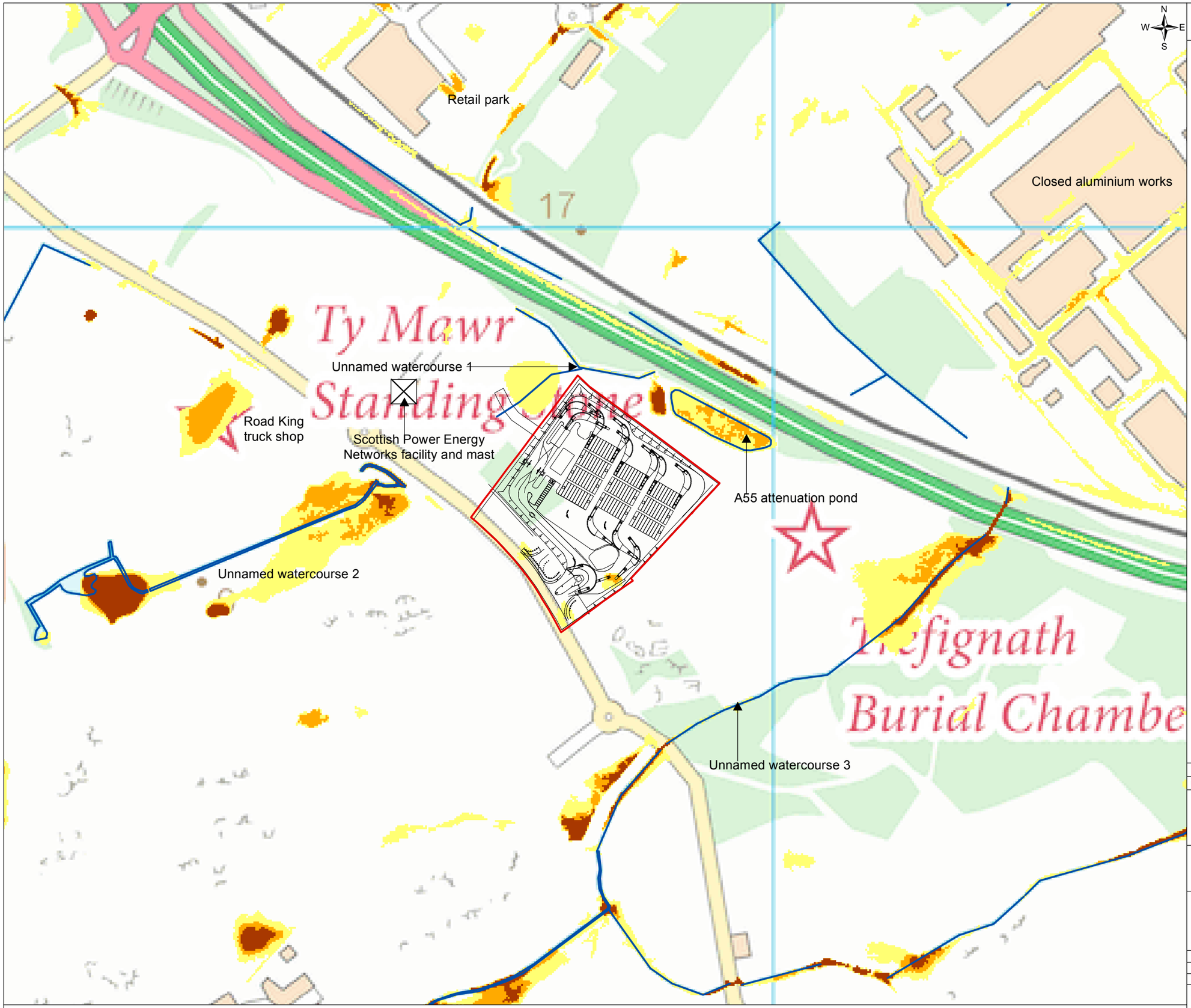
Drawing No. 60PO8077_DCO_VOL_H_08_01_01_02





0 50 100 200 300 400 500 Metres

# FIGURE H8-1-3




Legend

- Logistics Centre
- Logistics Centre masterplan
- Surface water features
- High surface water flood risk - extent
- Medium surface water flood risk - extent
- Low surface water flood risk - extent



| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 0 | AUG 17 | Initial Issue | HT | AJ | SH | RB |

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
FLOOD CONSEQUENCE ASSESSMENT

Drawing Title: RISK OF FLOODING
FROM SURFACE WATER

| | | |
|---|---|---|
| Scale @ A3 | 1:4,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No. 60PO8077_DCO_VOL_H_08_01_01_03

# Appendix H8-1-2 Site topography

Note: the red line shown on the topography figure does not represent the boundary for the Logistics Centre that is proposed by Horizon

| Revision History | Date |
|---|---|
| | |

Plot Boundary

*Chester Office:*
**Well House Barns**
**Bretton**
**Chester**
**CH4 0DH**

*South Manchester Office:*
**Camellia House**
**76 Water Lane**
**Wilmslow**
**SK9 5BB**

0844 8700 007 - www.axisped.co.uk

axis

**client:**
THE CONYGAR INVESTMENT COMPANY PLC

**project:**
PROPOSED LOGISTICS CENTRE
ON DEVELOPMENT ZONE 7 AT PARC CYBI - HOLYHEAD

**drawing title:**
SITE LOCATION

| | | |
|---|---|---|
| **date:** June 2015 | **drawn by:** SM | **checked:** DJ |
| **drawing number:** 881-01-LC01 | **status:** - | |
| **scale(s):** 1:1000@A1 | **rev:** - | |

planning environment design

N

0m 100m 200m

# Appendix H8-1-3 Assessment methodology

8-0.1.1 In order to allow for the wider assessment of flood risk, a generalised assessment methodology has been developed.

## *Assessment methodology*

8-0.1.2 In line with the risk-based approach detailed by the Welsh Government and recommended elsewhere in industry guidance [RD13], the key to the classification is that the designation of risk is based upon the consideration of:

- the sensitivity of the receptor – takes into account the nature of the proposals or receptor and its likely response to increased risk;
- the severity of flooding (or magnitude of the potential hazard) – takes into account the potential nature of the flooding; and
- the likelihood of occurrence (i.e. probability) – takes into account the presence of the hazard and receptor, and the integrity of the pathway.

## *Classification of sensitivity of the receptor*

8-0.1.3 When considering new developments, the classification of sensitivity is based (where possible) directly on the technical guidance set out within TAN 15 [RD4]. When considering off-site impacts, there is a general assumption that all developments are highly sensitive. This assumption can, however, typically be relaxed when considering a water-compatible development or undeveloped land. Given this, the sensitivity of the receptor is ranked as shown in table H8-1-4.

**Table H8-1-4 Classification of sensitivity of receptor**

| Sensitivity of receptor | New development | Off-site |
|---|---|---|
| Very high | Emergency services* developments | All built developments unless mitigating circumstances exist. Key access routes |
| High | Highly vulnerable* developments | Other access routes |
| Medium | Less-vulnerable* developments | Undeveloped land |
| Low | Water-compatible[1] developments | - |
| Very low | Flood attenuation features | - |

* For definitions of terms, please see figure 2 in TAN 15

[1] Category not outlined within TAN 15, but would include any types of development that often need to be in a floodplain, such as buildings associated with water-sports or pumping stations for low-lying areas.

### *Classification of the magnitude of hazard*

8-0.1.4 To classify the severity of flooding, it is necessary to look at the nature and scale of the individual impacts. These include, but are not confined to, the extent, depth and duration of flooding, and the velocity of flood waters. For new developments, the assessment is based on the likely post-development situation; for off-site receptors, it is based solely on the likely deterioration.

8-0.1.5 Given this, the severity of the potential flooding (hazard) is then ranked in terms of its magnitude as shown below in table H8-1-5.

**Table H8-1-5 Classification of magnitude of hazard**

| Magnitude of hazard | New development | Off-site |
|---|---|---|
| High | Any one of the following criteria achieved:<br>• flood depths greater than 1m;<br>• flood flow velocities greater than 0.45m/s; or<br>• likely flood duration in excess of 24 hours. | Any marked (>10%) increase in flood depth, flood flow velocity or flood duration<br>Any change in flood extent that impacts additional properties, including access to those properties |
| Medium | Any one of the following criteria achieved:<br>• flood depths between 0.3m and 1m;<br>• flood flow velocity greater than 0.15m/s;<br>• likely flood duration in excess of one hour; or<br>• any restrictions to access and egress. | Any other measurable increase of flood depths, durations, flow velocities or extent |
| Low | All of the following criteria achieved:<br>• flood depths below 0.3m;<br>• likely flood duration below one hour; and<br>• flood-proofing measures planned. | Likely but unquantifiable small increases of flood depths, durations, flow velocities or extent |
| Very low | Planned or permitted flooding that does not adversely impact the built development | - |
| Negligible | No potential for flooding, or no identifiable impact of flooding | No likely increase in flood severity at any off-site location |

## *Significance of potential effect*

8-0.1.6 The magnitude of the hazard and the sensitivity of the receptor are combined using a matrix (shown below in table H8-1-6) to determine the significance of the potential effect, if realised.

**Table H8-1-6 Matrix for determining the significance of the potential effect**

| | | SENSITIVITY OF RECEPTOR | | | | |
|---|---|---|---|---|---|---|
| | | VERY LOW | LOW | MEDIUM | HIGH | VERY HIGH |
| MAGNITUDE OF POTENTIAL HAZARD | HIGH | Low | Moderate | Moderate | High | High |
| | MEDIUM | Very low | Low | Moderate | Moderate | High |
| | LOW | Very low | Very low | Low | Moderate | Moderate |
| | VERY LOW | Negligible | Very low | Very low | Low | Low |
| | NEGLIGIBLE | Negligible | Negligible | Negligible | Negligible | Negligible |

## *Classification of likelihood of occurrence*

8-0.1.7 To classify the likelihood or probability of occurrence for a potential effect, it is necessary to understand how regularly a given event or outcome will occur. This can be assessed in a number of ways, including assessments based on historical data, quantitative analysis or experience from other similar sites. Often, this assessment will be based on standard guidance. The classifications used for defining the likelihood of a potential effect occurring are as shown below in table H8-1-7.

**Table H8-1-7 Classification of likelihood of occurrence**

| Likelihood of occurrence | Potential effect |
|---|---|
| High | Any consequence would likely appear in the medium term and inevitably in the long term (i.e. the lifetime of the proposed development). |
| | Equivalent to an annual probability of flooding of greater than 1% (0.5% for tidal). |
| Medium | Circumstances are such that an event is possible in the medium term and likely over the long term, although not necessarily inevitable. |
| | Equivalent to an annual probability between 0.1% and 1% (0.1% and 0.5% for tidal). |
| Low | It is unlikely that any consequence would arise within the lifetime of the proposed development. |
| | Equivalent to an annual probability of less than 0.1%. |
| Very low | It is unlikely that any consequence would ever arise. |

8-0.1.8 It should be noted that in circumstances where sites are defended by flood defences, determining an accurate assessment of probability of flood occurrence is complex, and assumptions that defences will not fail are unlikely to be acceptable. In such cases, assessments cannot be prescriptive and site-specific assessments would be undertaken. Factors that would be considered include construction, age, condition, maintenance, exposure and other external pressures.

### *Risk assessment*

8-0.1.9 Once the significance of the potential effect and likelihood of occurrence have been assessed, these are then combined using a risk matrix (table H8-1-8) to assess the flood risk of each potential effect.

**Table H8-1-8 Risk matrix**

| | | LIKELIHOOD OF OCCURRENCE | | | |
|---|---|---|---|---|---|
| | | VERY LOW | LOW | MEDIUM | HIGH |
| SIGNIFICANCE OF POTENTIAL EFFECT | HIGH | Low | Moderate | High | High |
| | MODERATE | Low | Low | Moderate | High |
| | LOW | Very low | Low | Low | Moderate |
| | VERY LOW | Negligible | Very low | Low | Low |
| | NEGLIGIBLE | Negligible | Negligible | Negligible | Negligible |

8-0.1.10 Typically, flood risks assessed as Low or less are considered acceptable. If the assessment results in moderate or high risk, this is considered significant (i.e. equivalent to a significant effect under the Environmental Impact Assessment regulations set out in chapter B8 (Application Reference Number: 6.2.8) of the Environmental Statement), and additional mitigation measures would be required to facilitate development.

8-0.1.11 In some situations, the risk assessment procedure will result in an artificially low assessment of risk. This is particularly the case in situations where consequences of very rare flooding (i.e. breach scenarios) are so extreme that any residual risk, however low, would not be allowed. In such instances, the assessed risk would be elevated. Such decisions must always be accompanied by detailed justification.

# Appendix H8-1-4 Parc Cybi Drainage Strategy

ATKINS

# Parc Cybi, Anglesey:
# Plot Drainage Statement

Nov 2008

Plan Design Enable

## Notice



## Document History

| JOB NUMBER: 5035112 | | | DOCUMENT REF: 5035112/62/DG/ZT/01 | | | |
|---|---|---|---|---|---|---|
| Revision | Purpose and Description | Originated | Checked | Reviewed | Authorised | Date |
| 00 | Draft for comments | Z Todorovic | D Sephton | R Whale | R Whale | 3 Jan 2008 |
| 01 | Final (incorporating WAG comments) | Z Todorovic | D Sephton | R Whale | R Whale | 20 Aug 2008 |
| 02 | Final (incorporating stone culvert position & plot 5001) | Z Todorovic | D Sephton | R Whale | R Whale | 20 Nov 2008 |
| | | | | | | |

# CONTENTS

# 1. Introduction

Atkins was commissioned in 2005 by the Welsh Assembly Government to investigate options and prepare detailed designs for foul and surface water disposal for the proposed Parc Cybi Business Park development in Anglesey, North Wales. The Parc Cybi site has been identified as a major strategic business investment site for North West Wales. It is located on the southern edge of Holyhead on the west side of A55 Junction 2, and has been formally designated for development in unitary development plans. The Welsh Assembly Government has obtained outline planning consent for the 50 Ha business park development, which is located in an area of outstanding natural beauty and archaeological interest. The main adoptable drainage and highway infrastructure on the site is programmed for completion in 2008. The installation of this infrastructure will facilitate the development of the plots within the site.

This report sets out the design philosophy for foul and surface water drainage for the development, which has been agreed with relevant regulatory authorities and will be issued to developers of the plots as the basis of the drainage design for each plot.

# 2. Site Description

The site is located approximately 1km south of the centre of Holyhead and immediately north of Trearddur Bay. The A55 forms the eastern boundary to the site. Similarly, Kingsland Road lies adjacent to the site's western boundary. The site's topography ranges from 6 - 12 m AOD with gentle undulating topography interrupted by rock outcrops running east to west. A number of rock outcrops occur throughout the site with the highest points of around 18 m AOD. The proposed development project included creation of:

1. A new road linking A55 Junction 2 with the Trearddur Bay - Kingsland road, joining it at a new roundabout near to the Leisure Centre, which is under construction and will be completed before the business park units are developed;
2. Development of 9 plots for business purposes (circa 48 Ha for business development), and
3. A 3 Ha housing development site north of the proposed link road.

The above features are shown on the Drainage Masterplan that is included in Appendix A.

# 3. Site Drainage

## 3.1. Foul Water Drainage

A new foul drainage system has been installed as part of the main infrastructure works for the development. This system discharges to the public foul sewer network. The main foul drainage infrastructure has been designed in accordance with Sewers for Adoption 6$^{th}$ Edition (SfA 6) and includes connections to proposed development plots. The main foul drainage system is in the process of adoption by Dwr Cymru.

In accordance with SFA 6, any subsequent foul drainage system serving multiple buildings may also be offered to Dwr Cymru for their adoption, providing they meet the required standards. Foul drainage systems serving individual units or plots should be designed in accordance with SfA 6 or the Building Regulations Part H (2002) depending on whether the system is to be offered for adoption or remain in private ownership.

The peak design foul discharge rate from the whole development should not exceed 36 l/s. This flow rate has been calculated using guidance given in SfA 6 and is based on the developable site area identified on the site master plan that was current at the time the drainage design for the site was undertaken(circa 26ha). The following Foul Drainage Schedule for Plots details maximum permitted discharges and connection points for each plot.

The limited discharges stated relate to groups of buildings within the plot and should be calculated pro rata for individual buildings.

## Foul Drainage Schedule for Plots

| Type of development | Buildings type/number | Max buildable area (ha) | Maximum flow permitted (l/s) [1] | Type of connection (gravity/possible pumping) | Connection point to the site drainage (MH) |
|---|---|---|---|---|---|
| Plot 1- Residential | - | 156 dwelling units | 7.3 | g | MH13a |
| Plot 2 - Commercial/Industrial | 2001 | 2.82 | 3.1 | g | MH 8 (MH11) |
| | 2002 | | | g | MH8 |
| Plots 3 + 9a - Commercial/Industrial | 2003 | 2.54 | 2.8 | g | MH6 |
| | 2004 | | | g | MH6 |
| | 2005 | | | g | MH6 |
| Plot 4a – Hotel | 1001 | 1.61 | 1.8 | g | MH11.1 |
| Plots 4b and 5 - Commercial/Industrial | 1002-1003 | 2.82 | 3.1 | g | MH8.1 |
| | 1004 | | | g | MH8.1 |
| | 1005 | | | g | MH8.1 |
| | 1006 | | | g | MH8.1 |
| | 1007 | | | g | MH8.1 |
| | 1008 | | | g | MH8.1 |
| Plot 6 - Commercial/Industrial | 3001 | 1.40 | 1.6 | pp | MH6.1 |
| | 3002 | | | g | MH6.1 |
| Plot 6a - Commercial/Industrial | 3003 | 1.40 | 1.6 | g | MH5.1 |
| | 3004 | | | g | MH5.1 |
| Plot 7 - Commercial/Industrial | 3005 | 1.5 | 1.7 | pp | MH3.1 |
| | 3006 | | | g/pp | MH3.1 |
| Plot 8 - Commercial/Industrial | 5001 | 6.44 | 7.1 | g | MH3.5 |
| Plot 9b - Commercial/Industrial | 4001 | 1.39 | 1.5 | g | MH2 |
| Plot 10 - Commercial/Industrial | 4002 | 3.73 | 4.1 | g | MH1 |
| | 4003 | | | g | MH1 |
| | 4004 | | | g | MH1 |
| | 4005 | | | g | MH1 |

[1] - for industrial/commercial sites of 1.1 l/s/ha of buildable area (as per SfA 6)
- for residential units peak design flow rate was calculated on the basis of SfA 6 guidance – 4000 l/dwelling unit/day

The developer shall ensure that the design of the foul drainage systems that may serve more than one units within a plot does not preclude a gravity connection (unless pumping connection required) to the common pipework from other units within the plot. The design shall also ensure that the common pipework has sufficient capacity to all other units within the plot.

Common pipework shall be laid at the following minimum gradients to ensure compliance with the above requirements:

D 100 mm – 1:80 (provided at least 1WC is connected)

D 150 mm – 1:150 (provided at least 5WCs are connected).

The developer should make reference to the 'as-built' records for details of pipe diameters and invert levels at the stated connection points. Connections should be made soffits level.

## 3.2. Surface Water Drainage

### 3.2.1. Introduction

In accordance with current planning guidance, TAN 15 in particular, surface water arising from the site will be managed using Sustainable Drainage Systems (SUDS). The design of the SUDS has been based upon the principles given in the CIRIA C697: 'Sustainable Drainage Systems Design Manual' (2007), which promotes the strategy of dealing with stormwater as close to source as possible. Broad agreement for the use of SUDS at the Parc Cybi development was given by Ynys Mon County Council and by Welsh Assembly Government who prize the potential benefits they bring to the environment. The purpose of a SUDS system is to minimise the impact that a development such as Parc Cybi has on the natural environment, with particular reference to the effects large impervious surfaces and sources of pollution have on nature. Negative impacts on development brings, with respect to drainage, include:

- Changes in flow characteristics of runoff. Runoff from hard surfacing and building roofs is quicker than from natural surfaces; this can cause flooding downstream.
- Changes in the quality of runoff. Runoff from the sites is likely to be more polluted than runoff from natural surfaces as pollutants from activities on the sites (e.g. oil from car parks) can be washed into the drainage system. Conventional drainage systems are not designed to remove pollution.
- Biodiversity and amenity losses.

All drainage systems have been designed to accommodate storm return periods of up to 1 in 30 year return frequency (site attenuation features to 100 years with an additional 20 % factor of safety to take account of climate change in accordance with TAN 15). Flows arising from exceedance events will either pond on the surface and enter the drainage system as the drainage system draws down, or follow flood routes over the surface and into the site attenuation features. Flows from the site will enter either one of two unnamed watercourses at rates equivalent to that of the pre-developed site. These rates are referred to as greenfield rates. The following greenfield runoff rates for Parc Cybi have been agreed with the Environment Agency Wales for different return periods:

| Storm Return Period (1 in x years) | Predicted Greenfield Runoff (l/s/ha) |
|---|---|
| 2.34 | 5.08 |
| 5 | 7.49 |
| 10 | 9.04 |
| 30 | 12.42 |
| 50 | 14.28 |
| 100 | 16.72 |

These rates should be used in the design of the future pond serving plot 8. The discharges from this pond should be restricted to the rates stated in the table above.

Due to the space constraints for the attenuation pond serving all other plots, discharges from the car parks and hardstandings need to be restricted to 5 l/s/ha and the limited rates for each plot are detailed in the Surface Drainage Schedule for Plots.

Surface water drainage systems serving individual units or plots should be designed in accordance with SfA 6 or the Building Regulations Part H (2002) depending on whether the system is to be offered for adoption or remain in private ownership.

The developer shall ensure that the design of the surface water drainage systems that may serve more than one unit within a plot does not preclude a gravity connection to the common pipework from other units within the plot. The design shall also ensure that the common pipework has sufficient capacity to all other units within the plot.

Common pipework shall be laid at the following minimum gradients to ensure compliance with the above requirements:

- D100 mm – 1:100
- D150 mm – 1:150 (1:100 if offered for adoption)
- D225 mm – 1:225 (1:170 if offered for adoption)
- D300 mm – 1:240
- D375 mm - 1:320
- D450 mm – 1:400

The developer should make reference to the ‘as-built’ records for details of pipe diameters and invert levels at the stated connection points. Connections should be made soffits level in accordance with normal drainage construction practice.

### 3.2.2. Carriageway Drainage and Main Site Drainage

The main surface water drainage system within the spine road has already been installed. Land drainage associated with the highway drainage has been constructed as part of the preliminary infrastructure work.

In order to provide pollution mitigation for surface water runoff from the main carriageway of the spine road, bio-swales have been designed along the shoulder of the main carriageway to accept water from the road before it discharges into the main surface water drain. Bio-swales have been utilised to attenuate flows, provide habitat for wildlife and the primary phase of

treatment. Road runoff will be conveyed from the road surface by traditional gullies into the bio-swales before discharge into the main surface water drain.

Purpose designed attenuation system controls surface water runoff on site to pre-development site rates. An existing ditch has been utilised for attenuation and a new pond has been constructed in the wetland area at the eastern boundary of the site which discharges into the watercourse draining through the A55 culvert. These features will attract and support a variety of flora and fauna and enhance the biodiversity of the site. The attenuation ponds will form the final phase of treatment and attenuation for run-off from the main carriageway before surface water runoff is discharged beyond the site.

## 3.2.3. Plot Drainage

The Welsh Assembly Government's aspiration is that all new buildings in Wales from 2011 onwards should be built to zero carbon standards. As from 2007, WAG is making BREEAM 'Excellent' or equivalent a core condition of its funding for projects and programmes involving new buildings. That means that the units proposed to be build on this site should be designed to meet those WAG standards. For further information regarding BREEAM scoring, please refer to the British Research Establishment website (www.breeam.org).

Surface water run-off from plots has been divided into two categories:

- Roof run-off, which is relatively unpolluted, and
- Other hardstading areas, which have a risk of surface water pollution from diffuse pollution sources and accidental spillages.

In that respect, there are different criteria for surface water disposal from those two sources.

### 3.2.3.1. Roof Drainage

Surface water runoff from all roofs shall be allowed to discharge freely to the site attenuation ponds/wetlands via the common main drainage infrastructure, providing that the maximum roof areas per plot are not exceeded (for further reference for each plot please see Surface Drainage Schedule further in this text).

This approach ensures that the relatively unpolluted roof runoff passes through the drainage system and does not dilute the potentially contaminated car park runoff thus preventing its effective treatment. In order to further BREEAM requirements, rainwater harvesting either in water butts or in underground tanks and utilising of green roofs should be considered.

### 3.2.3.2. Other Hardstanding Areas

SUDS use on all Business Park plots is a requirement and these systems could be used to meet both quantity and quality requirements for surface water disposal from individual boundaries of units to be developed.

#### Quantity Requirements

Drainage runoff from all carparks, access roads and hardstanding areas within the boundaries of individual units shall be attenuated and only the restricted flows, not exceeding 5 l/s/ha, shall be discharged from the areas occupied by the developed units. The exception to this is plot 8 as the final discharge point rates should depend on the capacity of the proposed pond to be constructed within the plot prior to final discharge beyond the site. Plot drainage should be designed so that flows arising from the drainage system do not present a flood risk to buildings. Further guidance can be found in CIRIA guidance C635: 'Designing for exceedance in urban drainage - good practice', 2006.

#### Quality Requirements

As runoff from these areas is at the risk of being polluted, utilisation of SUDS to treat surface water runoff has been required. In order to maximise the benefits of SUDS systems and minimise the risk of polluted water from being conveyed to the existing wetland and ponds, a

SUDS treatment train has been anticipated to link different SUDS techniques in series. The treatment train concept is based on a series of complementary techniques to achieve enhanced water quality. For the proposed development plots, two levels of SUDS techniques need to be provided for water discharging from each individual unit, or group of units to be developed. As the existing wetland and ponds count as one level of treatment in this train, all plots are required to provide at least one additional level within the individual development plot boundary. Each of the following techniques proposed for Parc Cybi should be treated as one level of treatment in the treatment train:

- Minimising impermeable paved area wherever possible - allowing surface water runoff to drain naturally, through landscape areas,
- Utilising green planters,
- Utilising grass strips and permeable surfaces where possible (car parks) – offering alternatives to conventional hard surfaces. These systems attenuate flow and provide natural filters to treat contaminants at the source,
- Utilising swales to convey stormwater from the plots and to connect to the main drainage network.

Selection and design of individual SUDS types should depend on individual plot topography and final plot layouts. Use of SUDS on these developments will have positive impact on BREEAM scoring. For further information regarding BREEAM scoring, please refer to the British Research Establishment website (www.breeam.org).

### 3.2.3.3. Residential Area (Plot 1)

Surface water flows arising from the development of residential area for storm events up to 1 in 100 years return frequency shall be discharged into the main drainage system without restriction, providing that no more than 60% of total plot area is covered by impermeable surfaces (roofs, roads, hardstandings, etc.). Plot drainage should be designed so that flows arising from the drainage system do not present a flood risk to buildings. Further guidance can be found in CIRIA guidance C635: 'Designing for exceedance in urban drainage - good practice', 2006.

Although it is advisable to use SUDS for surface water attenuation, there is no need to utilise SUDS for pollution control purposes on this plot, as the downstream pond already provides one level of treatment recommended by the Environment Agency for residential sites.

### 3.2.3.4. Plot 8

Surface water from the plot 8 will discharge via a future pond into the watercourse forming the boundary of plot 8. This is a different watercourse from the one receiving discharges from other plots. Discharge requirements from roofs and other hardstanding areas should depend on the capacity of the proposed pond to be built within the plot prior to final discharge beyond the site. The agreed restricted greenfield runoff flows from the plot to the watercourse should be calculated according to the table provided in section 3.2.1.

Part of the main highway drainage discharges via an existing bio-swale on site. The potential developer should make an effort to retain this bio-swale. However, in the case that it has to be removed in order to provide adequate space for the future pond, the developer should incorporate within the design of the pond an equivalent level of treatment for the highway runoff in addition to the treatment for the runoff from the development plot. More details on SUDS pollution mitigation levels and SUDS treatment trains could be found in CIRIA C697: 'Sustainable Drainage Systems Design Manual' (2007).

In addition to the above the developer of Plot 8 shall ensure that any surface water flows generated within the areas to the south west of the site can continue to be conveyed across Plot 8 to the existing watercourse, without presenting an increased flood risk to the properties on the adjacent existing housing area. Within the vicinity of Plot 8 there is an existing stone culvert that should be taken into account by the developer prior to construction. Further investigations should be undertaken by the developer to confirm the location, depth, condition

and purpose of the culvert. The approximate location of the culvert is shown on the Drainage Masterplan that is included in Appendix A.

## Surface Drainage Schedule for Plots

| Type of development | Roof drainage | | | Car parks/hardstanding drainage | | |
|---|---|---|---|---|---|---|
| | Maximum roof area (m2) | Discharge limit (l/s) | Discharge point (SW) | Max car park/ hardstanding and green area (ha) | Discharge limit (l/s) | Discharge point (SW) |
| Plot 1 (residential) | 21450 (max 60% site area to be developed) | No limit – free discharge | SW11 | 14300 [2] | No limit – free discharge | SW11 |
| Plot 2 | 3100 | No limit – free discharge | SW9 | 4.16 | 20.8 | SW9 |
| Plots 3 + 9a | 2000 + 1000 | No limit – free discharge | SW5 | 2.03 + 0.65 | 10.1 + 3.2 | SW5 |
| Plot 4a (hotel) | 1700 | No limit – free discharge (the footprint of the hotel should not impair the hydraulic performance of the swale) | SW10.1 | 1.04 | 5.3 | SW10.1 |
| Plot 4b | 3250 | No limit – free discharge | SW8.1 | 2.43 | 12.1 | SW8.1 |
| Plot 5 | 3000 | No limit – free discharge | SW7.1 | 2.64 | 13.2 | SW7.1 |
| Plot 6 | 6800 | No limit – free discharge | SW4.1 | 3.02 | 15.1 | SW4.1 |
| Plot 6a | 3300 | No limit – free discharge | Existing ditch | 2.56 | 12.8 | Existing ditch |
| Plot 7 | 4700 | No limit – free discharge | Existing ditch | 3.70 | 18.5 | Existing ditch |
| Plot 8 | 17350 | No limit – free discharge | To the future pond [3] | 9.18 | | To the future pond |
| Plot 9b | 3400 | No limit – free discharge | SW1 | 2.07 | 10.4 | SW1 |
| Plot 10 | 8000 | No limit – free discharge | SW1 | 5.78 | 28.9 | To the pond |

[2] Total plot area minus the roof area
[3] Pond shall be restricted to the Greenfield runoff rates detailed in Section 3.2.1.

# 4. Construction and Maintenance

Any construction works within the plots shall be designed not to disturb main drainage systems already in place. Special attention needs to be taken to secure integrity of bio-swales and ponds already in place. For further guidance on protection of SUDS systems during construction, please refer to ‘CIRIA SUDS construction handbook C697, 2007’.

The main foul drainage system has been submitted for adoption by Dwr Cymru. The main surface water infrastructure and attenuation ponds are to be adopted by Ynys Mon with the Welsh Assembly Government currently taking responsibility for the maintenance of the swales and bio-swales. However, this commitment may be reviewed if the swales were utilised for draing areas other than the public highway.

It should be noted that at the present time neither Dwr Cymru nor Ynys Mon will adopt SUDS systems within individual plots. Developers will be responsible for providing alternative means of operating and maintaining these SUDS in accordance with the best practice guidelines.

Prior to connection of the foul or surface water systems to the existing adopted foul and surface water drainage, agreement needs to be sought from Dwr Cymru and Ynys Mon. Discussions with the relevant authorities should commence at the earliest opportunity in the design process to ensure that the design of the foul and surface water systems within each development plot comply fully with the requirements of this drainage statement and the adopting authorities.

In addition to the above, the developers of each individual plot shall submit their detailed drainage proposals to the Welsh Assembly Government for approval prior in conjunction with the submission of any planning application to Ynys Mon.

# Appendix A – Drainage Masterplan

0 10 Millimetres 100

TO HOLYHEAD RAILWAY TO BANGOR

A55

Plot 1
Roof Area 21450m sq
Unlimited l/s

156 houses
7 l/s

Possible Alternative For SW

3.1 l/s

Plot 2
Roof Area 3100m sq
20.81 l/s

Possible Alternative For 2001

Possible Alternative For 2001/2002

Possible Alternative For SW

2.8 l/s

Plot 3
Roof Area 2000m sq
10.1 l/s

Plot 9b
Roof Area 2750m sq
10.37 l/s

1.5 l/s

Pumping Station

4.1 l/s

Plot 10
Roof Area 8000m sq
28.91 l/s

Plot 9a
Roof Area 1000m sq
3.21 l/s

Plot 4a
Roof Area 1700m sq
5.19 l/s

1.8 l/s

Plot 4b
Roof Area 3250m sq
12.13 l/s

Plot 5
Roof Area 3000m sq
13.2 l/s

3.1 l/s

Plot 6
Roof Area 5000m sq
15.10 l/s

1.6 l/s

Plot 6A
Roof Area 5000m sq
12.8 l/s

1.1 l/s

Gravity/ Pumped

Possible Alternative For 3007

Plot 7
Roof Area 9900m sq
18.5 l/s

Pumped

Pumped

Pumped

Plot 8
Roof Area 17350m sq
Swale to be Replaced by POND Serving Plot 8

7.1 l/s

Approximate location of existing culvert. Position, level, condition & purpose to be confirmed prior to development of plot 8

Neolithic Burial Chamber

Standing Stone

Project No. 5035112 | Office: StA | Rev: C | Rev. No. C 579

THIS IS A CAD DRAWING - HAND AMENDMENTS SHOULD BE CARRIED OUT IN ACCORDANCE WITH Q.A. PROCEDURES

ATKINS
DO NOT SCALE

NOTES

1. All dimensions are in millimetres unless noted otherwise.
2. All levels are m AOD unless noted otherwise.
3. All existing levels, pipe sizes, manhole positions, etc, are to be proven on site by the developer.

LEGEND

- MH1 — Proposed Foul Water Sewer & Manhole
- Foul Water Catchment Boundary
- SW1 — Proposed Surface Water Sewer & Manhole
- Surface Water Catchment/Plot Boundary
- Peak Permissible Foul Discharge Connection Point
- Peak Permissible Roof Area & Restricted Discharge Rate to Connection Point
- Carriageway Swale
- Proposed Foul Water Pumping Station
- Existing Culvert

| PLOT | CURRENT ASSUMED FINISHED FLOOR LEVEL (AOD) |
|---|---|
| 1001 | 15.500 |
| 1002 | 12.500 |
| 1003 | 13.000 |
| 1004 | 13.500 |
| 1005 | 13.500 |
| 1006 | 13.500 |
| 1007 | 12.500 |
| 1008 | 12.500 |
| 2001 | 13.000 |
| 2002 | 13.000 |
| 2003 | 12.000 |
| 2004 | 10.000 |
| 2005 | 10.500 |
| * 3001 | 10.000 |
| * 3002 | 10.000 |
| * 3003 | 9.500 |
| * 3004 | 9.000 |
| * 3005 | 9.000 |
| * 3006 | 10.500 |
| 4001 | 9.000 |
| * 4002 | 7.000 |
| 4003 | 6.500 |
| 4004 | 10.000 |
| 4005 | 10.000 |
| 5001 | 16.000 |

* TO BE CONFIRMED AT DESIGN STAGE FOR EACH PLOT

| Item | Hazard | Risk |
|---|---|---|

| Rev | Modifications | By | Date | Chk'd | Auth |
|---|---|---|---|---|---|
| C | Existing surface water culvert & note added at plot 5001 | AF | 20.11.08 | DRS | DRS |

| Purpose of Issue | Rev | Date | Authorised |
|---|---|---|---|
| FINAL | C | 20.11.08 | DRS |
| rev. | B | 20.08.08 | RJW |
| DRAFT | A | 21.01.08 | RJW |

ATKINS
Unit 7,
St Asaph Business Park,
Ffordd Richard Davies,
Denbighshire,
LL17 0LJ
Telephone (01745) 585 351
Fax (01745) 583 323
www.http://atkinsglobal.com

Client: YR UNDEB ENNILL PAROD AMCAN 1 EUROPEAN UNION OBJECTIVE 1 — Llywodraeth Cynulliad Cymru Wales Assembly Government

Project
TY MAWR BUSINESS PARK DEVELOPMENT
INFRASTRUCTURE

Title
FOUL & SURFACE WATER
CONNECTION POINT

| Original Size: | Scale: | Designed: | Drawn: | Checked: | Authorised: |
|---|---|---|---|---|---|
| A0 | 1:1250 | DRS 17.01.08 | AF 17.01.08 | DRS 17.01.08 | RJW 17.01.08 |

| Project No. | Office: | Drawing No. | Rev: |
|---|---|---|---|
| 5035112 | StA | C 579 | C |