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WYLFA NEWYDD

# Wylfa Newydd Project

## Operational Water Discharge Activity – Environmental Permit Application: Appendices M to O

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Operational Water Discharge Activity – Environmental Permit Application: Appendices M to O

# Appendix M – Signposting document to the Water Framework Directive Compliance Assessment

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Operational Water Discharge Activity – Environmental Permit Application: Appendices M to O

# Appendix M – Signposting document to the Water Framework Directive Compliance Assessment

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# List of abbreviations

| | |
|---|---|
| EIA | Environmental Impact Assessment |
| EP | Environmental Permit |
| GEP | Good Ecological Potential |
| GES | Good Ecological Status |
| HRA | Habitat Regulations Assessment |
| NRW | Natural Resources Wales |
| SSSI | Sites of Special Scientific Interest |
| TRO | Total Residual Oxidants |
| WFD | Water Framework Directive |
| ZoI | Zones of Influence |

# 1 About this Report

## 1.1 Purpose and Applicability

1. The Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2017 (as amended) require an assessment of the impact of any works/modifications to WFD water bodies. For the Wylfa Newydd Power Station (referred to as the Project), a WFD Compliance Assessment has been produced to provide support to all relevant applications.

2. This signposting document has been prepared to accompany the Operational Water Discharge Activity Environmental Permit (EP) application for activities related to the operation of the Power Station site. This document presents a summary of the WFD Compliance Assessment relating to this EP application and 'signposts' the reader to relevant sections where further evidence is presented (e.g. on WFD assessment methodology, consideration of cumulative effects, underpinning analysis etc). This signposting document forms Appendix M of the Operational Water Discharge Activity EP application. A copy of the WFD Compliance Assessment is provided as Appendix N.

## 1.2 Scope

3. Activities relevant to the Operational Water Discharge Activity EP application have been assessed in the WFD Compliance Assessment.

4. The WFD Compliance Assessment builds on the advice provided by Natural Resources Wales (NRW) on the Preliminary WFD Assessment for the Project. The approach to the WFD assessment for the Project has been developed by environmental practitioners with experience of carrying out WFD Assessment and has been informed by available guidance.

5. The aim of the WFD Compliance Assessment was to assess the effects of the Project on the relevant water bodies and to determine whether the Project is compliant with the objectives of the WFD. It identified all of the Project activities which could potentially lead to deterioration in water body status, or could prevent achievement of Good Ecological Status (GES)/Good Ecological Potential (GEP) in a water body. This signposting document focuses on the Project activities which are covered by the Operational Water Discharge Activity EP and provides cross-references to the relevant sections of the WFD Compliance Assessment.

6. Table 1-1 below presents the project activities that are relevant to the assessment of WFD Compliance for the Operational Water Discharge Activity EP application. It is an extract of the full list of Project Activities included in the WFD Compliance Assessment.

**Table 1-1 Description of activities and pathways**

| Activities | Activity no. | Relevant project element |
|---|---|---|
| Abstraction of Cooling Water | 2.4 | Power Station Main Site operation |
| Discharge of Cooling Water and other operational water discharges | 2.5 | |

7. The structure of the WFD Compliance Assessment is shown in Table 1-2. Table 1-2 also provides a brief description of each section of the WFD Compliance Assessment.

**Table 1-2 Structure of the WFD Compliance Assessment document**

| Section | Title | Description |
|---|---|---|
| 1 | Introduction | Introduces the Wylfa Newydd Project, sets out relevant WFD terminology and details consultation. |
| 2 | Project Description | Provides an overview of the Wylfa Newydd Project and key activities forming the Power Station and Associated Developments. |
| 3 | Methodology | A summary of the WFD assessment process, guidance and survey and modelling undertaken. |
| 4 | Identification of Project activities and relevant water bodies | Explains the Wylfa Newydd Project activities that have been considered and how the relevant water bodies have been identified using a Zone of Influence approach (Step 1: WFD Screening). |
| 5 | Water body baseline data | Presents the baseline conditions for each water body including information on biological, physico-chemical and hydromorphological quality elements (Step 2). |
| 6 | WFD Assessment: Potential effects and identification of risks | For each water body this step considers the effects on quality elements and identifies where there is a risk of deterioration (Step 3: WFD Scoping). |
| 7 | Detailed WFD assessment | Provides a detailed examination of the risks identified in section 6 as having the potential to conflict with the WFD objectives (Step 4: Detailed WFD Assessment). |
| 8 | Inter-Project cumulative effects assessment | This addresses the potential for inter-Project cumulative effects on water bodies (Step 5). |
| 9 | Protected areas | This considers the potential effects on protected areas (Step 6). |
| 10 | Enhancements | This section considers the potential enhancements that would be implemented as part of the Wylfa Newydd Project. |
| 11 | Conclusions | Presents the conclusions of the WFD Compliance Assessment. |

# 2 Signposting to the Water Framework Directive Compliance Assessment

## 2.1 Identification of Project activities and relevant WFD water bodies (Step 1: WFD screening)

8. The initial stage of the WFD Compliance Assessment involved identifying the 'Project activities' and grouping them to form a consolidated list against which to consider the pathways and the relevant Project elements and applications. For the Wylfa Newydd Power Station, this was conducted at a Project level, covering both the construction and operation phase in the Wylfa Newydd development area and all associated developments.

9. Figure 1 of the WFD Compliance Assessment is presented in this signposting document (as Figure 2.1 below) to show the distribution of water bodies relative to the Wylfa Newydd Development Area, Associated Developments/off-site Power Station facilities and Sites of Special Scientific Interest (SSSI) Compensation Sites.

10. All the Project activities are listed in the WFD Compliance Assessment in Table 4-3, Section 4.1. All Project activities covered by the Operational Water Discharge Activity EP application are associated with the operation of the Power Station. These are summarised in Table 1.1, Section 1.2 of this signposting document.

11. Zones of Influence (ZoI) were identified by estimating the extent of potential Project effects on quality elements. This process was used to determine which water bodies were relevant to the assessment. WFD water bodies have been scoped into the assessment on the basis of whether they are:

    - a designated WFD water body directly within the ZoI;
    - a non-reportable (minor) water body directly affected by the ZoI; or
    - a designated WFD water body indirectly affected by the ZoI (principally related to migratory fish species).

12. To identify the ZoI, the activities and associated pathways to potential effects were considered alongside modelling results. The boundary of the ZoI was based on either published standards where available (e.g. for physico-chemical parameters), or on professional judgement as to where an effect would occur considering the pathways to all quality elements. The ZoI was then used to determine the appropriate geographical area over which effects on water bodies may potentially arise.

13. Further information on the ZoI approach can be found in Section 4.4 of the WFD Compliance Assessment.

14. Using the relevant ZoI, Table 4-7 in the WFD Compliance Assessment sets out the water bodies that are relevant to the WFD Compliance Assessment. The water bodies relevant for the Operational Water Discharge Activity EP application are The Skerries (GB611010390000) and Anglesey North (GB641010620000).

15. Fish is a quality element within riverine and transitional WFD water bodies, but not within coastal water bodies. However, it is recognised that migratory species that form part of the fish quality element in riverine and transitional water bodies could be affected whilst passing through coastal water bodies. As such migratory species interacting with the ZoI identified for the Wylfa Newydd Project could result in effects on the fish quality element in riverine and transitional WFD water bodies beyond the ZoI. Section 4.5 of the WFD Compliance Assessment describes the process applied to define ZoI for fish.

## 2.2 Water Framework Directive water body baseline data (Step 2)

16. The baseline data on each water body screened in for assessment is presented in Section 5 of the WFD Compliance Assessment. The WFD water bodies are considered as entire catchments, encompassing all tributaries that feed into the main named watercourse/coastal area. As a consequence, the coastal water bodies also include all fluvial non-reportable water bodies feeding into the coastal areas at this location.

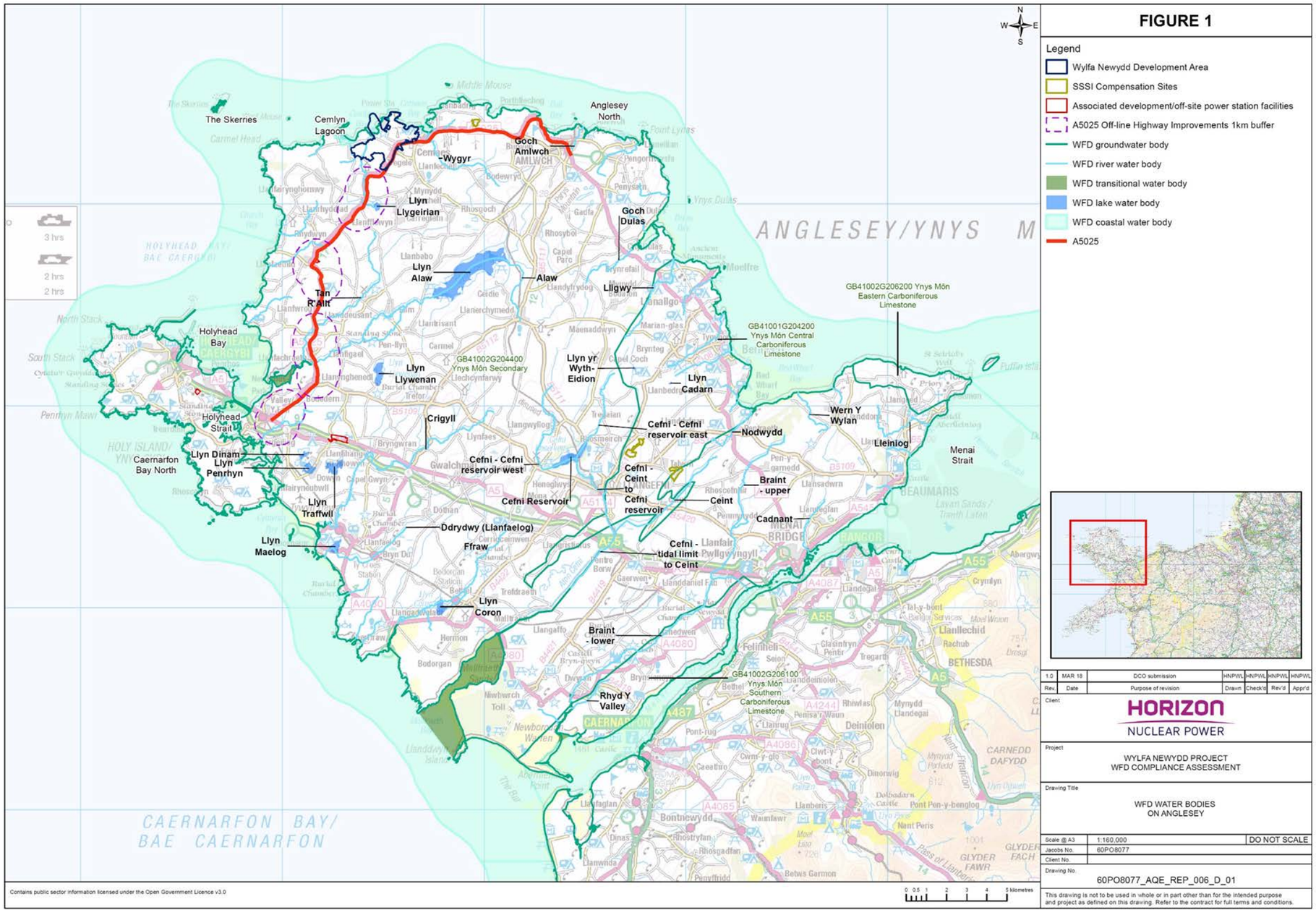
17. The baseline data on each water body screened in for assessment is presented in Section 5 of the WFD Compliance Assessment and is summarised in Table 2-1 below. The WFD water bodies are considered as entire catchments, encompassing all tributaries that feed into the main named watercourse/coastal area. As a consequence, the coastal water bodies also include all fluvial non-reportable water bodies feeding into the coastal areas at this location.

**Table 2-1 Coastal water body baseline data summary**

| Element | Details | |
|---|---|---|
| WFD water body name | The Skerries | Anglesey North |
| WFD water body ID | GB611010390000 | GB641010620000 |
| Hydromorphological designation | Not designated AWB/HMWB | Not designated AWB/HMWB |
| Overall status/potential | High status | Moderate status |
| Current ecological status/potential | High status | Good status |
| Current chemical status | Good | Fail |
| Failing element(s) | N/A | Mercury |
| Overall objective | High | Good by 2021 |
| Baseline section cross-reference | 5.2.2 to 5.2.21 | 5.2.22 to 5.2.37 |

18. Section 5.6 of the WFD Compliance Assessment presents baseline data for migratory fish species.

**Figure 2-1 WFD water bodies on Anglesey (a copy of Figure 1 in the WFD Compliance Assessment)**



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## 2.3 Water Framework Directive assessment: Potential effects and identification of risks (Step 3: WFD Scoping)

19. The assessment of potential effects and identification of risk is documented in Section 6 of the WFD Compliance Assessment.

20. This section is structured by water body. All activities in all water bodies screened into the assessment have been considered and assessed in relation to the potential effects on and risk to quality elements. Where relevant this has included an assessment of the effects on non-reportable water bodies that are part of the coastal water body catchments.

21. The following tables (Table 2. and Table 2.) document the assessment which has determined the Project activities which either alone or cumulatively could present a potential risk to the achievement of WFD objectives of the water bodies affected. These potential risks have been taken forward to the detailed assessment stage. The information presented in Table 2. and Table 2. has been abstracted from WFD Compliance Assessment, Appendix D.

22. For the activities relevant to the Operational Water Discharge Activity EP application there were no potential pathways to WFD water bodies for the following water bodies meaning no potential effects and risks were identified.

- Caernarfon Bay North
- Cemlyn Lagoon
- Alaw – transitional
- Alaw – downstream Llyn Alaw
- Tan R'Allt
- Cleifiog Valley
- Crigyll Ynys Môn Secondary

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**Table 2-2 Summary of activities and potential effects in The Skerries water body that require detailed assessment**

| Activity | Activity no. | Specific embedded mitigation | Potential pathways | Summary of potential effects and risks identified | Requires specific (detailed) assessment? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|
| Abstraction of Cooling Water | 2.4 | Fish and invertebrate protection measures including screens, acoustic deterrents and a recovery and return channel, all designed to best practice. | Loss of flora and fauna in abstracted water. | Long term effects from the continuous loss of plankton, invertebrates and fish which would be entrapped during operation. | Yes | Yes - the combined effects of abstraction and discharge of cooling water on plankton, fish and benthic invertebrates require consideration |
| Discharge of Cooling Water and other operational water discharges | 2.5 | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | Discharge of warmer water as a thermal plume. | Long term changes to thermal conditions (and associated effects on dissolved oxygen). Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects of abstraction and discharge of cooling water on plankton, fish and benthic invertebrates require consideration |
| Discharge of Cooling Water and other operational water discharges | 2.5 | The biocide dosing regime would be designed to reduce biofouling risk. In line with best practice, continuous dosing would be applied during a higher fouling risk period, typically between April and December, when sea temperatures are above 10°C. | Discharge of chemicals including total residual oxidants (TRO). | Long-term changes to release of a specific pollutant (chlorine measured as TRO) and from sodium nitrite. Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects of abstraction and discharge of cooling water on plankton, fish and benthic invertebrates require consideration |

**Table 2-3 Summary of activities and potential effects in the Anglesey North water body that require detailed assessment**

| Activity | Activity no. | Specific embedded mitigation | Potential pathways | Summary of potential effects and risks identified | Requires specific (detailed) assessment? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|
| Discharge of Cooling Water and other operational water discharges | 2.5 | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | Discharge of warmer water as a thermal plume. | Long term changes to thermal conditions (and associated effects on dissolved oxygen). Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects of abstraction and discharge of cooling water on plankton, fish and benthic invertebrates require consideration |
| Discharge of Cooling Water and other operational water discharges | 2.5 | The biocide dosing regime would be designed to reduce biofouling risk. In line with best practice, continuous dosing would be applied during a higher fouling risk period, typically between April and December, when sea temperatures are above 10°C. | Discharge of chemicals including TRO. | Long-term changes to release of a specific pollutant (chlorine measured as TRO) and from sodium nitrite. Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects of abstraction and discharge of cooling water on plankton, fish and benthic invertebrates require consideration |

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## 2.4 Detailed Water Framework Directive assessment (Step 4)

23. The effects and risks identified in the first stage of the assessment as having the potential to conflict with the WFD objectives in WFD water bodies are examined in Section 7 of the WFD Compliance Assessment. This assessment has been informed by the assessment being carried out for the Environmental Impact Assessment (EIA), but is made in relation to specific WFD criteria and objectives.

24. The impacts which relate to the Operational Water Discharge Activity EP application that have been taken forward to the detailed assessment stage are listed in Table 2.4.

**Table 2-4 Water bodies and potential impacts identified**

| Potential effects | Activity no. and activity | WFD water bodies |
|---|---|---|
| Potential effects on biological quality elements in The Skerries water body from the abstraction of Cooling Water during operation | 2.4 Abstraction of Cooling Water | The Skerries |
| Potential effects on physico-chemical quality elements in The Skerries and Anglesey North water bodies from discharge of Cooling Water during operation. | 2.5 Discharge of Cooling Water and other operational water discharges | The Skerries and Anglesey North |
| Potential effects on physico-chemical quality elements in The Skerries and Anglesey North water bodies from other operational water discharges during operation. | 2.5 Discharge of Cooling Water and other operational water discharges | The Skerries and Anglesey North |
| Potential effects on the fish quality element in riverine and transitional water bodies from changes to hydromorphological and physico-chemical quality elements during operation. | 2.5 Discharge of Cooling Water and other operational water discharges | Wygyr, Goch Amlwch<br>Goch Dulas, Lligwy, Ddrydwy (Llanfaelog), Ffraw, Cefni, Ceint, Cefni - Ceint to Cefni reservoir, Cefni - Cefni reservoir east and Cefni - Cefni reservoir west |

25. The detailed assessment, presented in Section 7 of the WFD Compliance Assessment, concluded that all the impacts listed in Table 2.4 would neither cause deterioration in the status of the following water bodies, nor comprise the ongoing achievement of their objectives with respect to these effects.

- The Skerries;
- Anglesey North;
- Wygyr;
- Goch Amlwch;
- Goch Dulas;
- Lligwy;
- Ddrydwy (Llanfaelog);
- Ffraw;
- Cefni;

- Ceint;
- Cefni - Ceint to Cefni reservoir;
- Cefni - Cefni reservoir east; and
- Cefni - Cefni reservoir west.

## 2.5 Inter-project cumulative assessment (Step 5)

26. Section 8 of the WFD Compliance Assessment addresses the potential for inter- project cumulative effects. Inter-project cumulative effects can arise when a single resource or water body is affected by more than one project at the same time. Whilst effects from a particular development may not cause deterioration alone, in combination the effects could prevent a water body from achieving WFD objectives.

27. Intra-development and intra-project cumulative effects were considered as part of Step 3 (WFD Scoping) (Section 2.3 of this document).

28. The assessment did not identify any potential inter-project cumulative effects that could result in effects on the status of quality elements or could comprise the ongoing achievement of water body objectives.

## 2.6 Protected areas (Step 6)

29. Section 9 of the WFD Compliance Assessment addresses the potential effects on protected areas that are identified in the Western Wales River Basin Management Plan (RBMP) and also addresses Article 4.9 of the WFD which states that *"…steps must be taken to ensure that the application of the new provisions, including the application of paragraphs 3, 4, 5, 6 and 7 [of Article 4] guarantees at least the same level of protection as the existing Community legislation…".*

30. The activities included in the Operational Water Discharge Activity EP application have been assessed against other protected areas:

- **Bathing Water Directive**: There are no effects predicted on the bathing water at Cemaes, therefore the activities are considered to be compliant with the Bathing Water Directive.
- **Special Protection Areas and Special Areas of Conservation**: A stage two report has been prepared as part of the Habitats Regulations Assessment (HRA) for the Wylfa Newydd Project, and this has concluded that there would be no effect on the integrity of the European Designated Sites.
- **Drinking water protected area**: The Wylfa Newydd Development Area lies within a drinking water protected area. This has been assessed and there are no predicted effects.

## 2.7 Enhancements

31. There are no enhancements associated with the Operational Water Discharge Activity EP application.

## 2.8 Conclusion

32. The WFD Compliance Assessment determined that the Project would not cause deterioration in WFD water bodies on a non-temporary basis and would not prevent WFD water bodies from attaining GES/GEP in relation to the Operational Water Discharge Activity EP.

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Operational Water Discharge Activity –
Environmental Permit Application: Appendices M to O

# Appendix N –
# Water Framework Directive Compliance Assessment and Article 4(7)

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ENERGY WORKING FOR BRITAIN

# Wylfa Newydd Project

## 8.26 Water Framework Directive Compliance Assessment

PINS Reference Number: EN010007

Application Reference Number: 8.26

June 2018

Revision 1.0

Regulation Number: 5(2)(q)

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

Horizon Internal DCRM Number: WN0902-JAC-PAC-REP-00064

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# Appendices



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**Main report**

**Appendix C: Migratory fish baseline figures**

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# Executive Summary

A Compliance Assessment has been carried out to consider the effects of the Wylfa Newydd Project in respect of *The Water Framework Directive (WFD)* (2000/60/EC). This report considers all project elements in relation to the objectives set out in the WFD.

The assessment was carried out following a stepped approach as outlined below:

- WFD Screening was undertaken to identify the relevant project activities and water bodies requiring assessment.
- The baseline conditions of the WFD water bodies were detailed.
- A WFD Scoping exercise was carried out to identify the effects and potential risks to quality elements in each water body.
- The potential risks identified in WFD Scoping stage were then examined in detail to determine whether there was potential for deterioration in the status of a quality element or the potential for the Wylfa Newydd Project to prevent the achievement of WFD objectives.
- Consideration was given to potential cumulative effects as a result of the Wylfa Newydd Project and with other third party projects.

With the exception of the Ynys Môn Secondary groundwater body and The Skerries coastal water body, the WFD Compliance Assessment determined that the Wylfa Newydd Project would not cause deterioration in WFD water bodies on a non-temporary basis and would not prevent WFD water bodies from attaining Good Ecological Status or Potential. The exceptions are described below.

The assessment determined that there is potential for the Wylfa Newydd Project to jeopardise the ongoing attainment of good status of the saline intrusion test in the Ynys Môn Secondary groundwater body. The predicted extent of saline intrusion is limited in both space and time. However, the dewatering during construction does not have a defined end date and the duration of the effect is uncertain. Although the extent of the effect would be small, it may take longer than one River Basin Management Plan (RBMP) cycle (six years) to fully recover. Advice provided by Natural Resources Wales (NRW) stated that any saline intrusion would be considered as a deterioration. This effect is relevant to both quantitative and chemical tests for saline intrusion. However, it is specifically related to a reversal of groundwater flow along the coast rather than an introduction of any chemicals into the groundwater body.

In relation to the Groundwater dependent terrestrial ecosystem (GWDTE) quality element, it was concluded that the Wylfa Newydd Project could cause deterioration in the status of the Ynys Môn Secondary groundwater body with respect to the effects on Tre'r Gof Site of Special Scientific Interest (SSSI) GWDTE. This effect is relevant only to the quantitative status test for GWDTE.

The changes to morphological conditions represent a small change proportionally in The Skerries water body, which are considered to result in a minor anthropogenic alteration to the hydromorphological quality elements from those normally associated with undisturbed conditions (less than 5%). The assessment determined that it was not possible to definitively conclude that new modifications within The Skerries water body would result in minor anthropogenic change, and therefore constitute within class, rather than between class deterioration. It is therefore concluded that there is a risk that the morphological conditions quality element could deteriorate from high to good status.

There is a requirement to develop a case to support an application for derogation under Article 4.7 of the WFD, which makes provision for a situation where the objectives of the WFD cannot be met. This case will cover both the Ynys Môn Secondary groundwater and The Skerries coastal water body.

Horizon will provide the necessary information to support an application for derogation under Article 4.7. Horizon will discuss the timing for submission of such a report with the Planning Inspectorate and NRW in their respective roles in relation to the Development Consent Order, Marine Licence and Environmental Permit applications.

# 1 Introduction

1.1.1 Horizon is applying to the Secretary of State for a Development Consent Order (DCO) under the Planning Act 2008, to construct, operate and maintain a new Nuclear Power Station on land west of Cemaes at Anglesey.

1.1.2 Development of the Wylfa Newydd Project requires a number of applications to be made under different legislation to differing regulators. In addition to an application for development consent, applications will be made for a Marine Licence and Environmental Permits to carry out water discharge activities. To support these applications an assessment has been carried out to consider the effects of the Wylfa Newydd Project in respect of The Water Framework Directive (2000/60/EC) (WFD) which is implemented in Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the 2017 Regulations). The applications are also supported by assessments carried out in accordance with the Environmental Impact Assessment (EIA) Directive (2011/92/EU) and the Habitats Directive (92/43/EEC). The Enabling Works, which are the subject of Town and Country Planning Act 1990 applications, are supported by separate WFD Compliance Assessments.

1.1.3 This WFD Compliance Assessment for the Wylfa Newydd Project is intended to inform National Resources Wales (NRW) and the Secretary of State in relation to their duty to have regard to the River Basin Management Plan (Western Wales) (RBMP) and any supplementary plans (Regulation 33 of 2017 Regulations). This report presents the WFD Compliance Assessment for the Wylfa Newydd Project and considers all project elements in relation to the objectives set out in the WFD. Throughout this report signposting is provided to the activities and effects that are relevant to each application, i.e. the DCO, Marine Licence and construction and operation water discharge permits.

## 1.2 Aims and objectives

1.2.1 The aim of this WFD Compliance Assessment is to assess the effects of the Wylfa Newydd Project on the relevant water bodies and to determine whether the Wylfa Newydd Project is compliant with the objectives of the WFD. The specific objectives of this WFD Compliance Assessment are to:

- determine the water bodies and catchments relevant to the Wylfa Newydd Project;
- present the current baseline conditions of water bodies and their associated catchments;
- define the Wylfa Newydd Project activities and consider the sources of effect, pathways and consequences of the works;
- carry out a detailed assessment of these effects on water bodies and their associated quality elements;

- assess whether water body measures could still be implemented with the Wylfa Newydd Project in place; and
- take into account the protection provided by other European Union (EU) legislation.

## 1.3 WFD terminology

1.3.1 Table 1-1 provides a definition of key terms associated with the WFD that are used throughout this assessment. A full glossary is provided at the end of this report.

**Table 1-1 WFD terminology**

| Term | Abbreviation | Explanation |
|---|---|---|
| General | | |
| Artificial Water Body | AWB | A water body that has been artificially created, such as a canal. |
| Compliance | - | Adherence to the requirements of legislation, in this case the WFD. |
| Chemical status | - | A measure of the overall chemical quality of the water body (surface water or groundwater). For surface water good chemical status is the chemical status achieved by a body of surface water in which concentrations of pollutants do not exceed the environmental quality standards established in Annex IX of the WFD and under Article 16(7), and under other relevant Community legislation.<br>For groundwater good chemical status is the chemical status of a body of groundwater, which meets all the conditions set out in table 2.3.2 of Annex V of the WFD. |
| Ecological Potential | - | Those surface waters identified as Heavily Modified Water Bodies (HMWB) or Artificial Water Bodies (AWB) must achieve Good Ecological Potential (Good Ecological Potential is a recognition that changes to morphology could make Good Ecological Status very difficult to meet). |
| Ecological Status | - | This is an expression of the quality of the structure and functioning of aquatic ecosystems associated with surface waters, classified in accordance with Annex V of the WFD. |

| Term | Abbreviation | Explanation |
|---|---|---|
| Groundwater dependent terrestrial ecosystem | GWDTE | A terrestrial ecosystem that is directly dependent on the water level in or flow of water from a groundwater body (that is, in or from the saturated zone). |
| Heavily Modified Water Body | HMWB | A water body not considered to be able to achieve 'natural reference conditions' as a result of its physical modification to support a defined use. The WFD recognises the important uses of HMWBs (e.g. from past engineering works). |
| Mitigation measure (specific to WFD) | - | A specific activity assigned to a WFD water body catchment or specific HMWB to help to address any modifications or pressures on the quality elements preventing the achievement of Good Status or Potential. The mitigation measures are assessed as being 'in place' or 'not in place' and contribute towards the achievement of Good Potential. |
| Non reportable water bodies | | Catchments and associated water features that are too small to be a formal WFD water body. Examples are reens, ditches, streams or brackish lagoons. It is likely that these stretches of water are not monitored by Natural Resources Wales (NRW) and their status is not reported. NRW has confirmed that these water bodies must be considered as part of the WFD Compliance Assessment. |
| River Basin District | - | The area of land and sea, made up of one or more adjacent river basins together with their associated groundwaters and coastal waters. |
| River Basin Management Plan | RBMP | The preparation of an RBMP is required under the WFD for each River Basin District. The RBMP should outline the current status of all water bodies and identify measures for achieving the protection, improvement and sustainable use of water within a river's catchment area. |
| Water body | - | A discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water |

| Term | Abbreviation | Explanation |
|---|---|---|
| | | (estuary) or a stretch of coastal water. Groundwater bodies are defined as distinct volumes of groundwater within an aquifer or aquifers. |
| Status/potential classes | | |
| High Ecological Status | - | WFD term used for natural water bodies denoting only very minor or no deviation from undisturbed 'natural reference conditions' in a water body, for hydromorphological, physico-chemical and biological quality elements. |
| Maximum Ecological Potential | | WFD term used for HMWBs or AWBs to reflect, as far as possible, the hydromorphological and associated physico-chemical conditions of the closest comparable surface water body type. |
| Good Ecological Status | GES | Good Ecological Status is a WFD term denoting a slight deviation from 'natural reference conditions' in a water body or the hydromorphological, physico-chemical and biological conditions associated with little or no human pressure. |
| Good Ecological Potential | GEP | Those surface waters identified as HMWBs must achieve Good Ecological Potential. Good Ecological Potential is a recognition that changes to morphology could make Good Ecological Status very difficult to meet. |
| Moderate Ecological Status/Potential | - | WFD term denoting a moderate deviation from the 'reference condition' in a water body, for hydromorphological, physico-chemical and biological quality elements. |
| Poor Ecological Status/Potential | - | WFD term denoting a relatively significant deviation from the 'reference condition' in a water body, for hydromorphological, physico-chemical and biological quality elements. |
| Bad Ecological Status/Potential | - | WFD term denoting a complete deviation from the 'reference condition' in a water body, for hydromorphological, physico-chemical and biological quality elements. |
| Good chemical status | | Good chemical status is achieved in a water body in which concentrations of pollutants do not exceed the |

| Term | Abbreviation | Explanation |
|---|---|---|
| | | environmental quality standards established in Annex IX and under Article 16(7) for surface waters and table 2.3.2 of Annex V for groundwater. |
| Quantitative status | | 'Quantitative status' is an expression of the degree to which a body of groundwater is affected by direct and indirect abstractions. |
| Groundwater Status | | The status of a body of groundwater, determined by the poorer of its quantitative status and its chemical status. |
| Quality elements | | |
| Biological quality element | - | Parameters that form the biology in both coastal and fluvial waters; for example, fish, aquatic flora and phytoplankton. |
| Hydromorphological quality element | - | Parameters that define the hydrology and geomorphology of both coastal and fluvial waters. Examples for coastal water bodies include the structure of the intertidal zone and wave exposure; and, for fluvial water bodies include the riparian zone, structure of the bed and banks and lateral and longitudinal connectivity. |
| Physico-chemical quality element | - | Parameters that support the assessment of the water quality in surface and groundwaters; for example, transparency, thermal conditions, salinity, pH, nutrient conditions and specific pollutants. |
| Nature of effects | | |
| Temporary | - | An effect is defined as temporary if it persists for only a short period of time without the need for further restoration measures. A 'short period of time' is not defined in the Directive but can be taken to be the frequencies mentioned for the monitoring programmes (Annex V 1.3.4 and 2.2.3). |
| Non-temporary | - | A non-temporary effect is one from which recovery is expected, but recovery may or may not occur within the duration of one RBMP cycle (six years). |

| Term | Abbreviation | Explanation |
|---|---|---|
| Permanent | - | A permanent effect is one from which recovery is not possible. |

## 1.4 WFD requirements and objectives

1.4.1 The primary aim of the WFD is to improve/maintain the ecological statuses/potential of all WFD water bodies. In addition, the WFD requires no deterioration in overall status or the status of individual quality elements. Ecological quality comprises a series of biological, physico-chemical and hydromorphological quality elements.

1.4.2 For surface WFD water bodies to achieve overall GES or GEP, a series of quality elements that fall within three categories: biological, physico-chemical and hydromorphological are assessed. GES refers to situations where the ecological characteristics show only a slight deviation from a natural reference condition. Artificial water bodies (AWBs) and highly modified water bodies (HMWBs) have a target to achieve GEP, which recognises that important societal uses depend on physical modification, whilst ensuring that the ecology of the water body is protected as far as possible.

1.4.3 For groundwater the aim is to achieve Good Groundwater Status which is met when both the quantitative and chemical status are at good status.

1.4.4 The WFD outlines a number of objectives including:

- to prevent deterioration of the status of all bodies of surface water (Article 4.1 (a)(i));
- to protect, enhance and restore all bodies of surface water with the aim of achieving good surface water status by 2015 (cycle one) and 2021 (cycle two) (Article 4.1 (a)(ii));
- to protect and enhance all AWBs/HMWBs, with the aim of achieving GEP and good surface water chemical status by 2015 (cycle one) and 2021 (cycle two) (Article 4.1 (a)(iii));
- to reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances (Article 4.1 (a)(iv));
- to prevent or limit the input of pollutants into groundwater and prevent deterioration of the status of all bodies of groundwater (Article 4.1 (b)(i));
- to protect, enhance and restore all bodies of groundwater and to ensure a balance between abstraction and recharge of groundwater (Article 4.1 (b)(ii)); and
- to ensure compliance with other community environmental legislation (Article 4.9).

1.4.5 The compliance of the Wylfa Newydd Project with the WFD is determined based on the achievement of the following WFD objectives:

- The Wylfa Newydd Project shall not cause deterioration of any quality element from one status class to the next at the WFD water body level on a non-temporary basis.[1]
- The Wylfa Newydd Project shall not jeopardise the attainment of GES/GEP in WFD surface water bodies (including the delivery of measures intended to facilitate such improvements).
- The Wylfa Newydd Project shall prevent (or limit) the input of pollutants into groundwater and prevent deterioration of the status of groundwater bodies, such that changes to the level of groundwater would not result in failure to achieve the environmental objectives for associated surface waters nor any significant damage to terrestrial ecosystems which depend directly on the groundwater body, nor saline intrusion.
- The Wylfa Newydd Project shall not cause a permanent exclusion or jeopardise the attainment of the WFD objectives in other WFD water bodies within the same River Basin District.
- The Wylfa Newydd Project shall be compliant with other European Union environmental legislation.

1.4.6 Where a scheme is considered likely to cause deterioration (i.e. where the objectives defined in section 1.4.5 cannot fully be met), or where it could contribute to a failure of the water body to meet GES/GEP or Good Status, then a case would need to be made to support an application for derogation under Article 4.7 of the WFD (Water Framework Directive Information to support Article 4(7) Derogation, Application Reference Number: 8.2.7). Article 4.7 makes provision for a situation where the objectives of the WFD cannot be met, thereby allowing derogation from its requirements. Provided all of the conditions set out in Article 4.7 are met, then the scheme can be permitted.

## 1.5 Consultation

1.5.1 A Preliminary WFD Assessment for the Wylfa Newydd Project was submitted to NRW in November 2016. Following this a WFD working group was set up and regular meetings were held between Horizon and NRW between December 2016 and July 2017. A subsequent meeting was held in August 2017. These meetings provided an opportunity to gain feedback from NRW on key aspects relating to the WFD assessment. Feedback was sought on the Preliminary WFD Compliance Assessment for the Wylfa Newydd Project

[1] The implications of the Court for Case C-461/13 (Bund für Umwelt und Naturschutz Deutschland eV v Bundesrepublik Deutschland) (the 'Bund case') are recognised within this objective. 'Deterioration of the status' of a body of surface water means deterioration in the status of one quality element by one class, even if that fall does not result in a fall in classification of the body of surface water as a whole. However, if the quality element concerned is already in the lowest class, any deterioration of that element constitutes a 'deterioration of the status' of a body of surface water.

[RD1], on technical notes, on the compliance assessment template and on assessment tables for key water bodies (see table 1-2). This advice informed the assessment scope and methodology followed in this WFD Compliance Assessment. A summary of stakeholder consultation relating to the WFD is provided in table 1-2.

1.5.2 Stakeholder engagement specific to the development of the baseline and modelling is described within the relevant chapters of the Environmental Statement;

- Surface water and groundwater –
  - Volume D - WNDA Development D8 - Surface water and groundwater, (Application Reference Number: 6.4.8);
  - Volume E - Off-Site Power Station Facilities: AECC, ESL and MEEG E8 - Surface water and groundwater, (Application Reference Number: 6.5.8);
  - Volume F - Park and Ride F8 - Surface water and groundwater, (Application Reference Number: 6.6.8);
  - Volume G - A5025 Off-line Highway Improvements G8 - Surface water and groundwater, (Application Reference Number: 6.7.8); and
  - Volume H - Logistics Centre H8 - Surface water and groundwater, (Application Reference Number: 6.8.8).
- Terrestrial and freshwater ecology –
  - Volume D - WNDA Development D9 - Terrestrial and freshwater ecology, (Application Reference Number: 6.4.9);
  - Volume E - Off-Site Power Station Facilities: AECC, ESL and MEEG E9 - Terrestrial and freshwater ecology, (Application Reference Number: 6.5.9);
  - Volume F - Park and Ride F9 - Terrestrial and freshwater ecology, (Application Reference Number: 6.6.9);
  - Volume G - A5025 Off-line Highway Improvements G9 - Terrestrial and freshwater ecology, (Application Reference Number: 6.7.9); and
  - Volume H - Logistics Centre H9 - Terrestrial and freshwater ecology, (Application Reference Number: 6.8.9).
- Marine environment - Volume D - WNDA Development D13 - The marine environment, (Application Reference Number: 6.4.13); and
- Coastal processes and geomorphology - Volume D - WNDA Development D12 - Coastal processes and coastal geomorphology, (Application Reference Number: 6.4.12).

1.5.3 The key aspects covered as part of the wider consultation that are relevant to the WFD include marine hydrodynamic modelling, coastal processes, fish and groundwater dependednt terrestrial ecosystems (GWDTE).

**Table 1-2 Stakeholder consultation relating to the WFD for the Wylfa Newydd Project**

| Date | Stakeholder | Title | Description |
|---|---|---|---|
| 11 March 2015 | NRW and Isle of Anglesey County Council (IACC) | Fluvial geomorphology and the WFD | A technical meeting to discuss the methodology for the fluvial geomorphology baseline and impact assessments. This included initial consultation on the WFD water bodies and Compliance Assessment to agree the methodologies for the proposed assessments. |
| 17 September 2015 | NRW | WFD assessment (conference call) | Call to discuss the format and contents of WFD assessments. |
| 14 December 2016 | NRW | Preliminary WFD assessment meeting | Meeting to discuss the Preliminary WFD assessment and comments on Pre-Application Consultation Stage Two, including Article 4.7. |
| 23 February 2017 | NRW | WFD working group meeting 1 | NRW's comments on the technical memos on Article 4.7, temporary and non-temporary effects and migratory fish were discussed. |
| 5 April 2017 | NRW | WFD working group meeting 2 | Meeting to discuss NRW's comments on the Preliminary WFD assessment (this set out the initial stages of WFD Screening and WFD Scoping) and technical memos. Presentation of the methodology and format of the WFD Compliance Assessment. |
| 25 May 2017 | NRW | WFD working group meeting 3 | Meeting to discuss updates on the Wylfa Newydd Project and WFD-related activities. Baseline conditions for non-reportable water bodies outlined. Approach to the assessment discussed with an overview table presented. |
| 26 May 2017 | IACC | WFD | Update on progress with the WFD Compliance Assessment. |

| Date | Stakeholder | Title | Description |
|---|---|---|---|
| 20 June 2017 | NRW<br>IACC | WFD working group meeting 4 | Discussion of assessment table for The Skerries and Cemlyn Lagoon WFD water bodies (WFD Scoping stage). |
| 28 June 2017 | NRW | Groundwater and the WFD | Presentation of groundwater modelling and interpretation of this for WFD assessment. |
| 27 July 2017 | NRW<br>IACC | WFD working group meeting 5 | Workshop to discuss and gain feedback from NRW on the draft WFD Compliance Assessment. |
| 22nd August 2017 | NRW<br>IACC | WFD Working group meeting 6 | Workshop to discuss further feedback on draft WFD Compliance Assessment. |
| 12th October 2017 | NRW | WFD Working group meeting 7 | Workshop to discuss draft WFD Compliance Assessment. |
| 2nd November 2017 | NRW | WFD Working group meeting 8 | Update on progress with the WFD Compliance Assessment. |

## 1.6 The approach to Water Framework Directive assessment

1.6.1 The approach to WFD assessment for the Wylfa Newydd Project has been developed by environmental practitioners with experience of carrying out WFD Assessments and has been informed by available guidance, including guidance provided by NRW [RD2] [RD3] and PINS [RD4].

1.6.2 The approach to assessment was discussed and agreed with NRW in September 2015 [RD5] and is outlined in the Approach to Water Framework Directive Compliance Assessment report [RD6]. Since 2015 the specific methodology and format of the assessment have been discussed with NRW at the WFD working group meetings (see table 1-2).

1.6.3 In June 2017 the Planning Inspectorate released Advice Note 18 on the Water Framework Directive [RD6]. This WFD Compliance Assessment is broadly consistent with the Advice Note, but does not carry out the exact process that the Advice Note recommends. This is because the assessment was nearing completion at the time the Advice Note was issued.

## 1.7 Non-reportable water bodies and WFD assessment

1.7.1 The WFD water bodies on Anglesey are shown in figure 1. Guidance provided by NRW stated that small water bodies (e.g. minor streams and ditches) relevant to the Wylfa Newydd Project should also be considered within this

assessment [RD2]. These small water bodies are termed 'non-reportable water bodies'. These watercourses are still legally protected from pollution, modification and abstraction [RD7].

1.7.2 A briefing note was provided by NRW which clarified how these water bodies should be considered within the assessment [RD7]. Where a new activity or project is planned, the objectives for non-reportable water bodies are to protect, and where necessary improve them to the extent needed to achieve the objectives of the WFD for the water body to which they are directly or indirectly connected [RD7].

1.7.3 The non-reportable water bodies that are considered within this assessment are outlined in figure 2 and figure 3. Baseline conditions for non-reportable water bodies are presented in section 5, which is informed by data collected for the Wylfa Newydd Project. Where names of non-reportable water bodies are not shown on maps or other available data sources, appropriate names have been given to facilitate assessment and aid readability.

1.7.4 The effects of all activities on non-reportable water bodies have been considered and are presented in appendix D. To determine compliance with WFD objectives, the assessment is carried out on the designated WFD water bodies, whether they be fluvial, transitional or coastal. Where receiving water bodies do not have fluvial biological quality elements (e.g. a non-reportable fluvial water body draining directly into a coastal catchment) then the effects on fluvial quality elements are evaluated to provide context to the assessment of compliance, which is then carried out on the receiving designated WFD water body.

1.7.5 The effects on non-reportable water bodies are also relevant to the assessment of cumulative effects. For example, the assessment of effects on migratory fish takes into consideration the effects experienced by migratory species in fluvial (including non-reportable), transitional and coastal WFD water bodies.

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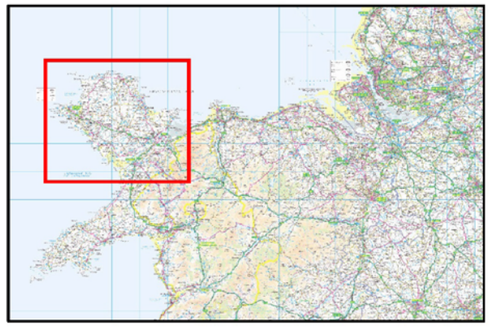
# FIGURE 1

Legend

- Wylfa Newydd Development Area
- SSSI Compensation Sites
- Associated development/off-site power station facilities
- A5025 Off-line Highway Improvements 1km buffer
- WFD groundwater body
- WFD river water body
- WFD transitional water body
- WFD lake water body
- WFD coastal water body
- A5025

| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title: WFD WATER BODIES ON ANGLESEY

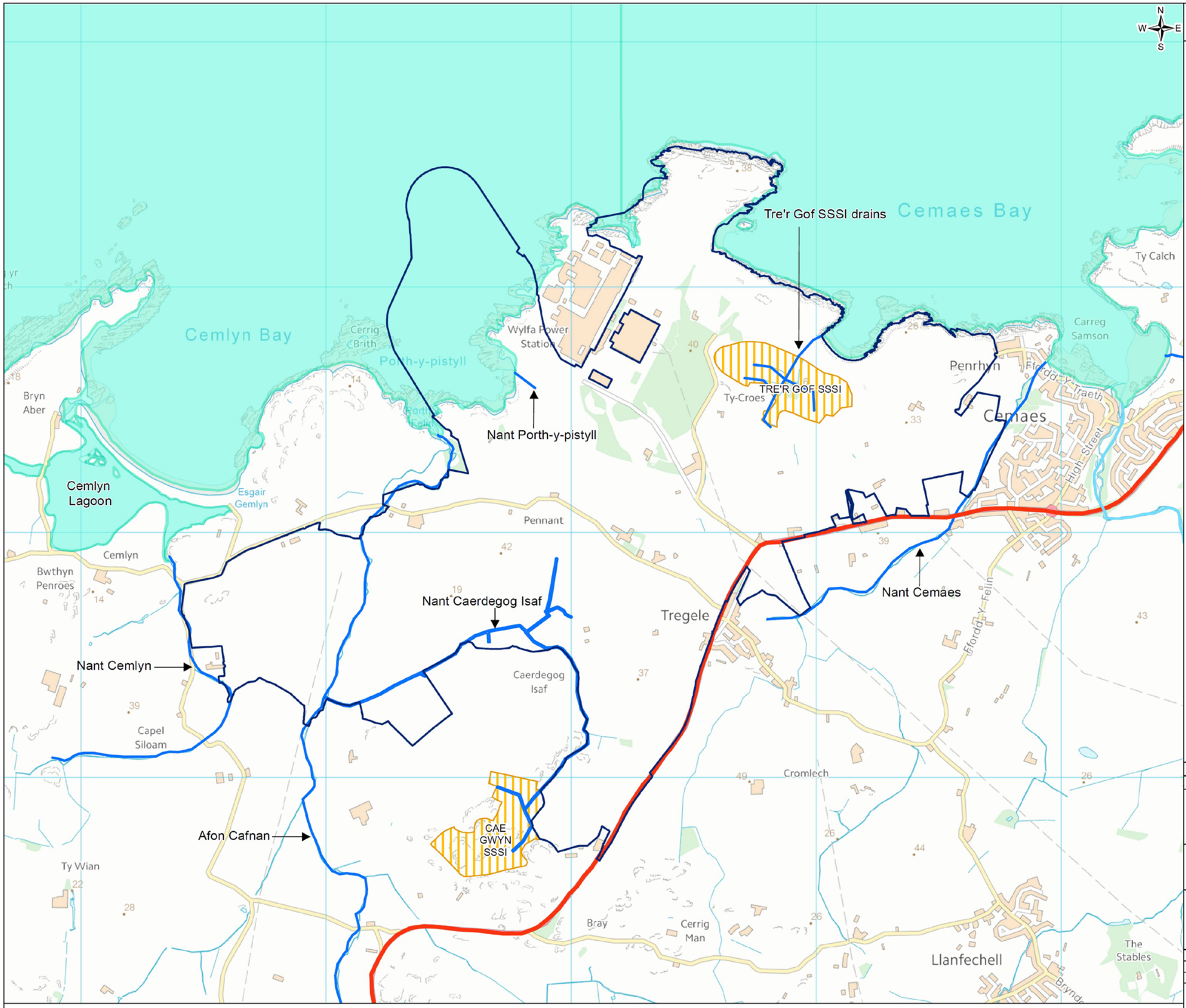
| | | |
|---|---|---|
| Scale @ A3 | 1:160,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |
| Drawing No. | 60PO8077_AQE_REP_006_D_01 | |





0 0.5 1 2 3 4 5 kilometres

# FIGURE 2

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0 0.25 0.5 1 1.5 2 kilometres

Legend

- Wylfa Newydd Development Area
- A5025
- Non reportable water body
- WFD river water body
- WFD lake water body
- WFD coastal water body
- Groundwater Dependent Terrestrial Ecosystems


| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

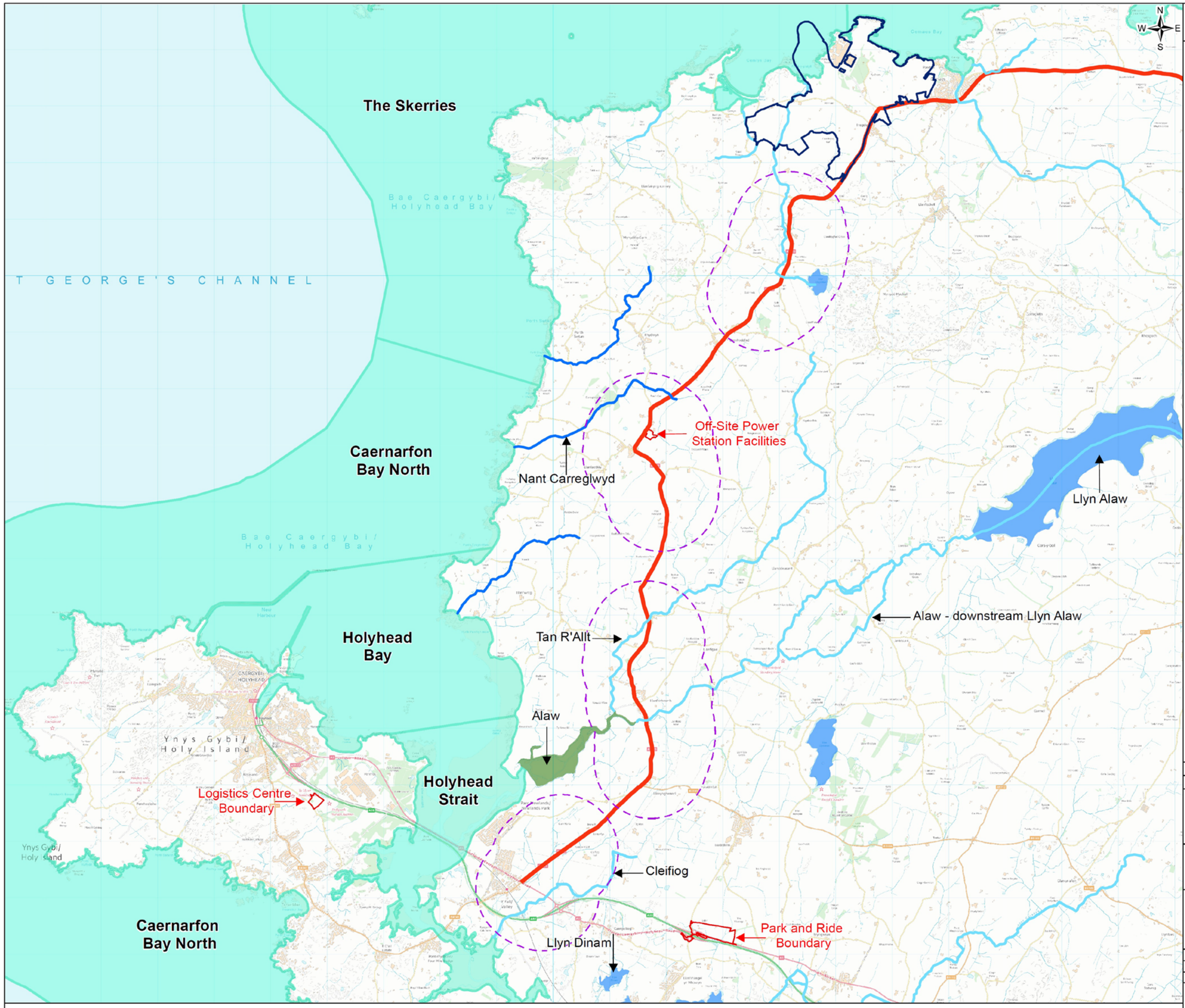
WYLFA NEWYDD DEVELOPMENT AREA WITH WFD AND NON REPORTABLE WATER BODIES PRESENTED

| | | |
|---|---|---|
| Scale @ A3 | 1:15,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

60PO8077_AQE_REP_006_D_02

# FIGURE 3




Legend

- Wylfa Newydd Development Area
- Associated development/off-site power station facilities
- A5025 Off-line Highway Improvements 1km buffer
- A5025
- Non reportable water body
- WFD river water body
- WFD transitional water body
- WFD lake water body
- WFD coastal water body

| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

ASSOCIATED DEVELOPMENT AND OFF-SITE POWER STATION FACILITIES WITH WFD AND NON REPORTABLE WATER BODIES PRESENTED

| | | |
|---|---|---|
| Scale @ A3 | 1:65,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |
| Drawing No. | 60PO8077_AQE_REP_006_D_03 | |





0 0.25 0.5 1 1.5 2 2.5 kilometres

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## 1.8 Structure of this report

1.8.1 The structure of this report and an outline of the contents of each section are described in table 1-3.

**Table 1-3 Report structure**

| Section | Title | Description |
|---|---|---|
| 1 | Introduction | Introduces the Wylfa Newydd Project, sets out relevant WFD terminology and details consultation. |
| 2 | Project description | Provides an overview of the Wylfa Newydd Project and key activities forming the Power Station and Associated Development. |
| 3 | Methodology | A summary of the WFD assessment process, guidance and survey and modelling undertaken. |
| 4 | Identification of project activities and relevant water bodies | Explains the Wylfa Newydd Project activities that have been considered and how the relevant water bodies have been identified using a Zone of Influence (ZoI) approach (step 1: WFD Screening). |
| 5 | Water body baseline data | Presents the baseline conditions for each water body including information on biological, physico-chemical and hydromorphological quality elements (step 2). |
| 6 | WFD assessment: Potential effects and identification of risks | For each water body this step considers the effects on quality elements and identifies where there is a risk of deterioration (step 3: WFD Scoping). |
| 7 | Detailed WFD assessment | Provides a detailed examination of the effects and risks identified in section 6 as having the potential to conflict with the WFD objectives (step 4: Detailed WFD Assessment). |
| 8 | Inter-project cumulative effects assessment | This addresses the potential for inter-project cumulative effects on water bodies (step 5). |
| 9 | Protected areas | This considers the potential effects on protected areas (step 6). |
| 10 | Enhancements | This section considers the potential enhancements that would be implemented as part of the Wylfa Newydd Project. |
| 11 | Conclusions | Presents the conclusions of the WFD Compliance Assessment. |

# 2 Project description

## 2.1 The Wylfa Newydd Project

2.1.1 The Wylfa Newydd Project is defined as those parts which are to be consented by the DCO, comprising: the Power Station; other on-site development; marine works; the Off-site Power Station Facilities; and the Associated Development. A description of each part is provided below and further detail is presented in the following chapters of the Environmental Statement:

- Volume D – WNDA Development D1 Proposed development, (Application Reference Number: 6.4.1);
- Volume E – Off-Site Power Station Facilities: AECC, ESL and MEEG E1 – Proposed development, (Application Reference Number: 6.5.1);
- Volume F - Park and Ride F1 – Proposed development, (Application Reference Number: 6.6.1);
- Volume G – A5025 Off-line Highway Improvements G1 – Proposed development, (Application Reference Number: 6.7.1); and
- Volume H – Logistics Centre H1 – Proposed development, (Application Reference Number: 6.8.1).

### *The Nationally Significant Infrastructure Project*

- Power Station: the proposed new nuclear power station, including two UK Advanced Boiling Water Reactors (UK ABWRs) to be supplied by Hitachi-GE Nuclear Energy Ltd., supporting facilities, buildings, plant and structures, and radioactive waste and spent fuel storage buildings;
- Other on-site development: including landscape works and planting, drainage, surface water management systems, public access works including temporary and permanent closures and diversions of public rights of way, new power station access road and internal site roads, car parking, construction compounds and temporary parking areas, laydown areas, working areas and temporary works and structures, temporary construction viewing area, diversion of utilities, perimeter and construction fencing;
- Marine works: comprising a Cooling Water System (CWS) intake and outfall, Marine Off-Loading Facility (MOLF) and breakwater structures; and
- Off-site Power Station Facilities: comprising the Alternative Emergency Control Centre (AECC), Environmental Survey Laboratory (ESL) and a Mobile Emergency Equipment Garage (MEEG). These would be located on one site at Llanfaethlu, approximately 6km south of the Power Station Site, adjacent to the A5025.

### *Associated Development*

- On-site campus providing temporary workers' accommodation (Site Campus);
- A temporary Park and Ride facility at Dalar Hir for construction workers (Park and Ride);
- A temporary Logistics Centre at Parc Cybi (Logistics Centre); and
- A5025 Off-line Highway Improvements.

2.1.2 The Logistics Centre site would be located to the south-east of Holyhead at Parc Cybi, close to Junction 2 of the A55. The proposed Park and Ride facility would be located at Dalar Hir to the north of Junction 4 of the A55. A5025 Off-line Highway Improvement works would take place at a number of locations along the A5025: Valley, Llanfachraeth, Llanfaethlu and Cefn Coch (see chapter G1, Application Reference Number: 6.7.1).

2.1.3 An overview of the Wylfa Newydd Project and a brief description of the various project development components are presented in chapter A2 (project overview and introduction to the developments) (Application Reference Number: 6.1.2) of the Environmental Statement. Figure A1-1 in chapter A2 (Application Reference Number: 6.1.2) shows the locations on Anglesey of the various project components that make up the Wylfa Newydd Project.

2.1.4 Horizon has prepared planning applications under the *Town and Country Planning Act 1990* (as amended) (TCPA) for the Enabling Works, to be submitted to the IACC as the determining Local Planning Authority.

2.1.5 The Enabling Works comprise the A5025 On-line Highway Improvements TCPA works and the Site Preparation and Clearance (SPC) TCPA works. These separate TCPA applications are accompanied by separate WFD Compliance Assessments. Potential cumulative effects from the Wylfa Newydd Project and the separate TCPA applications are considered in section 8 where relevant.

2.1.6 The following terms are used when describing the geographical areas related to the Wylfa Newydd Project:

- Power Station Site – the indicative area of land and sea within which the majority of the permanent Power Station buildings, plant and structures would be located. This includes the two nuclear reactors, steam turbines, the CWS intake, outfall structures, breakwaters and the MOLF.
- Wylfa Newydd Development Area – the indicative areas of land and sea including the Power Station Site, and the surrounding areas that would be used for construction and operation of the Power Station. It would also include the Site Campus. This area is representative of the maximum area that would be physically affected by construction activities related to the Power Station and used to form the setting and landscaping features of the operational Power Station.

# 3 Methodology

## 3.1 The WFD assessment process

3.1.1 The methodology for this WFD Compliance Assessment is summarised below.

- **Step 1: WFD Screening.** Identification of the activities that are to be assessed and determination of which WFD water bodies could potentially be affected by the Wylfa Newydd Project. This step also provides a rationale for any water bodies screened out of the assessment.
- **Step 2**: Description of the baseline conditions (biological, physico-chemical and hydromorphological) derived from the Western Wales RBMP, desk-based studies and surveys.
- **Step 3: WFD Scoping**. For each water body identified in step 1 an assessment is carried out to identify the effects and potential risks to quality elements from all activities. The assessment is made with embedded mitigation (measures that can reasonably be incorporated into the design of the scheme) and good practice mitigation (measures that would occur with or without input from Environmental Impact Assessment (EIA) feeding into the design process) already in place. Assessment tables are provided in appendix D and the activities that require further detailed assessment are outlined in section 6. This step identifies where intra-development and inter-project cumulative effects may arise (see description in 3.2).
- **Step 4: Detailed WFD Assessment**[2]. The risks identified in step 3 of the assessment as having the potential to conflict with WFD objectives are examined in detail. The assessment considers intra-development and inter-project cumulative effects. A summary of compliance/non-compliance is provided at the end of each section. This considers both the potential for deterioration in the status of a quality element and the potential for the Wylfa Newydd Project to prevent the achievement of 'good' status or the relevant objective set for the water body if an exemption has been applied.
- **Step 5**: Assessment of inter-project cumulative effects (see description in section 3.2). This considers the cumulative effects of the Wylfa Newydd Project with the relevant Reasonably Foreseeable Future Projects.
- **Step 6**: This step considers the effects on Protected Areas.

[2] This step is equivalent to the WFD Impact Assessment as referred to in *Advice note 18: The Water Framework Directive* [RD6].

## 3.2 Cumulative effects

3.2.1 Cumulative effects can potentially occur at each level (project, development or activity). For example, cumulative effects can arise from different activities (but within the same development), from different developments (within the same project), or across different projects. The following terminology has been adopted to describe cumulative effects associated with the Wylfa Newydd Project.

- Intra-development: combined topic effects can arise when a quality element in a water body is affected by more than one effect from the same development, usually at the same time. For example, fish may be affected by both noise and light arising from that development; the combined effect may be more significant than the individual noise and light effects assessed separately.
- Intra-project: in a complex project involving multiple developments, such as the Wylfa Newydd Project, cumulative effects can arise when a quality element in a water body is affected by different developments (in the same project) at the same time. For example, noise from the construction of the Wylfa Newydd Power Station and light from construction of A5025 Highway Improvements could combine to have an effect on a single population of migratory fish.
- Inter-project: cumulative effects can arise when a quality element in a water body is affected by more than one project at the same time. For example, underwater noise from construction of the Wylfa Newydd Power Station and underwater noise from the decommissioning of the Existing Power Station could combine to have a cumulative effect on fish.

## 3.3 Information supporting the assessment

3.3.1 Table 3-1 provides an overview of the reports that support the WFD Compliance Assessment which includes baseline surveys, desk-based studies and modelling work carried out specifically for the Wylfa Newydd Project.

**Table 3-1 Reports relevant to the WFD Compliance Assessment**

| Report | Details |
|---|---|
| **Freshwater ecology** | |
| Appendix D9-16 - Wylfa Freshwater Baseline Survey 2011 to 2015, (Application Reference Number: 6.4.49) | Baseline data for fish, diatoms (phytobenthos), macrophytes, macroinvertebrates, pond and stream habitat and water quality |
| Appendix F9-9 - Dalar Hir Freshwater Ecology Report, (Application Reference Number: 6.6.26) | Baseline data for freshwater aquatic ecology and water quality |

| Report | Details |
|---|---|
| Appendix G9-1 - A5025 Freshwater Baseline Surveys 2014-2015, (Application Reference Number: 6.7.22) | Baseline data for freshwater aquatic ecology and water quality |
| **Marine environment** | |
| Appendix D13-1 - Water Quality and Plankton Survey Report, (Application Reference Number: 6.4.83) | Baseline water quality and plankton surveys to characterise the prevailing environmental conditions |
| Appendix D13-2 - Benthic Ecology Report, (Application Reference Number: 6.4.84) | Findings of the intertidal ecological surveys (2010- 2014); the subtidal drop-down camera surveys (2010 and 2011); and, subtidal grab surveys (2010, 2011 and 2015) |
| Appendix D13-3 - Porth-y-pistyll Biotope Surveys. Report (Application Reference Number: 6.4.85) | Findings of the intertidal and subtidal biotope surveys carried out in 2014 |
| Appendix D13-4 - Fish Surveys Report, (Application Reference Number: 6.4.86) | Baseline fish surveys and assessment of prevailing environmental and ecological conditions |
| Appendix D13-5 - Subtidal Dive Surveys at the Cooling Water outfall for the Existing Power Station, (Application Reference Number: 6.4.87) | Subtidal dive surveys that were conducted during 2011 and 2012 to assess gradients in biodiversity with increasing distance from the CW outfall at the Existing Power Station |
| Appendix D13-8 - Marine Hydrodynamic Modelling Report – Wylfa Newydd Development Area, (Application Reference Number: 6.4.90) | Marine modelling covering construction and operation including coastal processes, water quality and thermal aspects |
| Appendix D13-9 - Underwater Noise Baseline and Modelling, (Application Reference Number: 6.4.91) | Baseline conditions and modelling assessment |
| Appendix D13-10 - Entrapment of Marine Organisms at the Existing Power Station, (Application Reference Number: 6.4.92) | To understand the current rates of impingement and entrainment of fish, including their eggs and larvae (Ichthyoplankton) within the Cooling Water intake |
| Appendix D13-11 - Marine modelling of the operational discharge, (Application Reference Number: 6.4.93) | Provides the H1 assessment (risk assessment for the Environmental Permit) and modelling of the operational discharge |

| Report | Details |
|---|---|
| Appendix D13-12 - Marine hydrodynamic modelling report - Disposal Site, (Application Reference Number: 6.4.94) | Marine modelling at the Disposal Site covering coastal processes and water quality effects |
| Appendix D13-14 – Marine modelling of the construction discharge, (Application Reference Number: 6.4.96) | Provides the H1 assessment (risk assessment for environmental permitting) and modelling of discharges during construction |
| Cemlyn Lagoon – a baseline review [RD8] | Biological and physico-chemical quality elements in Cemlyn Lagoon |
| **Surface water and groundwater** | |
| Appendix D8-1 - Surface Water Baseline Report, (Application Reference Number: 6.4.26) | Hydrological quality of surface water bodies |
| Appendix D8-3 Groundwater Baseline Report, (Application Reference Number: 6.4.28) | Groundwater quality and quantity<br>Hydrological connections between fluvial and groundwater body |
| Appendix D8-4 Flood Consequence Assessment, (Application Reference Number: 6.4.29) | Assesses the flood risk posed to and by the Power Station Site |
| Appendix D8-5 Tre'r Gof Hydroecological Assessment, (Application Reference Number: 6.4.30) | Baseline of the water environment around Tre'r Gof Site of Special Scientific Interest (SSSI) drains and evaluating hydrological supporting conditions |
| Appendix D8-6 Cae Gwyn SSSI Hydroecological Assessment, (Application Reference Number: 6.4.31) | Baseline of the water environment around Cae Gwyn SSSI and evaluating hydrological supporting conditions |
| Appendix D8-7 Surface water and groundwater modelling results, (Application Reference Number: 6.4.32) | Presents the results of 4R modelling (computer model used to calculate daily Rainfall to Routed Runoff and Recharge, i.e. surface and near-surface processes) and groundwater modelling carried out in MODFLOW (a three dimensional finite-difference model). |
| Appendix D8-8 - Summary of preliminary design for construction surface water drainage, (Application Reference Number: 6.4.33) | The drainage design report |
| Appendix E8-1 - MEEG/AECC/ESG - Flood Consequence Assessment, (Application Reference Number: 6.5.16) | Assesses the flood risk and includes details of the surface water modelling |

| Report | Details |
|---|---|
| Appendix F8 -1 Dalar Hir - Flood Consequence Assessment, (Application Reference Number: 6.6.16) | Assesses the flood risk and includes details of the surface water modelling |
| Appendix G8-1 - A5025 Flood Consequence Assessment, (Application Reference Number: 6.7.20) | Assesses the flood risk and includes details of the surface water modelling |
| Appendix G8-2 – HAWRAT and Spillage Risk Assessment, (Application Reference Number: 6.7.21) | Assessment of water quality parameters |
| Appendix H8-1 - Logistics Centre Flood Consequence Assessment, (Application Reference Number: 6.8.16) | Assesses the flood risk and includes details of the surface water modelling |
| **Hydromorphology** | |
| Appendix D8-2 - Fluvial Geomorphology Baseline Report, (Application Reference Number: 6.4.27) | Fluvial geomorphology baseline and assessment of physical processes |
| Appendix D12-1 - Coastal Geomorphology Baseline for the Wylfa Newydd Project - 2014, (Application Reference Number: 6.4.80) | Hydromorphological quality elements in coastal water bodies |
| Appendix D12-2 - Sediment Regime, (Application Reference Number: 6.4.81) | Coastal hydromorphology – sediment model results |
| Appendix D12-3 - Wylfa Newydd Main Site Wave Modelling Report, (Application Reference Number: 6.4.82) | Coastal hydromorphology - wave modelling results |
| Appendix D13-8 - Marine Hydrodynamic Modelling Report– Wylfa Newydd Development Area, (Application Reference Number: 6.4.90) | Marine modelling covering construction and operation including coastal processes, water quality and thermal aspects |
| Appendix D13.12 - Marine hydrodynamic modelling report - Disposal Site, (Application Reference Number: 6.4.94) | Marine modelling at the Disposal Site covering coastal processes and water quality effects |

# 4 Identification of project activities and relevant WFD water bodies (step 1: WFD Screening)

## 4.1 Project activities

4.1.1 The activities identified cover all elements and stages of the Wylfa Newydd Project including:

- Power Station Site construction, operation and decommissioning (including the Site Campus and disposal of material from marine excavation (dredging));
- construction and operation of the A5025 Off-line Highway Improvements;
- construction, operation and decommissioning of the AECC/MEEG/ESL;
- construction, operation and decommissioning of Park and Ride facility at Dalar Hir; and
- construction, operation and decommissioning of the Logistics Centre at Parc Cybi.

4.1.2 A full list of activities and durations is provided in appendix A. It is recognised that the long duration and nature of some activities within the construction phase could potentially lead to effects on quality elements. The assessment has therefore taken a precautionary approach when identifying the activities relevant to the assessment to ensure that all works that are potentially relevant to the WFD Compliance Assessment have been assessed.

4.1.3 All activities are relevant to the DCO application. Only certain activities are relevant to the other applications and these are set out in table 4-1 (Marine Licence), table 4-2 (construction water discharge permit) and table 4-3 (operation water discharge permit).

**Table 4-1 Activities relevant to the Marine Licence application**

| Project Element | Activity no. | Activity |
|---|---|---|
| Power Station Site: construction | 1.17 | Construction of the CWS breakwaters and MOLF including dewatering |
| | 1.18 | Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering |
| | 1.19 | Installation (and removal) of cofferdams for CW intake and outfall construction |
| | 1.20 | Excavation and construction of CW intake and outfall, including tunnelling |
| | 1.37 | Disposal of material (rock and soft sediment) from marine excavation (dredging) |
| Power Station Site: operation | 2.3 | Maintenance dredging |
| Power Station Site: decommissioning | 3.3 | Removal of marine structures (MOLF etc., but not breakwaters) |

**Table 4-2 Activities relevant to the construction water discharge permit application**

| Project Element | Activity no. | Activity |
|---|---|---|
| Power Station Site: construction | 1.14 | Construction and commissioning of concrete batching plant and associated surface water drainage |
| | 1.18 | Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering |
| | 1.19 | Installation (and removal of cofferdams for Cooling Water (CW) intake and outfall construction |
| | 1.20 | Excavation and construction of CW intake and outfall, including tunnelling |
| | 1.22 | Installation and operation of a drainage system during Power Station construction |
| | 1.25 | Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering |
| | 1.26 | Excavation of other features including building foundations including dewatering |

| Project Element | Activity no. | Activity |
|---|---|---|
| | 1.30 | Operation of concrete batching plant and associated surface water drainage |
| | 1.36 | Sewage discharge during construction |

**Table 4-3 Activities relevant to the operation water discharge permit application**

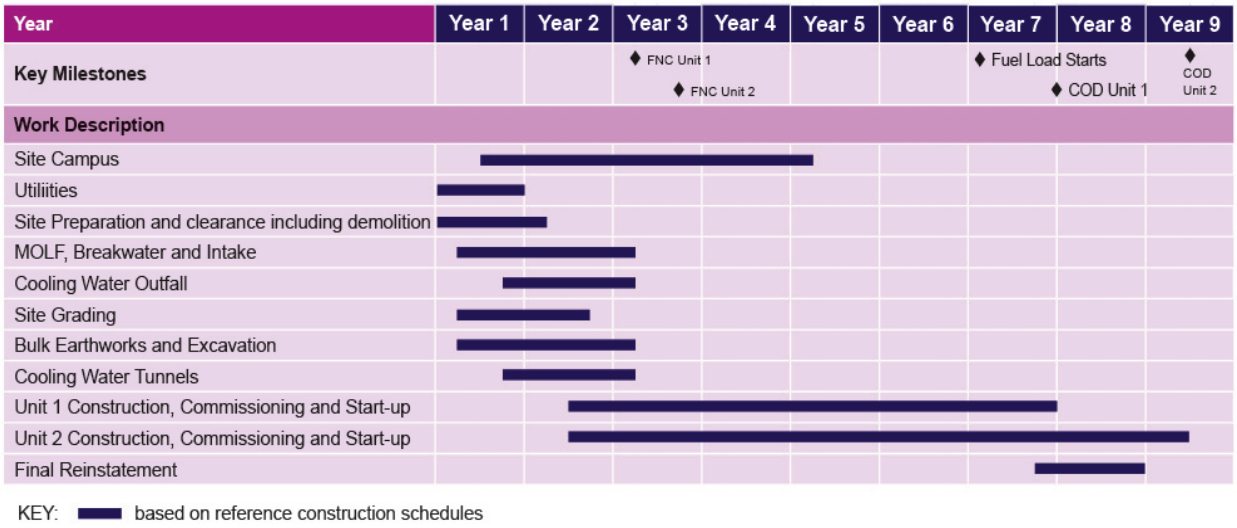
| Project Element | Activity no. | Activity |
|---|---|---|
| Power Station Site: operation | 2.4 | Abstraction of CW |
| | 2.5 | Discharge of CW and other operational water discharges |

## 4.2 Sequencing of activities

### *Overview of the construction schedule*

4.2.2 The overall construction timeline for the Wylfa Newydd Project is shown in figure 4. Bulk earthworks and deep excavations would commence as soon as the site has been prepared and cleared. In year one of construction the major activities would be the bulk earthworks, deep excavations and the marine works (construction of the semi-dry cofferdam, CW intake and dredging/excavation) which would happen concurrently. Once the MOLF has been constructed it would then be used to bring in bulk materials and AILs to enable construction of the Power Station.

**Figure 4: Construction timeline for the Wylfa Newydd Development Area**



## 4.3 Embedded and good practice mitigation

4.3.1 The assessment of effects and risks to quality elements has taken account of embedded and good practice mitigation and the key mitigation measures relevant to each activity are outlined in appendix D.

4.3.2 The term 'embedded mitigation' includes all those measures to avoid or reduce environmental effects that are directly incorporated into the design of the development.

4.3.3 Good practice mitigation' contains measures that would occur with or without input from EIA feeding into the design process (for example, mitigation that represents established industry practice or would be undertaken to meet existing legal compliance).

4.3.4 Mitigation measures would be secured through a number of 'control documents' which are an integral component of Horizon's DCO strategy and will be certified as part of the DCO.

4.3.5 The control documents include the following:

- Construction Method Statement (Volume D – WNDA Development appendix D1-1, Application Reference Number: 6.4.17): The CMS sets out the construction methodologies, works, and types of machinery required for works on the Power Station Site.
- Phasing Plans (Application Reference Number: 8.29): The Phasing Plans identify when key mitigation (such as the Site Campus and Park and Ride facility) will be constructed.
- Design and Access Statement (Vol 1 (Project Wide), 2 (Power Station Site) and 3 (Associated Developments and Offsite Facilities). Application Reference Numbers: 8.2.1, 8.2.2, 8.2.3 respectively): The DAS sets out the "design principles" that will guide how Horizon will construct the authorised development, and illustrative design concepts which demonstrate how the Wylfa Newydd Project could be brought forward in accordance with those principles.
- The Wylfa Newydd Code of Construction Practice (Application Reference Number: 8.6) and sub-CoCPs (Application Reference Number: 8.7, 8.8, 8.9, 8.10, 8.11, and 8.12). The Wylfa Newydd CoCP, together with location-specific sub-CoCPs, sets out how construction activities will be managed and controlled in order to deliver the mitigation commitments identified in the Environmental Statement as well as other assessment processes undertaken (e.g. the WFD Compliance Assessment).
- The Wylfa Newydd Code of Operational Practice (Application Reference Number: 8.13): Similar to the CoCPs, the Wylfa Newydd CoOP sets out the controls that will apply during the operation of the Project (e.g. operating hours).

4.3.6 Other measures that are proposed in EIA assessments will be secured through other mechanisms, such as planning obligations.

4.3.7 A Mitigation Route Map (Application Reference Number: 8.14) is also submitted with the DCO application. This document sets out all of the mitigation (embedded, good practice and additional) identified through the EIA, HRA and WFD processes.

## 4.4 Zone of Influence

4.4.1 The relevant WFD water bodies were determined using a Zone of Influence (ZoI) approach. This required firstly the identification of all potential pathways to an effect on all quality elements and secondly the determination of the extent of the effect (the ZoI). The ZoI relating to construction activities is shown in figure 5. The ZoI relating to operation activities is shown in figure 6. The ZoI relating to construction and operation activities for the Associated Development and Off-site Power Station Facilities is shown in figure 7. The ZoI for groundwater bodies during construction and operation is shown in figure 8.

4.4.2 The ZoI for the operation effects has been determined by modelling and a worst case scenario (the annual base case with no wind or waves) has been used to define the ZoI. This is explained further in the detailed assessment (section 7).

4.4.3 This step also took into account the requirement for achieving WFD objectives in other water bodies beyond the ZoI. This is particularly relevant to the assessment of migratory fish (see paragraph 4.5.2 to 4.5.12).

4.4.4 WFD water bodies have been screened into this assessment on the basis of whether they are:

- a designated WFD water body directly within the ZoI;
- a non-reportable water body directly within the ZoI; or
- a designated WFD water body indirectly affected by the ZoI (principally related to migratory fish species).

4.4.5 To identify the ZoI, the activities and associated pathways to potential effects were considered alongside modelling results. The boundary of the ZoI was based on either published standards where available (e.g. for physico-chemical parameters), or on professional judgement as to where an effect would occur considering the pathways to all quality elements. The ZoI was then used to determine the appropriate geographical area over which effects on water bodies may potentially arise.

4.4.6 Eighty-three separate activities have been identified across the Wylfa Newydd Project and these are listed in full in appendix A. Table 4-4 sets out the pathways to an effect, the extent of the ZoI and the water bodies that are directly within the ZoI.

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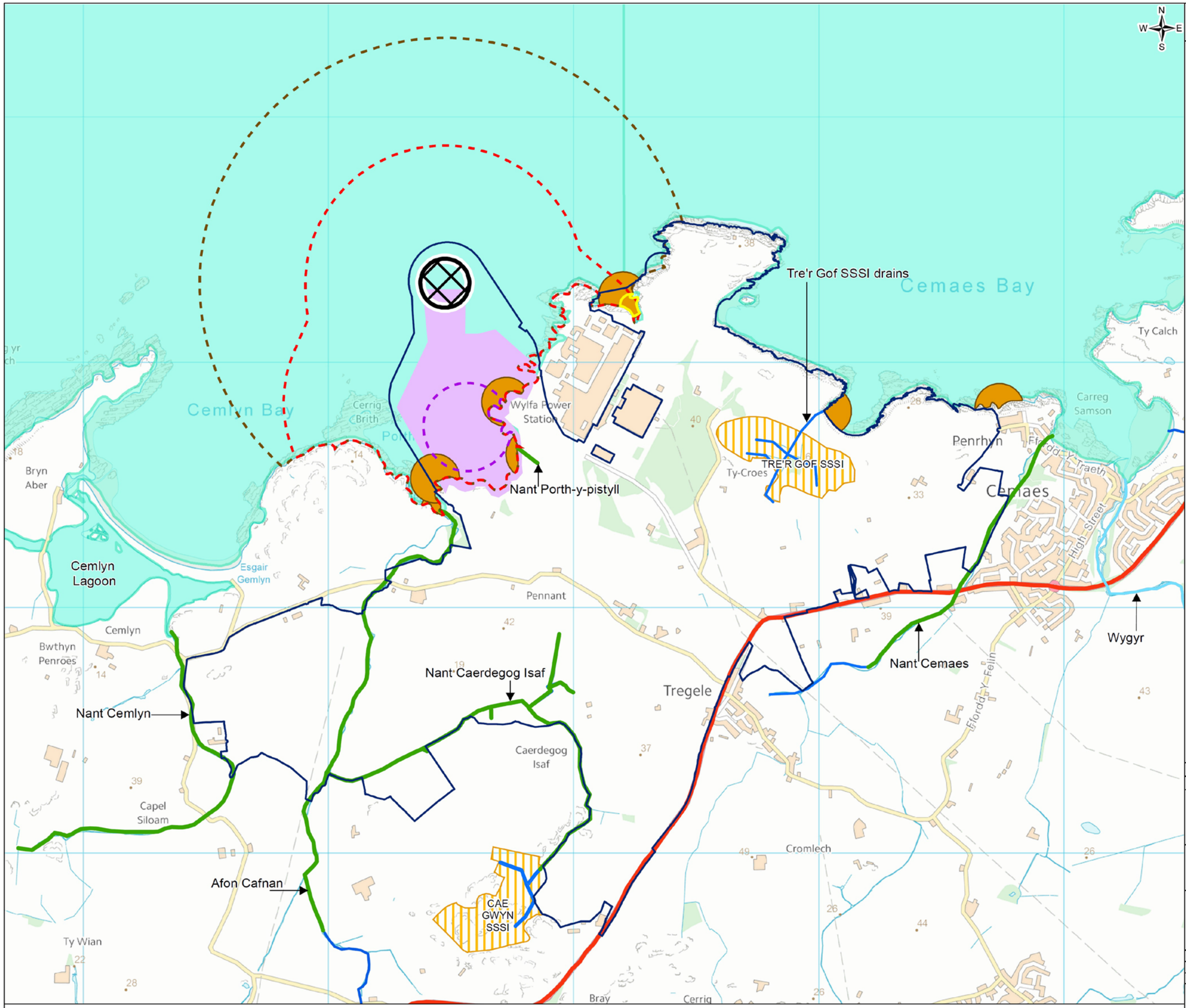
# FIGURE 5




Legend

- Wylfa Newydd Development Area
- A5025
- Non reportable water body
- WFD river water body
- WFD lake water body
- WFD coastal water body
- Zone of influence – acoustic stimuli (underwater noise for fish)
- Zone of influence – visual stimuli (underwater visual for fish)
- Water quality – dredging
- Water quality – land drainage*
- Water quality – sewage
- Water quality – physical modification, physical interaction
- Physical modification – Porth-y-pistyll
- Physical modification – cooling water outfall
- Groundwater Dependent Terrestrial
- Water quality disposal (5000m)

*Note: This area is indicative of the predicted maximum extent of discharge into coastal water bodies including Cemlyn lagoon.

| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

WYLFA NEWYDD DEVELOPMENT AREA SURFACE WATER ZONES OF INFLUENCE (CONSTRUCTION)

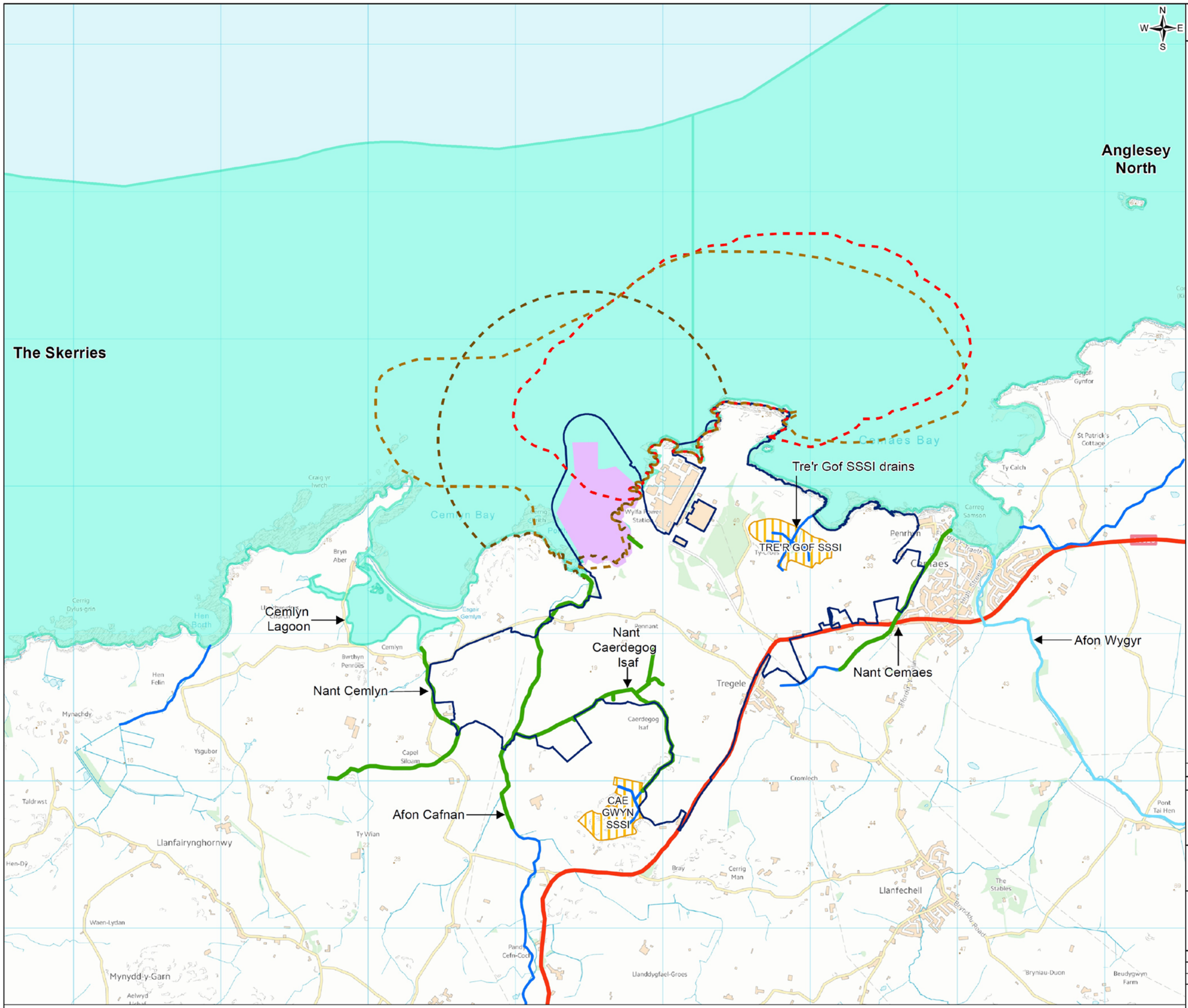
| | | |
|---|---|---|
| Scale @ A3 | 1:15,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |
| Drawing No. | 60PO8077_AQE_REP_006_D_05 | |





0 0.25 0.5 1 1.5 2 kilometres

# FIGURE 6

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Legend

- Wylfa Newydd Development Area
- A5025
- Non reportable water body
- WFD river water body
- WFD coastal water body
- Water quality – biocide
- Water quality – discharge of heated water based on 2°C rise
- Water quality – dredging
- Water quality – physical modification, physical interaction
- Physical modification – Porth-y-pistyll
- Groundwater Dependent Terrestrial Ecosystems

| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

WYLFA NEWYDD DEVELOPMENT AREA SURFACE WATER ZONES OF INFLUENCE (OPERATION)

| | | |
|---|---|---|
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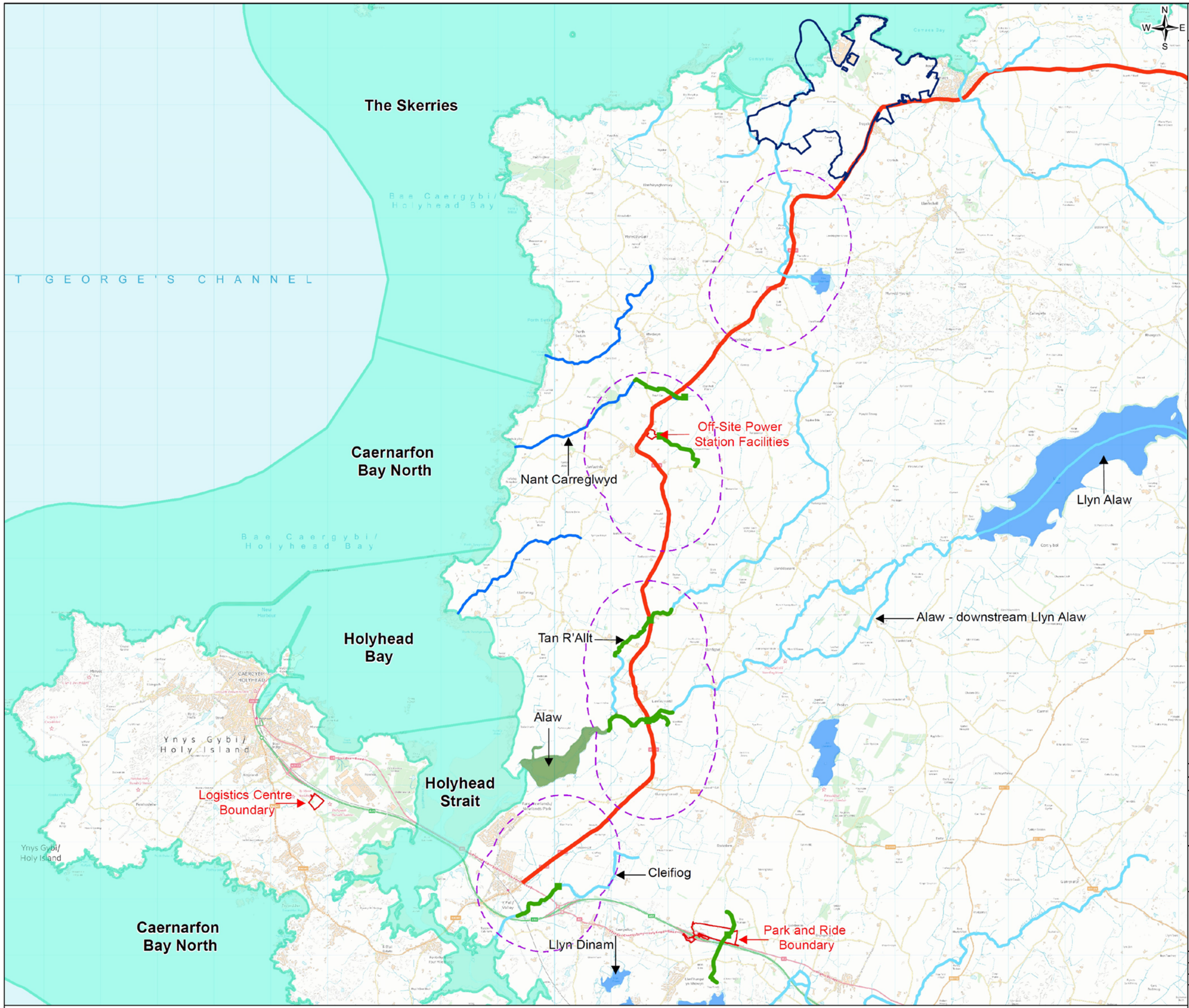
| Client No. | | |

Drawing No.

60PO8077_AQE_REP_006_D_06

# FIGURE 7




Legend

- Wylfa Newydd Development Area
- Associated development/off-site power station facilities
- A5025 Off-line Highway Improvements 1km buffer
- A5025
- Non reportable water body
- WFD river water body
- WFD transitional water body
- WFD lake water body
- WFD coastal water body
- Visual, acoustic, water quality, physical modification, physical interaction location
- Visual, acoustic, water quality, physical modification, physical interaction


| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

ASSOCIATED DEVELOPMENT AND OFF-SITE POWER STATION FACILITIES SURFACE WATER ZONES OF INFLUENCE

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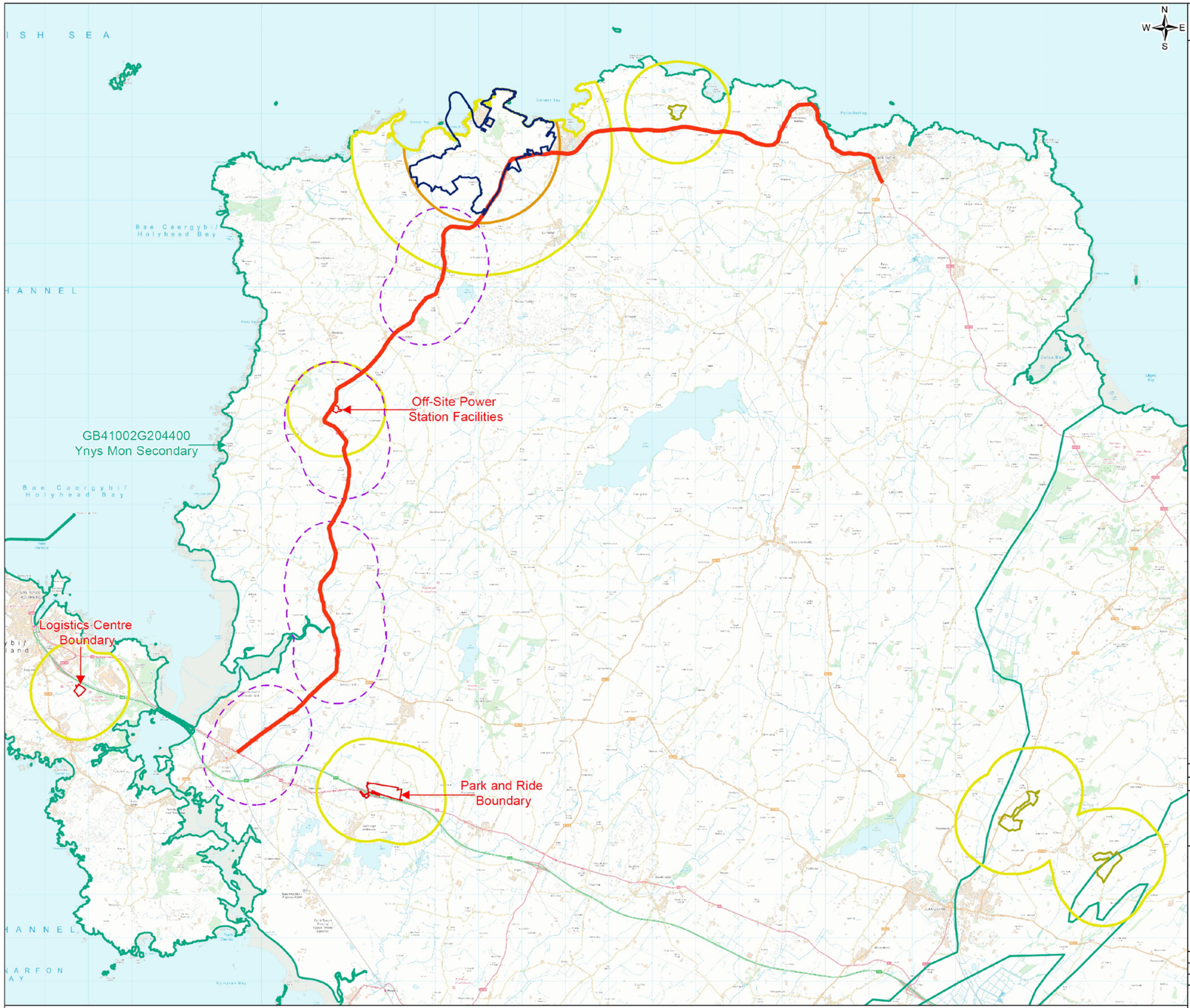
| Scale @ A3 | 1:65,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |
| Drawing No. | 60PO8077_AQE_REP_006_D_07 | |





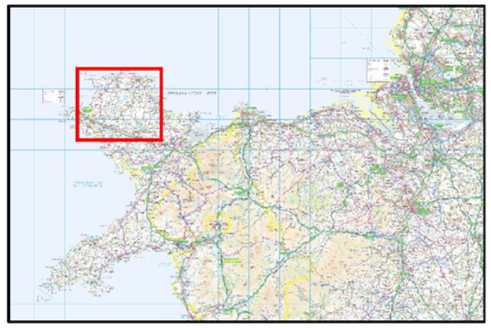
0 0.25 0.5 1 1.5 2 2.5 kilometres

# FIGURE 8




Legend

- Wylfa Newydd Development Area
- SSSI Compensation Sites
- Associated development/off-site power station facilities
- A5025 Off-line Highway Improvements 1km buffer
- A5025
- WFD groundwater body
- Inner groundwater Zone of Influence
- Outer groundwater Zone of Influence



| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

GROUNDWATER BODIES
AND ZONES OF INFLUENCE

| | | |
|---|---|---|
| Scale @ A3 | 1:85,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

60PO8077_AQE_REP_006_D_08

**Table 4-4 ZoIs and relevant WFD water bodies (those directly within the ZoI)**

| Pathway (marine) | ZoI and basis for determination | Relevant water bodies |
|---|---|---|
| **Construction** | | |
| Changes in visual stimuli (including artificial lighting) | Up to 500m (based on professional judgement from an understanding of the concept lighting design) | The Skerries, Anglesey North, Cemlyn Lagoon |
| Changes in acoustic stimuli (underwater noise) | 180m to Temporary Threshold Shift for fish (based on modelling predictions and criteria for hearing-sensitive species) | |
| Changes in marine water quality from increase in suspended sediment, release of chemical constituents from discharges. | Dredging: 1km from Porth-y-pistyll (based on modelling)<br>Land drainage: <100m from discharge locations into coastal water bodies (based on modelling)<br>Sewage: 100m from the discharge location (based on modelling)<br>Disposal: <5km from Holyhead North (based on modelling) | |
| Physical modification from footprint | Footprint of the marine works in Porth-y-pistyll (30.5ha) (based on the design)<br>Footprint of the marine works at the CW outfall (0.6ha) (based on the design) | |
| Physical modifications from scour | Up to 1km from the Wylfa Newydd Development Area (based on modelling) | |
| Physical interaction between species and project infrastructure | The infrastructure footprint (based on the design) | |
| **Operation** | | |
| Changes in marine water quality due to biocide dosing of the CWS | Surface: 4km east to west and 1.5km north to south from point of discharge (annual base case, no wind) (based on modelling)<br>Seabed: 0.4km north (based on modelling) | The Skerries, Anglesey North |

| | | |
|---|---|---|
| Changes in marine water quality due to the discharge of heated water from the CWS | Surface (based on 2ºC): total of 3km east to west and 2km north to south from point of discharge at the surface (annual base case, no wind) (based on modelling)<br>Seabed (based on 2ºC): 0.5km north and 0.5km from north-east to south-west (based on modelling) | |
| Physical modifications from scour and water discharge | Up to 1km from the Wylfa Newydd Development Area (based on modelling) | |
| Physical interaction between species and project infrastructure (impingement and entrainment) | Adult fish: ~50m from intake (based on professional judgement)<br>Larval fish: ~250m from intake (based on professional judgement) | |
| **Pathway (freshwater)** | **ZoI and basis for determination** | **Relevant water bodies** |
| **Construction** | | |
| Changes in visual and acoustic stimuli (disturbance) | Restricted to immediate vicinity of channel works in or adjacent (8m) of fluvial and non-reportable water bodies (based on professional judgement and understanding of the source and nature of visual and acoustic disturbance) | The Skerries, Anglesey North, Cemlyn Lagoon, Afon Crigyll, Afon Cleifiog, Tan R'Allt, Alaw, Alaw - downstream Llyn Alaw, Ceint. |
| Changes in surface water quality and/or hydrology | 1km downstream of new outfalls or physical modification on all fluvial and non-reportable water bodies (based on the 4R model results (see appendix D8-7, Application Reference Number: 6.4.23) and H1 assessment (see appendix D13-14, Application Reference Number: 6.4.96) | |
| Physical modification (habitat loss/impacts on hydromorphology) | Covering an area of 1km downstream and 500m upstream of all fluvial and non-reportable water bodies where there is a new outfall, culvert, crossing, bridge or works within 8m of either bank (based on professional judgement considering potential effects on connectivity for fish and invertebrate species and on potential effects on lateral adjustment .and the extent of changes to fluvial geomorphology) | |

| | | |
|---|---|---|
| Physical interaction between species and project infrastructure (mortality) | Restricted to immediate vicinity of channel works in riverine water bodies (based on professional judgement) | |
| **Operation** | | |
| Changes in surface water quality and/or hydrology | 1km downstream of new outfalls or physical modification on all fluvial and non-reportable water bodies (based on the 4R model results (see appendix D8-7, Application Reference Number: 6.4.23) and H1 assessment (see appendix D13-14, Application Reference Number: 6.4.96). | The Skerries, Anglesey North, Afon Crigyll, Afon Cleifiog, Tan R'Allt, Alaw, Alaw - downstream Llyn Alaw. |
| Physical interaction between species and project infrastructure | Covering an area of 1km downstream of all fluvial and non-reportable water bodies downstream of new outfalls, crossings and culverts (based on professional judgement) | |
| Physical modification within water bodies and surrounding floodplain (habitat loss/impacts on hydromorphology) | Covering an area of 1km downstream and 500m upstream of all fluvial and non-reportable water bodies where there is a new outfall, culvert, crossing, bridge or works within 8m of either bank (based on professional judgement considering potential effects on connectivity for fish and invertebrate species, the potential effects on lateral adjustment .and the extent of changes to fluvial geomorphology) | |
| **Pathway (groundwater)** | **ZoI and basis for determination** | **Relevant water bodies** |
| **Construction and operation** | | |
| Infiltration to groundwater (effects on recharge rates, groundwater levels and flow direction and baseflow to surface water).<br>Dewatering with potential effects on groundwater levels and flows. | For the Wylfa Newydd Development Area an inner study area (ZoI) with a 1.8km radius has been set (see figure 8). It is a circular area (albeit truncated by the coast) to reflect the nature of groundwater movement and the potential ZoI of dewatering activities, which in homogeneous aquifers would be circular in nature. The inner study area captures all of the groundwater features considered to have the highest potential for being affected by the development, including important ecological sites.<br>An outer study area (ZoI), 3km in radius, has also been defined to capture residual uncertainty associated with the radius of influence calculations, | Ynys Môn Secondary |

| | | |
|---|---|---|
| | especially the degree of heterogeneity of the aquifer (as confirmed by pumping tests undertaken in late summer 2015) and the possibility that potential effects could extend further than 1.8km. The 3km boundary was set based on professional judgement regarding how secondary fractured aquifers behave and the maximum likely distance across which the construction, operation and decommissioning of the Power Station could have a potential effect. This outer study area allows all relevant features that could be a concern to the public and regulators and in need of assessment, even if the potential effect is likely to be assessed as extremely low.<br>The area considered for the groundwater model comprises a larger study area (from east of Hen Borth to Cemaes and south to incorporate Llyn Llygeirian), than shown above to ensure that boundary effects do not affect the results of the model (see appendix D8-7, Application Reference Number: 6.4.32).<br>For all other sites (Associated Development and Off-Site Power Station Facilities), where the potential effects are far smaller, a 1km radius around the site has been selected for the groundwater study area (ZoI). This reflects the nature of the aquifer and the scale of development at each of these sites. | |
| Compensation site enhancement<br>• Removal and storage of topsoil<br>• Modification of site drainage features<br>• Seeding, fencing and landscaping to create wetland habitat | Precautionary compensation in the form of habitat creation and enhancement of wetland sites with at least partial groundwater dependency is proposed for 3 sites - Ty Du, the valley head of Cors Bodeilio SSSI and Cae Canol – Dydd.<br>An area around each compensation site with a 1 km radius has been set as a Zone of Influence (see figure 8). This is a radial area to reflect the potential ZoI of groundwater movement which may change during the activities. It is larger than would normally be anticipated as a ZoI in a homogeneous aquifer. This is due to the potentially anisotropic nature of groundwater flow in the Carboniferous Limestone aquifer. This is in line with the 1km radius around other sites (Associated Development and Off-Site Power Station Facilities), but is smaller than the inner and outer ZoI for the Wylfa Newydd Development Area. This reflects the different scale of development. The ZoI captures important contiguous and connected designated wetland sites which the compensation is designed to enhance. | Ynys Môn Secondary<br>Ynys Môn Central Carboniferous |

## 4.5 Water bodies relevant to the assessment of fish

### *Overview*

4.5.2 Fish is a quality element within riverine and transitional WFD water bodies, but not within coastal water bodies. However, it is recognised that migratory species that form part of the fish quality element in riverine and transitional water bodies could be affected whilst passing through coastal water bodies. As such migratory species interacting with the ZoI identified for the Wylfa Newydd Project could result in effects on the fish quality element in riverine and transitional WFD water bodies beyond the ZoI.

4.5.3 The migratory fish species relevant to the assessment were identified using baseline data collected for the Wylfa Newydd Project and supplemented by desk-based searches. These data were presented in a technical memo to NRW titled 'Migratory fish and the WFD' [RD9]. The migratory fish species scoped into the assessment were then based upon feedback on this technical memo.

4.5.4 Four migratory species are considered within this assessment: Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*), river lamprey (*Lampetra fluviatilis*) and European eel (*Anguilla anguilla*) (table 4-5). Other migratory species, including Allis and Twaite shad (*Alosa alosa* and *Alosa fallax* respectively) and sea lamprey (*Petromyzon marinus*) are known to be present in Welsh waters but have not been recorded within the study area and are therefore not included in the assessment.

4.5.5 The initial area considered for migratory species included the northern and western coasts of Wales and associated rivers and transitional WFD water bodies. This aligned with the starting point for the HRA screening in relation to Atlantic salmon (Shadow Habitats Regulations Assessment Report. Application Reference Number: 5.2), and stemmed from the uncertainty about the extent of the ZoI and the magnitude of effects. For the WFD Compliance Assessment consideration was given to the following WFD Management Catchments; Clwyd, Conwy, Ynys Môn, Llyn and Eryi, Meirionydd, Teifi and North Ceredigion.

4.5.6 As the understanding of the Wylfa Newydd Project and its potential effects has developed, it has been possible to improve the definition of each ZoI. This understanding has established sufficient confidence to screen out potential indirect effects on WFD water bodies in the WFD Management Catchments situated many kilometres from the localised ZoI. Only those water bodies lying within the Ynys Môn Management Catchment were screened into the compliance assessment. The potential for a species to interact with a ZoI is explained further in table 4-5. The pathways and effects on fish are considered in detail in section 7.

### *Interaction with the Zone of Influence*

4.5.7 River lamprey and sea trout could remain in near-shore coastal environments during their marine phase, and consequently would be at higher risk of

interaction with the ZoI compared to European eel and salmon that migrate through coastal waters into the Irish Sea and beyond.

**Table 4-5 Migratory fish species considered in the assessment**

| Species | Water bodies requiring further consideration | Justification |
|---|---|---|
| River lamprey,<br>sea trout | Coastal water bodies within or adjacent to ZoI<br>Fluvial and transitional water bodies hydrologically linked to a coastal water body that is directly within the ZoI | Species known from coastal water bodies or entering coastal waters from freshwater environments within these water bodies.<br>Migration behaviours concentrate marine life phase close to natal rivers with localised movement in near-shore coastal waters. |
| European eel | Coastal water bodies within or adjacent to ZoI<br>Fluvial and transitional water bodies hydrologically linked to a coastal water body that is directly within the ZoI | Species known to inhabit coastal waters or enter coastal waters from freshwater environments within these water bodies.<br>Migration behaviour requires migration from freshwater environments westwards, through the Irish Sea into the Atlantic. |
| Atlantic salmon | Coastal water bodies within or adjacent to ZoI<br>Fluvial and transitional water bodies hydrologically linked to a coastal water body that is directly within the ZoI | Species known to inhabit coastal waters or enter coastal waters from freshwater environments within these water bodies.<br>Salmon could interact with the ZoI and proceed to migrate into natal rivers beyond the ZoI. |

4.5.8 Given the relatively small ZoI for the Wylfa Newydd Project, which for fish is restricted to near-shore coastal environments and non-reportable fluvial WFD water bodies, the likelihood is that migratory species would only interact with the ZoI for short periods within their life cycle. There is no detectable pathway to effect on WFD water bodies beyond the immediate ZoI (The Skerries and Anglesey North water bodies) due to the short residency times of the species in the ZoI, their high mobility (ability to avoid the ZoI or likely interaction with the ZoI) and wider marine resource. It is therefore considered that effects on migratory species in far field WFD water bodies is likely to be below the limit of detection.

4.5.9 There remains a risk to migratory species moving through the ZoI but it is considered that WFD water bodies discharging directly into the coastal WFD water bodies known to be affected by the ZoI are at the greatest risk. Migratory species whose marine life phase or migratory pathway interacts with the ZoI have been considered. A list of these water bodies is presented below.

### *Water bodies screened into the assessment for migratory fish*

4.5.10 All fluvial and transitional WFD water bodies screened into the assessment (prior to consideration of migratory species) have been assessed for the fish quality element in addition to other quality elements where applicable. This includes Alaw (transitional), Alaw - downstream Llyn Alaw, Tan R'Allt, Afon Cleifiog and Afon Crigyll.

4.5.11 Where fish have already been assessed as a biological quality element, this adequately considers migratory species within either the overall community composition or as key indicator species. Further assessment is therefore not required, to avoid the risk of 'double counting' migratory species. Those water bodies not assessed for the fish quality element but are within the Ynys Môn Management Catchment have been screened into the assessment for migratory fish only (table 4-6).

4.5.12 Data collected for the Wylfa Newydd Project and publicly available data have been used to compile the baseline for migratory fish (see section 5.6). Where data are not available, or considered unsuitable for establishing baseline conditions, professional judgement has been made by a suitably qualified (chartered) fisheries scientists based on the best available information and experience, e.g. in relation to fish migration routes.

**Table 4-6 WFD water bodies that are indirectly affected by the ZoI in relation to effects on migratory fish species**

| WFD water body name | WFD water body number | Migratory species recorded |
|---|---|---|
| Wygyr | GB110102059170 | European eel, sea trout |
| Goch Amlwch | GB110102059230 | European eel |
| Goch Dulas | GB110102059000 | European eel |
| Lligwy | GB110102059070 | European eel |
| Ddrydwy (Llanfaelog) | GB110102058860 | European eel, sea trout |
| Ffraw | GB110102058680 | European eel |
| Cefni | GB521010207500 | No records, but assume European eel, and sea trout pass through to get to upstream water bodies |
| Ceint | GB110102058940 | Sea trout |
| Cefni - Ceint to Cefni reservoir | GB110102058770 | European eel, sea trout |
| Cefni - Cefni reservoir east | GB110102058780 | European eel, sea trout |
| Cefni - Cefni reservoir west | GB110102058790 | Sea trout |

## 4.6 Summary

4.6.1 Using the relevant ZoI, table 4-7 sets out the water bodies that are relevant to the WFD Compliance Assessment.

**Table 4-7 Summary of step 1 (WFD Screening): water bodies and non-reportable WFD water bodies screened in to each project element**

| WFD water body name | WFD water body number | Project element | Non-reportable water bodies |
|---|---|---|---|
| **Coastal** | | | |
| The Skerries | GB611010390000 | Power Station (construction, operation and decommissioning)<br>A5025 Off-line Highway Improvements | Afon Cafnan<br>Nant Porth-y-pistyll |
| Anglesey North | GB641010620000 | Power Station (construction, operation and decommissioning) | Tre'r Gof drains<br>Nant Cemaes<br>Nant Nodwydd |
| Cemlyn Lagoon | GB610100083000 | Power Station (construction, operation and decommissioning) | Nant Cemlyn |
| Caernarfon Bay North | GB621010380000 | Power Station (construction)<br>A5025 Off-line Highway Improvements | Nant Carreglwyd |
| **Transitional (included for all quality elements)** | | | |
| Alaw | GB521010207600 | A5025 Off-line Highway Improvements | n/a |
| **Transitional (included only for fish)** | | | |
| Cefni | GB521010207500 | Power Station (construction, operation and decommissioning)<br>A5025 Off-line Highway Improvements<br>AECC/MEEG/ESL<br>Park and Ride facility at Dalar Hir | n/a |
| **Fluvial (included for all quality elements)** | | | |
| Alaw - downstream Llyn Alaw | GB110102058981 | A5025 Off-line Highway Improvements | n/a |
| Tan R'Allt | GB110102059100 | A5025 Off-line Highway Improvements<br>AECC/MEEG/ESL | n/a |

| WFD water body name | WFD water body number | Project element | Non-reportable water bodies |
|---|---|---|---|
| Afon Cleifiog | GB110102058930 | A5025 Off-line Highway Improvements | n/a |
| Afon Crigyll | GB110102058970 | Park and Ride facility at Dalar Hir | n/a |
| Ceint | GB110102058940 | SSSI compensation sites | n/a |
| **Fluvial (included only for fish)** | | | |
| Wygyr | GB110102059170 | Power Station (construction, operation and decommissioning)<br>A5025 Off-line Highway Improvements<br>AECC/MEEG/ESL<br>Park and Ride facility at Dalar Hir | n/a |
| Goch Amlwch | GB110102059230 | | n/a |
| Goch Dulas | GB110102059000 | | n/a |
| Lligwy | GB110102059070 | | n/a |
| Ddrydwy | GB110102058860 | | n/a |
| Ffraw | GB110102058680 | | n/a |
| Cefni – Ceint to Cefni reservoir | GB110103058770 | | n/a |
| Cefni – Cefni reservoir east | GB110102058780 | | n/a |
| Cefni – Cefni reservoir west | GB110103058790 | | n/a |
| Ceint | GB110102058940 | | n/a |
| **Groundwater** | | | |
| Ynys Môn Secondary | GB41002G204400 | Power Station (construction, operation and decommissioning)<br>A5025 Off-line Highway Improvements<br>AECC/MEEG/ESL<br>Park and Ride facility at Dalar Hir<br>Logistics Centre at Parc Cybi | n/a |
| Ynys Môn Central Carboniferous Limestone | GB41001G204200 | SSSI Compensation sites | n/a |

4.6.2 Llyn Llygeirian water body is hydrologically linked to a non-reportable water body that is within the ZoI, but has been screened out of the assessment.

4.6.3 Llyn Llygeirian is a lacustrine water body located at the source of the Afon Cafnan, approximately 3km upstream from the Wylfa Newydd Development Area and approximately 3.3km from the proposed river realignment in Nant Caerdegog Isaf. It is considered that effects on quality elements in the

downstream reaches of the Afon Cafnan Catchment would not result in effects further upstream nor would there be any effects on groundwater quantity and quality of the Ynys Môn Secondary groundwater body which could support elements of Llyn Llygeirian water body. Given the distance from the Wylfa Newydd Development Area, there are no predicted effects on quality elements in Llyn Llygeirian, and therefore this water body is not considered further in this assessment.

# 5 WFD water body baseline data (step 2)

5.1.1 The following sections of the report present the baseline data on each WFD water body screened in for assessment. Further information is available in the baseline sections of the following Environmental Statement chapters:

- surface water and groundwater - chapters D8 (Application Reference Number: 6.4.8), E8 (Application Reference Number: 6.5.8), F8 (Application Reference Number: 6.6.8), G8 (Application Reference Number: 6.7.8) and H8 (Application Reference Number: 6.8.8);
- terrestrial and freshwater ecology - chapters D9 (Application Reference Number: 6.4.9), E9 (Application Reference Number: 6.5.9), F9 (Application Reference Number: 6.6.9), G9 (Application Reference Number: 6.7.9) and H9 (Application Reference Number: 6.8.9);
- the marine environment - chapter D13 (Application Reference Number: 6.4.13); and
- coastal processes and geomorphology - chapter D12 (Application Reference Number: 6.4.12).

5.1.2 Further detail is also contained in the supporting appendices (see table 3-1).

5.1.3 The WFD water bodies are considered as entire catchments, encompassing all tributaries feeding into the main named water body/coastal area. As a consequence, the coastal water bodies also include all fluvial non-reportable water bodies feeding into the coastal area at this location. The locations of the WFD water bodies and the contributing fluvial catchments are shown in figure 2 and figure 3. The catchment names are based on the primary WFD water body within the catchment and for consistency are referred to throughout this report.

5.1.4 Summaries of the baseline information for the four coastal water bodies, one transitional water body, five fluvial water bodies and two groundwater water bodies screened into the assessment are provided in table 5-2, and table 5-4 respectively. The baseline for water bodies screened in for migratory fish is presented in 5.6.2. The detailed breakdown of the classification of quality elements for each water body, as monitored by NRW, is provided in appendix B. The baseline provided for each water body draws upon both NRW data and data specifically collected for the Wylfa Newydd Project.

**Table 5-1 Coastal water body baseline data summary**

| Element | Details | | | |
|---|---|---|---|---|
| WFD water body name | The Skerries | Anglesey North | Cemlyn Lagoon | Caernarfon Bay North |
| WFD water body ID | GB611010390000 | GB641010620000 | GB610100083000 | GB621010380000 |
| Hydromorphological designation | Not designated AWB/ HMWB | Not designated AWB/ HMWB | HMWB | Not designated AWB/ HMWB |
| Overall status/potential | High status | Moderate status | Good potential | Good status |
| Current ecological status/potential | High status | Good status | Good potential | Good status |
| Current chemical status | Good | Fail | Good | Good |
| Failing element(s) | N/A | Mercury | N/A | N/A |
| Overall objective | High | Good by 2021 | Good | Good |

**Table 5-2 Transitional water body baseline data summary**

| Element | Detail |
|---|---|
| WFD water body name | Alaw |
| WFD water body ID | GB521010207600 |
| Hydro-morphological designation | Not designated AWB/HMWB |
| Overall status/potential | Moderate status |
| Current ecological status/potential | Moderate status |
| Current chemical status | Good |
| Failing element(s) | Dissolved inorganic nitrogen |
| Overall objective | Good by 2021 |

**Table 5-3 Fluvial water body baseline data summary**

| Element | Details | | | | |
|---|---|---|---|---|---|
| WFD name | Alaw – downstream Llyn Alaw | Tan R'Allt | Cleifiog (Valley) | Crigyll | Ceint |
| WFD ID | GB110102058981 | GB110102059100 | GB110102058930 | GB110102058970 | GB110102058940 |
| Hydro-morphological designation | HMWB | Not designated AWB/HMWB | Not designated AWB/HMWB | Not designated AWB/HMWB | Not designated AWB/HMWB |
| Overall status /potential | Moderate Potential | Moderate Status | Moderate Status | Moderate Status | Moderate Status |
| Current ecological status /potential | Moderate | Moderate | Moderate | Moderate | Moderate |
| Current chemical status | Good | Good | Good | Good | Good |
| Failing element (s) | Mitigation measures | Phosphate | Phosphate | Invertebrates | Mitigation assessment |
| Overall objective | Good by 2021 | Good by 2021 | Good by 2021 | Good by 2021 | Good by 2021 |

**Table 5-4 Groundwater body baseline data summary**

| Element | Details | |
|---|---|---|
| WFD water body name | Ynys Môn Secondary | Ynys Môn Central Carboniferous Limestone |
| Water body ID | GB41002G204400 | GB41001G204200 |
| Overall status | Poor status | Poor status |
| Current quantitative status | Good | Good |
| Current chemical status | Poor | Poor |
| Failing element(s) | Chemical dependent surface water body status | Chemical GWDTE test |
| Reasons for not achieving Good (GES/GEP) | Diffuse source (certainty: probable)<br>Activity: abandoned mine (certainty: probable) | Failure of the chemical dependent GWDTE status test with respect to the Corsydd Lynn Anglesey Fen system - a Natura 2000 and SAC designated site. The fens are reliant on base rich water from the |

| Element | Details | |
|---|---|---|
| | | groundwater body which is contaminated by diffuse sources arising from pesticide and herbicide use in the agricultural and rural land management sector. |
| Overall objective | Poor (no known technical solution is available) | Achieve overall good status by 2021 via local targeted measures are to control and manage diffusion pollution at source by undertaking investigations and implementing waste management licences |

## 5.2 Coastal WFD water bodies

### *The Skerries (GB611010390000)*

5.2.2 The Skerries water body comprises the coastal environment from the Existing Power Station out to around 2km north-west of The Skerries islands and to just south of Porth Trwyn on the west coast of Anglesey. There are a number of fluvial non-reportable water bodies within the Wylfa Newydd Development Area which drain into The Skerries water body, including watercourses within the:

- Afon Cafnan Catchment; and
- Power Station Catchment (Nant Porth-y-pistyll) (see figure 2).

5.2.3 The Cemlyn Lagoon coastal waterbody is situated to the west of the study area and discharges into The Skerries coastal waterbody via a sluice. Cemlyn Lagoon is considered separately to the Skerries (see below) and has a small, non-reportable water body (Nant Cemlyn) associated with it.

### The Skerries coastal water body

5.2.4 The Skerries water body is classified as having high status overall. Data provided by NRW (see appendix B) show that biological quality elements are at high status (based on benthic invertebrates). The classification of physico-chemical quality elements (based on dissolved oxygen) is also at high status. The hydromorphological supporting elements are at high status (based on morphology being classified as high) and the chemical assessment is good.

5.2.5 The Skerries coastal water body is characterised by strong tidal currents, semi-diurnal tides and localised eddies in the bays around Wylfa Head. The water body waters are well mixed all year round with no evidence of a permanent temperature or salinity gradient (thermocline and halocline respectively) or seasonal stratification (see appendix D13-1, Application Reference Number: 6.4.83). The coast mainly comprises hard rocky cliffs with sandy bays. The hard geology would have been covered by ice sheets in the last glaciation and loose material eroded/detached during that period has since been moved and sorted by currents driven by tidal and wave forces.

Offshore, the sea floor is composed of a mixture of solid bedrock, boulders, cobbles, gravels and sands. Over the long term, the rocky coast will be extremely slow to change, even with strong tidal currents (see appendix D12-2, Application Reference Number: 6.4.81).

5.2.6 The results of water quality surveys carried out between 2010 and 2014 showed expected concentrations of chemicals sampled (many below the limit of detection), with values in line with previous studies and typical of coastal waters around the north of Anglesey (see appendix D13-1, Application Reference Number: 6.4.83).

5.2.7 Phytoplankton production is low, most likely as a consequence of the low nutrient levels, which is a known feature of this area of the Irish Sea (see appendix D13-1, Application Reference Number: 6.4.83). The intertidal ecological communities are characteristic of an exposed, western, rocky coastline, and the habitats support diverse assemblages of macrophytes (see appendix D13-2, Application Reference Number: 6.4.84). The subtidal benthic communities are considered to be of high quality and are generally undisturbed (see appendix D13-2, Application Reference Number: 6.4.84).

5.2.8 Where comparisons can be made, the baseline data collected for the Wylfa Newydd Project show good correlation with WFD water body monitoring data as provided by NRW.

***The Afon Cafnan Catchment***

5.2.9 The Afon Cafnan Catchment comprises the Afon Cafnan, Nant Caerdegog Isaf, Nant Caerdegog Uchaf, Afon Cefn Coch and the Afon Cafnan tributary. The catchment area is approximately 9.9km$^2$. Much of the catchment has historically been subject to realignment and modified, likely to be a reflection of the need to drain land for agricultural purposes. Analysis of recent aerial photography shows that the predominant land use in the catchment appears to be livestock grazing.

5.2.10 The Afon Cafnan, the main water body within the catchment, is a small stream channel flowing north from Llyn Llygeirian to Porth-y-pistyll. It has a relatively artificially straightened planform and forms the boundary of several fields. During a geomorphological reconnaissance survey, the water body was found to exhibit signs of natural adjustment of channel processes and forms following previous artificial modification between Mynydd Ithel and Cafnan (see appendix 8-2, Application Reference Number: 6.4.27). The predominant land use within the Afon Cafnan Catchment appears (from reference to aerial photography) to be agricultural for livestock grazing.

5.2.11 During surveys carried out between 2011 and 2016 the average channel width was recorded as between 0.8m and 1.0m and channel depth to be between 0.1m and 0.3m. Locations with poaching and erosion were noted and longitudinal connectivity was observed to be affected by culverts and bridges throughout the length of the water body (see appendix 8-2, Application Reference Number: 6.4.27).

5.2.12 During a physical habitat characterisation survey, some localities were found to exhibit complex flow diversity with a number of flow types, including runs,

glides and areas of slacker flow (see appendix 8-2, Application Reference Number: 6.4.27). During the survey, substrate was observed to be predominantly gravel, and riparian vegetation was found to be present along both banks, providing potentially good-quality habitat for macroinvertebrates and fish. The water body was noted to support a varied macrophyte assemblage in some locations, and the numbers of species and biomass were found to be greatest in reaches without overhanging trees and shrubs providing shade.

5.2.13 At the downstream reach at the Felin Gafnan confluence, large herbaceous riparian species were recorded during the survey, shading the left bank; ferns were observed to dominate the steeper right bank. The river was noted to flow over the rocky foreshore into Porth-y-pistyll and fucoid seaweeds were found to be present at the downstream extent, although physico-chemical water analysis indicated a dominant freshwater source, with no indication of saline intrusion.

5.2.14 From surveys carried out between 2011 and 2016, suspended solids concentrations within this water body were found to vary between sites and seasons (see appendix D9-16, Application Reference Number: 6.4.49). Reactive phosphorus concentrations fail to meet good WFD status at two of the survey sites, indicating possible enrichment due to the adjacent agricultural land use.

5.2.15 The River Invertebrate Classification Tool[3] classified invertebrates on the Afon Cafnan as moderate, although only one site on this water body was sampled (see appendix D-19, Application Reference Number: 6.4.49). The Lotic-invertebrate Index for Flow Evaluation[3] score reflected an invertebrate community of faster, consistently flowing waters. Analysis of the Proportion of Sediment-sensitive Invertebrates showed that the sites sampled had undergone moderate sedimentation. The Ecological Quality Ratio suggested that there were few flow-stressors at these sites that would not be present in pristine reference conditions.

5.2.16 Fish species recorded on this water body during aquatic ecology surveys between 2011 and 2014 included brown trout (*Salmo trutta*) and the protected European eel, the latter indicating that the water bodies have sufficient connectivity to the sea to allow eel migration between fluvial and coastal water bodies.

5.2.17 The other smaller non-reportable water bodies within the catchment, including the Nant Caerdegog Isaf, Nant Caerdegog Uchaf, Afon Cefn Coch and the Afon Cafnan tributary, have typically been heavily modified. The planforms were found to be typically straight, with over-wide and/or over-deep channels. Riparian vegetation was often not present, with poaching up to the bank edges. Some hedgerows along lengths of the channel banks were noted, providing little bank stability through root strength but some shading.

[3] The River Invertebrate Classification Tool and Lotic-invertebrate Index for Flow Evaluation tool are indices used for classification of macroinvertebrates.

### *Power Station Catchment*

5.2.18 Nant Porth-y-pistyll lies within the Power Station Catchment which is adjacent to the Existing Power Station. The main water body within this catchment is the stream at Porth-y-pistyll, running in a north-westerly direction along the south-western boundary of the Existing Power Station through boggy wet grassland. During a geomorphological reconnaissance survey, the stream was observed to emerge from a culvert structure adjacent to the Existing Power Station gates. A drain cover located upstream of this point suggested an extensive culverted water body (see appendix D8-2, Application Reference Number: 6.4.27). The source of the water body is thought to be on the site of the Existing Power Station where drainage is fed into a culvert structure.

5.2.19 The channel was observed during the surveys to be wetted for approximately 200m south of the shoreline in autumn and dry in the upper reaches over summer. A tributary 75m upstream from the shoreline and flowing from elevated gorse and tall shrub was considered to contribute a significant proportion of total summer flow in the main stem.

5.2.20 With the exception of the lower 75m of the water body, no defined channel was observed, with an increase in wetland vegetation species (emergent rush and reed) delineating the extent of the channel. The channel appeared unmodified, following an undefined channel form. The lower reach of the water body was noted to be deeper, but with thick vegetation (95% cover) present. This had resulted in flow types being limited to slack and very low-energy, depositional glides (see appendix D8-2, Application Reference Number: 6.4.27). The channel was judged likely to be choked year round by terrestrial grasses and a mix of wetland and semi-aquatic plant species throughout its length. The wetted depth recorded was less than 0.1m and the channel width variable, but rarely more than 0.5m (see appendix D8-2, Application Reference Number: 6.4.27). The stream was noted to disappear into a culvert immediately above the beach and was observed to run over the shingle foreshore further down the beach.

5.2.21 Water quality conditions were found to be typical of a catchment dominated by rural land use. The River Invertebrate Classification Tool classification of invertebrates on the Porth-y-pistyll water body was found to be good and with species typical of cleaner waters, such as stoneflies and some caddisflies, contributing to the good status (see appendix D8-2, Application Reference Number: 6.4.27). European eels are known to be present within this water body and are thought to have entered the stream by crossing over the shoreline from Porth-y-pistyll, as there is limited connectivity between the marine and freshwater environments at this location.

## *Anglesey North (GB641010620000)*

5.2.22 The Anglesey North water body comprises the coastal environment from the Existing Power Station to the east (as shown in figure 1). There are a number of fluvial non-reportable water bodies which drain into Anglesey North water body, including watercourses within the:

- Tre’r Gof Catchment (Tre’r Gof drains);

- Cemaes Catchment (Nant Cemaes); and
- Nant Nodwydd

### Anglesey North coastal water body

5.2.23 The Anglesey North water body is classified as having moderate status overall. Data provided by NRW (see appendix B) show that biological quality elements are at good status (based on benthic invertebrates). The classification of physico-chemical quality elements is high (based on dissolved inorganic nitrogen, dissolved oxygen, copper and zinc). The hydromorphological supporting elements are at high status (based on morphology being classified as high). However, Anglesey North fails the chemical assessment due to mercury and its compounds.

5.2.24 The boundary of the Anglesey North water body lies just to the east of the Existing Power Station and follows the coast as far as Trwyn Du. It is characterised by strong tidal currents and semi-diurnal tides and is well mixed all year round with no evidence of seasonal stratification with the exception of a weak thermal stratification near the Existing Power Station CW discharge (which lies within this water body). The Anglesey North water body is located immediately adjacent to The Skerries water body and the geology and seabed are the same as described for The Skerries water body.

5.2.25 The results of analysis from samples taken between 2010 and 2014 showed expected concentrations of chemicals. Many were below the limit of detection and values were in line with previous studies and typical of coastal waters around the north of Anglesey (see appendix D13-1, Application Reference Number: 6.4.83). In line with WFD monitoring data collected by NRW, mercury was found to exceed the Environmental Quality Standard (EQS) at site 1 (near Porth Wen) in October 2010 (see appendix D13-1, Application Reference Number: 6.4.83).

5.2.26 As with The Skerries water body, phytoplankton production was found to be low and the ecological communities characteristic of the exposed rocky coastline. In the immediate vicinity of the current CW discharge, the biota was noted to be clearly impoverished with the influence extending up to around 200m (see appendix 13-2, Application Reference Number: 6.4.84). The subtidal benthic communities were assessed to be of high quality and generally undisturbed (see appendix D13-2, Application Reference Number: 6.4.84).

5.2.27 Where comparisons can be made, the baseline data collected for the Wylfa Newydd Project show good correlation with WFD water body monitoring data as provided by NRW, including the exceedance of the EQS for mercury in water quality samples (see paragraph 5.2.25).

#### *Tre'r Gof Catchment*

5.2.28 The Tre’r Gof Catchment is located to the south-east of the Existing Power Station and the non-reportable water bodies within this catchment are referred to as Tre’r Gof drains. Tre’r Gof SSSI lies within the catchment and is

recognised for its rich fen habitat. The SSSI wetland area was found to be wetted all year round ensuring a permanently wetted channel at its margin.

5.2.29 During the geomorphological reconnaissance survey, the Tre'r Gof drains were noted to have an artificially straightened planform, with a uniform channel cross-section, typically noted as over-deep and over-wide (see appendix D8-2, Application Reference Number: 6.4.27). The water body was observed during the survey to be choked with terrestrial vegetation and to be acting as a sediment sink, with the channel observed to be narrowing in some reaches. The channel substrate was found to predominantly consist of silt.

5.2.30 Water quality surveys carried out between 2011 and 2016 indicated that suspended sediment concentrations within the catchment varied between sites and sampling seasons. Water quality conditions within the Tre'r Gof Catchment were found to be typical of a catchment dominated by rural land use, including livestock grazing. Occasional elevated metal concentrations were detected in samples taken between 2012 and 2014 (see appendix D13-1, Application Reference Number: 6.4.83).

5.2.31 Lotic-invertebrate Index for Flow Evaluation scores from this catchment indicated that the invertebrate communities are characteristic of slow-flowing or standing waters, reflecting the fen/wetland nature of this site (see appendix D9-16, Application Reference Number: 6.4.49). Proportion of Sediment-sensitive Invertebrates was interpreted as sedimented or heavily sedimented, indicating that a significant proportion of taxa present in the Tre'r Gof Catchment are tolerant of sedimentation.

5.2.32 In 2013 and 2014, incidental records were made of European eel at Porth Wylfa (see appendix D9-16, Application Reference Number: 6.4.49). In 2014, an additional incidental record of European eel was made at the Tre'r Gof drains (see appendix D9-16, Application Reference Number: 6.4.49). A natural head drop between the Porth y Wylfa cliff and beach was observed, resulting in limited upstream access for fish. It is therefore assumed that the European eel are migrating across the headwaters of the fluvial catchments and are not ascending this head drop.

***Cemaes Catchment***

5.2.33 The Nant Cemaes is a small non-reportable water body flowing through Cemaes from its source west of Llanfechell for approximately 3.5km before discharging into Cemaes Bay. The predominant land use within the Cemaes Catchment appears from aerial photography images to be agricultural, with some tilled land and some livestock grazing. The water body is fed by some smaller drains that were observed to typically be man-made with artificially straightened planforms.

5.2.34 A geomorphological reconnaissance survey has been conducted of the fluvial water body. The channel has a straightened channel planform with a uniform cross-section, considered over-deep and over-wide (see appendix D8-2, Application Reference Number: 6.4.27). Smooth flow was noted during the survey to be the predominant flow type; however, rippled flow was also observed at the mouth of the water body into Cemaes Bay. The upstream

reach along the A5025 was recorded as artificially reinforced with silt substrate. The downstream reach immediately upstream of Cemaes Bay had fully vegetated banks.

5.2.35 It is likely that Nant Cemaes has been historically modified, with visual evidence of realignment alongside field boundaries or urban development (see appendix D8-2, Application Reference Number: 6.4.27). Improved flow diversity and substrate was observed towards the lower sections of the sub-catchment (see appendix D8-2, Application Reference Number: 6.4.27).

5.2.36 Water quality surveys carried out between 2011 and 2016 indicate that suspended sediment concentrations within the stream varied between sites and sampling seasons. Water quality conditions were within expected ranges, and nutrient and metal concentrations recorded as generally low (see appendix D9-16, Application Reference Number: 6.4.49).

5.2.37 Both macroinvertebrate and macrophyte communities within the Cemaes Catchment were found to be of low value and typical of lowland coastal streams (see appendix D9-16, Application Reference Number: 6.4.49). The value of fish communities was also considered to be low (see appendix D9-16, Application Reference Number: 6.4.49). A single record of a European eel from 2013 indicates that migratory species could enter the lower reaches of the catchment and utilise available habitats. However, limited habitat for fish species was recorded within the upper catchment due to channel modification and low flows (see appendix D9-16, Application Reference Number: 6.4.49).

#### *Nant Nodwydd*

5.2.38 The Nant Nodwydd is a small non-reportable water body rising in Talwrn, flowing northeast for approximately 6.3km, passing through Pentraeth before draining into Red Wharf Bay (Anglesey North water body). The upper reach of the Nant Nodwydd flows through the Corsydd Mon (Anglesey Fens) SAC and Cors Bodeilio SSSI.

## *Cemlyn Lagoon (GB610100083000)*

5.2.39 The Cemlyn Lagoon water body is located to the west of the Wylfa Newydd Development Area. It is hydrologically connected to The Skerries water body via a sluice at the lagoon outfall and also via the shingle bank which separates the lagoon from the sea. Nant Cemlyn lies within the Cemlyn catchment and is one of the main inputs of freshwater into the lagoon (see figure 2).

### Cemlyn Lagoon Coastal Water Body

5.2.40 Cemlyn Lagoon is a coastal water body located just to the north-west of the western boundary of the Wylfa Newydd Development Area. It is designated as a SSSI, a SAC and a Special Protection Area (SPA) and is an Annex 1 priority habitat. The nature conservation status of this feature is currently favourable.

5.2.41 Cemlyn Lagoon water body is a HMWB and is classified as having Good Ecological Potential. Biological and physico-chemical quality elements are not assessed. Data provided by NRW (see appendix B) show that the supporting

hydromorphological element (surface water) is classified as 'good' and that it has good chemical status.

5.2.42 The movement and sorting of glacially derived materials by tidal and wave forces has historically caused sediments to become locally gathered forming beaches, including that at Cemlyn Bay (see appendix D12-2, Application Reference Number: 6.4.81). Cemlyn Lagoon is classified as an HMWB due to flood protection [RD10]. Despite this pressure, it is considered to be the best example of a saline coastal lagoon in Wales and the current status is good. The lagoon is fed with freshwater from two main streams (Nant Cemlyn and Afon Hen Borth) and a number of minor drains and springs. Cemlyn Lagoon was classified as a percolation lagoon [RD11], as there is an exchange of water between the sea (The Skerries water body) and the lagoon through the shingle bank, which is occasionally overtopped. It is also classified as a 'sluiced' lagoon, as seawater exchange occurs via the sluice, which is operated to control water levels for nature-conservation purposes.

5.2.43 The lagoon supports specialist invertebrate fauna able to cope with the fluctuating environmental conditions (temperature and salinity). This pattern of seasonal changes has been described in previous work [RD12]. The lagoon supports aquatic flora species, most of which are typically associated with brackish and marine environments.

***Cemlyn Catchment***

5.2.44 The Nant Cemlyn has a catchment area of approximately 2.3km$^2$. The catchment encompasses both Nant Cemlyn and Nant Plas Cemlyn (a small tributary). The valley profile is shallow and has a main land use of pastoral agriculture with some tilled arable land. The non-reportable water bodies within the catchment appear to have been artificially straightened for land drainage purposes, particularly the Nant Plan Cemlyn. The Nant Cemlyn, the main non-reportable water body within the catchment, is a small channel demarking a field boundary, located just west of the Wylfa Newydd Development Area. The channel was noted to be approximately 2m wide where it heads north towards Neuadd. The channel was observed to become narrower, approximately 1m in width, continuing in a northerly direction alongside Nanner Road. Some locations of natural adjustment were noted during the survey in the form of erosion and deposition, creating a sinuous planform for the confined channel. Several locations of poaching and consequent slumping were also noted along the left bank of the channel during the geomorphological survey.

5.2.45 Culverts and bridges were recorded along the entire reach. During surveys carried out between 2011 and 2016, some terrestrial vegetation was observed within the channel and the substrate, recorded as primarily gravels, cobbles and pebbles (see appendix D8-2, Application Reference Number: 6.4.27). Some geomorphological features were noted during the survey, including riffles and runs. At Neuadd, there was also a diverse range of macrophytes noted in the channel. The culvert upstream at Nanner is not thought to pose a significant impediment to fish passage.

### *Caernarfon Bay North (GB621010380000)*

5.2.46 The Caernarfon Bay North water body lies to the south of The Skerries water body and extends down the eastern side of Anglesey to Dinas Dinlle, just south of the Menai Strait. There is one non-reportable water body that drains into Caernarfon Bay North, known as Nant Carreglwyd.

#### The Caernarfon Bay North coastal water body

5.2.47 The Caernarfon Bay North water body is classified as having good status overall. Data provided by NRW (see appendix B) show that biological quality elements are at good status (based on benthic invertebrates). The classification of physico-chemical quality elements is high (based on dissolved oxygen, copper and zinc). The hydromorphological supporting elements are classified as 'supports good' (based on morphology) and the chemical assessment is good (based on an assessment of priority substances).

***Nant Carreglwyd***

5.2.48 The source of the Carreglwyd is situated to the east of Llanrhuddlad, where it flows west to its mouth on the western coast of Anglesey. The water body flows under several small road bridges. The Carreglwyd has long sections where the water body appears to have been artificially straightened. Aerial photography shows that the water body is predominantly bordered by agricultural fields, consisting of semi-improved grassland typically used for pasture, except for one section of woodland around the Carreglwyd Estate.

5.2.49 The Carreglwyd is a small field drain demarking a field boundary to the south of the A5025, and running through an agricultural field to the north of the road. The channel to the north of the A5025 was noted to consist of a small, silty channel approximately 1m in width. The channel banks were observed to have been poached in several locations and there was also evidence of bank erosion and channel narrowing (exacerbated by poaching).

5.2.50 Water quality surveys carried out between 2011 and 2016 indicated that suspended sediment concentrations varied between sites and sampling seasons. Water quality conditions within the Nant Carreglwyd were found to be typical of a catchment dominated by rural land use, including livestock grazing.

5.2.51 Both macroinvertebrate and macrophyte communities within Nant Carreglwyd were found to be of low value and typical of lowland coastal streams (see appendix D9-16, Application Reference Number: 6.4.49). This water body was not suitable for sampling fish.

## 5.3 Transitional WFD water bodies

### *Alaw (transitional) (GB521010207600)*

5.3.2 The Alaw (transitional) water body is classified as having moderate status overall. Data provided by NRW (see appendix B) show that biological quality elements are at good status (based on macroalgae). The classification of physico-chemical quality elements is moderate (based on dissolved inorganic

nitrogen and dissolved oxygen). The hydromorphological supporting elements are classified as 'supports good' (based on morphology) and the chemical assessment is good.

5.3.3 The Alaw transitional water body commences just west of the A5025, at the Alaw fluvial water body. The downstream limit of the Alaw transitional water body is where it meets Holyhead Bay coastal water body at the coast at Traeth y Gribin. The transitional water body has agricultural semi-improved grassland present along both banks. A weir is located at the upstream extent of the water body, demarcating the boundary between a catchment influenced by coastal processes and one influenced by fluvial processes.

5.3.4 The transitional water body was found to be approximately 20m to 30m wide in the upper reaches, becoming wider as it progressed towards the coast. Some areas of vegetation had developed at the margins of the channel. The bed appeared uniform with the channel becoming progressively deeper towards the west.

5.3.5 The Alaw is typified by large tides, small river flow and littoral drift. Habitats within the estuary include cliffs, saltmarsh, sand and mudflats and rock platforms.

5.3.6 Cefas [RD13] indicates that the enclosed Alaw estuary is a highly significant contaminating influence on the adjacent inland sea, with sewage, agriculture and grazing wildfowl identified as contributors to poor water quality. The Alaw estuary is influenced significantly by the freshwater inflows from the Afon Alaw and the enclosed nature of the estuary results in decreased salinities across the water body. Fish surveys undertaken below the existing A5025 crossing point indicate a number of estuarine species tolerant of low salinity, including flounder (*Platichthys flesus*) and common goby (*Pomatoschistus microps*). European eel and river lamprey have been recorded form the Afon Alaw water body and are known to migrate through the transitional water body. Incidental records indicate bass (*Dicentrarchus labrax*) and mullet (unknown species) using the Alaw estuary.

5.3.7 The Alaw (transitional) water body is currently failing to meet its objectives due to dissolved inorganic nitrogen. This is suspected to be due to diffuse source pollution from dairy/beef cattle and due to point source pollution related to sewage discharge [RD14].

## 5.4 Fluvial WFD water bodies

### *Alaw – downstream Llyn Alaw (GB110102058981)*

5.4.2 The Alaw – downstream Llyn Alaw water body is a HMWB which is classified as having moderate potential overall. Data provided by NRW (see appendix B) shows that biological quality elements are classified as good (based on fish and invertebrates achieving high and good potential respectively). The classification of physico-chemical quality elements is good and the chemical assessment is also good. The mitigation measures assessment is 'moderate or less' which is the reason that this water body has not yet reached good potential.

5.4.3 The source of the Alaw is situated to the north-east of Llannerch-y-medd, where it flows in a northerly then westerly direction into the Llyn Alaw reservoir. The Alaw flows out of the reservoir through an overflow and continues in a south-westerly direction. The water body then passes under several small road bridges and access tracks before joining the Alaw estuarine/transitional water body at Llanfachraeth.

5.4.4 The Afon Alaw has a uniform, artificially straightened planform for the majority of its length. Aerial photography shows large areas of woodland and shrub bordering the water body for approximately 2.4km downstream of the Llyn Alaw reservoir. Further downstream, the water body flows adjacent to pastoral grazing fields with very little riparian/buffer zone. Some signs of natural adjustment can be seen in the form of erosion, particularly to the west of Llanfachraeth.

5.4.5 Results from aquatic ecology surveys revealed that suspended sediment was less than the laboratory minimum recordable value (<3 mg/L) at the two survey sampling sites. However, reactive phosphorus concentrations failed to meet good WFD status at one of the survey sites, indicating possible enrichment due to land use and potentially linked to increased faecal matter caused by livestock poaching. However, WFD monitoring data indicated that phosphate met the criteria for good status (see appendix B).

5.4.6 The River Invertebrate Classification Tool classification of invertebrates was possible on two sites within the catchment, which both achieved good status under WFD guidelines, which is in line with WFD monitoring data (see appendix B). The River Invertebrate Classification Tool classification generates Ecological Quality Ratios, which allow comparison of the metrics to reference sites.

5.4.7 Electrofishing surveys revealed six fish species have been found within the catchment. These are brown trout, European eel, river lamprey, three-spined stickleback (*Gasterosteus aculeatus*), flounder and perch (*Perca fluviatilis*). The marine influence at the lower end of the catchment explains the presence of the flounder caught in the near-estuarine environment of the lowermost site sampled.

### *Tan R'Allt (GB110102059100)*

5.4.8 The Tan R'Allt water body is classified as having moderate overall status. Biological quality elements have not been monitored for WFD reporting purposes. Data provided by NRW (see appendix B) show that physico-chemical quality elements are at moderate status. The hydromorphological supporting elements are classified as 'supports good' (based on morphology and the hydrological regime) and the chemical assessment is good.

5.4.9 The Tan R'Allt water body includes the Tan R'Allt and the network of tributaries feeding into this channel. The source of the Tan R'Allt is to the west of Mynydd Mechell, and it flows south to a confluence with the Alaw estuary (a transitional water body).

5.4.10 The Tan R'Allt channel has a sinuous planform but some reaches have been artificially straightened. Aerial photography indicates that the Tan R'Allt is

predominantly adjoined by agricultural fields, consisting of both semi-improved grassland and tilled arable fields. There appeared to be very little vegetated riparian corridor present along either bank at the time of the survey.

5.4.11 Road and field drains were observed to enter the channel, potentially sources of fine sediment into the Tan R'Allt. The channel was observed to be between 2m and 2.5m width throughout, with the exception of locations where poaching by animals had widened the channel. There was evidence of undercutting, slumping and vertically eroding banks within the downstream reach indicating active processes. A vegetated gravel mid-channel bar and side bars were observed (indicative of deposition).

5.4.12 Water quality sampling carried out for the Wylfa Newydd Project indicated that the water body failed to meet good status for reactive phosphorus at the representative site. WFD monitoring data indicated that phosphate did not meet the criteria for good status and is currently classified as moderate (see appendix B).

5.4.13 The adjacent agricultural land could potentially be a contributor to the high phosphate concentrations through runoff. Following field sampling, the River Invertebrate Classification Tool achieved good status within this catchment (see appendix G9-1, Application Reference Number: 6.7.22). Several species of mayfly (from families Baetidae, Caenidae and Ephemerellidae) were recorded within the water body. The Lotic-invertebrate Index for Flow Evaluation score reflects an invertebrate community of faster, consistently flowing waters. Analysis of the Proportion of Sediment-sensitive Invertebrates shows that the site sampled had a moderate amount of sediment accumulation. The Ecological Quality Ratio suggested that there were few flow-stressors at these sites that would not be present in pristine reference conditions. Brown trout, European eel, lamprey (*Lampetra* spp.) and three-spined stickleback were caught from this water body, with brown trout as the most abundant species.

### *Cleifiog (Valley) (GB110102058930)*

5.4.14 The Cleifiog (Valley) water body is classified as having moderate status overall. Biological quality elements have not been monitored for WFD reporting purposes. Data provided by NRW (see appendix B) show that physico-chemical quality elements are at moderate status. The hydromorphological supporting elements are classified as 'supports good' (based on morphology) and the chemical assessment is good.

5.4.15 The Cleifiog (Valley) water body flows in a south-westerly direction from Bodedern for approximately 4km before crossing through a large culvert (approximately 100m in length) under the A55. Section 2 of the proposed development would run parallel to the Cleifiog (Valley) for 2.5km, and at its closest point would be 140m to the east of the existing A5025. A number of small surface water drains feed the Cleifiog (Valley) from the A5025. These non-reportable water bodies are low-quality field drainage and likely to be ephemeral during drier months.

5.4.16 The channel for the Cleifiog (Valley) is likely to have been historically realigned (straightened) for agricultural purposes, delineating a number of field boundaries. The vegetated riparian zone was found to be fragmented along the water body, with a scattering of trees. Aerial photography suggests the predominant land use in the catchment to be livestock grazing. Some fords were visible along the water body, possibly leading to accelerated erosion and fine sediment delivery by vehicle and animal movements. The channel was observed to have some submerged and floating macrophytes at the time of the visit, particularly in reaches of no perceptible flow.

5.4.17 Reactive phosphorus concentrations were elevated such that the water body failed to meet good WFD status at one of the survey sites, indicating possible enrichment due to adjacent agricultural land use. All other monitored sites currently meet good WFD status. This is in line with WFD monitoring data which shows that phosphate is currently achieving moderate status in this water body (see appendix B).

5.4.18 The biological quality element for invertebrates on the Cleifiog (Valley) water body was classified as poor during the surveys of the Off-line sections of the Highway Improvements in 2015, although only one site along this water body was sampled. Analysis of the Proportion of Sediment-sensitive Invertebrates indicated that the site sampled had extensive sediment deposits and when the Ecological Quality Ratio was calculated, it revealed that there was a serious impact from sedimentation at this site that would not be present in pristine reference conditions.

5.4.19 Macrophyte surveys showed species indicative of nutrient-enriched, slow-flowing environments including two species of duckweed, the fat duckweed (*Lemna gibba*) and the least duckweed (*Lemna minuta*).

5.4.20 Fish surveys on the Cleifiog (Valley) revealed the presence of European eel and three-spined stickleback.

### Nant BrynTeg and tributary of Nant Cleifiog Isaf (north and south)

5.4.21 Nant BrynTeg and tributary of Nant Cleifiog Isaf (north and south) form part of the Cleifiog (Valley) Catchment. These non-reportable water bodies are man-made drainage channels with limited geomorphological features, ephemeral in nature. They are considered to be fine sediment sources to the main WFD water body in the Cleifiog (Valley) water body catchment.

### *Crigyll (GB110102058970)*

5.4.22 The Crigyll water body is classified as having moderate status overall. Data provided by NRW (see appendix B) show that biological quality elements are at moderate status (based on fish and invertebrates achieving good and moderate status respectively). The classification of physico-chemical quality elements is good and the chemical assessment is also good. The hydromorphological supporting elements are classified as 'supports good' (based on morphology and hydrological regime).

5.4.23 The Crigyll water body catchment is located to the east of Valley where the river flows from near Trefor to Bryngwran and then onwards to the coast at Rhosneigr. The land use is predominantly rural, dominated by pasture. Hedgerows line the bank tops of a number of the smaller drains and non-reportable water bodies, providing some diversity of land use. The catchment is sparsely populated with small farm holdings.

5.4.24 Within the vicinity of the Park and Ride facility at Dalar Hir, the Nant Dalar Hir is the key water body forming part of the Crigyll water body. The study area lies approximately 3.1km upstream of the Crigyll. Situated between the study area and the water body lies Llyn Traffwll, a shallow lake previously used as a reservoir, and now a SSSI designated for aquatic plant interests.

5.4.25 At the time of the walkover survey the Nant Dalar Hir was observed to have a modified channel cross-section, likely to be a reflection of historical dredging. The bed substrate was noted to consist of gravels and pebbles with some silt in the slacker flowing areas. Some in-channel vegetation was observed to have narrowed the channel locally. It is likely that the channel would become choked with vegetation during the summer months. A number of small drains were noted draining Nant Dalar Hir. These were observed to be typically trapezoidal and uniform in cross-section, with stagnant water recorded at the time of survey. It is likely that Nant Dalar Hir also receives surface water runoff during wet periods from the remainder of the site.

5.4.26 At the time of the walkover survey the Nant Dalar Hir supported macrophyte and phytobenthos communities, indicative of a minor deviation from reference condition. Invertebrates were reported as poor quality, attributed to potential organic pollution. The presence of a range of bed materials and submerged and emergent macrophytes was judged to provide adequate habitat and not to be a limiting factor to macroinvertebrates. Biological metrics indicated that sections of the Nant Dalar Hir support biological assemblages typical of environments with a high degree of sediment deposition. Three-spined and nine-spined stickleback (*Pungitius pungitius*) were reported in abundance

from the Nant Dalar Hir, and European eel were recorded from the wider catchment, indicating the potential for migratory pathways to the Crigyll.

5.4.27 The presence of Llyn Traffwll could reduce the potential for mobile species to move between the Nant Dalar Hir and the Crigyll water body.

### *Ceint (GB110102058940)*

5.4.28 The Afon Ceint water body is classified as having moderate status overall. Data provided by NRW (see appendix B) show that biological quality elements are at moderate status (based on mitigation assessment). The classification of physico-chemical quality elements is good and the chemical assessment is also good. The hydromorphological supporting elements are classified as 'supports good' (based on morphology and hydrological regime).

5.4.29 The Ceint waterbody catchment is located to the south west of Pentraeth and flows south west for 6.9km before joining the Afon Cefni (Ceint to Cefni reservoir water body). The compensation site at Cae Canol-Dydd lies on an unnamed tributary of the Afon Ceint, with this watercourses draining into the Afon Ceint approximate 4.8km downstream of the compensation site.

## 5.5 Groundwater WFD water bodies

5.5.1 The Wylfa Newydd Project includes elements within two groundwater bodies. The majority of the project is underlain by the Ynys Môn Secondary WFD groundwater body, but part of the scheme to the east of Llangefni is underlain by the Ynys Môn Central Carboniferous Limestone WFD groundwater body. Each of these water bodies and the development activities within them are discussed below.

### *Ynys Môn Secondary (GB41002G204400)*

5.5.2 The Ynys Môn Secondary WFD groundwater body covers an area of 623km$^2$ comprising most of northern, central and southern Anglesey. The aquifers it comprises are a mixture of Pre-Cambrian schists, psammites and igneous intrusions, Upper Cambrian and highly indurated Ordovician bedrock and extrusive Cambrian igneous units. All component strata are considered by NRW to be secondary aquifers that contain small to limited amounts of groundwater, dominantly occurring in near surface weathered zones and fractures.

5.5.3 The bedrock aquifer is overlain by superficial deposits although there are a small number of areas where there is no superficial cover. The superficial deposits comprise glacial till, occasional alluvium and relatively rare glaciofluvial sand and gravel. In the far south of Anglesey, there are blown sand and tidal flat coastal zone deposits. Recharge through the glacial tills and alluvium is likely to be low although, the superficial deposits can contain small and locally important groundwater resources.

5.5.4 The WFD defines groundwater as "all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil". This is further defined in the United Kingdom technical advisory group (UKTAG) guidance [RD15] which states that a groundwater body is "part of an

aquifer and is a receptor as a long term resource that can be exploited for human activities or support surface flows & ecosystems." UKTAG guidance [RD15] also includes groundwater in strata overlying or underlying a groundwater body and groundwater that is permanently unsuitable for use as water that is within the saturation zone, and therefore using the definition in the WFD would be considered as part of a groundwater body. Therefore, when the groundwater body is referred to in this report this includes all superficial, perched and bedrock layers.

5.5.5 Depths to water in the Ynys Môn secondary groundwater body are variable, depending partly upon the landform. Regionally all groundwater flow is towards the coast, but surface water baseflow and springflow discharges from the superficial and bedrock aquifer occur.

5.5.6 Groundwater quality is spatially variable across the water body with groundwater generally varying from mildly acidic to mildly alkaline (pH6 to pH8). Alkalinity and hardness vary across the body as do sulphate, chloride and nitrate. Chloride and nitrate can occasionally exceed the drinking water limits. Localised pollution also occurs, the most significant associated with historical mining activities at Parys Mountain.

5.5.7 The IACC maintains a list of Private Water Supplies (PWSs) that it is aware of under the Private Water Supplies (Wales) Regulations 2010. Under these Regulations, the local authority has a duty to monitor private supplies and to make and maintain records for every water supply in its area used for potable purposes.

5.5.8 There are numerous wells and springs marked on maps across the area, many of them historic and disused although there remain a number of private and commercial agricultural and potable groundwater abstractions. Abstractions are small as the inherent nature of the aquifers cannot support large abstractions.

5.5.9 The published data state that the Ynys Môn Secondary groundwater body is currently achieving poor status overall, as the current chemical status is poor due to failure of the chemical dependent surface water body status test.

5.5.10 NRW has advised that an objective of less than good by 2027 (less stringent objective) has been set for the Ynys Môn Secondary groundwater body. Groundwater bodies which fail because of legacy metal mine contamination have been described as "*Technically infeasible - no known technical solution is available*". This includes Ynys Môn Secondary which fails due to contamination of surface water bodies Goch Dulas and Goch Amlwch by contaminated groundwater.

5.5.11 The following sections present further information on the Ynys Môn Secondary groundwater body in relation to the different geographical areas covered by the Wylfa Newydd Project.

### Wylfa Newydd Development Area

5.5.12 The following documents provide detailed baseline information regarding the Wylfa Newydd Development Area:

- chapter D8 (Application Reference Number: 6.4.8);
- appendix D8-3 (Application Reference Number: 6.4.28);
- appendix D8-5 (Application Reference Number: 6.4.30); and
- appendix D8-6 (Application Reference Number: 6.4.31).

5.5.13 The Wylfa Newydd Development Area is located in a geologically complex area. The superficial deposits of glacial origin underlie much of the Wylfa Newydd Development Area in varying thicknesses. Typically, the superficial deposits are less than 5m thick; however, superficial deposits are up to 30m thick beneath half-egg-shaped hills known as 'drumlins'. A deep sequence, potentially about 30m thick, of alluvial deposits and lacustrine sediments underlie the Tre'r Gof SSSI basin (see appendix D8-5, Application Reference Number: 6.4.30).

5.5.14 Groundwater is encountered in both the superficial deposits (where they are sufficiently thick) and in the bedrock. Fracture flow is the dominant flow mechanism for groundwater movement in the bedrock. For the superficial deposits, intergranular flow within the pore spaces will be the dominant flow mechanism.

5.5.15 Permeability testing indicates a range in the superficial deposits from 0.0005m/d to 60m/d, whilst that in the bedrock ranges from 0.001m/d to 3m/d. Results of the two pumping tests, which measure permeability over a larger area than the tests in individual boreholes (from which the majority of data have been derived), showed permeability to be approximately 0.1m/d to 1m/d.

5.5.16 Granular superficial deposits, expected to be more permeable and consisting of variably clayey, silty sand and gravel, are present across the south-western half of the site. These include examples where significant layers of both low permeability and granular materials are present. The ground investigations information suggests that granular materials become the predominant superficial deposits broadly to the south-west of a line between Tregele village and Porth-y-pistll (Application Reference Number: 6.4.28). Low permeability, clay dominated deposits are still present in this area and are observed further to the south-west in the vicinity of Cae Gwyn.

5.5.17 Groundwater levels are monitored in boreholes across the Wylfa Newydd Development Area using a combination of manual dipping and pressure transducers, connected to data loggers. In general terms, the groundwater levels show that groundwater flow follows ground levels with groundwater discharging locally to streams to the sea at the rocks along the coastline. The highest water levels in the bedrock are recorded to the south of the Wylfa Newydd Development Area at around 30m Above Ordnance Datum (AOD), with groundwater levels towards the coast being close to sea level (see appendix D8-3, Application Reference Number: 6.4.28).

5.5.18 Groundwater contours in the superficial deposits do show a different pattern from those in the bedrock with much greater topographic control than for the bedrock, although ultimately with groundwater flowing towards the coast, as is the case with the bedrock. There are groundwater 'mounds' to the south of the Wylfa Newydd Development Area associated with drumlins, and there is a further groundwater high associated with elevated land to the east of the Existing Power Station. There is a distinct groundwater low point for the superficial deposits associated with the basin at the Tre'r Gof SSSI with the levels indicating that groundwater flow in the superficial deposits in this area is to the Tre'r Gof Catchment (see appendix D8-5, Application Reference Number: 6.4.30).

5.5.19 Until 2018 Anglesey was exempt from groundwater abstraction licensing, and so NRW does not hold any records of groundwater abstractions. However, the IACC has identified three active PWSs within 1.5km of the centre of the Wylfa Newydd Development Area (see appendix D8-3, Application Reference Number: 6.4.28).

5.5.20 Groundwater quality has been measured in the period June 2015 to August 2017 on a quarterly basis at approximately 30 boreholes installed in the bedrock and superficial deposits across the Wylfa Newydd Development Area (see appendix D8-3, Application Reference Number: 6.4.28). Groundwater quality is considered to be generally good (when compared to surface water EQSs). However, elevated manganese was measured in several boreholes and localised elevated concentrations of ammoniacal nitrogen and metals were also recorded. In terms of electrical conductivity, the monitoring data do not show saline intrusion into the aquifer.

5.5.21 Within the Wylfa Newydd Development Area there are two GWDTEs associated with the Ynys Môn Secondary groundwater body; Tre'r Gof and Cae Gwyn which are both also designated as SSSIs. Tre'r Gof SSSI is located to in the east of the Wylfa Newydd Development Area whilst Cae Gwyn SSSI is situated within the Afon Cafnan catchment at the head of the Nant Caerdegog Isaf (see figure 2).

### Off-Site Power Station Facilities

5.5.22 Superficial deposits are absent for the majority of this site, although glacial till is present in the east. The bedrock beneath the site comprises the Gwna Group, a metamorphic bedrock unit containing psammite, quartzite and pillow lavas. A quartzitic igneous intrusion, also belonging to the Gwna Group, crosses the bedrock in the north-east of the site, with a north-east/south-west trend, and has a surface width of approximately 25m.

5.5.23 Despite the absence of any drift at the site, the low permeability soils and the existing hardstanding are likely to restrict local recharge rates to the aquifer (see chapter E8, Application Reference Number: 6.5.8).

5.5.24 A list of potable abstractions in Anglesey is held by the Isle of Anglesey County Council and one private water supply is identified to the immediate west of the site at Ty'n-y-Buarth as detailed in chapter E8 (Application Reference Number: 6.5.8). However, it should be noted that there may be abstractions in the area

that are unknown to the Isle of Anglesey County Council. A private water supply at Garreglwyd, to the north west of the proposed Off-Site Power Station facilities has been scoped out due to its distance (chapter E8, Application Reference Number: 6.5.8) from the Off-Site Power Station Facilities.

5.5.25 A well is shown on OS mapping, along the southern site boundary of the Off-site Power Station Facilities site, although no evidence was found during the site walkover to suggest that this well was in use. A spring is shown approximately at this location on historical mapping dating from 1889 which is subsequently marked as a well on the 1900 map. This suggests it may originally have been a natural feature that was formalised before falling into disuse. There are a total of 13 wells shown within 1km on OS maps but none are known to be in use (see chapter E8, Application Reference Number: 6.5.8).

5.5.26 Groundwater monitoring at a borehole that is 170m to the south-west of the proposed Off-site Power Station Facilities shows that the water table is at 3m to 4m below ground level (see chapter E8, Application Reference Number: 6.5.8). Water levels are likely to drop further during the summer months with annual fluctuations in the bedrock in this area typically being of the order of 2m.

### Park and Ride facility at Dalar Hir

5.5.27 With the exception of a small area in the south of the site, superficial deposits at the Park and Ride predominantly comprise glacial till. The bedrock underlying the majority of the site comprises mica schist and psammite, belonging to the New Harbour Group rock formation. Two igneous intrusions cut into the New Harbour Group in the centre of the Park and Ride and trend north-east to south-west. The eastern portion of the site, to the east of the Nant Dalar Hir, is underlain by interbedded sandstone and conglomerate.

5.5.28 Given the absence of groundwater-monitoring boreholes in the area, there is no groundwater level or flow data available for this assessment. Based on the geology the groundwater body is associated with the superficial deposits and most incident rainfall will run off or become shallow throughflow to local streams and ditches (see chapter F8, Application Reference Number: 6.6.8).

5.5.29 Data provided by the IACC indicates that there are two known PWS within the Park and Ride study area. The closest is a PWS located approximately 750m south of the site at Alltwen-wen, although the IACC records show that this is no longer in use. The closest active abstraction is a commercial PWS that lies 830m north-west of the site at Bodowyr (chapter F8, Application Reference Number: 6.6.8) at a commercial caravan site and hotel. Ordnance Survey mapping shows the presence of two wells within the immediate vicinity of the proposed Park and Ride: one located within the Park and Ride boundary, immediately south of the Dalar Hir farmhouse; and another which is located 150m north of the northern border of the proposed Park and Ride (chapter F8, Application Reference Number: 6.6.8).

### A5025 Off-line Highway Improvements

5.5.30 The majority of section 1 is underlain by tidal flat deposits, with an area to the north and east underlain by glacial till (see chapter G1, Application Reference Number: 6.7.1) for a description of the sections). Data provided by the IACC indicates that there are no known PWS within 500m of section 1.

5.5.31 A thin strip of alluvium comprising clay, silt, sand, gravels and organic soils is present in section 3 along the watercourses associated with the Afon Alaw and extends to the east and west. The alluvium contains permeable layers capable of supporting water supplies at a local scale and may act as an important source of baseflow to rivers. The deposits are from 0.3m to 3m thick. There are also more permeable glaciofluvial sand and gravel deposits that can be considered important for local water supplies. There is a small area in the middle of section 3 where superficial deposits are absent and bedrock is exposed at the surface. There are thirteen wells, including two active PWSs, within 500m of section 3 (see chapter G8, Application Reference Number: 6.7.8).

5.5.32 Along the majority of section 5 superficial deposits are absent and bedrock is exposed at the surface. In the section 5 study area there are ten wells within 500m of highway improvements, including one active PWS recorded by the IACC (see chapter G8, Application Reference Number: 6.7.8).

5.5.33 Section 7 is underlain mostly by low permeability glacial till and there are six wells within 500m of the scheme, including one active PWS recorded by the IACC (see chapter G8, Application Reference Number: 6.7.8).

5.5.34 The Power Station Access Road Junction is located on glacial till overlying bedrock. The IACC holds details of one licensed groundwater abstraction within the study area and there are two wells shown on OS mapping (chapter G8, Application Reference Number: 6.7.8).

5.5.35 Depths to groundwater vary from 0.9m below ground level to 6m below ground level and often with one or more thin poorly permeable water bearing layers (see chapter G8, Application Reference Number: 6.7.8).

5.5.36 The underlying bedrock varies along the length of the A5025, but are largely identified by NRW as the Secondary B aquifer. The bedrock comprises predominantly lower permeability layers that could store and yield limited amounts of groundwater due to localised water-bearing features such as fissures, thin permeable horizons and weathering.

5.5.37 There are multiple wells marked on the OS mapping within 500m of the site, but none are identified as being in use.

### Logistics Centre at Parc Cybi

5.5.38 With the exception of a small area in the southwest of the site, which is underlain by glaciofluvial sand and gravel (maximum known thickness of 1.6m), the whole of the proposed Logistics Centre site is underlain by superficial deposits comprised of glacial till. Data provided by the IACC indicates that there is one known PWS within the study area and there are two wells shown on OS mapping.

### *Ynys Môn Central Carboniferous Limestone Groundwater Body (GB41001G204200)*

5.5.39 The Ynys Môn Central Carboniferous Limestone WFD groundwater body covers an area of 57.7 $km^2$ in east central Anglesey. The limestone belongs to the Clwyd Limestone Group and comprises a diverse range of limestone facies with subordinate sandstone and mudstone units and exhibits local dolomitisation and silicification. The limestone was deposited in faulted basins.

5.5.40 The Carboniferous Limestone bedrock is mostly overlain by superficial deposits comprising glacial till and occasional alluvium deposits. Dispersed recharge to the limestone through the glacial till is likely to be low but concentrated (point source) recharge to the limestone can also occur through small closed basins or dolines. Mudstone horizons will inhibit the downward percolation of rainwater through the limestone.

5.5.41 The glacial till is classified by NRW as Secondary (Undifferentiated) aquifer as although of generally low permeability, it can have a wide range of permeability and storage and may be locally important for groundwater supply and for river, lake and wetlands base flow and ecological support. As all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil is part of the groundwater body, the till is considered as part of the Ynys Môn Central Carboniferous Limestone groundwater body.

5.5.42 There are a number of private groundwater abstractions but no public groundwater abstractions in the groundwater body. Numerous wells and springs are marked on maps across the area. The depths and geology of these are unknown. Some will be historical and disused. Borehole yields are variable and unpredictable but typically small, up to 1 l/s. Good supplies in the limestone are only obtained if water-filled fractures with access to recharge are intersected.

5.5.43 The Ynys Môn Central Carboniferous Limestone groundwater body under Cycle 2 2015 classification is currently achieving poor status overall. This is due to poor chemical status attributed to failure of the chemical dependent GWDTE status test with respect to the Corsydd Lynn Anglesey Fen system which is a Natura 2000 and SAC designated site. The fens are reliant on base rich water from the groundwater body which is contaminated by diffuse sources arising from pesticide and herbicide used in the agricultural and rural land management sector.

5.5.44 NRW has set an objective to achieve overall good status by 2021 for the Ynys Môn Central Carboniferous Limestone groundwater body. Local targeted measures are to control and manage diffusion pollution at source by undertaking investigations and implementing waste management licences.

## SSSI Compensation Sites

5.5.45 Two SSSI Compensation Sites are proposed to the east of Llangefni at Cors Gwawr and Cae Canol-dydd, further details of which are provided in appendix D1-2 (Application Reference Number: 6.4.18). At Cae Canol-dydd the

bedrock beneath the majority of the site comprises of Lligwy Sandstone Formation with the bedrock to the east comprising of Clwyd Limestone Group. A layer of glacial till covers the bedrock across the majority of the site, with the exception of the far east of the site where there is no drift cover. Alluvium overlays the till in the west, along the route of the ordinary watercourse. A well is shown on OS mapping within the south-east of the site, adjacent to Canol-dydd farm (ruins), although this could not be found on site.

5.5.46 At Cors Gwawr the bedrock underlying the majority of the site comprises the Clwyd Limestone Group with interbedded sandstone with the east of the site being underlain by schist, quartzite and pillow lavas. A layer of glacial till covers the whole of the site, with alluvium overlaying the till in the north. There are two wells within the study area but it is not known if water is abstracted from these.

## 5.6 Migratory fish baseline

5.6.1 The baseline for migratory fish species draws upon baseline data collected for the Wylfa Newydd Project and is supplemented by desk-based searches. This has included data from the North Wales biodiversity records centre [RD16], online angling records, historical Environment Agency (Wales) routine monitoring, and consultation with current NRW fisheries officers.

5.6.2 Of the sixteen water bodies that may be indirectly affected through potential effects on migratory fish species (see table 4-6), seven water bodies have been monitored by NRW for the fish quality element. The classification of the fish quality element is summarised as follows:

- High status in Alaw – downstream Llyn Alaw, Wygyr, Goch Dulas, Ceint, and Cefni - Ceint to Cefni reservoir;
- Good status in Afon Crigyll and Cefni - Cefni reservoir east; and
- Not assessed in Tan R'Allt, Afon Cleifiog (Valley), Goch Amlwch, Lligwy, Ddrydwy (Llanfaelog), Ffraw, Cefni - Cefni reservoir west, Alaw (transitional) and Cefni.

5.6.3 River lamprey reside in optimal freshwater catchments and estuarine/near-coastal environments. This species is considered as being transient through the area for purposes of migration as it could utilise near-shore marine environments to move between river catchments.

5.6.4 River lamprey were not recorded within non-reportable water bodies in the Wylfa Newydd Development Area, but baseline surveys did record their presence on the Alaw – downstream Llyn Alaw water body and the Tan R'Allt. Between 2014 and 2015 a total of five river lamprey were recorded on the Alaw – downstream Llyn Alaw and one unidentified ammocoete on the Tan R'Allt.

5.6.5 There is also a single record of a river lamprey from entrapment surveys at the drum screens of the CW intake of the Existing Power Station (40 surveys carried out between March 2011 and July 2012) (see appendix D13-10, Application Reference Number: 6.4.92).

5.6.6 European eel migrate from freshwater through the coastal environment to spawning grounds in the mid-Atlantic. Glass eels returning from Atlantic breeding grounds may utilise near-shore migration routes, whereas adults migrating to breeding grounds would be found further offshore.

5.6.7 European eel have been recorded frequently across all of the fluvial water bodies discharging into The Skerries and Anglesey North coastal water bodies (see appendix D9-16, Application Reference Number: 6.4.49). Previous studies from the 1980s also recorded this species at the intake of the Existing Power Station [RD17].

5.6.8 Sea trout are known to reside locally in freshwater environments around Anglesey and have been recorded in the Wygyr, Ddrydwy and Cefni. Migration behaviours concentrate the marine life phase of this species close to natal rivers with localised movement in near-shore coastal waters. Evidence of long-distance (hundreds of kilometres) movement in coastal environments has been reported from some populations on the east coast of the UK.

5.6.9 Sea trout smolts have been reported from the coastal environment in baseline surveys carried out for the Wylfa Newydd Project. Between 2010 and 2015, a total of 16 sea trout were recorded.

5.6.10 Atlantic salmon move rapidly through the near-shore coastal waters to reach feeding grounds (as smolts) and on their return to natal rivers as adults. Smolts are assumed to migrate directly to offshore feeding grounds, whilst adult fish are more likely to traverse through coastal waters searching for their natal river.

5.6.11 Atlantic salmon were not recorded in marine surveys from 2010 to 2015, either in seine netting or trawling surveys. Neither was this species recorded in entrapment surveys at the Existing Power Station from 2011 to 2012 (see appendix D13-10, Application Reference Number: 6.4.92). There was one record of salmon from impingement surveys carried out by Spencer from 1985 to 1987 [RD17]. There is also one record from local biological records [RD16] of an Atlantic salmon in Cemlyn Bay in July 2005.

# 6 WFD assessment: Potential effects and identification of risks (step 3: WFD Scoping)

## 6.1 Introduction

6.1.1 This section is structured by WFD water body. All activities in all water bodies screened into the assessment have been considered and assessed in relation to the potential effects on and risks to quality elements. Where relevant this has included an assessment of the effects on non-reportable water bodies that are connected to coastal water bodies.

6.1.2 The detailed assessment tables for all relevant water bodies are provided in appendix D. This section should be read alongside the assessment tables for completeness. For each water body, a summary is given of the potential effects and risks requiring consideration as part of a detailed assessment.

## 6.2 The Skerries WFD water body

6.2.1 The assessment table for The Skerries water body is provided in appendix D, table 1. To inform the identification of potential risks to The Skerries, the effects on non-reportable fluvial water bodies that are hydrologically connected were considered, including the Afon Cafnan catchment (encompassing the Nant Caerdegog Isaf and other tributaries) and Nant Porth-y-pistyll.

### *Water body classification*

6.2.2 The Skerries water body is at high ecological status. The biological quality elements are at high status which is based on the status of invertebrates. No other biological quality elements were assessed (see appendix B).

### *Consideration of measures*

6.2.3 There are no measures identified in the Western Wales River Basin Management Plan (RBMP) for The Skerries water body.

### *Summary of potential effects and identified risks for The Skerries water body*

6.2.4 The assessment has determined the activities which either alone or cumulatively could present a potential risk to the achievement of the WFD objectives in The Skerries water body. The Site Campus lies within the Anglesey North coastal catchment and there are no pathways to an effect on The Skerries water body. The activities and impacts that are taken forward to the detailed assessment stage either alone or cumulatively are outlined in table 6-2 and include:

Power Station Site construction:

- construction and commissioning of concrete batching plant and associated surface water drainage;
- construction of the CWS, breakwaters and MOLF including dewatering (this infrastructure remains in place during operation);
- semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering;
- excavation and construction of CW intake and outfall, including tunnelling;
- bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas;
- installation and operation of a drainage system during Power Station construction;
- deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering;
- excavation of other features including building foundations including dewatering;
- progressive mound creation
- construction of internal roads, car parking, security fencing and permanent lighting;
- operation of the MOLF
- operation of concrete batching plant and associated surface water drainage; and
- sewage discharge during construction.

Power Station Site operation:

- abstraction of CW; and
- discharge of CW and other operational water discharges.

6.2.5 A list of structures that would be built within The Skerries water body and the associated footprints and durations that structures would be in place, is presented in table 6-1. The structures are shown on figure 9.

**Table 6-1 Structures present within The Skerries water body**

| Structure | Footprint | Duration in place |
|---|---|---|
| MOLF | 4.53ha | Throughout construction and operation |
| Western breakwater | 2.7ha | Throughout construction and operation |
| Eastern breakwater | 0.9ha | Throughout construction and operation |

| Structure | Footprint | Duration in place |
|---|---|---|
| CW intake | 5.4ha | Throughout construction and operation |
| Temporary cofferdam for CW intake | Within the footprint of the CW intake | Up to 5 years |
| CW outfall (* note 1) | 0.6ha (includes footprint of the outfall cofferdam) | Throughout construction and operation |
| Dredged area (this is the whole area that would be dredged including around the MOLF, breakwaters and CW intake. | 17.0ha | Maintenance dredging is likely to be required approximately every three to five years following completion of the capital dredge |
| Semi-dry cofferdam (* note 2) | 6.0ha (combined footprint of the causeway and cofferdam) | Up to 2 years. |
| Causeway to the western breakwater (* note 2) | | Up to 5 years |
| Temporary access ramp (* note 2) | 0.4ha | Up to 1 year. |
| Waste Water Treatment Effluent Outfall (Power Station Construction Phase) (* note 2) | Within the footprint of the western breakwater | Up to 10 years. |

* Note 1: The footprint of this structure is split between The Skerries and Anglesey North water bodies

*Note 2: These areas are accounted for in habitat calculations under 'area dredged'.

6.2.6 The activities relating to Power Station decommissioning and to the other project elements were not taken forward to the detailed assessment stage. The activities and impacts that do not require further assessment, including justification for this, are set out in appendix D, table 1. The embedded and good practice mitigation relevant to each activity is also provided in appendix D, table 1.

6.2.7 The final column in table 6-2 provides the link to step 4 (Detailed WFD Assessment) by detailing the heading under which the potential effect is considered. The quality elements scoped into the detailed WFD assessment are summarised in table 6-6.

6.2.8 The assessment identified potential intra-development cumulative effects in this water body and these have been considered within section 7.

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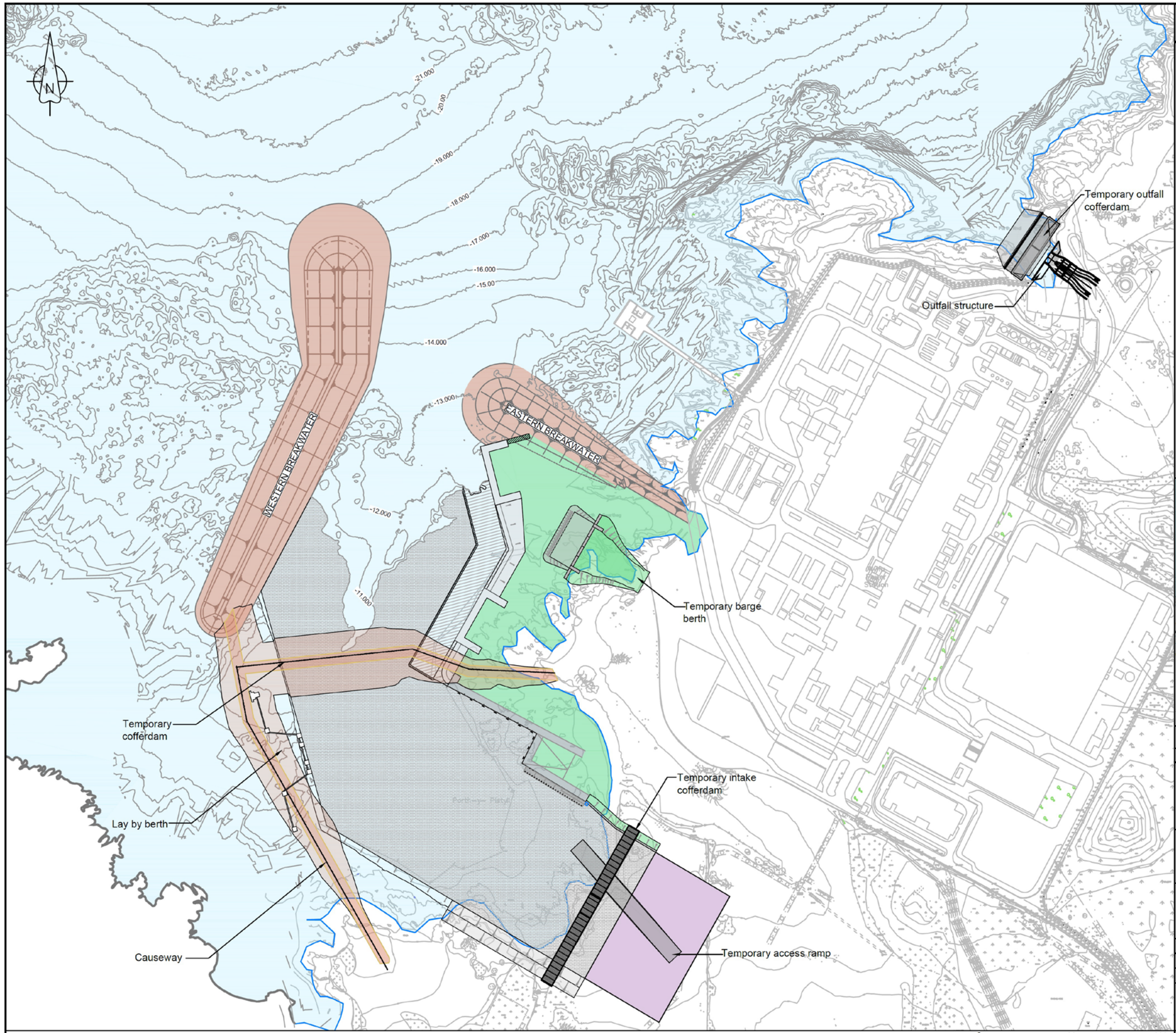

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# FIGURE 9

LEGEND

| | |
|---|---|
| 🟦 | Seawater |
| 🟩 | Reclaimed ground |
| 🟧 | Breakwater |
| 🟪 | Intake area |
| ▩ | Dredged area to -10m AOD |
| ▨ | MOLF dredged to -11.9m AOD |
| ▥ | Slope between the dredged area and the natural seabed |
| ━ | Mean high water |

NOTE:
This figure is intended for illustrative purposes only; the locations, sizes and layouts of the facilities and construction areas shown are approximate. Design evolution is ongoing and certain elements shown, such as the temporary cofferdam, will be subject to change. For further details, refer to Chapter D1 of the Environmental Statement.

| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |
|---|---|---|---|---|---|---|
| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |

Client

HORIZON
NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing title

INDICATIVE LAYOUT FOR THE
CONSTRUCTION OF MARINE FACILITIES

| | | |
|---|---|---|
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**Table 6-2 Summary of activities and potential effects in The Skerries water body that require detailed assessment**

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| **Power Station: construction** | | | | | |
| 1.14 | Construction and commissioning of concrete batching plant and associated surface water drainage | Mobilisation of soil or sediment resulting in delivery of fine sediment from runoff. | Drainage from the concrete batching plant would be managed to prevent high levels of sediment entering the sea. There could be localised increases in turbidity, although any effects are likely to be restricted to the location immediately surrounding the concrete batching plant. | Alone<br>• transparency<br>Cumulative<br>Physico-chemical:<br>• transparency | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |
| 1.14 | Construction and commissioning of concrete batching plant and associated surface water drainage | Changes in water quality | The embedded mitigation is that drainage would be via sediment settlement lagoons and water treatment facilities and discharge water quality to meet agreed standards. This would ensure that the discharge quality would be carefully controlled. The effect would be localised and there would be no detectable effects on quality elements within the coastal water body from this activity alone. | Alone<br>• no risk alone<br>Cumulative<br>Physico-chemical:<br>• transparency | Yes - potential effects cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |
| 1.14 | Construction and commissioning of concrete batching plant | Loss of intertidal zone | Loss of approximately 2ha of mainly intertidal habitat under the footprint of the concrete batching plant would result in small-scale changes to | Alone<br>• no risk alone<br>Cumulative | Yes - potential effects cumulatively on hydromorphological |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | and associated surface water drainage | | hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (0.04%) and would not affect the status of these quality elements within the coastal water body from this activity alone. | Hydromorphological:<br>• depth variation<br>• structure and substrate of the coastal bed<br>• structure of the intertidal zone<br>Biological:<br>• benthic invertebrates<br>• aquatic flora<br>• fish | quality elements from loss of the intertidal zone and coastal bed (and associated biological quality elements) (no.2). |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | Introduction of new structures with changes to coastal processes and hydrodynamics | Effects upon hydrodynamics and waves from near-shore changes to depth variation and loss of intertidal zone structure leading to changes in processes and hydrodynamics (note: this includes potential effects upon Esgair Gemlyn which are subject of more detailed investigations). Effects upon direction of dominant waves within the new harbour area from localised changes to wave transformation. Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Alone and cumulative<br>Hydromorphological:<br>• depth variation<br>• structure and substrate of the coastal bed<br>• structure of the intertidal zone<br>• direction of dominant current<br>• wave exposure<br>Biological:<br>• benthic invertebrates<br>• phytoplankton | Yes - potential effects both alone and cumulatively on hydromorphological quality elements from the introduction of new marine structures leading to changes in coastal processes and hydrodynamics (no.3). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | | • aquatic flora<br>• fish | |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures | The loss of the coastal bed and intertidal area in The Skerries from the footprint of the CWS (intake and outfall), breakwaters and MOLF would be approximately 13.1ha (this excludes dredging – see activity 1.18).<br>This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and an area of fish habitat. In comparison to the size of the water body this loss would be very small (0.28%). Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Alone and cumulative<br>Hydromorphological:<br>• depth variation<br>• structure and substrate of the coastal bed<br>• structure of the intertidal zone<br>Biological:<br>• benthic invertebrates<br>• aquatic flora<br>• fish | Yes - potential effects both alone and cumulatively on hydromorphological quality elements from loss of the intertidal zone and coastal bed (and associated biological quality elements) (no.2). |
| 1.17 | Construction of the CWS breakwaters and | Mobilisation of sediment from disturbance of the seabed | Excavation and dredging during the construction phase could lead to the mobilisation of suspended sediments with effects on hydromorphological | Alone and cumulative<br>Hydromorphological:<br>• depth variation | Yes – potential effect both alone and cumulatively on hydromorphological |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | MOLF including dewatering | | quality elements in The Skerries water body. | • structure and substrate of the coastal bed<br>• structure of the intertidal zone<br>Biological:<br>• benthic invertebrates<br>• aquatic flora<br>• fish | quality elements from mobilisation of sediment during construction (no.2). |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | Increase in underwater noise | Potential for fish (present in The Skerries but a quality element of other water bodies) to be affected by underwater noise from rock cutting and drilling. | Alone and cumulative<br>Biological:<br>• fish | Yes – potential effects both alone and cumulatively on fish during construction from changes to hydromorphological and chemical and physico-chemical quality elements, underwater noise and visual disturbance (no.5). |
| 1.18 | Semi-dry and wet marine excavation including construction and | Increase in underwater noise | Potential for fish (present in The Skerries but a quality element of other water bodies) to be affected by underwater noise from dredging, | Alone and cumulative<br>Biological:<br>• fish | Yes – potential effects both alone and cumulatively on fish during construction from |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | removal of cofferdam, piling and dewatering | | rock breaking, rock cutting and drilling. | | changes to hydromorphological and chemical and physico-chemical quality elements, underwater noise and visual disturbance (no.5). |
| 1.18 | Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures | Loss of approximately 17ha from excavation in Porth-y-pistyll (this includes excavation in both wet and dry). This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and an area of fish habitat. In comparison to the size of the water body this loss would be very small (0.36%). Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Alone and cumulative<br>Hydromorphological:<br>• depth variation<br>• structure and substrate of the coastal bed<br>• structure of the intertidal zone<br>Biological:<br>• benthic invertebrates<br>• aquatic flora<br>• fish | Yes - potential effects both alone and cumulatively on hydromorphological quality elements from loss of the intertidal zone and coastal bed (and associated biological quality elements) (no.2). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| 1.20 | Excavation and construction of CW intake and outfall, including tunnelling | Loss of coastal bed and intertidal zone from excavation | Approximate loss of 0.1ha at the CW outfall within The Skerries water body. Losses associated with the intake are covered in activity 1.17. This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (<0.01%) and would not affect the status of these quality elements within the coastal water body from this activity alone. | Alone<br>• no risk alone<br>Cumulative<br>Hydromorphological:<br>• depth variation<br>• structure and substrate of the coastal bed<br>• structure of the intertidal zone<br>Biological:<br>• benthic invertebrates<br>• aquatic flora<br>• fish | Yes - potential effects cumulatively on hydromorphological quality elements from loss of the intertidal zone and coastal bed (and associated biological quality elements) (no.2). |
| 1.21 | Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies although the effects are likely to be restricted to the location immediately surrounding the ground works. However there remains potential for effects on transparency, | Alone<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants<br>Cumulative<br>Physico-chemical:<br>• transparency | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | nutrients and specific pollutant concentrations in the coastal WFD water body. Although there is a pathway to an effect on biological quality elements, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on Biological Quality Elements (BQE). | • nutrient conditions<br>• specific pollutants | |
| 1.22 | Installation and operation of a drainage system during Power Station construction | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment and changes to water quality | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies although the effects are likely to be restricted to the location immediately surrounding the discharge points. However there remains potential for effects on transparency, nutrients, specific pollutant and priority substance concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, | Alone<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants<br>Chemical:<br>• priority substances<br>Cumulative<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | based on professional judgement it is considered that there would be no detectable effect on BQEs. | | |
| 1.25 | Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | Changes in water quality (e.g. from dewatering) | Groundwater seepage into the deep excavation would be dewatered and discharged into the coastal water body. This could include specific pollutants which may be components of the groundwater. The discharge could contain suspended solids, although this would be treated via sediment settlement ponds. Groundwater would be diluted and dispersed by strong tidal currents. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Alone<br>Physico-chemical:<br>• specific pollutants<br>Cumulative<br>Physico-chemical:<br>• transparency<br>• specific pollutants | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |
| 1.26 | Excavation of other features including building foundations including dewatering | Changes in water quality | This would be managed via the surface water drainage system but discharge could include specific pollutants which may be components of the groundwater. The discharge would be fresh and could contain suspended solids. Although there is | Alone<br>Physico-chemical:<br>• specific pollutants<br>Cumulative<br>Physico-chemical:<br>• transparency | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | • specific pollutants | discharges and dredging (no.1). |
| 1.27 | Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off. | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies, although the effects are likely to be restricted to the location immediately surrounding the ground works. However there remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Alone<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants<br>Cumulative<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| 1.28 | Construction of internal roads, car parking, security fencing and permanent lighting | Changes in water quality from drainage from roads | Once constructed large numbers of vehicles would be using the internal roads. All runoff would be directed into the drainage system and the discharge quality would be carefully controlled but may contain suspended solids. With embedded mitigation there would be no effects on physico-chemical parameters and although there is a pathway to effects on biological quality elements there would be no detectable effect on quality elements within the coastal water body alone. | Alone<br>• no risk alone<br>Cumulative<br>Physico-chemical:<br>• transparency | Yes - potential effects cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |
| 1.28 | Construction of internal roads, car parking, security fencing and permanent lighting | Light shining into water bodies | Fish could be affected by lighting in both fluvial and coastal waters. Lighting could attract some species and deter others and could disrupt feeding, migration and spawning. However, with embedded mitigation to minimise light spill and avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | Alone<br>• no risk alone<br>Cumulative<br>Biological:<br>• fish | Yes – potential effects cumulatively on fish (no.5). |
| 1.29 | Operation of the MOLF | Introduction of non-native species | Risk that non-native species could be introduced with effects on benthic invertebrates and aquatic flora. | Alone and cumulative<br>Biological: | Yes - potential risks both alone and cumulatively to |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | | • benthic invertebrates<br>• phytoplankton<br>• aquatic flora | biological quality elements during construction and operation from the introduction of non-native species (no.6). |
| 1.30 | Operation of concrete batching plant and associated surface water drainage | Changes in water quality | Embedded mitigation would ensure that the discharge quality would be carefully controlled. The effect would be localised and there would be no detectable effects on quality elements within the coastal water body from this activity alone. | Alone<br>• no risk alone<br>Cumulative<br>Physico-chemical:<br>• transparency | Yes - potential effects cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |
| 1.36 | Sewage discharge during construction | Changes in water quality from discharge of sewage effluent | With embedded mitigation the effluent quality would be carefully controlled. There remains potential for effects on turbidity, changes to nutrients and specific pollutant concentrations. These effects would be localised around the point of discharge and dispersion and dilution would occur rapidly within the coastal water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, | Alone<br>Physico-chemical:<br>• nutrient conditions<br>• specific pollutants<br>Cumulative<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants | Yes - potential effects alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | based on professional judgement it is considered that there would be no detectable effect on BQEs. | | |
| **Power Station: operation** | | | | | |
| 2.4 | Abstraction of CW | Loss of flora and fauna in abstracted water | Long-term effects from the continuous loss of plankton, invertebrates and fish which would be entrapped during operation. | Alone and cumulative<br>Biological:<br>• plankton<br>• benthic invertebrates<br>• fish | Yes - potential effects alone and cumulatively on plankton, benthic invertebrates and fish from:<br>• the abstraction of CW (no.7)<br>• the discharge of CW (no.8 and no.9) |
| 2.5 | Discharge of CW and other operational water discharges | Discharge of warm water as a thermal plume | Long-term changes to thermal conditions (and associated effects on dissolved oxygen). Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Alone<br>Physico-chemical:<br>• thermal conditions<br>• oxygenation conditions<br>Biological:<br>• benthic invertebrates<br>• plankton<br>• aquatic flora<br>• fish | Yes - potential effects alone on thermal conditions and oxygenation conditions and potential effects both alone and cumulatively on plankton, benthic invertebrates and fish from: |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | | Cumulative<br>Biological:<br>• benthic invertebrates<br>• plankton<br>• aquatic flora<br>• fish | • the abstraction of CW (no.7)<br>• the discharge of CW (no.8 and no.9) |
| 2.5 | Discharge of CW and other operational water discharges | Discharge of chemicals including total residual oxidants (TRO) | Long-term changes to release of a specific pollutant (chlorine measured as TRO) and from sodium nitrite. Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Alone<br>Physico-chemical:<br>• specific pollutants<br>Biological:<br>• benthic invertebrates<br>• plankton<br>• aquatic flora<br>• fish<br>Cumulative<br>Biological:<br>• benthic invertebrates<br>• plankton<br>• aquatic flora<br>• fish | Yes - potential effects alone on specific pollutants and potential effects and both alone and cumulatively on plankton, benthic invertebrates and fish from:<br>• the abstraction of CW (no.7)<br>• the discharge of CW and other operational water discharges (no.8 and no.9) |

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## 6.3 Anglesey North WFD water body

6.3.1 The assessment table for the Anglesey North water body is provided in appendix D, table 2. To inform the identification of potential risks to the Anglesey North water body, the effects on the non-reportable fluvial water bodies (Tre'r Gof drains and Nant Cemaes) have been considered.

### *Water body classification*

6.3.2 The Anglesey North water body is at moderate overall status. The biological quality elements are at good status which is based on the status of invertebrates (see appendix B). The water body fails the chemical standard for mercury and its compounds, resulting in the moderate overall status.

### *Consideration of measures*

6.3.3 There are no specific measures identified in the Western Wales RBMP for the Anglesey North water body.

### *Summary of potential effects and identified risks for the Anglesey North Water Framework Directive water body*

6.3.4 The assessment has determined the activities which either alone or cumulatively could present a potential risk to the achievement of WFD objectives in the Anglesey North water body. The activities and impacts that are taken forward to the detailed assessment stage are outlined in table 6-3 and include:

Power Station Site construction (including construction of the Site Campus):

- bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas;
- installation and operation of a drainage system during Power Station construction;
- excavation of other features including building foundations including dewatering;
- progressive mound creation;
- construction of internal roads, car parking, security fencing and permanent lighting; and
- operation of the MOLF.

Power Station Site operation:

- discharge of CW and other operational water discharges.

6.3.5 The activities and impacts that do not require further assessment, including justification for this, are set out in appendix D, table 2. The embedded and good practice mitigation relevant to each activity is also provided in appendix D, table 2. The quality elements as scoped into the detailed WFD assessment are summarised in table 6-6.

6.3.6 The assessment identified potential intra-development cumulative effects in this water body and these have been considered within section 7.

**Table 6-3 Summary of activities and potential effects in the Anglesey North water body that require detailed assessment**

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| **Power Station: construction** | | | | | |
| 1.21 | Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies although the effects are likely to be restricted to the location immediately surrounding the ground works. However there remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Alone<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants<br>Cumulative<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |
| 1.22 | Installation and operation of a drainage system during Power Station construction | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment and changes to water quality | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies although the effects are likely to be restricted to | Alone<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | the location immediately surrounding the discharge points. However there remains potential for effects on transparency, nutrients, specific pollutant and priority substance concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Chemical:<br>• priority substances<br>Cumulative<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants | discharges and dredging (no.1). |
| 1.26 | Excavation of other features including building foundations including dewatering | Changes in water quality | This would be managed via the surface water drainage system but discharge could include specific pollutants which may be components of the groundwater. The discharge would be fresh water (i.e. low salinity) and could contain suspended solids. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Alone<br>Physico-chemical:<br>• specific pollutants<br>Cumulative<br>Physico-chemical:<br>• transparency<br>• specific pollutants | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| 1.27 | Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off. | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies, although the effects are likely to be restricted to the location immediately surrounding the ground works. However there remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Alone<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants<br>Cumulative<br>Physico-chemical:<br>• transparency<br>• nutrient conditions<br>• specific pollutants | Yes - potential effects both alone and cumulatively on physico-chemical quality elements during construction from water discharges and dredging (no.1). |
| 1.28 | Construction of internal roads, car parking, security fencing and permanent lighting | Changes in water quality from drainage from roads | Once the road has been constructed large numbers of vehicles would be using the internal roads. All runoff would be directed into the drainage system and the discharge quality would be carefully controlled but may contain suspended solids. With embedded mitigation there would be no effects on physico-chemical | Alone<br>• no risk alone<br>Cumulative<br>Physico-chemical:<br>• transparency | Yes - potential effects cumulatively on physico-chemical quality elements during construction from water discharges |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | parameters and although there is a pathway to effects on biological quality elements there would be no detectable effect on quality elements within the coastal water body alone. | | and dredging (no.1). |
| 1.28 | Construction of internal roads, car parking, security fencing and permanent lighting | Light shining into water bodies | Fish could be affected by lighting in both fluvial and coastal waters. Lighting could attract some species and deter others and could disrupt feeding, migration and spawning. However, with embedded mitigation to minimise light spill and avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | Alone<br>• no risk alone<br>Cumulative<br>Biological:<br>• fish | Yes – potential effects cumulatively on fish (no.5). |
| 1.29 | Operation of the MOLF | Introduction of non-native species | Risk that non-native species could be introduced to The Skerries water body but could potentially affect benthic invertebrates and aquatic flora in the Anglesey North water body. | Alone and cumulative<br>Biological:<br>• benthic invertebrates<br>• aquatic flora | Yes - potential risks both alone and cumulatively to biological quality elements during construction and operation from the introduction of non-native species (no.6). |
| **Power Station: operation** | | | | | |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| 2.5 | Discharge of CW and other operational water discharges | Discharge of warm water as a thermal plume | Long-term changes to thermal conditions (and associated effects on dissolved oxygen). Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Alone<br>Physico-chemical:<br>• thermal conditions<br>• oxygenation conditions<br>Biological:<br>• benthic invertebrates<br>• plankton<br>• aquatic flora<br>• fish<br>Cumulative<br>Biological:<br>• benthic invertebrates<br>• plankton<br>• aquatic flora<br>• fish | Yes - potential effects alone on thermal conditions and oxygenation conditions and potential effects both alone and cumulatively on plankton, benthic invertebrates and fish from:<br>• the abstraction of CW (no.7)<br>• the discharge of CW (no.8 and no.9) |
| 2.5 | Discharge of CW and other operational water discharges | Discharge of chemicals including TRO. | Long-term changes to release of a specific pollutant (chlorine measured as TRO) and from sodium nitrite. Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Alone<br>Physico-chemical:<br>• specific pollutants<br>Biological:<br>• benthic invertebrates<br>• plankton<br>• aquatic flora<br>• fish<br>Cumulative | Yes - potential effects alone on specific pollutants and potential effects and both alone and cumulatively on plankton, benthic invertebrates and fish from: |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | | | Biological:<br>• benthic invertebrates<br>• plankton<br>• aquatic flora<br>• fish | • the abstraction of CW (no.7)<br>• the discharge of CW and other operational water discharges (no.8 and no.9) |

## 6.4 Cemlyn Lagoon WFD water body

6.4.1 The assessment table for the Cemlyn Lagoon water body is provided in appendix D, table 3. To inform the identification of potential risks to Cemlyn Lagoon, the effects on the non-reportable fluvial water body, Nant Cemlyn, have been considered.

### *Water body classification*

6.4.2 The Cemlyn lagoon water body is at good ecological potential. The biological quality elements have not been assessed (see appendix B).

### *Consideration of measures*

6.4.3 There are no measures identified in the Western Wales RBMP for the Cemlyn Lagoon water body.

6.4.4 This water body is classified as an HMWB as a result of flood protection use [RD10]. The HMWB mitigation measures assessment is good, meaning that all of the relevant and required measures have been implemented for this water body. The standard set of mitigation measures relating to flood protection use were all described as 'not applicable' and that the assessment of good ecological potential was made on expert judgement [RD18]. Given that there are no activities within the Cemlyn Lagoon water body, it is considered that the Wylfa Newydd Project would not prevent any future mitigation measures from being assigned or implemented.

### *Summary of potential effects and identified risks for the Cemlyn Lagoon water body*

6.4.5 The assessment has determined the activities which either alone or cumulatively could present a potential risk to the achievement of WFD objectives in the Cemlyn Lagoon water body. The activities and impacts taken forward to the detailed assessment stage are outlined in table 6-4 and relate to Power Station Site construction only, including:

- construction of the CWS breakwaters and MOLF including dewatering;
- mobilisation of sediment from disturbance of the seabed.

6.4.6 The activities and impacts not requiring further assessment, including justification for this, are set out in appendix D, table 3. The embedded and good practice mitigation relevant to each activity is also provided in appendix D, table 3. The quality elements as scoped into the detailed WFD assessment are summarised in table 6-6.

6.4.7 The potential effects of deep excavations (activity 1.25) on Cemlyn Lagoon were considered under the Ynys Mon groundwater body in appendix D table 10 as dewatering of the basements of Unit 1 and Unit 2 could affect the quantity of groundwater reaching Cemlyn Lagoon over 1km from the deep excavations. The modelled impact of dewatering found that groundwater discharging to Cemlyn Bay SSSI will reduce by 0.1m$^3$/day in both wet and dry

periods. This represents a negligible 0.06% - 0.012% reduction of groundwater flow when compared to the total modelled bedrock groundwater inflow into the Cemlyn Bay SSSI of between 81.6m$^3$/day and 170m$^3$/day. There would be no detectable change in the input from groundwater into Cemlyn Lagoon.

6.4.8 The potential effects of land changes on sediment availability and surface run off (activities 1.9, 1.27 and 1.34) on Cemlyn Lagoon were considered as earthworks, topsoil removal and mounding, which could affect the quantity and quality of surface water reaching Cemlyn Lagoon. Embedded mitigation includes the collection, treatment and diversion of surface water runoff from Mound E away from the Nant Cemlyn. Diversion of surface run off will be temporary, only occurring during construction of the Mound until it vegetates. During this period there may be a temporary, and minor reduction in catchment area (4% Cemlyn watershed) feeding surface water flows into the Nant Cemlyn.

6.4.9 The assessment identified potential intra-development cumulative effects in this water body and these have been considered within section 7.

**Table 6-4 Summary of activities and potential effects in the Cemlyn Lagoon water body that require detailed assessment**

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| **Power Station: construction** | | | | | |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | Introduction of new structures with changes to coastal processes and hydrodynamics. | Potential for a change in wave height as a result of the breakwaters with detectable effects in Cemlyn Bay. This could have an effect on the shingle ridge and therefore could affect overtopping. | Alone and cumulative<br>Morphological conditions:<br>• structure and integrity of lagoon banks | Yes, potential effects both alone and cumulatively on the structure and integrity of lagoon banks (no.3) |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | Mobilisation of sediment from disturbance of the seabed | Excavation and dredging during the construction phase could lead to the mobilisation of suspended sediments in Cemlyn Bay which could affect Esgair Gemlyn. | Alone and cumulative<br>Morphological conditions:<br>• structure and integrity of lagoon banks | Yes, potential effects both alone and cumulatively on the structure and integrity of lagoon banks (no.2) |

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## 6.5 Caernarfon Bay North WFD water body

### *Water body classification*

6.5.2 The Caernarfon Bay North water body is at good overall status. The biological quality elements are at good status which is based on the status of invertebrates. No other biological quality elements were assessed (see appendix B).

### *Summary of potential effects*

6.5.3 The assessment presented in appendix D, table 4, determined that there are no project activities which would either alone, or cumulatively, present a potential risk to the achievement of the WFD objectives in the Caernarfon Bay North water body.

6.5.4 The potential effects initially identified were from the A5025 Off-line Highway Improvements as a result of hard bank protection, channel realignments, channel crossings and new outfalls and discharges. However, the effects were determined to be localised to the Nant Carreglwyd and would not lead to a permanent/long-term change in any quality elements in the Caernarfon Bay water body. There are no water body measures identified in the Western Wales RBMP for the Caernarfon Bay North water body.

6.5.5 The Disposal Site is located approximately 3km north west of the boundary of the Caernarfon Bay North water body. The effects of the disposal of material (rock and soft sediment) from dredging were considered in relation to this water body. The potential pathway to an effect would be from disposal of soft sediment with potential effects on transparency and specific pollutants.

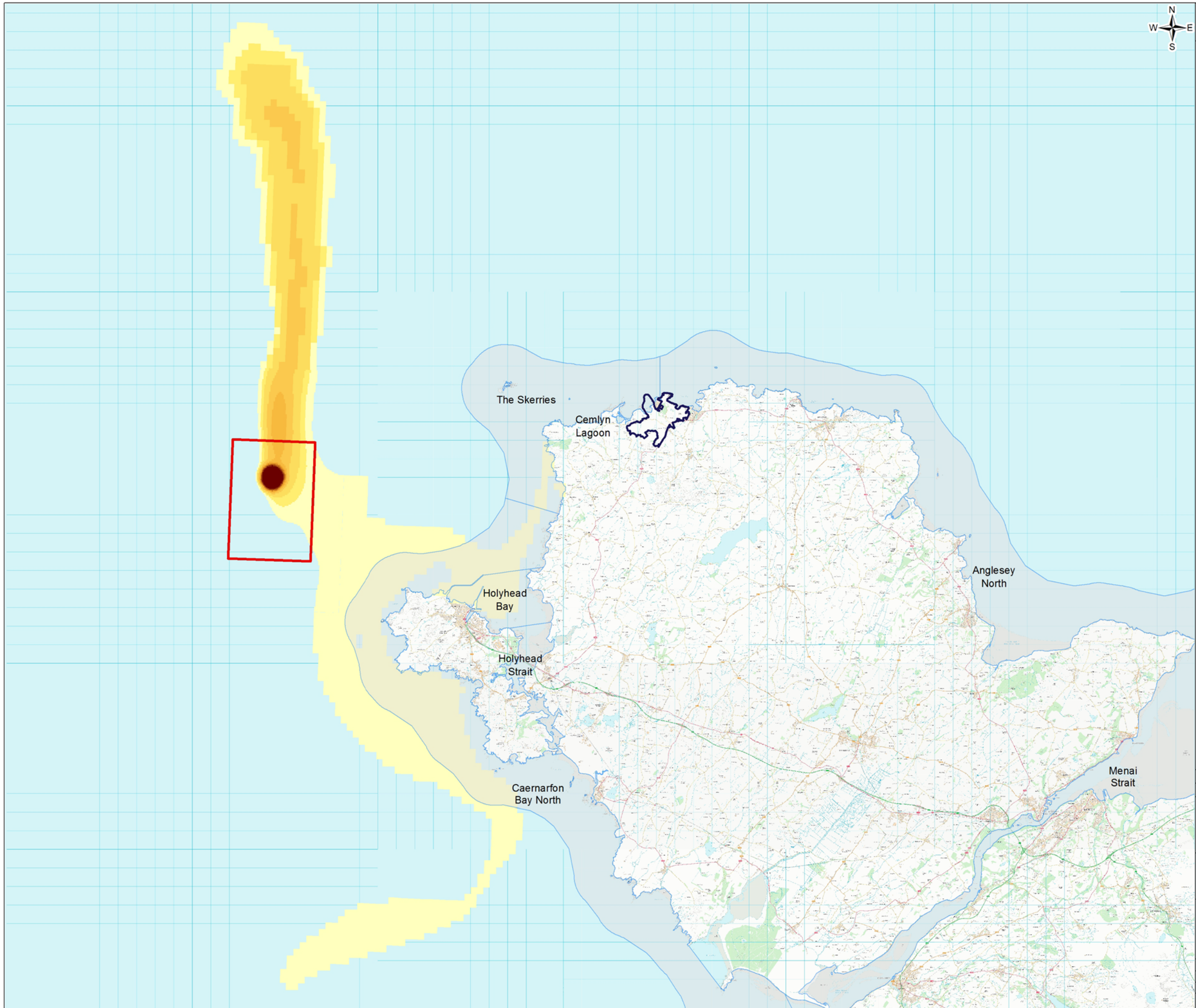
6.5.6 Modelling was carried out to predict the area where suspended sediment concentrations would increase above typical background concentrations. This showed that increases in suspended solid concentrations were highly transitory. Modelling also accounted for the potential coincidence of disposal of sediment with ongoing maintenance dredging at the Port of Holyhead. The cumulative effect from the addition of the proposed sediment disposal was not readily discernible from that of the much larger maintenance dredging disposal. The extents of the sediment plume at various time intervals are shown in figures D13-35 to D13-39 (Application Reference Number: 6.4.101). Figure 10 shows a snapshot in time which is the largest extent of the sediment plume (fine material, which is transported wider than sand) in relation to the Caernarfon Bay North water body. This is the worst case as it shows largest plume area which occurs one hour after the final disposal event following the full 35-day disposal programme.

6.5.7 At this point in time there is an increase in suspended sediment concentration in part of the Caernarfon Bay North water body of up to 1.5mg/L above background. In reality the magnitude of increase is likely to be below the limit of detection. After 48 hours following a single disposal event all sediment would have dispersed to such a degree that suspended solid concentrations

would be within typical background concentrations at the Disposal Site and there would be no predicted increase above background in any coastal water body. Figure 11 shows a snapshot in time following a full 35-day disposal programme plus 48 hours after the final disposal event. Given the very small increase predicted and the temporary nature of the effect there would be no effect on any quality elements in the Caernarfon Bay North water body.

6.5.8 The assessment concluded that there would be no intra-development or intra-project cumulative effects from the Wylfa Newydd Project on this water body.

# FIGURE 10

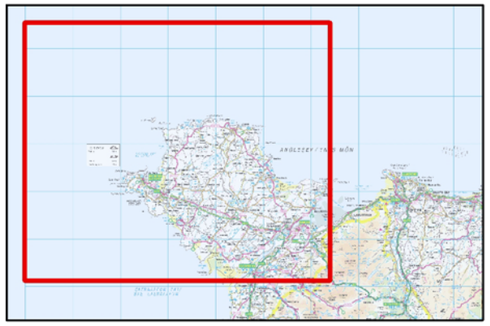



Legend

- Wylfa Newydd Development Area
- Disposal Site
- Water Framework Directive coastal water bodies

Suspended sediment concentration

- >1.0mg/L - 1.5mg/L
- >1.5mg/L - 2.0mg/L
- >2.0mg/L - 3.0mg/L
- >3.0mg/L - 4.0mg/L
- >4.0mg/L - 5.0mg/L
- >5.0mg/L - 6.0mg/L
- >6.0mg/L - 7.0mg/L
- >7.0mg/L - 8.0mg/L
- >8.0mg/L - 9.0mg/L
- >9.0mg/L - 10.0mg/L
- >10.0mg/L



| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

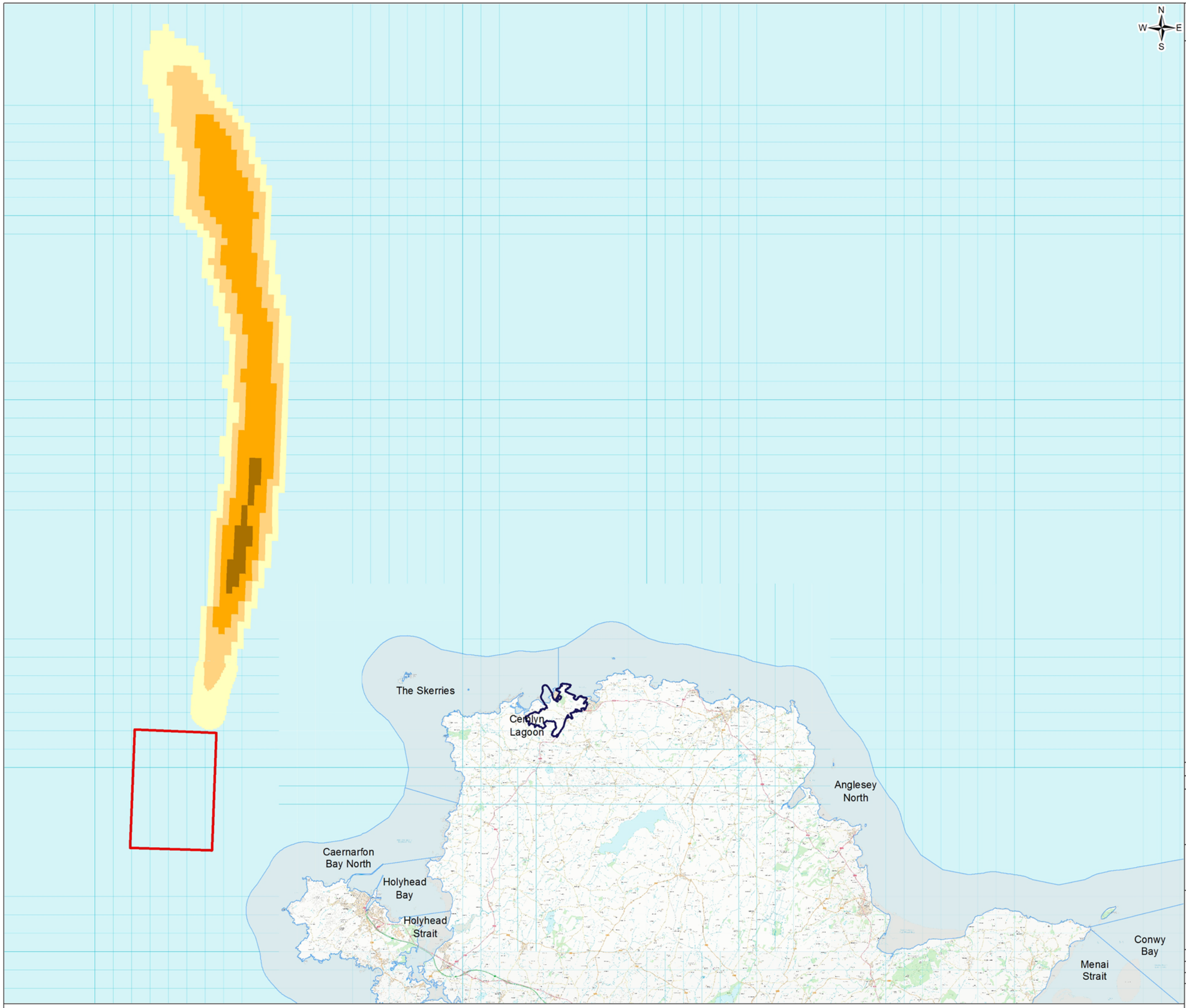
Drawing Title

EXCESS SUSPENDED SEDIMENT CONCENTRATION
OF FINES FOLLOWING FULL 35 DAYS DISPOSAL PROGRAMME
(+1HR AFTER FINAL DISPOSAL EVENT)

| | | |
|---|---|---|
| Scale @ A3 | 1:200,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

60PO8077_AQE_REP_006_D_10





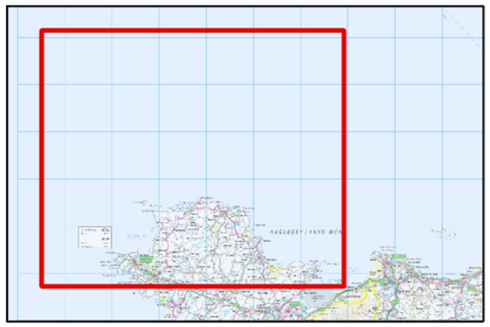

# FIGURE 11

Legend

- Wylfa Newydd Development Area
- Disposal Site
- Water Framework Directive coastal water bodies

Suspended sediment concentration

- >1.0mg/L - 1.5mg/L
- >1.5mg/L - 2.0mg/L
- >2.0mg/L - 2.5mg/L
- >2.5mg/L



| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

EXCESS SUSPENDED SEDIMENT CONCENTRATION OF FINE FOLLOWING FULL 35 DAY PROGRAMME (+48HR AFTER FINAL DISPOSAL EVENT)

| | | |
|---|---|---|
| Scale @ A3 | 1:200,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

60PO8077_AQE_REP_006_D_11

## 6.6 Alaw (transitional) WFD water body

### *Water body classification*

6.6.2 The Alaw water body is at moderate overall status. The biological quality elements are at good status which is based on the status of macroalgae. The moderate overall status results from the physio-chemical element, specifically Dissolved Inorganic Nitrogen only meeting moderate ecological status.

### *Summary of potential effects*

6.6.3 The assessment presented in appendix D, table 5, has determined that there are no project activities which would either alone, or cumulatively, present a potential risk to the achievement of the WFD objectives in the Alaw (transitional) water body.

6.6.4 There are no direct works within this water body. The potential effects initially identified were from the A5025 Off-line Highway Improvements, specifically the installation of a viaduct at Llanfachraeth, approximately 240m upstream from the Alaw (transitional) water body. However, the effects were determined to be localised to the Alaw – downstream Llyn Alaw Water Framework Directive water body and would not lead to a permanent/long-term change in any quality elements in the Alaw (transitional) water body. There are no water body measures identified in the Western Wales RBMP for the Alaw (transitional) water body.

6.6.5 The assessment concluded that there would be no intra-development or intra-project cumulative effects from the Wylfa Newydd Project on this water body.

## 6.7 Alaw – downstream Llyn Alaw WFD water body

### *Water body classification*

6.7.2 The Alaw – downstream Llyn Alaw water body is at moderate overall status. The biological quality elements are at good status which is based on the status of fish (high) and invertebrates (good). The overall ecology status of moderate is driven by supporting elements (surface water) (Appendix B).

### *Summary of potential effects*

6.7.3 The assessment presented in appendix D, table 6, has determined that there are no project activities that would either alone, or cumulatively, present a potential risk to the achievement of the WFD objectives in the Alaw – downstream Llyn Alaw water body.

6.7.4 The potential effects on the water body arise from the A5025 Off-line Highway Improvements and include: earthworks, physical presence of structures, in-channel construction, attenuation ponds and new outfalls and discharges. However, the effects have been determined to be localised and would not lead to a permanent/long-term effect at the WFD water-body scale.

6.7.5 Considering all potential effects, it was determined there would be no intra-development or intra-project cumulative effects from the Wylfa Newydd Project on this water body.

### *Consideration of measures*

6.7.6 There are no water body measures identified in the Western Wales RBMP for the Alaw – downstream Llyn Alaw water body.

6.7.7 The Alaw – downstream Llyn Alaw water body is classified as an HMWB due to drinking water supply [RD10]. The HMWB mitigation measure assessment is classified as moderate or less [RD14]. NRW provided details of the HMWB mitigation measures which include the following:

- good downstream dissolved oxygen levels (in place);
- good downstream temperature (in place);
- sediment management regime (not in place);
- downstream flow regime (not in place); and
- flows to move sediment (not in place).

6.7.8 The Wylfa Newydd Project would result in changes to dissolved oxygen, temperature, the sediment regime or flows in the Alaw – downstream Llyn Alaw water body. Therefore, the Wylfa Newydd Project would not prevent the HMWB mitigation measures that are 'not in place' from being implemented.

## 6.8 Tan R'Allt WFD water body

### *Water body classification*

6.8.2 The Tan R'Allt water body is at moderate overall status. The biological quality elements have not been assessed and the status is determined by the status of physico-chemical quality elements which are at moderate status (see appendix B).

### *Summary of potential effects*

6.8.3 The assessment presented in appendix D, table 7, has determined that there are no project activities that would either alone, or cumulatively, present a potential risk to the achievement of the WFD objectives in the Tan R'Allt water body.

6.8.4 The potential effects identified relate to the A5025 Off-line Highway Improvements and Off-site Power Station Facilities. The potential effects typically arise as a result of hard bank protection, channel realignments, channel crossings, new outfalls and discharges, attenuation ponds, construction of roads and buildings and operation of the facilities. However, the effects have been determined to be localised (see appendix D, table 7) and would not lead to a permanent/long-term change at the WFD water-body scale.

6.8.5 The assessment concluded that there would be no intra-development or intra-project cumulative effects from the Wylfa Newydd Project on this water body.

### *Consideration of measures*

6.8.6 The Tan R'Allt water body is not designated as an HMWB and therefore is not assessed for compliance with specific mitigation measures. However, within the Western Wales RBMP there are two locally targeted measures outlined for the Tan R'Allt water body. The measures relate to the control or management of point and diffuse source inputs within the water body [RD14]. To address this the measures proposed are to:

- mitigate/remediate point source impacts on receptors; and
- reduce diffuse pollution at source.

6.8.7 The Wylfa Newydd Project would require the discharge of surface water runoff and road drainage to the Tan R'Allt water body. However, with the implementation of embedded and good practice mitigation in the form of a drainage strategy (including treatment of runoff) during construction and operation there are not anticipated to be any potential effects or creation of point or diffuse sources of pollution. As a result, it is not considered that the Wylfa Newydd Project would prevent the implementation of the locally targeted measures.

## 6.9 Cleifiog (Valley) WFD water body

### *Water body classification*

6.9.2 The Cleifiog water body is at moderate overall status. The biological quality elements have not been assessed and the status is determined by the status of physico-chemical quality elements which are at moderate status (see appendix B).

### *Summary of potential effects*

6.9.3 The assessment presented in appendix D, table 8, has determined that there are no project activities which would either alone, or cumulatively, present a potential risk to the achievement of the WFD objectives in the Cleifiog (Valley) water body.

6.9.4 The potential effects on the water body arise from the A5025 Off-line Highway Improvements and include: earthworks, physical presence of structures, in-channel construction, new outfalls and discharges and construction of a flood compensation storage area. However, the effects have been determined to be localised and permanent, but would not lead to an effect at the WFD water-body scale. There are no measures identified in the Western Wales RBMP for the Cleifiog (Valley) water body.

6.9.5 The assessment concluded that there would be no intra-development or intra-project cumulative effects from the Wylfa Newydd Project on this water body.

## 6.10 Crigyll WFD water body

### *Water body classification*

6.10.2 The Crigyll water body is at moderate overall status. The biological quality elements are at moderate status and the status is determined by fish (good) and invertebrates (moderate) (see appendix B).

### *Summary of potential effects*

6.10.3 The assessment presented in appendix D, table 9, has determined that there are no project activities which would either alone, or cumulatively, present a potential risk to the achievement of the WFD objectives in the Crigyll water body.

6.10.4 The potential effects on the water body arise from the Park and Ride facility and include:

- Construction: site clearance, topsoil stripping, excavation of topsoil, placement of permeable surfaces, landscaping and in-channel construction.
- Operation: physical presence of structures, a clear-span bridge over the Nant Dalar Hir, operation of the site as a car park and new outfalls and discharges.
- Decommissioning: return of the site to agricultural land.

6.10.5 However, the effects were determined to be localised and would not lead to a permanent/long-term effect at the WFD water-body scale. There are no measures identified in the Western Wales RBMP for the Crigyll water body.

6.10.6 The assessment concluded that there would be no intra-development or intra-project cumulative effects from the Wylfa Newydd Project on this water body.

## 6.11 Ceint WFD water body

### *Water body classification*

6.11.2 The Ceint water body is at moderate overall status. The biological quality elements have been assessed as being at high status, with the overall ecology status of moderate being driven by supporting elements (surface water) (Appendix B).

### *Summary of potential effects*

6.11.3 The assessment presented in appendix D, table 13, has determined that there are no project activities which would either alone, or cumulatively, present a potential risk to the achievement of the WFD objectives in the Ceint water body.

6.11.4 The potential effects on the water body arise from the SSSI compensation sites and include:

- Construction: site clearance, topsoil stripping, excavation of topsoil, inclusion of drainage features and landscaping.

6.11.5 However, the effects were determined to be localised and would not lead to a permanent/long-term effect at the WFD water-body scale. There are no measures identified in the Western Wales RBMP for the Ceint water body.

## 6.12 Ynys Môn Secondary WFD groundwater body

### *Water body classification*

6.12.2 The Ynys Môn Secondary groundwater body is at poor overall status. The status is determined by the status of the chemical dependent surface water body status which is poor (see paragraph 5.5.9 and appendix B).

### *Consideration of measures*

6.12.3 The current formal overall status is poor due to diffuse local discharges of metals from abandoned mines leading to some effects on local surface water quality thus failing the chemical dependent surface water body status (see 5.5.2). As there is no known technical solution to resolving this problem a less stringent objective (less than good) has been set for this specific test [RD10].

6.12.4 There are no measures identified in the Western Wales RBMP for the Ynys Môn Secondary groundwater body.

### *Basis of Assessment*

6.12.5 The assessment addresses the impact of the activities against the groundwater quantitative and qualitative status as defined in WFD Annex V as follows:

6.12.6 Groundwater Quantitative Status:

The level of groundwater in the groundwater body is such that the available groundwater resource is not exceeded by the long-term annual average rate of abstraction. Accordingly, the level of groundwater is not subject to anthropogenic alterations such as would result in:

- failure to achieve the environmental objectives specified under Article 4 for associated surface waters;
- any significant diminution in the status of such waters; or
- any significant damage to terrestrial ecosystems that depend directly on the groundwater body (e.g. GWDTE).

In addition, alterations to flow direction resulting from level changes could occur temporarily, or continuously in a spatially limited area, but such reversals do not cause saltwater or other intrusion, and do not indicate a sustained and clearly identified anthropogenically induced trend in flow direction likely to result in such intrusions.

6.12.7 Groundwater Chemical Status:

For a groundwater body to achieve good chemical status the chemical composition is such that:

- the concentrations of pollutants do not exhibit the effects of saline or other intrusions;
- there is no exceedance of the quality standards applicable under other relevant European Community legislation; and
- it would not result in failure to achieve the environmental objectives specified under Article 4 for associated surface waters nor any significant diminution of the ecological or chemical quality of such bodies nor in any significant damage to terrestrial ecosystems which depend directly on the groundwater body.

6.12.8 In line with NRW guidance [RD3] the assessment for groundwater bodies has been structured using the component tests for quantitative and chemical status. These tests are outlined in UK TAG Papers 11b (i) and (ii) which provide guidance on groundwater chemical classification and groundwater quantitative classification [RD18] [RD20], although it is noted that these tests are for classification purposes, rather than for the assessment of modifications. Therefore, the interpretation of deterioration carried out under these tests has been applied against the wording in WFD Annex V rather than the guidance provided in [RD19] and [RD20].

6.12.9 The WFD groundwater body quality elements are therefore assessed under the four quantitative status tests - saline or other intrusion, surface water, GWDTE and water balance; and the five chemical status tests - saline or other intrusion, surface water, GWDTE, Drinking Water Protected Areas and general quality assessment. It is noted that several of these tests cover both quantitative and chemical status.

6.12.10 The general quality assessment test (chemical only) is designed to assess whether the impact of groundwater pollution will be sufficiently widespread to compromise the use of the groundwater resource either currently or in the future. It is not intended to assess local pollution impacts. As the Wylfa Newydd Development Area occupies less than 1% of the groundwater body and there is strong embedded and good practice mitigation to prevent pollution, it is not considered a relevant test and therefore it has been scoped out.

6.12.11 Similarly, the water balance test (quantitative only) is targeted at the groundwater body scale, in contrast to the surface water test (in Section 5), which is applied at the surface water body scale. The actual test calls for:

- calculation of the annual average recharge to the groundwater body;
- the annual average abstraction from groundwater;
- estimation of the groundwater contribution as an annual average needed to support all river ecosystems across the groundwater body; and
- calculation of the available groundwater resource.

6.12.12 Given the scale and the hydrogeological complexity of the groundwater body (see paragraph 5.5.2) and its component abstractions and ecological flows across the 623km$^2$ area of the groundwater body, it is not feasible to carry out this test. The Ynys Môn Secondary groundwater body covers a majority of Anglesey whilst the Wylfa Newydd Development Area covers less than 1% of the groundwater body. The only significant additional abstraction is that from the temporary excavation dewatering which the model has shown will be limited in extent and will not affect existing abstractions. This test has therefore been scoped out of further assessment.

### *Summary of potential effects and identified risks for the Ynys Môn Secondary groundwater body*

6.12.13 The assessment table for the Ynys Môn Secondary groundwater body is provided in appendix D, table 10.

6.12.14 The assessment has determined the activities that either alone or cumulatively could present a potential risk to the achievement of WFD objectives in the Ynys Môn Secondary groundwater body water body. The activities and impacts that are taken forward to the detailed assessment stage are outlined in table 6-5 below. The activities and impacts not requiring further assessment, including justification for this, are set out in appendix D, table 10.

6.12.15 No activities outside the Wylfa Newydd Development Area have been carried forward for detailed assessment. The quality elements scoped into the detailed WFD assessment are summarised in table 6-6.

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**Table 6-5 Summary of activities and potential effects in Ynys Môn Secondary groundwater body that require detailed assessment**

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| **Power Station: construction** | | | | | |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | Excavation dewatering causing groundwater levels to fall affecting local groundwater abstractions and water-dependent ecosystems and reversal of groundwater flow at the coast. | Saline intrusion of limited extent (6.5m$^3$/d) could occur on the seaward side of a small 200m length of coast north of the MOLF.<br>Reduction in water resource availability will be limited to the area being dewatered and not relevant at the water body scale.<br>There are no predicted effects on any PWS from the dewatering drawdown.<br>There would be no effect from the dewatering-induced drawdown on the Tre'r Gof SSSI groundwater interest. | Alone and cumulative<br>Quantitative and chemical:<br>• Duration and extent of saline intrusion | Yes – potential risk of saline intrusion during construction (no.11). Cumulative effects with Power Station Site dewatering. |
| 1.21 | Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Changes to bedrock and superficial groundwater occurrence with consequent change in surface water baseflow, shallow groundwater seepages and | Platform construction would result in change to groundwater recharge rates (both up and down), rise in the groundwater level and/or removal of local perched aquifers. These effects would be localised and mostly affect superficial groundwater quantity and quality and surface water baseflow. This | Alone and cumulative<br>Quantitative:<br>• GWDTE interests at Tre'r Gof and Cae Gwyn SSSIs<br>• surface water | Yes – potential effects on GWDTE and surface water quantity (no.12 and no.13).<br>Potential cumulative effects with mounding and Power |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | springs and changes to groundwater quality. | could include those supporting Tre'r Gof SSSI but would be unlikely at Cae Gwyn SSSI due to distance from the works and the lack of superficial deposit groundwater throughflow.<br>There would be no effect on PWS as all are upgradient of main activities. | | Station Site dewatering. |
| 1.22 | Installation and operation of a drainage system during Power Station construction | Changes to groundwater recharge, level and flow direction, seepages and springs.<br><br>Changes to groundwater quality from infiltrating water contact with geology.<br><br>Changes to groundwater baseflow to streams and ditches. | Changes in groundwater flow and recharge would be likely. These would be relatively small to bedrock as much of the area has low permeability drift which limits recharge to bedrock. Shallow surface water baseflow quantities could be affected.<br>There would be a reduction in water availability to Tre'r Gof SSSI due to the potential to affect shallow groundwater seepages and interlinkage with surface water.<br>Tre'r Gof and Cae Gwyn SSSIs could also be affected by changes in quality due to different areal distribution of drainage. | Alone and cumulative<br>Quantitative:<br>• GWDTE interests at Tre'r Gof and Cae Gwyn SSSIs<br>• surface water | Yes – potential effects on GWDTE and surface water quantity (no.12 and no.13).<br>Potential cumulative effects with earthworks and dewatering activities. |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| 1.25 | Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | Groundwater dewatering for deep basements could lead to changes in, groundwater levels and flow direction in the bedrock aquifer and superficial deposits and changes in surface water baseflow. | Changes in groundwater level would not extend greatly from the area being dewatered.<br>There is however a possible cumulative link to saline intrusion from the combination of this dewatering with that of the MOLF and CW intake.<br>All PWS are to the south and up hydraulic gradient and would not be affected.<br>Small water level decline effects on Tre'r Gof SSSI GWDTE interests are possible and there is potential to draw down bedrock groundwater levels and therefore GWDTE at Cae Gwyn SSSI.<br>There will be no discernible impact on Cemlyn Bay SSSI which has no GWTDE interest | Alone and cumulative<br>Quantitative:<br>• GWDTE interests at Tre'r Gof and Cae Gwyn SSSIs<br>• surface water<br>• saline intrusion | Yes – potential effects on GWDTE and surface water quantity (no.12 and no.13).<br>Potential cumulative effects with MOLF and CW excavation activities which may induce saline intrusion (no.11). |
| 1.27 | Progressive mound creation | Change in recharge runoff due to compaction, steep slopes and the interception of shallow groundwater by perimeter drains. | Risks to Tre'r Gof SSSI sensitive groundwater dependent species from changes to superficial groundwater level, seepages and springs, water quality changes and surface water baseflow changes.<br>Potential risk to Cae Gwyn SSSI if winter water recharge rates are | Alone and cumulative<br>Quantitative:<br>• GWDTE interests at Tre'r Gof and Cae Gwyn SSSIs<br>• surface water | Yes – potential effects on GWDTE and surface water quantity (no.12 and no.13). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | Changes to groundwater levels and surface water baseflow and GWDTE groundwater supply. | reduced and water flows into the northern part of the SSSI (the Primary Outflow Basin) and contribute to the drying of the SSSI.<br>No predicted impact on Cemlyn Bay SSSI from change in groundwater baseflow | | |
| 1.32 | Main plant construction (Unit 1 and Unit 2) | as for above | | Alone and cumulative<br>Quantitative:<br>• GWDTE interests at Tre'r Gof and Cae Gwyn SSSIs<br>• surface water | Yes, but together with the above entries of this table for construction– potential effects on GWDTE and surface water quantity (no.12 and no.13). |
| **Power Station: operation** | | | | | |
| 2.1 | Presence of buildings, hardstanding and roads | Changes to groundwater recharge rates and groundwater flow direction and groundwater occurrence due to passive drainage around basements, | Fall in groundwater levels could affect surface water baseflow. Likely to be limited in extent. Low likelihood of changes in water availability within the Tre'r Gof SSSI over the long term.<br>Structures below the groundwater table could form a barrier to flow potentially locally altering the | Alone and cumulative<br>Quantitative:<br>• GWDTE interests at Tre'r Gof SSSI<br>• surface water | Yes – potential effects on GWDTE and surface water quantity (no.12 and no.13). |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | the presence of buildings, hardstanding and drainage, below-ground structures and large area of increased permeable fill. | groundwater flow direction. Inputs of groundwater to surface water features could then be affected, although this is unlikely to be detectable at any distance from the infrastructure. | | |
| 2.2 | Presence of mounds | Changes to groundwater recharge, level and flow direction, seepages and springs.<br><br>Changes to groundwater quality from infiltrating water contact with geology.<br><br>Changes to groundwater baseflow to streams and ditches. | Risks to the interest features of Tre'r Gof SSSI sensitive species from changes to superficial groundwater level, seepages and springs, water quality changes and surface water baseflow changes.<br><br>Potential risk to Cae Gwyn SSSI if recharge rates are reduced by mounding and water flows into the northern part of the SSSI (the Primary Outflow Basin) are reduced and contribute to the drying of the SSSI. | Alone and cumulative<br>Quantitative:<br>• GWDTE interests at Tre'r Gof SSSI<br>• surface water | Yes – potential effects on GWDTE and surface water quantity (no.12 and no.13). |
| 2.6 | Drainage during operation | Changes to groundwater recharge, level and flow direction, | Although localised there is potential that structures constructed below the groundwater table would form a barrier to flow. This could potentially | Alone and cumulative<br>Quantitative and chemical: | Yes – potential effects on GWDTE and surface water |

| Activity no. | Activity | Pathway | Potential effects and risks | Quality elements at risk either alone or cumulatively | Impact taken forward (see table 7-1 for summary) |
|---|---|---|---|---|---|
| | | seepages and springs.<br><br>Changes to groundwater quality from infiltrating water contact with geology.<br><br>Changes to groundwater baseflow to streams and ditches. | lead to change in groundwater levels which could contribute to change in surface waters and GWDTE groundwater supply. Potential effects on the groundwater calcium concentrations within the SSSI.<br>Changes in groundwater flow and recharge likely to be relatively small, especially to bedrock as much of the area is low permeability drift which limits recharge to bedrock. Shallow surface water baseflow quantities could be affected. There could be a reduction in water availability to Tre'r Gof SSSI due to the potential to affect shallow groundwater seepages and interlinkage with surface water. Tre'r Gof SSSI GWDTE interests could also be affected by changes in quality due to different areal distribution of drainage.<br>As Cae Gwyn is upstream of any outfalls from the drainage system and has a relatively small catchment, dominated by direct rainfall, it is not considered to be at risk from drainage during Power Station operation. | • GWDTE interests at Tre'r Gof SSSI<br>Quantitative:<br>• surface water | quantity (no.12 and no.13). |

## 6.13 Ynys Môn Central Carboniferous Limestone WFD groundwater body

### *Water body classification*

6.13.2 The Ynys Môn Carboniferous Limestone groundwater body is at poor overall status. The status is determined by the status of the chemical dependent surface water body status which is poor.

### *Summary of potential effects*

6.13.3 The assessment presented in appendix D, table 12 has determined that there are no project activities which would either alone, or cumulatively, present a potential risk to the achievement of the WFD objectives in the Ynys Môn Central Carboniferous Limestone groundwater body.

6.13.4 Removal of topsoil will expose calcareous subsoil and facilitate rich-fen habitat creation by enhancing seepage zones along valley slope and creating fen meadow on valley slopes with topogenous communities in valley bottom. The diversion of calcareous water onto pasture will create new spring sources. Alkaline fen will be created in areas flushed with water diverted from streams and on areas of strong groundwater influence, within a mosaic of fen meadow. Drainage will be beneficially modified by use of small dams or plank weirs, topography and lower ground level to raise relative groundwater levels. Modification of drainage will also restore shallow groundwater flows presently intercepted by ditches.

6.13.5 This work will be in line with NRW partnership with North Wales Wildlife Trust (NWWT), Dwr Cymru and Anglesey Local Grazing Partnership to create a holistic management approach to the targeted measures to achieve WFD objectives and enhance and connect key sites including the very rare fen habitats, which depend on a delicate water balance and limestone springs that flow into the peat.

6.13.6 The potential effects on the water body arising from the compensation sites and together lead to an enhancement of the adjacent and connected GWDTE SSSIs and enhance the GWDTE status of the groundwater body.

## 6.14 Cumulative effects

6.14.1 Cumulative effects have been identified throughout the scoping stage of the assessment. This was done by firstly considering each individual activity and the effects on each quality element separately and subsequently going back through the list of quality elements to identify where activities together (including across all developments and all stages of construction and operation) could affect each quality element. This resulted in some activities being scoped into the assessment as a result of the potential effects on quality elements when combined with other activities, even when that activity alone would not affect a quality element.

6.14.2 The scoping stage identified both intra-development (combined effects when a quality element in a water body is affected by more than one effect from the same development, usually at the same time) and intra-project effects (when a quality element in a water body is affected by different developments at the same time).

6.14.3 The quality elements that have been scoped into the assessment (including those alone and cumulatively) are shown in tables 6-2 to 6-5 and are summarised in table 6-6. Further information on how cumulative effects have been considered within the detailed assessment is outlined in section 7.3.

## 6.15 Summary of step 3 WFD Scoping

6.15.1 A summary of the quality elements that have been scoped into the assessment is provided in table 6-6. This list forms the basis for step 4 (Detailed WFD Assessment).

**Table 6-6 Summary of quality elements scoped for each water body into the detailed WFD assessment**

| WFD water body name | Quality elements scoped into the assessment | | | |
|---|---|---|---|---|
| | **Hydromorphological** | **Physico-chemical** | **Chemical** | **Biological** |
| The Skerries | • depth variation<br>• structure and substrate of the coastal bed<br>• structure of the intertidal zone<br>• direction of dominant current<br>• wave exposure | • transparency<br>• nutrient conditions<br>• specific pollutants<br>• thermal conditions<br>• oxygenation conditions | • priority substances | • plankton<br>• benthic invertebrates<br>• aquatic flora |
| Anglesey North | None | • transparency<br>• nutrient conditions<br>• specific pollutants<br>• thermal conditions<br>• oxygenation conditions | • priority substances | • plankton<br>• benthic invertebrates<br>• aquatic flora |
| Cemlyn Lagoon | • structure and integrity of lagoon banks | None | None | None |
| Wygyr, Goch Amlwch, Goch Dulas, Lligwy, Ddrydwy (Llanfaelog), Ffraw, Cefni, Ceint, Cefni - Ceint to Cefni reservoir, Cefni - Cefni reservoir east and Cefni - Cefni reservoir west | None | None | None | • fish |
| | **Quantitative** | | **Chemical** | |
| Ynys Môn Secondary | • saline intrusion<br>• GWDTE<br>• surface water | | • saline intrusion | |

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# 7 Detailed Water Framework Directive assessment (step 4)

## 7.1 Introduction

7.1.1 The effects and risks identified in the first stage of the assessment as having the potential to conflict with the WFD objectives in WFD water bodies are examined in detail below. This assessment has been informed by the assessments being carried out for the EIA and Shadow HRA Report, but is made in relation to specific WFD criteria and objectives. The locations of the relevant sections in the Environmental Statement are outlined in table 7-1.

7.1.2 The detailed assessment follows the guidance provided by NRW which sets out the definition of deterioration. This states that "deterioration is when the status of at least one quality element reduces by one class or more, even if that fall does not result in the classification of the body of surface water as a whole. If a quality element is already at the lowest status class, then a measurable and meaningful within-class deterioration counts as deterioration" [RD2].

**Table 7-1 Potential impacts identified and location of further information**

| Potential effects | | WFD water bodies | Location of assessment in the Environmental Statement |
|---|---|---|---|
| 1 | Potential effects on chemical and physico-chemical quality elements in The Skerries, Anglesey North and Cemlyn Lagoon water bodies from water discharges and dredging during construction and potential effects on biological quality elements in Cemlyn Lagoon. | The Skerries, Anglesey North and Cemlyn Lagoon | Chapter D13 (Application Reference Number: 6.4.13) |
| 2 | Potential effects on hydromorphological quality elements in The Skerries and Cemlyn Lagoon water bodies from direct loss of the intertidal zone and coastal bed and from indirect effects from scour and sediment deposition during construction. | The Skerries<br>Cemlyn Lagoon | Chapter D12 (Application Reference Number: 6.4.12)<br>Chapter D13: (Application Reference Number: 6.4.13) |
| 3 | Potential effects on hydromorphological quality elements in The Skerries and Cemlyn Lagoon water bodies from the introduction of new marine structures leading to changes in coastal processes, waves and hydrodynamics during construction and operation. | The Skerries and Cemlyn Lagoon | Chapter D12: (Application Reference Number: 6.4.12) |
| 4 | Potential effects on the fish quality element in riverine and transitional water bodies from changes to hydromorphological, chemical and | Wygyr, Goch Amlwch, Goch Dulas, Lligwy, | Chapter D9 (Application |

| | Potential effects | WFD water bodies | Location of assessment in the Environmental Statement |
|---|---|---|---|
| | physico-chemical quality elements, underwater noise and visual disturbance (artificial lighting) during construction. | Ddrydwy (Llanfaelog), Ffraw, Cefni, Ceint, Cefni - Ceint to Cefni reservoir, Cefni - Cefni reservoir east and Cefni - Cefni reservoir west | Reference Number: 6.4.9) Chapter D13 (Application Reference Number: 6.4.13) |
| 5 | Potential risk to biological quality elements in The Skerries and Anglesey North water bodies from the introduction of non-native species during construction. | The Skerries and Anglesey North | Chapter D13 (Application Reference Number: 6.4.13) |
| 6 | Potential effects on biological quality elements in The Skerries water body from the abstraction of CW during operation. | The Skerries | Chapter D13 (Application Reference Number: 6.4.13) |
| 7 | Potential effects on physico-chemical and biological quality elements in The Skerries and Anglesey North water bodies from discharge of CW during operation. | The Skerries and Anglesey North | Chapter D13 (Application Reference Number: 6.4.13) |
| 8 | Potential effects on physico-chemical quality elements in The Skerries and Anglesey North water bodies from other operational water discharges during operation. | The Skerries and Anglesey North | Chapter D13 (Application Reference Number: 6.4.13) |
| 9 | Potential effects on the fish quality element in riverine and transitional water bodies from changes to hydromorphological and physico-chemical quality elements during operation. | Wygyr, Goch Amlwch, Goch Dulas, Lligwy, Ddrydwy (Llanfaelog), Ffraw, Cefni, Ceint, Cefni - Ceint to Cefni reservoir, Cefni - Cefni reservoir east and Cefni - Cefni reservoir west | Chapter D13 (Application Reference Number: 6.4.13) |
| 10 | Potential risk to quantitative and chemical status of the Ynys Môn Secondary groundwater body from saline intrusion during construction. | Ynys Môn Secondary | Chapter D8 (Application Reference Number: 6.4.8) |

| Potential effects | | WFD water bodies | Location of assessment in the Environmental Statement |
|---|---|---|---|
| 11 | Potential risk to quantitative status of the Ynys Môn Secondary groundwater body from changes to GWDTE during construction and operation. | Ynys Môn Secondary | Chapter D8 (Application Reference Number: 6.4.8) |
| 12 | Potential risk to quantitative status of the Ynys Môn Secondary groundwater body from changes to the surface water element during construction. | Ynys Môn Secondary | Chapter D8 (Application Reference Number: 6.4.8) |

## 7.2 Cumulative effects

7.2.1 Cumulative effects have been considered throughout the scoping stage of the assessment and are part of the detailed WFD assessment (section 7.3). The scoping stage identified a number of instances where quality elements are affected by more than one effect from the same development (intra-development effects). No intra-project effects were identified.

7.2.2 The detailed assessment is structured so that intra-development effects are assessed together, to allow a full understanding of how the quality elements in each water body may be affected. For example, all of the potential effects from all possible activities which may contribute to an effect on physico-chemical quality elements, are assessed together under 7.3 (Potential effects on chemical and physio-chemical quality elements in The Skerries and Anglesey North water bodies from water discharges and dredging during construction).

7.2.3 The detailed assessment is split into construction and operation. Section 7.4 details the cumulative effects on certain quality elements which may arise from being affected both during construction and in operation.

## 7.3 Detailed WFD assessment

### *1. Potential effects on chemical and physico-chemical quality elements in The Skerries and Anglesey North water bodies from water discharges and dredging during construction.*

#### Classification of quality elements

7.3.2 The current classification of chemical and physico-chemical quality elements in The Skerries, Anglesey North and Cemlyn Lagoon water bodies is summarised in section 5.2.

**Table 7-2 Classification of chemical and physico-chemical quality elements in coastal water bodies (data provided by NRW)**

| | Details | | |
|---|---|---|---|
| WFD water body name | The Skerries | Anglesey North | Cemlyn Lagoon |
| Overall status/potential | High status | Moderate status | Good potential |
| Current chemical status | Good | Fail | Good |
| Physico-chemical quality elements | High | High | Not assessed |
| Specific pollutants | Not assessed | High | Not assessed |
| Priority hazardous substances | Not assessed | Fail (based on mercury and its compounds) | Not assessed |
| Priority substances | Not assessed | Good | Not assessed |

7.3.3 The biological quality elements in Cemlyn Lagoon have not been classified.

### Relevant activities

7.3.4 The activities relevant to this part of the assessment are outlined in table 7-3. This part of the assessment is only relevant to the DCO and the construction water discharge permit application (table 7-3).

**Table 7-3 Activities relevant to the assessment of effects on chemical and physico-chemical quality elements from water discharges and dredging during construction**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 1.14 | Construction and commissioning of concrete batching plant and associated surface water drainage | ✓ | | ✓ | |
| 1.21 | Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | ✓ | | ✓ | |
| 1.22 | Installation and operation of a drainage system during Power Station construction | ✓ | | ✓ | |
| 1.25 | Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | ✓ | | ✓ | |
| 1.26 | Excavation of other features including building foundations including dewatering | ✓ | | ✓ | |

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 1.27 | Progressive mound creation | ✓ | | | |
| 1.28 | Construction of internal roads, car parking, security fencing and permanent lighting | ✓ | | | |
| 1.30 | Operation of concrete batching plant and associated surface water drainage | ✓ | | ✓ | |
| 1.36 | Sewage discharge during construction | ✓ | | ✓ | |

7.3.5 An assessment of the potential effect of water discharge and dredging during construction on chemical and physico-chemical quality elements in WFD coastal water bodies has been made in chapter D13 (Application Reference Number: 6.4.13). This information has been used to support the assessments outlined under the subsequent headings.

### Basis of modelling and the worst case

7.3.6 Horizon's marine hydrodynamic model was used to assess the cumulative effects of all sources of suspended solids (drainage, dewatering, sewage and dredging). The modelling methodology, details of the input parameters and assumptions, and results are described in appendix D13-8 (Application Reference Number: 6.4.90). Scenarios have been developed for both the dredge programme, and the drainage discharges. The dredging of soft sediments has been modelled for 35 consecutive days as a worse case and the drainage discharges modelled to capture all land drainage, sewage, and dewatering from the deep excavations, cofferdams and tunnels. The model runs have also taken into consideration the particle size distribution to take account of fine clay particles as these have a lower settling velocity and could therefore travel further.

7.3.7 To assess the effects on specific pollutants and priority substances an assessment was carried out using the Environment Agency's H1 software tool to calculate the chemical composition of discharge from all drainage sources and compare the predicted discharge qualities to EQSs. The modelling methodology, details of the input parameters and assumptions, and results are described in appendix D13-14 (Application Reference Number: 6.4.96). The H1 assessment represents the worst case scenario as the screening phase uses raw data from leaching tests and it assumes that the surfaces of mounds are bare soil.

## Effects on physico-chemical quality elements

### *Suspended sediments (transparency)*

#### The Skerries and Anglesey North water bodies

7.3.8 The drainage design has been prepared to meet a minimum treatment standard of between 40mg/L and 70mg/L total suspended solids (depending upon the background concentration in the receiving watercourses) during normal rainfall conditions. Discharge of sediment from the drainage system would be limited to a maximum threshold of 70mg/L at all marine discharge points. Worst case assessments to the marine environment have been based on suspended solid concentrations predicted during a spring-neap tidal cycle for a 1 in 2 year average with a 1 in 30 year storm event as presented in appendix D13-8 (Application Reference Number: 6.4.90). In reality the majority of rainfall events will be much lower than this and the maximum discharge of 70mg/L would be reached infrequently. The modelling of drainage discharge includes all surface water runoff, including runoff from the platform and the concrete batching plant. There would be no other discharges relating to the concrete batching plant other than drainage of surface water as any excess process water would be tankered off site.

7.3.9 Discharge from dewatering (from deep excavations, cofferdams and tunnels) would be limited to 70mg/L suspended solids, whilst sewage discharge would be limited to 30mg/L suspended solids. A lower limit of 40mg/L would be in place for the majority of new discharges in the fluvial water bodies that drain into The Skerries and Anglesey North coastal water bodies.

7.3.10 One other potential source of suspended solids is the channel realignment works on the Caerdegog Isaf, however as these are 2km upstream any sediment would fall out of suspension over this distance before reaching the coastal water bodies.

7.3.11 The dispersion of suspended sediment in The Skerries and Anglesey North water bodies has been modelled and the concentrations at the seabed are shown in figure D13-22 (Application Reference Number: 6.4.101.

7.3.12 The dominant source of suspended solids is fugitive spill from dredging activity. During the dredging operation there is an area of approximately 18ha to 25ha, varying with the depth in the water column, which has an increment in concentration of 6.1mg/L (equal to the low end of observed ambient concentrations which varied between 6.1mg/L in 2011 to 13.0mg/L in 2014). Between the dredge events this area reduces as the material is flushed out of the bays.

7.3.13 The modelled suspended solids concentrations resulting from the drainage discharges are low (figure D13-22, Application Reference Number: 6.4.101). The highest concentrations occur around the discharge of the Afon Cafnan, in Porth-y-pistyll. Away from Cerrig Brith, the only areas with a suspended solids concentration equal to the lower end of observed ambient concentrations are in the vicinity of discharges to Cemaes Bay. These are limited to the vicinity of the discharge.

7.3.14 The total area over which suspended solid concentrations from drainage discharges exceed ambient concentrations is predicted to be 1.1ha which equates to 0.011% of The Skerries water body (0.5ha) and 0.004% of Anglesey North water body (0.6ha).

7.3.15 For the majority of time the suspended solids levels will be similar to baseline conditions, with peaks occurring during rainfall events in line with the existing regime.

7.3.16 The Skerries and Anglesey North water bodies are characterised by strong tidal flows and the receiving coastal waters have a high capacity for mixing and dilution. Upon entering the coastal water bodies suspended solids would be rapidly dispersed.

***Nutrient conditions***

7.3.17 During construction, sewage from the construction site would be dealt with by the construction sewage package plant. Sewage from the Site Campus would be treated at the existing Dŵr Cymru Welsh Water Cemaes Waste Water Treatment Works. As the Site Campus element is being managed by Dŵr Cymru Welsh Water it is considered in section 8.2 as part of the inter-project cumulative effects assessment. The assessment below only considers the effects of the sewage from the construction site.

7.3.18 Sewage from the construction site would be discharged into The Skerries water body in the north of Porth-y-pistyll, in a location that during construction would become the northern end of the western breakwater. The discharge of sewage would not affect Anglesey North or Cemlyn Lagoon water bodies.

7.3.19 Sewage with conventional secondary treatment would be discharged to the north of Porth-y-pistyll. The wastewater treatment works is predicted to have a maximum daily discharge flow of 990m$^3$/d, which includes a 10% headroom allowance. Maximum instantaneous flow would be 11.5l/s. Secondary treatment has been assumed, with a discharge quality standard of 20mg/l:30mg/l:20mg/l (BOD:Suspended Soilds:Ammoniacal Nitrogen), which reflects the effluent discharge standard at the existing Cemaes WwTW.

7.3.20 Only ammonia has been assessed in the sewage effluent. Unionised ammonia concentrations depend on the equilibrium between the ammonium ion (NH4+) and unionised ammonia (NH3). The position of the equilibrium is affected by temperature, pH and salinity. The value for ammoniacal nitrogen would always be greater than the unionised ammonia fraction. The ammoniacal nitrogen concentrations following conventional treatment and after initial dilution would be 0.016mg/l (as N) as an Annual Average (AA) and represent worst case. This falls below the long-term (mean) EQS for coastal waters of 0.021mg/l. Although the latter is for NH3-N (un-ionised), as the concentration expressed as NH4-N would be greater than when expressed as NH3-N, the concentration after treatment would be below the EQS.

7.3.21 This therefore meets the required standards and would not affect water quality in coastal WFD water bodies. Assuming a worst case temperature (maximum from baseline was 16.7ºC), maximum pH (8.3) and salinity (34) the combined total ammonia concentration (baseline of <0.021mg/l plus the process

contribution of 0.016mg/l as worst case) would result in a non-ionised ammonia concentration after initial dilution of <1.57µg/l which is well inside the EQS for coastal waters (21µg/l). During operation all sewage would be treated at a Dŵr Cymru Welsh Water sewage treatment works (under Dŵr Cymru Welsh Water operations).

7.3.22 In relation to effects on nutrient conditions it is concluded that the Wylfa Newydd Project would not cause deterioration in the status of The Skerries water body, nor would it compromise the ongoing achievement of its objectives.

***Specific pollutants and priority substances***

7.3.23 During construction there is potential for changes to water chemistry from discharges into the marine environment including land drainage, dewatering and sewage. As rain falls onto exposed bare earth surfaces this could result in the leaching of substances from soil strip and topsoil mounds, resulting in elevated concentrations of substances in receiving water bodies (both fluvial and marine).

7.3.24 The substances discharged during construction have been determined as part of an H1 screening assessment. The results indicate that three substances (dissolved copper, dissolved zinc and dissolved lead) would be discharged at levels above their respective relevant EQS from land drainage discharge. The relevant EQSs and predicted discharge concentrations are presented in table 7-4.

**Table 7-4 Predicted concentrations at point of discharge from land drainage (surface water and groundwater)**

| Marine discharge point and receiving water | Outfall number and pathway to discharge point | Copper (dissolved) (µg/L) | Lead (dissolved) (µg/L) | Zinc (dissolved) (µg/L) | Nickel (dissolved) (µg/L) |
|---|---|---|---|---|---|
| EQS (Annual Average) | - | 3.76 | 1.3 | 7.9 | 8.6 |
| EQS (Maximum Allowable Concentration) | - | n/a | 14 | n/a | 34 |
| Surface water discharges | | | | | |
| 1S - Cemaes Bay | A3 via Nant Cemaes | 4.31 | 2.85 | Not exceeded | Not exceeded |
| A2 – Cemaes Bay | A2 direct to sea | 9.3 | 6.5 | 11 | Not exceeded |
| 2S - Porth y Wylfa | A1 and B1 via Tre'r | 9.25 | 6.50 | 11.4 | Not exceeded |

| Marine discharge point and receiving water | Outfall number and pathway to discharge point | Copper (dissolved) (µg/L) | Lead (dissolved) (µg/L) | Zinc (dissolved) (µg/L) | Nickel (dissolved) (µg/L) |
|---|---|---|---|---|---|
| | Gof outfall channel | | | | |
| PA, PB and PC - Porth-y-pistyll (direct to sea) | P locations direct to sea | 9.3 | 6.5 | 11 | Not exceeded |
| 3S – Porth-y-pistyll | C1, D1, D2 and E1 via Afon Cafnan | 8.53 | 5.95 | 10.9 | Not exceeded |
| Groundwater discharge | | | | | |
| PA, PB and PC - Porth-y-pistyll (direct to sea) | P locations direct to sea | Not exceeded | Not exceeded | 38 | 17 |

7.3.25 For the land drainage discharge the substance requiring the greatest dilution to achieve the EQS is dissolved lead, where the maximum concentration in the predicted discharge is 6. 5µg/L compared to the annual average EQS of 1.3µg/L, therefore requiring a dilution factor of 5.

7.3.26 For the groundwater dewatering discharge the substance requiring the greatest dilution to achieve the EQS is dissolved zinc, and the dilution factor is calculated to be 4.81.

7.3.27 Modelling was carried out using Delft3D to understand how both the surface water and groundwater discharges would disperse and dilute upon entering the marine environment at the marine discharge points within the Wylfa Newydd Development Area. Model runs emulated one complete spring neap tidal cycle. To represent the 'P' discharge within the model one location was modelled at discharge point PC.

7.3.28 The predicted discharge concentrations in surface water and groundwater from table 7-4 were combined, taking into account the flows from each discharge point to derive a maximum concentration once the discharge entered the marine environment. Once the flows from each discharge point were taken into account the maximum concentrations within the marine environment predicted by the Delft3D model differed from the original concentration in the predicted discharge. These results were processed for

each substance in turn and the model indicated that for all substances, the mixing zones[4] would occur within close proximity to the discharge points.

7.3.29 For dissolved zinc the predicted maximum concentration occurred in proximity to discharge point 3S, downstream of the Afon Cafnan, in The Skerries water body. Considering all locations where the discharge would exceed the dissolved zinc annual average EQS, the total area affected would be 2.01ha which equates to 0.039% (1.85ha) of The Skerries water body and 0.001% (0.16ha) of the Anglesey North water body.

7.3.30 For dissolved lead the predicted maximum concentration occurred in proximity to discharge point 3S in The Skerries water body. Considering all locations where the discharge would exceed the dissolved lead annual average EQS, the total area affected would be 31ha which equates to 0.35% (16.8ha) of The Skerries water body and 0.11% (14.3ha) of the Anglesey North water body (figure D13-24, Application Reference Number: 6.4.101).

7.3.31 For dissolved copper the predicted maximum concentration occurred in proximity to discharge point 3S in The Skerries water body. Considering all locations where the discharge would exceed the dissolved copper annual average EQS would be exceeded in 11.96ha, equating to 0.22% (10.26ha) of The Skerries water body and 0.01% (1.69ha) of the Anglesey North water body.

7.3.32 For dissolved nickel the predicted maximum concentration (0.15µg/L) would be well below the annual average EQS of 8.6µg/L and the dispersion would occur in very close proximity (within a few metres) of the discharge. This area would equate to less than 0.001% of The Skerries water body.

7.3.33 Given the predicted small extent of mixing zones, there would be no changes to physico-chemical quality elements, or failure of the chemical test water chemistry within The Skerries or Anglesey North water bodies. If the discharge at PC were to be located at PA or PB during different phases of construction (see [RD21] for locations) this could result in a slight increase in the extents of the mixing zones in Porth-y-pistyll. However, the relevant EQS for each substance would still be reached within close proximity to the discharge points and there would be no effect on the water chemistry within The Skerries or Anglesey North water bodies.

**7.3.34** In relation to effects on specific pollutants and priority substances it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries, Anglesey North and Cemlyn Lagoon water bodies, nor compromise the ongoing achievement of their objectives.

### *2. Potential effects on hydromorphological quality elements in The Skerries and Cemlyn Lagoon water bodies from direct loss of the intertidal zone and coastal bed and from indirect*

[4] The term 'mixing zone' is used to refer both to the zone of physical mixing processes and to the extent of the area where water quality parameters are allowed to exceed defined acceptable limits as defined by the *WFD (Standards and Classifications) Direction 2015*. Within the Directions the mixing zone concept is applied to both specific pollutants and priority substances.

### *effects from scour and sediment deposition during construction*

#### Classification of quality elements

7.3.35 The current classification of hydromorphological quality elements in The Skerries and Cemlyn Lagoon water bodies is summarised in table 7-5.

**Table 7-5 Classification of hydromorphological quality elements in coastal water bodies (data provided by NRW)**

| | Details | |
|---|---|---|
| WFD water body name | The Skerries | Cemlyn Lagoon |
| Overall status/potential | High status | Good potential |
| Hydromorphological supporting elements | High | Not assessed |
| Morphology | High | Not assessed |

#### Relevant activities

7.3.36 The activities relevant to this part of the assessment are outlined in table 7-6. This part of the assessment is only relevant to the DCO, the Marine Licence and the construction water discharge permit application (table 7-6).

**Table 7-6 Activities relevant to the assessment of effects on hydromorphological quality elements from loss of the intertidal zone and coastal bed**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 1.14 | Construction and commissioning of concrete batching plant and associated surface water drainage | ✓ | | ✓ | |
| 1.17 | Construction of the CWS, breakwaters and MOLF including dewatering | ✓ | ✓ | | |
| 1.18 | Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | ✓ | ✓ | ✓ | |
| 1.20 | Excavation and construction of CW intake and outfall, including tunnelling | ✓ | ✓ | | |

7.3.37 A list of structures that would be built within The Skerries water body and the associated footprints and durations that structures would be in place, is presented in table 6-1.

## Effects on hydromorphological quality elements

### *Basis of assessment*

7.3.38 The morphological conditions quality element in The Skerries water body is currently achieving high status. The normative definition of high status is given in Annex V:1.2 as *"There are no, or only very minor, anthropogenic alterations to the values of the physico-chemical and hydromorphological quality elements for the surface water body type from those normally associated with that type under undisturbed conditions."* Specifically, for the morphological conditions quality element in coastal water bodies the definition is *"The depth variation, structure and substrate of the coastal bed, and both the structure and condition of the inter-tidal zones correspond totally or nearly totally to the undisturbed conditions."*

7.3.39 UKTAG guidance [RD22] states that morphological condition limits are defined for the three zones- hydrodynamic, inter-tidal and sub-tidal zone. The condition limits proposed for these three zones are 5% of 'system capacity' for each zone, although it is noted that the limits do not imply that 15% of the water body can be altered before there is a risk to good status.

7.3.40 Part 4, Section 4 of *The* WFD (Standards and Classification) Directions (England and Wales) 2015 sets out how high status is determined for coastal waters. This states that "The morphological condition status of any transitional or coastal water body must not be classified as high if the water body:

- has been identified as being at risk of failing to achieve good ecological status due to the extent of morphological pressures; or
- exceeds the [RD22] Morphological Condition Limit of 5%."

7.3.41 It is recognised that the Morphological Condition Limits set out in UKTAG guidance [RD22] have not been formally adopted and are only intended as a guide. Although they do not replace the use of expert judgement or project-specific impact assessments, they provide a useful framework within which the effects can be considered.

7.3.42 The extent of the changes to morphological conditions have been considered using two different aspects to quantify the extent of the changes, these are:

- the overall loss of seabed/habitat compared to the size of The Skerries water body; and
- the loss of the coastal bed (subtidal area) and intertidal zone separately in relation to the subtidal and intertidal areas present in The Skerries water body.

7.3.43 The assessment also takes into account the capacity that is used in each zone by the combination of the existing modifications with the proposed additional modifications.

7.3.44 The existing modifications were determined based on information provided by NRW on the River Basin Characterisation 2 recent morphological risk assessment updates [RD23]. These updates built of earlier work carried out

on behalf of the Environment Agency to determine the designation of coastal water bodies as heavily modified [RD24].

7.3.45 The latest morphological risk assessment considers the nature and extent of impacts to morphological conditions from the following:

- land claim;
- dredging;
- aggregate;
- shellfisheries;
- fisheries; and
- shoreline structures (e.g. flood or coastal protection structures).

7.3.46 The morphological risk assessment carried out for The Skerries indicated that the water body is not at risk from morphological pressures under any of these categories. There is 0% land claim, no dredging or aggregate extraction and no shellfish beds or significant trawling within the water body. The shoreline structures assessment for The Skerries water body assigned a reporting category of ‘2a’. This is a low risk score which takes into consideration both the presence and influence of structures on the morphology of the water body) [RD6]. Although there are structures within the water body (e.g. the CW intake of the Existing Power Station), these are small and therefore exert very limited hydromorphological pressure on the water body.

***Extent of loss of the intertidal zone and coastal bed***

7.3.47 Construction of temporary (cofferdam and causeway) and permanent (MOLF, breakwaters, CW intake) structures, as well as excavation and dredging of the harbour and CW intake channel, would result in the loss of intertidal zone and coastal bed (and associated habitats) within Porth-y-pistyll (see figure 12). The area within Porth-y-pistyll would be dredged/excavated down to a depth of -10mAOD with slightly deeper berthing pockets up to -13mAOD. This could lead to effects on the ‘morphological condition’ elements in The Skerries water body, comprising the following quality elements: depth variation, structure and substrate of the coastal bed, structure of the intertidal zone.

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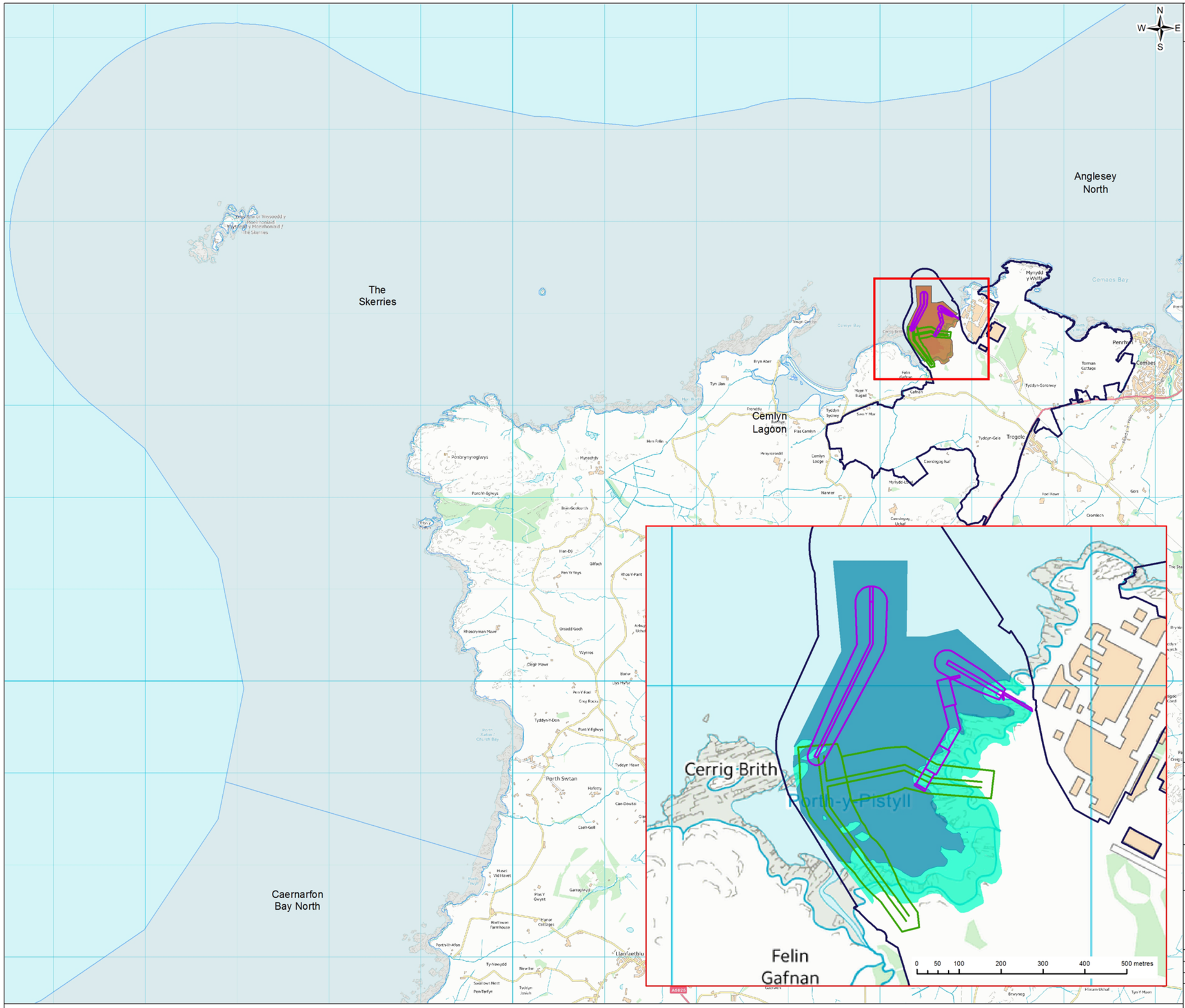
# FIGURE 12




Legend

- Wylfa Newydd Development Area
- Water Framework Directive coastal water bodies
- Permanent habitat loss
- Subtidal habitat (permanent loss)
- Intertidal habitat (permanent loss)
- Breakwater and Marine Off-Loading Facility
- Temporary cofferdam and causeway


| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | Initial Issue | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

INTERTIDAL AND SUBTIDAL HABITAT LOSS
UNDER THE FOOTPRINT OF THE MARINE WORKS

| | | |
|---|---|---|
| Scale @ A3 | 1:40,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |
| Drawing No. | 60PO8077_AQE_REP_006_D_12 | |

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### Permanent footprint of the marine works

7.3.48 For the purpose of assessment, the presence of all structures, including those which are temporary, is considered to be a permanent footprint given the duration of the construction period. Excavation and dredging is also considered to have a permanent effect as maintenance dredging would continue throughout the whole construction period (and potentially also in operation). Habitat losses associated with sediment deposition and scour are also considered as these could constitute permanent change.

7.3.49 The permanent loss of intertidal zone and coastal bed would alter the hydromorphology in this area. Excavation and dredging would result in a lowering of the seabed and a loss of soft substrates. Overall structural complexity of the seabed in this area would also be reduced to a more uniform habitat characterised by exposed rocky substrate.

7.3.50 The embedded mitigation includes the design of permanent structures to minimise the extent of the construction footprint. It is also recognised that the breakwater structures could provide permanent new hard substrate, although the hydromorphological quality (e.g. depth, substrate type, structural complexity) of these structures would not replace that which had been lost. Nonetheless, the inclusion of ecological habitat enhancement measures at suitable locations (e.g. features similar to bio-blocks (see chapter D13, Application Reference Number: 6.4.13) on the breakwaters would increase their structural complexity and therefore ecological value.

7.3.51 A total area of 30.5ha would be lost in Porth-y-pistyll under the footprint of the marine works (i.e. permanent and temporary structures as well as the excavated and dredged area and the direct footprint of the CW outfall). Of the 30.5ha, 7.3ha would be lost in the intertidal zone (including associated habitats) whilst the remaining 23.2ha would represent coastal bed (and associated habitats). Effects within the intertidal zone would be permanent resulting in a loss of hard rocky substrate and its associated structural complexity (e.g. rock pools, cracks, crevices and overhangs). Approximately 20 rock pools greater than 1m$^2$ are known to be present within the intertidal zone under the proposed footprint of the marine works and would also be lost.

7.3.52 The type of dredging (excavation using a rock breaker) is determined by the type of environment (rocky shore). Due to this substrate type it is possible to be precise about the footprint of dredging activity. The soft sediment that would be removed is overlying the rock. As the dredged/excavated area has been accurately determined it was not deemed appropriate to apply the generic 1.5x factor that can be used at the scoping stage to calculate the dredged area [RD2]. This factor may be more appropriate in predominantly soft sediment environments where the dredging is less accurate and the effects of scour may result in a larger area of the seabed being affected than the intended footprint.

### Scour

7.3.53 Changes in hydrodynamic conditions (i.e. waves and currents) can lead to changes in bed shear stress; this, depending on the substratum has the potential to cause physical disturbance (scour) of the seabed if the changes in bed shear stress manifest as increases from baseline conditions.

7.3.54 While physical disturbance from deposition or scour has the potential to effect the benthic habitats and communities it is acknowledged that in high energy systems the effects of scour are likely to be relatively small, as the community will consist of species with high tolerance to abrasion.

7.3.55 Based upon the results of the modelling studies, overall changes in maximum bed shear stress have been found to range mostly between -0.1N/m$^2$ and +0.1N/m$^2$ (figure D12-15, Application Reference Number: 6.4.101). Changes in bed shear stress ranging from -0.1N/m$^2$ and +0.1N/m$^2$ are judged to generate no more than minor differences in terms of the transportable sediment fraction for both sands and gravels (see chapter D12, section 12.5, Application Reference Number: 6.4.12).

7.3.56 However, a number of areas, specifically adjacent to the breakwaters and also around Cerrig Brith, Trwyn Cemlyn and Wylfa Head were predicted to experience changes in bed shear stress between -0.5N/m$^2$ and +0.5N/m$^2$ during spring tide conditions. Only under certain wave and tide conditions would any of these changes manifest in Cemlyn Bay and then these would be highly localised.

7.3.57 The greatest increases in bed shear stress from baseline occurred in extremely localised areas of seabed dominated by bedrock and were almost all confined to either the winter, but more usually, the high north wave conditions modelled. The generally small changes in bed shear stress predicted by the modelling are judged to generate no more than minor differences in terms of the transportable sediment fraction for both sands and gravels. Far larger differences in bed shear stress are required to generate significant changes to mobilisation of these grain sizes.

7.3.58 Considering these changes in relation to effects on habitats it is concluded that such small changes within the bays (Cemlyn, Porth-y-pistyll and Cemaes) would not have any detectable effect on habitats (see chapter D13, Application Reference Number: 6.4.13). Therefore, scour would not result in a non-temporary effect on the quality elements ‘structure of the intertidal zone’ and ‘structure and substrate of the coastal bed’ at the water body level.

### Sediment deposition

7.3.59 Hydrodynamic modelling considered deposition of sediments discharged from the drainage system (i.e. drainage, dewatering and sewerage outfalls) around the Wylfa Newydd Development Area and fugitive sediment released during dredging.

7.3.60 Under the worst case drainage discharges scenario, the deposition of sediment on the seabed is predicted to be up to 6cm in a highly localised area from the Afon Cafnan (see Chapter D13). This is based on no wind or wave effects which in reality would occur during a 1 in 30 year storm event; the effect

of waves would be to reduce deposition in this area further as a result of scour. The area of seabed classified as heavy deposition (according to the MarLIN MarESA criteria) is restricted to 0.93ha in Porth-y-pistyll.

7.3.61 In all other areas deposition is predicted to be less than 1cm therefore smothering from the deposition of sediment is predicted to range from negligible (<1cm) to light (up to 5cm) as defined by the MarLIN Marine Evidence based Sensitivity Assessment (MarESA) criteria [RD25]. It is likely that these sediments would be remobilised over several tidal cycles.

7.3.62 Therefore, sediment deposition would not result in a non-temporary effect on the quality elements of depth variation, structure of the intertidal zone and structure and substrate of the coastal bed in The Skerries water body.

7.3.63 The potential risk of increased deposition of the additional suspended load upon Esgair Gemlyn (the shingle ridge), has been investigated through both the hydrodynamic and wave model plume modelling scenarios (see appendix D13-8, Application Reference Number: 6.4.90). Potential effects from a change in fine sediment deposition upon the Esgair Gemlyn entering Cemlyn Bay could include smothering or impairment of the infiltration mechanisms that currently form part of the hydrological supply to exchange with the adjacent Cemlyn Lagoon.

7.3.64 The outcomes of baseline studies (see appendix D12-2, Application Reference Number: 6.4.81) show that there is no link or pathway between the potential sources of fine sediment from fluvial sources and the Esgair Gemlyn. Furthermore, the hydrodynamic plume modelling investigations also depict the potential movement and deposition of fine sediment from dredging activities during construction under calm conditions (representing worst case scenario) to be limited to a localised area around a spillage event.

***Assessment of effects***

7.3.65 The total area of the coastal bed and intertidal zone in The Skerries that would be modified, including all structures, excavation/dredging in Porth-y-pistyll is calculated as 30.5ha. This value accounts for the effects of scour and sediment deposition as these effects do not result in habitat loss.

7.3.66 In comparison to the total area of The Skerries water body (4723ha) the habitat loss of 30.5ha equates to 0.65%. This does not account for the recovery of habitats within the excavated area following completion of construction. This approach has been taken due to the uncertainty about the types and quality of habitats that would be created in the long term.

7.3.67 The total intertidal area of The Skerries coastal water body is 210ha. The Wylfa Newydd Project would directly affect an estimated 7.6ha intertidal area within The Skerries water body, equating to 3.6% of the total intertidal area within the water body.

7.3.68 The total subtidal area of The Skerries coastal water body is 4,513ha. The Wylfa Newydd Project would directly affect approximately 23.2ha subtidal area within The Skerries coastal water body, equating to 0.51% of the total subtidal area.

7.3.69 At present The Skerries water body has no modifications and is therefore considered to align with the normative description of 'totally undisturbed' conditions. The changes to morphological conditions represent a small change proportionally in The Skerries water body which are considered to result in a minor anthropogenic alteration to the hydromorphological quality elements from those normally associated with undisturbed conditions (less than 5%).

7.3.70 The estimated loss of intertidal area is below the 5% threshold stated in the draft UK TAG guidance [RD22]. The only other measure is against the normative description of "*no, or only very minor, anthropogenic alterations".* In this instance compliance with the objectives of the WFD is informed by the interpretation of case law, namely the 'Bund case' (Court for Case C-461/13 (Bund für Umwelt und Naturschutz Deutschland eV v Bundesrepublik Deutschland). The judgement states that where there *may* be a risk of deterioration (i.e. where the status of any quality element could be jeopardised) that consent may not be granted. It is not possible to definitively conclude that the new modifications would only result in minor anthropogenic change and would therefore constitute within class rather than between class deterioration. Considering the wording of the judgement it is concluded that there is a risk that the morphological conditions quality element could deteriorate from high to good status.

7.3.71 Therefore, in relation to effects on morphological conditions (depth variation, structure and substrate of the coastal bed and structure of the intertidal zone) it is concluded that the Wylfa Newydd Project may result in a risk of deterioration in the status of the 'morphological conditions' quality element in The Skerries water body.

7.3.72 In relation to effects on the structure and integrity of the Cemlyn lagoon bank, it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of the Cemlyn Lagoon water body, nor compromise the ongoing achievement of its objectives.

### Effects on biological quality elements

7.3.73 An assessment of the potential effects of habitat loss within the footprint of the marine works on biological quality elements (benthic invertebrates and aquatic flora) has been made in chapter D13 (Application Reference Number: 6.4.13). This assessment also considered provision and ecological value of new habitat on the breakwater structures.

7.3.74 Intertidal and subtidal habitats, and species that are functionally reliant on these habitats (e.g. microphytobenthos), are sensitive to direct physical loss at locations where new structures are added to the seabed or where extensive alteration of the seabed (e.g. excavation and dredging) occurs. Organisms occupying higher trophic levels (e.g. macroalgae and benthic invertebrates) would also be affected either by direct mortality or through loss of resources on which they depend (e.g. food and refuge).

7.3.75 The majority of habitats that would be lost from the intertidal zone in Porth-y-pistyll are characterised by hard rocky substrate. Associated

biological communities are typically characterised by dense fucoid seaweed species and invertebrates including molluscs and crustaceans. No intertidal species with any conservation designations have been recorded within the footprint of the marine works in Porth-y-pistyll.

7.3.76 Subtidal areas are characterised by a more complex mosaic of substrates including rock, coarse sediments and fine sediment habitats; no significant biogenic reef structures are known to be present under the proposed footprint of the marine works. The only subtidal species of conservation value known to be present is the ocean quahog (*Arctica islandica*), although only a single individual has been recorded in Porth-y-pistyll under the footprint of the western breakwater. A detailed assessment of the habitats and species lost is presented in chapter D13 (Application Reference Number: 6.4.13).

7.3.77 Despite direct habitat loss, the breakwater structures in Porth-y-pistyll would have the capacity to function as an artificial reef by providing new surfaces for colonisation by species dependent on hard substrate. Microorganisms such as diatoms, bacteria, protozoans, cyanobacteria and microalgae and macroalgal propagules would be the first colonisers, creating a biofilm that would encourage the settlement of larger organisms. Fast-growing algae such as *Blidingia*, *Ulva* and *Porphyra* spp. would be likely to be early colonisers which, as the complexity of habitats develop, would be replaced over time by later colonisers such as barnacles, limpets, mussels and foliose seaweeds. The exact nature of colonisation would depend on the physical characteristics of the structures (i.e. material, arrangement of blocks, position in the tidal frame, orientation and exposure); and is likely to vary across the surface of the breakwaters. Breakwater structures have been found to provide valuable habitat for aquatic flora and benthic invertebrates [RD26].

7.3.78 The breakwaters themselves would be designed to minimise the construction footprint, and therefore the extent of habitats lost. The design of the breakwaters would also include ecological enhancements at suitable locations to enhance the rate of colonisation and the species diversity on the structures. These would include ecological habitat enhancement measures at suitable locations. A gap at the southern end of the western breakwater would be maintained to ensure migratory species such as European eel and sea trout are not prevented from using freshwater habitats in the Afon Cafnan.

7.3.79 The habitats present under the footprint of the marine works in Porth-y-pistyll are common along the north coast of Anglesey and therefore the scale of habitat loss within The Skerries water body is small (0.64%). This does not account for any habitat enhancement measures or colonisation on marine structures or the dredged area and is therefore considered to be a conservative estimate.

7.3.80 In relation to effects on benthic invertebrates and aquatic flora it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries water body, nor compromise the ongoing achievement of its objectives.

### *3. Potential effects on hydromorphological quality elements in The Skerries and Cemlyn Lagoon water bodies from the introduction of new marine structures leading to changes in coastal processes, waves and hydrodynamics during construction and operation*

#### Classification of quality elements

7.3.81 The current classification of hydromorphological quality elements in The Skerries and Cemlyn Lagoon water bodies is summarised in table 7-7.

**Table 7-7 Classification of hydromorphological quality elements in coastal water bodies (data provided by NRW)**

| | Details | |
|---|---|---|
| WFD water body name | The Skerries | Cemlyn Lagoon |
| Overall status/potential | High status | Good potential |
| Hydromorphological supporting elements | High | Not assessed |
| Morphology | High | Not assessed |

#### Relevant activities

7.3.82 The activity relevant to this part of the assessment is outlined in table 7-8. This part of the assessment is relevant to the DCO, Marine Licence and the construction water discharge (table 7-8).

**Table 7-8 Activities relevant to the assessment of effects on hydromorphological quality elements from the introduction of new marine structures**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | ✓ | ✓ | | |

#### Basis of modelling and the worst case

7.3.83 Delft3D hydrodynamic and Simulating Waves Nearshore (SWAN) models were used to model the changes in coastal processes and hydrodynamics. The fully developed design (without causeway) was shown to be the worst case model for wave reflection.

### Effects on hydromorphological quality elements

7.3.84 Construction of temporary and permanent marine structures within Porth-y-pistyll could lead to the disturbance of coastal processes and hydrodynamics, including wave climate and tidal currents and sediment processes (e.g. scour and deposition) with potential effects on hydromorphological quality elements in The Skerries water body and Cemlyn Lagoon.

7.3.85 An assessment of the potential effects on coastal and marine processes and changes to hydromorphology is presented in chapter D12 (Application Reference Number: 6.4.12). This chapter presents a detailed assessment of wave, current and sediment regime with the marine structures in place using Delft3D hydrodynamic and Simulating Waves Nearshore (SWAN) models. This has helped inform the assessment made in this report of the specific effects on the hydromorphology of the coastal water bodies.

7.3.86 The Delft3D hydrodynamic model has been used to assess the potential influence of the activities associated with the Wylfa Newydd Project on the tidal currents during construction. This work has allowed a determination of changes to current speeds and associated bed shear stresses. Overall the work has shown that changes on tidal current speeds are minimal.

7.3.87 Analysis of all wave scenarios run within SWAN has revealed the greatest potential changes in wave heights occurs with the most severe winter storm (99 percentile) waves arising from the north-west.

7.3.88 Immediately west of the western breakwater (point 8 on figure D12-19, Application Reference Number: 6.4.101) the differences in wave height predicted by the wave model include the following potential changes:

- Under a partially built scenario, with the coffer dam in place, and storm waves approaching from the north-west, there could be a change in wave height ranging between +7% to +9%.
- Under a fully built scenario, with storm waves approaching from the north-east, there could be a change in wave height ranging between -14% to -10%.

7.3.89 Adjacent to the Esgair Gemlyn within Cemlyn Bay (point 6 on figure D12-19, Application Reference Number: 6.4.101):

- Under a partly built scenario, when the coffer dam is in place, with storm waves approaching from the north-west, there could be a change in wave height ranging between -1% and +2%.
- Under a fully built scenario, with storm waves approaching from the north-east, there could be a change in wave height ranging between +1% and -1%.

7.3.90 At the head of Cemlyn Bay adjacent to Esgair Gemlyn (at point 6), under the same winter storm conditions, an increase in wave height ranging between +1% and +2% is indicated upon a baseline wave height of 1.0m to 1.2m.

7.3.91 Further SWAN wave modelling (sensitivity testing) completed indicated minor changes in wave height within Cemlyn Bay with respect to the direction of approaching waves. The western breakwater will reflect waves from the west/north-west causing some minor refocussing of energy, but limited to relatively small waves. This refocussing (reflected in a minor increase of bed shear) affects the Cemlyn Bay seabed close to the most western part of the Esgair Gemlyn in an area of relatively hard bedrock. The levels of wave height increase remain lower than the baseline wave heights from the north-east (a direction unaffected by the breakwater).

7.3.92 Given the small changes in the baseline wave height it is not considered that there would be an effect on the integrity of the shingle ridge and disturbance with the Wylfa Newydd Project in place would be within the range of natural variability. Future overtopping of the shingle ridge is likely to continue to be focused at the eastern end, adjacent to the car park, which is currently protected by a short length of sea wall and is frequently inundated by high storm waves. The potential for large events typically associated with changing climatic patterns to trigger threshold or stochastic events is increasingly acknowledged and recognised.

7.3.93 The presence of the marine structures is considered to have a small overall effect on tidal currents and waves in Porth-y-pistyll which could lead to increased sediment deposition as a consequence of the sheltering effect. However, with consideration of mitigation such as the gap at the landward end of the western breakwater which would allow tidal currents to maintain a circulation of flow, deposition is likely to be minimal.

7.3.94 During all baseline wave conditions, the highest bed shear stress is predicted to occur inshore around headlands (e.g. Trwyn Cemlyn, to the west of Cemlyn Bay and west of Porth-y-pistyll). This area is characterised by high bed shear stress and exposed rock; any increase in bed shear stress is not therefore expected to have an effect on the sediment regime.

7.3.95 Within the bays (Cemlyn, Porth-y-pistyll and Cemaes) the changes to bed shear stress are minimal and, with the exception of Porth-y-pistyll, highly localised. In the head region of Cemlyn Bay near to the ridge the results show no change in bed stress except for a small localised zone to the north and associated with the ebb tidal delta of the lagoon drainage system. Within Porth-y-pistyll the changes are clearly dominated by a reduction in bed shear stress (figure D12-15, Application Reference Number: 6.4.101) with the only increases occurring to the north of the bay, between the breakwaters, and then only during the infrequent high north wave scenario.

7.3.96 In terms of the modelled decreases to bed shear stress, values in most areas range between -0.1N/m$^2$ and -0.5N/m$^2$ with some very small pockets of maximum bed shear stress decreasing to between -0.5N/m$^2$ and -1.0N/m$^2$.

7.3.97 The greatest increases were generally shown to occur in areas dominated by bedrock e.g. Cerrig Brith and Trwyn Cemlyn, with almost all modelled increases <1.0N/m$^2$. The exceptions are some highly localised areas where bed shear stress is predicted to increase, under certain wave conditions, to between 1.0N/m$^2$ and 3.0N/m$^2$. These increases are constrained to bedrock

areas at Cerrig Brith and Trwyn Cemlyn, and during the high north wave an area just west to the mouth of the CW outfall. In areas of sediment floored seabed, where an increase is bed shear stress was predicted, it was usually less than 0.5N/m$^2$.

7.3.98 In relation to effects on the direction of dominant currents and wave exposure it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries water body, nor compromise the ongoing achievement of its objectives.

In relation to effects on structure and integrity of the lagoon banks it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of the Cemlyn Lagoon water body, nor compromise the ongoing achievement of its objectives.

### *4. Potential effects on the fish quality element in riverine and transitional water bodies from changes to hydromorphological, chemical and physico-chemical quality elements, underwater noise and visual disturbance (artificial lighting) during construction*

#### Classification of quality elements

7.3.99 This effect relates to the fish quality element in sixteen water bodies. The classification of each water body is presented in table 7-9.

**Table 7-9 Classification of the fish quality element in riverine and transitional water bodies (data provided by NRW)**

| WFD water body Name | Status of the fish quality element |
|---|---|
| **Riverine** | |
| Alaw - downstream Llyn Alaw | High |
| Tan R'Allt | Not assessed |
| Afon Cleifiog (Valley) | Not assessed |
| Afon Crigyll | Good |
| Wygyr | High |
| Goch Amlwch | Not assessed |
| Goch Dulas | High |
| Lligwy | Not assessed |
| Ddrydwy (Llanfaelog) | Not assessed |
| Ffraw | Not assessed |
| Ceint | High |
| Cefni - Ceint to Cefni reservoir | High |
| Cefni - Cefni reservoir east | Good |

| WFD water body Name | Status of the fish quality element |
|---|---|
| **Riverine** | |
| Cefni - Cefni reservoir west | Not assessed |
| **Transitional** | |
| Alaw | Not assessed |
| Cefni | Not assessed |

### Relevant activities

7.3.100 The activities relevant to this part of the assessment are outlined in table 7-10. This part of the assessment is only relevant to the DCO, Marine Licence and construction water discharge (table 7-10).

**Table 7-10 Activities relevant to the assessment of effects on the hydrological regime in The Skerries and Anglesey North water bodies**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | ✓ | ✓ | | |
| 1.18 | Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | ✓ | ✓ | ✓ | |
| 1.28 | Construction of internal roads, car parking, security fencing and permanent lighting | ✓ | | | |

7.3.101 The assessment of effects on fish considers all relevant pathways and is made with specific consideration given to the effects on migratory species that may be present within the ZoI (Atlantic salmon, sea trout, river lamprey and European eel).

7.3.102 Across the whole Wylfa Newydd Project the following activities and pathways have been identified that could affect migratory fish in freshwater and marine environments:

- changes in visual and acoustic stimuli during ground preparation, earthworks and marine excavation and construction activities;
- changes in water quality and hydrology during ground preparation, earthworks and marine excavation and construction activities;
- physical interaction between species and project infrastructure (habitat loss and mortality) from earthworks and marine excavation and construction activities; and

- physical modifications including loss of intertidal and subtidal habitat in coastal water bodies and changes to hydromorphological quality elements.

7.3.103 The effects on fluvial and coastal water bodies are described and the assessment then considers the combined effects on each migratory species individually.

### Effects on migratory fish in non-reportable water bodies

7.3.104 Direct effects on fish could occur in the following non-reportable water bodies:

- Afon Cafnan (The Skerries water body);
- Nant Porth-y-pistyll (The Skerries water body);
- Tre'r Gof drains (Anglesey North water body);
- Nant Cemaes (Anglesey North water body); and
- Nant Carreglwyd (Caernarfon Bay North water body).

#### *Changes in visual and acoustic stimuli*

7.3.105 Topsoil clearance, vehicle movements, open cutting and excavation activities carried out in the vicinity of a watercourse could generate ground-borne vibrations that might propagate into watercourses and result in disturbance to migratory species. Lighting of construction compounds could also influence the utilisation of non-reportable watercourses by migratory species. Disturbance as a result of visual and acoustic stimuli would have the potential to lead to a variety of behavioural responses with possible long-term effects including a deterrent or barrier to migration, displacement from suitable habitats or reduced feeding and reproductive success.

7.3.106 The embedded mitigation includes 15m buffer zones from the non-reportable water bodies named above (with the exception of Nant Porth-y-pistyll). Good practice mitigation would ensure that vibratory work would be carried out at a distance sufficient to avoid effects on fish within water bodies. The lighting strategy aims to avoid light shining into water bodies and people would be at least 15m away at all times, thereby avoiding visual disturbance.

7.3.107 The sensitivity of migratory species to visual and acoustic stimuli varies between species but it is considered that the mitigation would avoid any effects on migratory fish whilst present in fluvial non-reportable water bodies and that therefore there would be no detectable effect on migratory fish at the water body level with respect to this effect.

#### *Changes in water quality and hydrology*

7.3.108 Water quality could be affected by spills, leaks or discharges of fuel and oil from plant, and fine sediment release from earthworks and excavations. Fish are particularly sensitive to soluble inorganic pollution, with mortality observed at relatively low levels where soluble metal salts are introduced. The organic constituents of runoff could include vehicle fuel and oil, other hydrocarbons, herbicides and pesticides, all of which cause deleterious effects to fish.

Immiscible fuel and oil could present a direct threat of mortality to fish by coating gill structures. Suspended solids mobilised through the excavation and land forming activities could prevent the successful development of fish eggs and larvae, and affect respiration through the clogging of gills and the smothering of food sources.

7.3.109 Potential changes in water quality would be controlled through embedded and good practice mitigation, such as the development of the drainage design, appropriate buffers around watercourses and adherence to the CoCP.

7.3.110 Hydrological changes could come about by discharge from new outfalls, river realignment promoting different flow types, changes in land runoff from increased hard standing and the insertion of hard engineering in river banks and bridge footings. Change is likely to be highly isolated to a point source and unlikely to be of a scale to bring about widespread changes to physical habitat structure, create a hydrological barrier to migration or replace optimal habitat for migratory species.

7.3.111 Overall it is predicted that there would be no detectable effect on migratory fish at the water body level with respect to this effect.

***Physical interactions between species and project infrastructure***

7.3.112 Physical interaction between migratory species and infrastructure in the fluvial environment would be restricted to a loss of 200m of riverine habitat in Porth-y-pistyll, and the proposed river realignment at Caerdegog Isaf. European eel are known to migrate through Porth-y-pistyll whilst there would be the potential for eel to be able to access the river realignment under high flow conditions.

7.3.113 River realignment and the loss of habitat at Porth-y-pistyll would have the potential to result in a reduction of suitable habitat and localised mortality of migratory species. Embedded mitigation described in chapter D9 (Application Reference Number: 6.4.9) would include fish relocation prior to works and the design of a sinuous realignment to increase habitat value. This would represent an improvement in fish habitat.

7.3.114 Whilst physical interaction between species and infrastructure would be likely to occur this would not affect migratory fish populations and there would be no effect on migratory fish at the water body level with respect to this effect.

***Physical modifications***

7.3.115 Physical modification to habitat, such as the installation of culverts, outfalls or bridge footings would have the potential to affect migratory species, particularly eel and sea trout present in non-reportable water bodies. This would be likely on all non-reportable water bodies. Modifications to physical habitat could result in riparian and in-channel habitat reduction and changes in hydrodynamics locally around the structures. This in turn could lead to deterioration in suitable habitats or fragmentation if a barrier to migration were created. Maintaining connectivity throughout the channel would be particularly important for migratory species that travel within catchments to access feeding, spawning and juvenile habitats.

7.3.116 The non-reportable water bodies listed above would not be culverted. It is possible that culverts may be used on a temporary basis in very small drains. However, these areas are in the upstream reaches and many of these drains are dry for much of the year and therefore do not support good fish habitat. Any new outfalls would be sensitively designed and installed under a watching brief of a qualified fluvial geomorphologist to reduce as far as possible any changes to the hydromorphology.

7.3.117 Overall it is predicted that there would be no detectable effect on migratory fish at the water body level with respect to this effect.

### Effects on migratory fish in coastal water bodies

#### *Changes in visual stimuli*

7.3.118 Construction activities and the use of artificial lighting could result in visual disturbance to fish. This could lead to a variety of behavioural responses with possible long-term effects of repeated disturbance, including displacement and/or disruption to feeding and reproduction, leading to a decline in fitness and productivity [RD27].

7.3.119 An assessment of visual disturbance effects on marine fish during the construction phase has been made in chapter D13 (Application Reference Number: 6.4.13).

7.3.120 Most fish species are photoreceptive, with key activity rhythms and behavioural patterns (e.g. feeding) stimulated by light. European eel, sea/brown trout and Atlantic salmon are known to exhibit direct avoidance of artificial light [RD28] [RD29] [RD30]. The response of river lamprey to artificial light is less clear although it is considered that this species is also photoreceptive.

7.3.121 For marine fish species that are deterred due to the presence of a visual disturbance, displacement is unlikely to affect the integrity of populations (i.e. reduction in fitness and productivity through effects on reproduction and feeding) given the availability of alternative habitats within The Skerries, Anglesey North and Cemlyn Lagoon water bodies as well as further afield. Species that are typically attracted by artificial lighting are unlikely to increase in abundance within the vicinity of the marine works due to the presence of other disturbance stimuli such as acoustic disturbance.

7.3.122 Migratory species such as European eel, sea trout and Atlantic salmon are only resident in coastal waters adjacent to the Power Station for short periods of time and are therefore unlikely to be visually disturbed when in the marine environment.

7.3.123 With embedded mitigation (buffering of watercourses, appropriately sensitive lighting of the site) in place it is predicted that there would be no detectable effect on migratory fish at the water body level with respect to this effect.

***Changes in acoustic stimuli (underwater noise)***

7.3.124 Increased underwater noise and vibration can affect fish in a number of ways including: masking biologically useful sound, disturbing natural behaviour, impairing hearing, and causing injury or death.

7.3.125 An assessment of underwater noise and vibration effects on fish during the construction phase has been made in chapter D13 (Application Reference Number: 6.4.13). Dredging, drilling, rock-breaking and vessel movements were identified as the primary construction activities leading to increased underwater noise and vibration during the construction phase. Whilst drilling and rock-breaking are expected to be intermittent activities, general construction activities such as dredging and vessel movements are likely to be ongoing, contributing to a general increase in underwater noise and vibration within The Skerries water body.

7.3.126 Hearing-sensitive species are likely to be most affected by underwater noise and vibration. These include hearing-specialist species such as herring (*Clupea harengus*) and sprat (*Sprattus sprattus*). Migratory species possibly affected by underwater noise and vibration include sea trout, river lamprey, European eel and Atlantic salmon. Sea trout and Atlantic salmon are considered to be hearing generalists. The hearing ability of river lamprey and European eel is poorly documented; anatomically there is little to suggest that these species are receptive to sound or vibration but for the purpose of the assessment they were also considered to be hearing generalists [RD31].

7.3.127 Modelling of construction activities and impact ranges (details are outlined in chapter D13 (Application Reference Number: 6.4.13), concluded that the risk of mortality of fish was low. The maximum distance within which recoverable injury of hearing specialists (i.e. most sensitive) is expected is 10m whilst temporary threshold shift may be caused out to 180m. There are no defined sound levels for behavioural effects in fish. Noise levels generated from vessel movements is not predicted to be discernible above background noise beyond 3km from the source.

7.3.128 Considering the relatively small impact ranges predicted and the limited presence of these species in the area it is predicted that there would be no detectable effect on migratory fish at the water body level with respect to this effect.

***Changes in marine water quality (chemical and physico-chemical quality elements)***

7.3.129 Fish could be affected in the marine environment from an increase in suspended sediments, changes to nutrient conditions and discharge of specific pollutants and priority substances. These changes are discussed in 7.3.8 to 7.3.16.

7.3.130 The majority of the discharge locations into coastal waters are existing watercourses and the areas likely to be affected are very small compared to the available habitat for fish and these areas do not represent key refuge or foraging habitat.

7.3.131 An increase in freshwater flows would mean that during high rainfall events there would be a stronger cue for fish seeking to migrate upstream. The changes to flow rates in the watercourses would not affect fish migration from the sea into watercourses and for the majority of time would be similar to the existing baseline.

7.3.132 The areas where suspended solids would be above background concentrations are small. It is possible that during heavy rain events when suspended solid concentrations are highest, some migratory fish species that are more sensitive to suspended sediments (e.g. sea trout) may choose to wait until levels have reduced prior to entering freshwater catchments. This may already occur, however, as suspended solid concentrations in catchments across the Wylfa Newydd Development Area are very variable. For example, the range of suspended solid concentrations recorded in the Afon Cafnan was between 2.5mg/L and 2,580mg/L (mean of 129mg/L) (see appendix D8-1, Application Reference Number: 6.4.26). Other species (e.g. European eel and river lamprey) which are accustomed to living on the river bed in silty environments would be unlikely to be affected.

7.3.133 The changes to transparency are temporary and suspended solids would be rapidly dispersed in coastal water bodies (see sections 7.3.17-7.3.22). There would be no change in nutrient conditions. Predicted changes to chemical and physico-chemical quality elements are restricted to the immediate vicinity of the marine discharge points. The areas affected would be small in relation to the available refuge and foraging habitat and given the temporary nature of the effects there would be no detectable effect on migratory fish at the water body level with respect to this effect.

***Physical modifications***

7.3.134 A total area of 30.5ha of habitat would be lost under the footprint of the marine works in The Skerries water body. Migratory fish may utilise these habitats for feeding or refuge during certain stages of their lifecycle. The breakwater structures in Porth y pistyll would have the capacity to function as an artificial reef by providing new habitat.

7.3.135 Fish could be affected indirectly affected by physical modifications (i.e. changes to hydromorphological quality elements) from the introduction of new marine structures leading to changes in coastal processes, waves and hydrodynamics during construction and operation. The changes to habitats resulting from coastal processes would be minimal and there would be no effect on migratory fish.

7.3.136 Overall there is predicted to be no detectable change to fish populations from physical modifications and no potential for a change in the fish quality element in any water body.

***Physical interactions between species and project infrastructure***

7.3.137 Particular consideration has been given to the position of the western breakwater, ensuring a sufficient gap exists at the landward end, post construction of the marine works. This would be designed to maintain hydrodynamic flows and allow mixing within Porth-y-pistyll to prevent long-

term physical disturbance to habitats located to the west of the breakwater structures around Cerrig Brith during the construction phase.

7.3.138 Overall there is predicted to be no detectable change to fish populations from physical interactions between species and project infrastructure and no potential for a change in the fish quality element in any water body.

### Summary of effects on migratory species during construction

#### *Atlantic salmon*

7.3.139 Given the absence of optimal habitat in the fluvial environments the effects on Atlantic salmon during construction would only occur within the marine environment. Atlantic salmon are considered to move rapidly through the near-shore coastal waters to reach feeding grounds and on their return to natal rivers as adults. Smolts are assumed to migrate directly to offshore feeding grounds, minimising the opportunity for interaction with the ZoI. Adult fish are more likely to traverse through coastal waters searching for their natal river. Whilst this could result in a higher incident of interaction with the ZoI the high mobility of adult salmon is considered to minimise the opportunity for interaction.

7.3.140 Due to the high mobility of the species to avoid suboptimal conditions, and a small ZoI (including the loss of habitat as a resource) it is considered that there would be no detectable effect on migratory species within the home-range rivers for Atlantic salmon.

7.3.141 There is predicted to be no effect on the statuses of the fish quality elements in riverine and transitional WFD water bodies that support Atlantic salmon as part of their wider fish community.

#### *Sea trout*

7.3.142 Sea trout are known to be present within the ZoI in the marine environment and may also be utilising the non-reportable fluvial water bodies around the coast of Anglesey. There are records of sea trout in fluvial WFD water bodies, the closest of these to the relevant ZoI being the Wygyr which enters the sea at Cemaes Bay.

7.3.143 Sea trout are highly mobile, with low thresholds for light, sound and sedimentation. As such this species could actively avoid affected areas (e.g. sediment plumes, increases in underwater noise, visual disturbance) during key construction phases.

7.3.144 The relevant ZoIs do not extend into Cemaes Bay and would not prevent the use of intertidal and subtidal habitat by sea trout in this area. The effects would be intermittent (e.g. suspended sediments would increase in relation to rainfall) and individuals would be able to swim around the affected areas to access habitats where there are more favourable conditions.

7.3.145 The loss of intertidal habitat in Porth-y-pistyll and at the CW outfall is not considered a significant effect given the size of the coastal resource, relative infidelity to particular coastal waters and mobility of the species.

7.3.146 There is predicted to be no effect on the statuses of the fish quality elements in riverine and transitional WFD water bodies that support sea trout as part of their wider fish community.

***River lamprey***

7.3.147 River lamprey may be present within the marine ZoI in The Skerries water body during construction. Given the low incidence of previous records within the ZoI, relatively high mobility, generally low hearing sensitivity and juvenile preferences for sediment, it is predicted that river lamprey would not be adversely affected by the Wylfa Newydd Project. Effects on river lamprey arising from marine construction activities are considered to be unlikely and undetectable at the water body level for any fluvial or coastal water body connected to the ZoI.

7.3.148 River lamprey may be present in the freshwater ZoI on the Alaw – downstream Llyn Alaw water body. This species has not been recorded from any other fluvial water bodies in the study area. The clear span crossing of the lower Alaw and minor modifications to physical habitat (e.g. outfalls on the main water body and localised realignment or culverting of associated field drainage within the wider catchment) are not considered to result in a detectable effect on river lamprey.

7.3.149 There is predicted to be no effect on the statuses of the fish quality elements in riverine and transitional WFD water bodies that support river lamprey as part of their wider fish community.

***European eel***

7.3.150 European eel have been recorded across all of the fluvial water bodies discharging into The Skerries and Anglesey North coastal water bodies. Adult migration from the water bodies listed above to the Atlantic has the potential for eels to interact with the ZoI. The high mobility of adult eels during migration, the relatively short residency time in near-shore coastal waters, low records of impinged eel at the Existing Power Station and likelihood of adults migrating at a distance sufficiently offshore to avoid the ZoI suggest very low interaction would be likely within the ZoI.

7.3.151 Glass eels returning from Atlantic breeding grounds may utilise near-shore migration routes, whereas adults migrating to breeding grounds would be found further offshore. Very low incidents of entrapment at the Existing Power Station when operational suggest very low interaction would be likely within the ZoI.

7.3.152 European eel would be affected through the loss of habitat at Porth-y-pistyll. The 200m reach of watercourse that would be lost supports a small number of eel immediately above mean high water springs. The size of the watercourse and relatively small number of individuals indicates that rather than this being a discrete population it is likely to consist of vagrants from adjacent river catchments. Relocation of these individuals into the adjacent coastal waters would result in redistribution to local river catchments and would not represent a loss of resource to the wider European eel population of either WFD coastal catchment or fluvial water bodies.

7.3.153 Realignment of a section of the Cerdegog Isaf catchment will result in the creation of riverine habitat that would support European eel. The lower Nant Cemaes is known to support European eel and improvement to hydromorphological condition has the potential to increase eel movement through the upper catchment. The creation of habitat will offset the loss of habitat at Porth-y-pistyll.

7.3.154 European eel present on other fluvial watercourses would interact with ZoI from in-channel works, physical habitat modification and changes in water quality. With low sensitivity to light and noise, and the ability to tolerate sedimentation, it would be unlikely, providing migratory pathways remain unimpeded, that the fluvial ZoI would result in a detectable change to European eel populations in fluvial environments.

7.3.155 There is predicted to be no effect on the statuses of the fish quality elements in riverine and transitional WFD water bodies that support European eel as part of their wider fish community.

### *5. Potential risk to biological quality elements in The Skerries and Anglesey North water bodies from the introduction of non-native species during construction*

#### Classification of quality elements

7.3.156 The current classification of biological quality elements in The Skerries and Anglesey North water bodies is summarised in table 7-11.

**Table 7-11 Classification of the biological quality elements in The Skerries and Anglesey North water bodies (data provided by NRW)**

| | Details | |
|---|---|---|
| WFD water body name | The Skerries | Anglesey North |
| Overall status/potential | High status | Moderate status |
| Biological quality elements | High | Good |
| Phytoplankton | Not assessed | Not assessed |
| Invertebrates | High | Good |
| Infaunal Quality Index | Not assessed | Good |
| Imposex | High | High |
| Macroalgae | Not assessed | Not assessed |
| Opportunistic Macroalgae | Not assessed | Not assessed |

#### Relevant activities

7.3.157 The activity relevant to this part of the assessment is outlined in table 7-12. This part of the assessment is only relevant to the DCO (table 7-12).

**Table 7-12 Activities relevant to the assessment of effects of non-native species in The Skerries and Anglesey North water bodies**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 1.29 | Operation of the MOLF | ✓ | | | |

7.3.158 The inadvertent introduction and establishment of Invasive Non-Native Species has the potential to displace native species through competition for resources, alteration of substrata and water conditions, smothering and predation [RD32].

7.3.159 An assessment of the effects of introducing non-native species during the construction and operational phases has been made within chapter D13 (Application Reference Number: 6.4.13). The assessment describes the pathways of effect, reviews current baseline data and outlines the possible significant effects.

7.3.160 The risk of introducing non-native species is greatest during the construction phase; the most likely pathway is from marine plant and vessels which can transport non-natives as fouling on hulls and ballast waters. Changes to the physical conditions (e.g. hydrodynamics) and disturbance of established communities during the construction phase may also make it easier for existing or introduced non-native species to proliferate. Although the introduction of non-native species during the operational phase is considered low, it is recognised that increased water temperatures from CW discharge could facilitate the establishment and spread of non-native species adapted to warmer waters.

7.3.161 Only two non-native plankton species have been recorded from the Wylfa Newydd Development Area and of these only one, the diatom *Coscinodiscus wailesii*, has known environmental impacts. Both were recorded in extremely low abundance and are not considered to represent a significant risk to biodiversity.

7.3.162 The North Wales Wildlife Trust has identified 17 non-native benthic species of concern in North Wales; these have either already been recorded in Wales or are expected to arrive soon [RD33]. Of most concern is the carpet sea squirt (*Didemnum vexillum*); this species represents a significant risk to biodiversity owing to the speed at which it can colonise artificial structures. Once established it can form large colonies, growing over existing sessile hard structure communities, resulting in significant alterations to the native species composition. To date, the carpet sea squirt has not been recorded in any of the marine ecology surveys carried out for the Wylfa Newydd Project, although it is known to be present in Holyhead Harbour.

7.3.163 A number of good practice mitigation measures including production and adherence to a Biosecurity Risk Assessment and Method Statement are

proposed (see chapter D13, Application Reference Number: 6.4.13). This would be informed by industry guidelines such as The International Convention for the Control and Management of Ships' Ballast Water and Sediments. Even with these measures in place, it was considered that there remains a risk to biological quality elements from non-native species.

7.3.164 Therefore, additional mitigation measures were identified to further reduce the risk of transfer and establishment of non-native species. This mitigation comprises a monitoring programme for non-native species to include observational surveys on structures that could provide substrate for non-native species. Surveys would record presence/abundance of non-native species with reporting in agreement with NRW. Surveys would begin once construction of the breakwaters and MOLF is completed. The frequency and extent of monitoring would reduce over time, particularly once the MOLF is no longer operational. The ongoing requirement for monitoring would be regularly reviewed and agreed with NRW.

7.3.165 This additional mitigation is likely to significantly increase the probability of detecting the introduction and/or spread of non-native species which could have potentially occurred as a result of construction, allowing time and opportunity for additional action to be taken if necessary. This additional mitigation is considered sufficient to minimise the risk to biological quality elements.

7.3.166 In relation to effects on benthic invertebrates and aquatic flora it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries and Anglesey North water bodies, nor compromise the ongoing achievement of their objectives.

## *6. Potential effects on biological quality elements in The Skerries water body from the abstraction of CW during operation*

### Classification of quality elements

7.3.167 The current classification of biological quality elements in The Skerries and Anglesey North water bodies is summarised in table 7-11. Note that the assessment of effects on fish from abstraction of CW are described in patagraph 7.3.227 (Potential effects on the fish quality element in riverine and transitional water bodies from changes to hydromorphological and physico-chemical quality elements during operation).

### Relevant activities

7.3.168 The activity relevant to this part of the assessment is outlined in table 7-13. This part of the assessment is only relevant to the DCO and the operation water discharge permit (table 7-13).

**Table 7-13 Activity relevant to the assessment of effects on biological quality elements from effects from abstraction of Cooling Water in The Skerries water body**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 2.4 | Abstraction of CW | ✓ | | | ✓ |

7.3.169 During operation, CW would be abstracted from the sea, and flora and fauna would be at risk of being drawn into the CWS. Upon entry into the CW intake, larger flora and fauna (e.g. macroalgae benthic invertebrates and fish) would be impinged on fine mesh screens. Smaller marine flora and fauna (e.g. larval fish, microscopic plants and planktonic animals including invertebrate larvae), able to pass through these screens, would be entrained through the remaining CWS. Separation between the two components (impingement and entrainment) is dependent on the aperture size of the mesh screens.

7.3.170 The CW intake design incorporates coarse and fine mesh screens to prevent large debris as well as marine organisms from entering the system. Flora and fauna would be at risk of becoming impinged on the fine mesh screens (e.g. macroalgae, benthic invertebrates and fish) or, if small enough (e.g. larval fish, microscopic plants and plankton animals including invertebrate larvae), could pass through the fine mesh screens and entrained through the CWS.

7.3.171 If impinged on the CW screens, marine flora and fauna would be exposed to a range of stresses including mechanical effects (such as impacts from falling on to hard structures and abrasion), increased predation risk and emersion. If entrained through the CWS, marine flora and fauna entrained would be subject to pressure and temperature differentials, mechanical effects (e.g. abrasion), hydraulic shear stress and biocide toxicity. In either case, marine flora and fauna would be vulnerable to mortality both within the system and upon return to The Skerries water body (e.g. from increased risk of predation).

7.3.172 A number of mitigation measures would be incorporated into the design of the CW intake to minimise mortality. These are summarised in table 7-14.

**Table 7-14 Summary of embedded mitigation measures associated within the abstraction of Cooling Water and their intended purpose.**

| Component | Mitigation measure | Purpose |
|---|---|---|
| Impingement | Low approach velocities (<0.3m/s) | To allow fish to swim away from the draw of the CW intake. |
| | Acoustic fish deterrents | To deter hearing-sensitive species from entering the CW intake. |

| Component | Mitigation measure | Purpose |
|---|---|---|
| | Fine mesh screens | To minimise the entrainment fraction and maximise the abundance of marine flora and fauna being returned by the fish and invertebrate recovery and return system. |
| | Fish and invertebrate recovery and return system | To transfer impinged marine flora and fauna from the fine mesh screens to a safe seaward location. |
| Entrainment | Biocide dosing system | To balance the biofouling risk and toxicity risk to entrainment marine flora and fauna. |

7.3.173 An assessment of the effects of CW abstraction during the operation phase has been made within chapter D13 ((Application Reference Number: 6.4.13). This includes a quantitative prediction of the abundance and species of benthic invertebrates likely to be lost due to CW abstraction.

### Effects on phytoplankton

7.3.174 Survival of planktonic organisms through the CWS depends on species-specific tolerance to the stressors experienced during cooling system passage. Planktonic organisms are incapable of avoiding entrainment due to their inability to swim against the intake currents.

7.3.175 Simulation studies in controlled conditions, such as the Entrainment Mimic Unit, have been used to assess the effect of entrainment on various planktonic species. Evidence from studies such as these suggests that a large proportion of entrained plankton is able to survive passage through CWS.

7.3.176 Responses to increased temperature exposure during entrainment could be seen in phytoplankton community composition, e.g. changes in the relative proportions of component species. However, changes to communities as a whole are not likely to be significant because of the very small percentage of the overall community being entrained and high productivity of such groups.

7.3.177 There could be reduced productivity in the immediate waters receiving the discharge, perhaps by up to 60%. It is expected that any reduced phytoplankton abundance as a result of entrainment through the CWS would be short-term as The Skerries water body is well mixed.

7.3.178 In relation to effects on plankton it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries water body, nor compromise the ongoing achievement of its objectives.

### Effects on benthic invertebrates

7.3.179 The predicted numbers of benthic invertebrates that would be impinged are presented in chapter D13 (Application Reference Number: 6.4.13). Based on the numbers predicted an unmitigated system, effects of impingement on benthic invertebrates including commercial catches (e.g. scallop, whelk and lobster), would be minimal. The predicted impingement of edible crab (based

on survey data from the Existing Power Station), whilst reasonably high, is considered to overestimate the impact on this species. In terms of mortality through the impingement process, survival rates for crustaceans are good (>80%) [RD34]. If invertebrates are in viable condition then many would have a good chance of survival.

7.3.180 In relation to effects on benthic invertebrates it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries water body, nor compromise the ongoing achievement of its objectives.

## *7. Potential effects on physico-chemical and biological quality elements in The Skerries and Anglesey North water bodies from discharge of CW during operation*

### Classification of quality elements

7.3.181 The current classification of chemical and physico-chemical quality elements in The Skerries and Anglesey North water bodies is summarised in table 7-15.

**Table 7-15 Classification of chemical and physico-chemical quality elements in coastal water bodies (data provided by NRW)**

| | Details | |
|---|---|---|
| WFD water body name | The Skerries | Anglesey North |
| Overall status/potential | High status | Moderate status |
| Biological quality elements | High | Good |
| Phytoplankton | Not assessed | Not assessed |
| Invertebrates | High | Good |
| Infaunal Quality Index | Not assessed | Good |
| Imposex | High | High |
| Macroalgae | Not assessed | Not assessed |
| Opportunistic Macroalgae | Not assessed | Not assessed |
| Current chemical status | Good | Fail |
| Physico-chemical quality elements | High | High |
| Specific pollutants | Not assessed | High |
| Priority hazardous substances | Not assessed | Fail (based on mercury and its compounds) |
| Priority substances | Not assessed | Good |

### Relevant activities

7.3.182 The activity relevant to this part of the assessment is outlined in table 7-16. This part of the assessment is only relevant to the DCO and the operation water discharge permit (table 7-16).

**Table 7-16 Activity relevant to the assessment of effects on biological quality elements from effects from discharge of Cooling Water in The Skerries and Anglesey North water bodies**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 2.5 | Discharge of CW and other operational water discharges | ✓ | | | ✓ |

7.3.183 The CW outfall would be located within the Anglesey North WFD coastal water body. The discharge would also influence the adjacent Skerries WFD coastal water body.

### Basis of modelling and the worst case

7.3.184 Horizon's marine hydrodynamic model was used to carry out simulations of the CW discharge using the excess temperature surface heat exchange sub model within Delft3D. The modelling methodology is described in appendix D13-8 (Application Reference Number: 6.4.90).

7.3.185 The base case simulations used a fixed discharge condition of 126m$^3$/s and a temperature rise of 12°C (98 percentile). Four base case simulations were modelled covering summer, autumn, winter and spring seasons. These simulations used seasonally appropriate surface heat loss rates and Total Residual Oxidants (TRO) decay rates, and were undertaken without the influence of wind or wave stress on the water surface.

7.3.186 Sensitivity studies were then completed to investigate the influence of wind and waves. These studies showed that the exclusion of wind and waves was likely to result in conservative modelling outputs.

7.3.187 The worst case scenario was therefore defined as being the annual base case with a continuous discharge of 126m$^3$/s and no wind (or wave) stress. This case combines the separate seasonal simulations which is appropriate when considering the effects over the scale of operation of the Power Station. The use of the annual base case also allows comparisons with thermal standards proposed for mixing zones in relation to WFD status [RD35].

### Thermal conditions

7.3.188 During operation, the water discharged from the CWS would be 12°C (98 percentile) warmer than the water being abstracted. The thermal plume would disperse over both water bodies (figure 13).

7.3.189 An assessment of the potential effects of changes in thermal conditions on the WFD water bodies has been made in chapter D13 (Application Reference Number: 6.4.13). The total area of the mixing zone at the surface, based on a 2°C (98 percentile) rise is 209ha (annual base case) and 97ha (summer base case with wind) (see chapter D13 (Application Reference Number: 6.4.13) for descriptions of the modelling cases used for assessment). The total area of the mixing zone at the seabed, based on a 2°C (98 percentile) rise is 4.2ha (annual base case) and 4.1ha (summer base case with wind).

7.3.190 To inform this assessment, the proportion of the mixing zone which falls within each water body has been calculated as a percentage of their overall size. The results are summarised in table 7-17; further information is provided in chapter D13 (Application Reference Number: 6.4.13).

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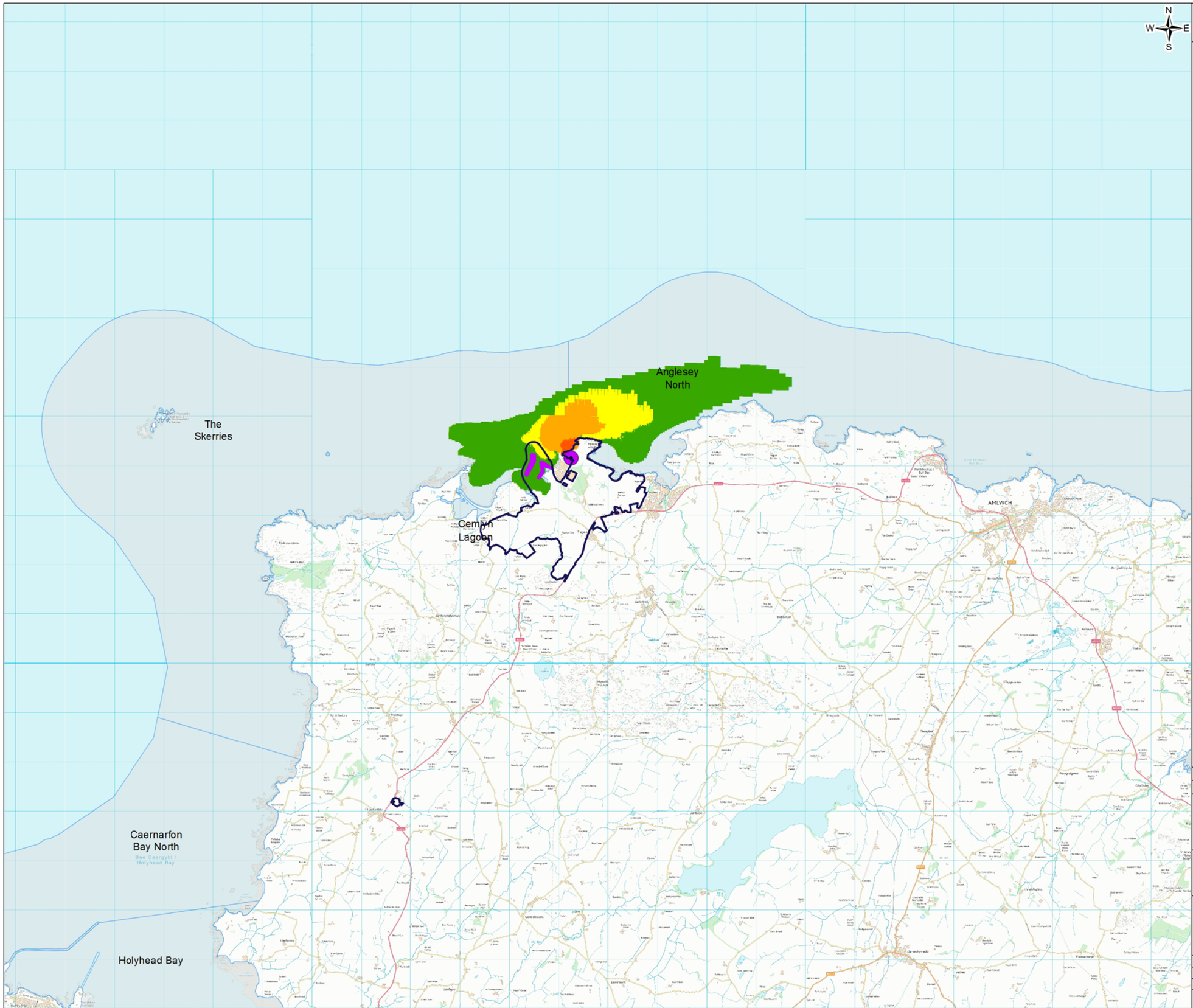
# FIGURE 13




Legend

- Wylfa Newydd Development Area
- Water Framework Directive coastal water bodies
- Breakwater and Marine Off-Loading Facility
- Cooling water outfall

Increase in temperature at the surface (annual base case)

Predicted 98 percentile

- >1.00°C - 2.00°C
- >2.00°C - 3.00°C
- >3.00°C - 8.00°C
- >8.00°C


| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

PREDICTED 98 PERCENTILE INCREASE IN TEMPERATURE AT THE SURFACE OVER A REPRESENTATIVE SPRING-NEAP TIDAL CYCLE (ANNUAL BASE CASE)

| | | |
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| Scale @ A3 | 1:75,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |
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7.3.191 Assuming a worst case scenario (i.e. 2°C uplift boundary; annual base case conditions), the mixing zone in the Anglesey North water body would be 0.97% of the water body area at the surface. The 2°C (98 percentile) mixing zone in The Skerries water body would be 1.69% of the water body area at the surface. The mixing zones at the seabed represent an even smaller proportion of the Anglesey North and The Skerries water bodies, being 0.03% and 0.04%, respectively.

**Table 7-17 Proportion of WFD water bodies exceeding 2°C and 3°C boundaries (98 percentile)**

| Scenario | WFD water body | Area of the water body exceeding boundaries (98 percentile) at the surface (%) | | Area of the water body exceeding boundaries (98 percentile) at the seabed (%) | |
|---|---|---|---|---|---|
| | | >2°C | >3°C | >2°C | >3°C |
| Annual base case (126m$^3$/s at +12°C (98 percentile)) – no wind | Anglesey North | 0.97 | 0.27 | 0.03 | 0.02 |
| | The Skerries | 1.69 | 1.09 | 0.04 | 0.03 |
| Summer base case (126m$^3$/s at +12°C (98 percentile)) – with variable wind | Anglesey North | 0.32 | 0.11 | 0.02 | 0.01 |
| | The Skerries | 1.11 | 0.75 | 0.05 | 0.03 |

7.3.192 The absolute temperature (the water temperature taking into account the ambient water temperature and the temperature of the CW discharge) was also determined. For the annual base case, the surface area with an absolute temperature greater than 23°C (maxima) is approximately 14.6ha, compared to 14.2ha in the summer base case with variable wind. In both scenarios the area of the 23°C (98 percentile) mixing zone at the seabed is limited to the immediate vicinity of the outfall in Porth Wnal.

7.3.193 Given the large area of the water bodies and the comparatively small area of the thermal plume at the surface and seabed, the effects on the thermal conditions quality elements are small and would only be detectable over a very small proportion of the water bodies.

7.3.194 In relation to effects on thermal conditions it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries or Anglesey North water bodies, nor compromise the achievement of objectives in either water body.

## Effects on biological quality elements (plankton, benthic invertebrates and aquatic flora) from changes to thermal conditions

### *Phytoplankton*

7.3.195 Plankton have limited motility and their distribution is governed by external factors including the hydrodynamic regime and degree of vertical mixing. Localised effects are therefore usually hard to detect in coastal waters owing to the patchiness of plankton concentrations. Separating the effects of entrainment and temperature is difficult and may be outweighed by the effects of entrainment.

7.3.196 Phytoplankton respond rapidly to changes in environmental factors. Baseline surveys have demonstrated that seasonal patterns in abundance and community composition are driven by changes in light and nutrients (see appendix D13-1, Application Reference Number: 6.4.83).

7.3.197 A study on the effects of high temperature on marine phytoplankton undertaken by Hirayama and Hirano [RD36] reported that CW discharges from power stations rarely adversely affect marine plankton even in the immediate vicinity of the discharge. This study investigated potential harmful effects on plankton from heated effluents, focusing on direct inhibitory influences of high temperature (in conjunction with residual chlorine) on growth, and photosynthesis of marine phytoplankton. For the phytoplankton species studied, adverse effects were not apparent until significant temperatures had been reached (>35°C, a temperature rise of 15°C relative to the 'ambient' temperature of the experimental media used at 20°C), far in excess of temperatures (or temperature rise) that would be experienced at the CW outfall.

7.3.198 In relation to effects on phytoplankton it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries or Anglesey North water bodies, nor compromise the achievement of objectives in either water body.

### *Benthic invertebrates and aquatic flora*

7.3.199 Based on the modelling results outlined in table 7-17 benthic invertebrates and aquatic flora that would be affected in close proximity to the outfall. The affected habitats are predominantly rocky reef which have associated benthic invertebrates and aquatic flora.

7.3.200 Available scientific literature, the MarLIN MarESA and professional judgement has been used to determine if a community is stenothermal (able to tolerate only a small range of temperature conditions). The details of this assessment are provided in chapter D13 (Application Reference Number: 6.4.13). This concluded that the assessment of resilience of habitat that were present was either high (full recovery in two years) or medium (full recovery in two to 10 years).

7.3.201 The area of habitat that would be subjected to an increase in temperature is comparatively small in relation to the size of The Skerries and Anglesey North water bodies (see table 7-17) and the effects on benthic invertebrates and aquatic flora would be limited to the area at the outfall.

7.3.202 In relation to effects on benthic invertebrates and aquatic flora from thermal changes to thermal conditions it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries or Anglesey North water bodies, nor compromise the achievement of objectives in either water body.

### Oxygenation conditions

7.3.203 The minimum predicted dissolved oxygen concentration, assuming average salinity of 33.6 and a maximum temperature rise, is greater than the high status boundary value of 5.7mg/L. The minimum saturated dissolved oxygen concentration occurs at the discharge, where the temperature increase is greatest (see chapter D13, Application Reference Number: 6.4.13).

7.3.204 In relation to effects on oxygenation conditions it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries or Anglesey North water bodies, nor compromise the achievement of objectives in either water body.

### Specific pollutants (TRO)

7.3.205 During operation, the water discharged from the CWS would contain TRO. Following discharge, concentrations of TRO would diminish through dilution and absorption by oxidisable material (e.g. organic and inorganic material) contained within the water body.

7.3.206 An assessment of the potential effects of increased TRO concentrations on the WFD water bodies has been made in chapter D13 (Application Reference Number: 6.4.13). The total area of the mixing zone at the surface, based on TRO concentration of 0.01mg/L (95 percentile) is 248ha (annual base case) and 128.5ha (summer base case with wind) (see figure 14 and chapter D13, Application Reference Number: 6.4.13) for descriptions of the modelling cases used for assessment). The total area of the mixing zone at the seabed, is 5.6ha (annual base case) and 5.7ha (summer base case with wind).

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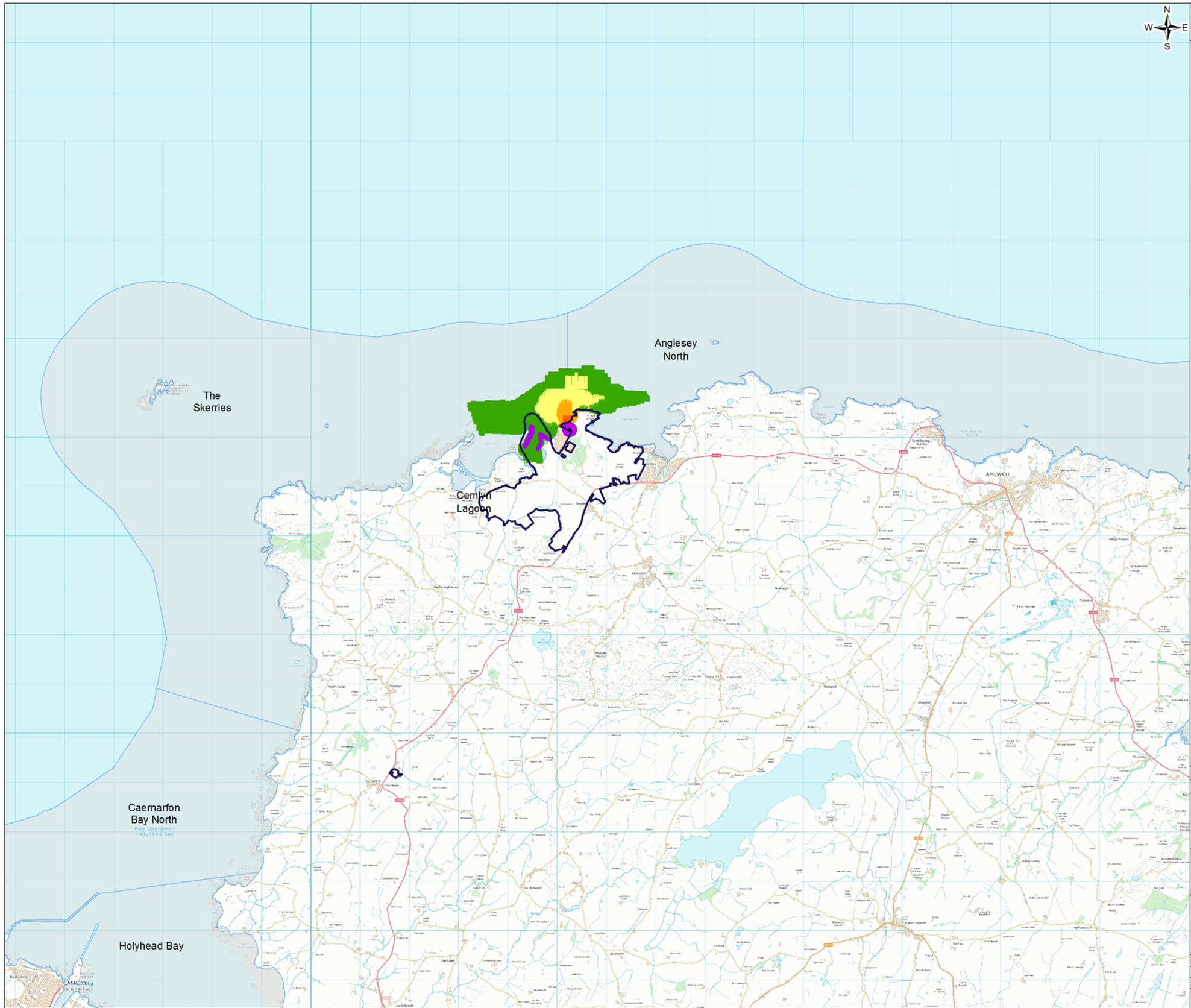
# FIGURE 14

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Legend

- Wylfa Newydd Development Area
- Water Framework Directive coastal water bodies
- Breakwater and Marine Off-Loading Facility
- Cooling water outfall

Increase in Total Residual Oxidant at the surface (annual base case)

Predicted 95 percentile

- >0.01mg/L - 0.02mg/L
- >0.02mg/L - 0.05mg/L
- >0.05mg/L - 0.08mg/L
- >0.08mg/L - 0.10mg/L


| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd |
|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

PREDICTED TOTAL RESIDUAL OXIDANT
95 PERCENTILE INCREASE AT THE SURFACE
OVER A REPRESENTATIVE SPRING-NEAP TIDAL CYCLE
(ANNUAL BASE CASE)

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|---|---|---|
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7.3.207 To inform this assessment, the proportion of the mixing zone which falls within each water body has been calculated as a percentage of the overall size. The results are summarised in table 7-18; further information is provided in chapter D13 (Application Reference Number: 6.4.13).

7.3.208 Assuming an exceedance threshold of 0.01mg/L the mixing zones at the surface in the Anglesey North and The Skerries water bodies would be 0.6% and 3.4% respectively. The mixing zones at the seabed represent an even smaller proportion of the Anglesey North and The Skerries water bodies, being 0.3% and 0.8% respectively.

**Table 7-18 Proportion of WFD water bodies exceeding 0.01mg/L TRO (95 percentile) (ha)**

| Scenario | WFD water body | Area of the water body exceeding 0.01mg/L TRO (95 percentile) at the surface (%) | Area of the water body exceeding 0.01mg/L TRO (95 percentile) at the seabed (%) |
|---|---|---|---|
| Annual base case (126m$^3$/s at +12°C) – no wind | Anglesey North | 0.6 | 0.03 |
| | The Skerries | 3.4 | 0.08 |
| Summer base case (126m$^3$/s at +12°C) – with variable wind | Anglesey North | 0.4 | 0.03 |
| | The Skerries | 1.7 | 0.08 |

7.3.209 Given the large area of the water bodies and the comparatively small area of the TRO mixing zone at the surface and seabed, the effect on the specific pollutant quality elements are small and would only be detectable over a very small proportion of the water bodies.

7.3.210 In relation to effects on specific pollutants (TRO) it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries or Anglesey North water bodies, nor compromise the achievement of objectives in either water body.

### Effects on biological quality elements (plankton, benthic invertebrates and aquatic flora) from discharge of biocide

7.3.211 Changes to chemical and physico-chemical water quality elements can affect biological quality elements via effects on mortality, reproduction, and growth which could lead to changes in the abundance, distribution and species composition of biological quality elements.

7.3.212 An assessment of the potential effects of biocide dosing (TRO) on biological quality elements has been made in chapter D13 (Application Reference Number: 6.4.13). This information is summarised below.

#### *Phytoplankton*

7.3.213 Plankton have limited motility and their distribution is governed by external factors including the hydrodynamic regime. Localised effects are therefore

usually difficult to detect in coastal waters owing to patchiness of plankton concentrations. It is also difficult to separate the effects of TRO on planktonic communities at power stations from the combined effects of exposure to thermal discharges and entrainment (particularly in close proximity to the outfall). Furthermore, temperature and TRO are known to interact, with some species becoming more susceptible to the effects of TRO at higher temperatures [RD37].

7.3.214 Beyond the immediate vicinity of the outfall the modelling showed that in the worst case scenario, TRO at the surface would reduce to 0.05mg/L at approximately 500m offshore. This level of TRO would be restricted to the surface layer, and there would be no detectable increase in the TRO concentration at the seabed at this distance.

7.3.215 The peak in phytoplankton abundance occurs just below the surface and the proportion of the plankton community exposed to TRO concentrations that would affect metabolic rates is very small compared to the size of the water body. The effects are not considered likely to have any wider implications for the abundance and diversity of plankton communities.

7.3.216 In relation to effects on plankton it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries or Anglesey North water bodies, nor compromise the achievement of objectives in either water body.

***Benthic invertebrates and aquatic flora***

7.3.217 The TRO in the CW discharge has the potential to affect individual benthic species either through lethal or sub-lethal effects. Sessile species are at particular risk as they are unable to move away from the stressor.

7.3.218 The available literature indicates that most of the benthic invertebrate species would not experience lethal effects from TRO at the highest concentrations (i.e. 0.1mg/L) modelled close to the outfall.

7.3.219 At the Existing Power Station, the effects of CW discharge on intertidal habitats and species were recorded from 200m to 250m. Based on modelling and on studies at the Existing Power Station CW outfall it is predicted that the effects on intertidal habitats would result in low diversity and abundance of some species within a few hundred metres from the outfall, although it is not possible to attribute this to the effects of TRO (or thermal) discharge alone.

7.3.220 The area of habitat that would be subjected to an increase in TRO is comparatively small in relation to the size of The Skerries and Anglesey North water bodies (see table 7-17) and the effects on benthic invertebrates and aquatic flora would be limited to the area at the outfall.

7.3.221 In relation to effects on benthic invertebrates and aquatic flora from TRO it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries or Anglesey North water bodies, nor compromise the achievement of objectives in either water body.

## *8. Potential effects on physico-chemical quality elements in The Skerries and Anglesey North water bodies from other operational water discharges during operation*

### Classification of quality elements

7.3.222 The current classification of chemical and physico-chemical quality elements in The Skerries and Anglesey North water bodies is summarised in table 7-15.

### Relevant activities

7.3.223 The activity relevant to this part of the assessment is outlined in table 7-19. This part of the assessment is only relevant to the DCO and the operation water discharge permit (table 7-19).

**Table 7-19 Activity relevant to the assessment of effects on biological quality elements from effects from other operational water discharges in The Skerries and Anglesey North water bodies**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 2.5 | Discharge of CW and other operational water discharges | ✓ | | | ✓ |

7.3.224 During operations, sodium nitrite would be released into the marine environment via the CW discharge. Neither substance is listed as a specific pollutant or priority substance but these have been considered as both substances, given sufficient concentrations, are toxic to fish [RD38].

7.3.225 By comparison of published data with the anticipated operational conditions at Wylfa Newydd, the maximum concentration of sodium nitrite within the CW discharge would be over six times lower than the most sensitive example of a fish species (96 hour $LC_{50}$ Rainbow trout) [RD39] and therefore it has not been considered further in the assessment.

7.3.226 In relation to effects on physico-chemical quality elements it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of The Skerries or Anglesey North water bodies, nor compromise the achievement of objectives in either water body.

## *9. Potential effects on the fish quality element in riverine and transitional water bodies from changes to hydromorphological and physico-chemical quality elements during operation*

### Classification of quality elements

7.3.227 This effect relates to the fish quality element in sixteen water bodies. The classification of each water body is presented in table 7-20table 7-9.

**Table 7-20 Classification of the fish quality element in riverine and transitional water bodies (data provided by NRW)**

| WFD water body Name | Status of the fish quality element |
|---|---|
| **Riverine** | |
| Alaw - downstream Llyn Alaw | High |
| Tan R'Allt | Not assessed |
| Afon Cleifiog (Valley) | Not assessed |
| Afon Crigyll | Good |
| Wygyr | High |
| Goch Amlwch | Not assessed |
| Goch Dulas | High |
| Lligwy | Not assessed |
| Ddrydwy (Llanfaelog) | Not assessed |
| Ffraw | Not assessed |
| Ceint | High |
| Cefni - Ceint to Cefni reservoir | High |
| Cefni - Cefni reservoir east | Good |
| Cefni - Cefni reservoir west | Not assessed |
| **Transitional** | |
| Alaw | Not assessed |
| Cefni | Not assessed |

### Relevant activities

7.3.228 The activity relevant to this part of the assessment is outlined in table 7-21. This part of the assessment is only relevant to the DCO and the operation water discharge permit.

**Table 7-21 Activity relevant to the assessment of effects on fish during operation in The Skerries and Anglesey North water bodies**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 2.4 | Abstraction of CW | ✓ | | | ✓ |
| 2.5 | Discharge of CW and other operational water discharges | ✓ | | | ✓ |

7.3.229 The assessment of effects on fish during operation considers all relevant pathways and is made with specific consideration given to the effects on migratory species that could be present within the ZoI (Atlantic salmon, sea trout, river lamprey and European eel).

7.3.230 Across the whole Wylfa Newydd Project the following activities and pathways have been identified that could potentially affect migratory fish in freshwater and marine environments during operation:

- abstraction of CW leading to entrapment of fish;
- changes in marine water quality due to biocide dosing of the CWS;
- changes in marine water quality due to the discharge of heated water from the CWS; and
- changes in marine water quality from other operational water discharges.

### Entrapment of fish during abstraction of CW

7.3.231 The process of entrapment is described in paragraphs 7.3.169 to 7.3.171 and the mitigation measures which are embedded into the design of the CW intake are outlined in table 7-14.

7.3.232 An assessment of the effects of CW abstraction during the operation phase has been made within chapter D13 (Application Reference Number: 6.4.13). This includes a quantitative prediction of the abundance and species of fish likely to be lost due to CW abstraction.

7.3.233 River lamprey and European eel have both been recorded historically within impingement catches at the Existing Power Station [RD17] whilst sea trout is known to be present in the vicinity of the Wylfa Newydd Development Area. These species are considered to have a very low risk of impingement, the predicted impingement in the absence of mitigation being in the order of tens per year. It is considered unlikely that Atlantic salmon would be impinged and the risk associated with this is very low. Migratory species are not considered to be at risk of entrainment.

7.3.234 Mitigation embedded into the design of the CWS includes a low approach velocity (less than 0.3m/s) allowing fish to actively avoid impingement, the use of acoustic fish deterrents to deter fish from the area and a fish recovery and return system for impinged individuals. All migratory species have burst speeds capable of escaping the proposed approach velocity and are sensitive to acoustic deterrents (with the exception of eel). With the addition of this mitigation, it is considered highly unlikely migratory fish would interact with abstraction infrastructure.

7.3.235 Given the size of the subtidal habitat resource available, relative to the small ZoI from the CW abstraction (50m for adult fish), in combination with the construction activities reducing the habitat suitability as an attractive feeding resource, there is likely to be limited preferential utilisation of the ZoI for migratory fish.

7.3.236 Salmon and European eel are not resident within the ZoI, whilst river lamprey and sea trout may reside within coastal waters. Sea trout typically spend over 65% of their marine phase within 4km of their natal rivers, the majority remaining within 80km of their home river throughout their marine phase. Local populations therefore may be at increased risk from impingement. However, it is still considered that interaction with the ZoI would be infrequent, with impingement occurring even less frequently due to the mitigation described above. The assessment is based on the predicted numbers of migratory species that would be impinged and considering the mitigation measures that would be in place.

7.3.237 In relation to effects on fish it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of riverine and transitional WFD water bodies that support migratory fish, nor compromise the ongoing achievement of their objectives.

### Effects on fish from changes in marine water quality due to the discharge of heated water

7.3.238 As identified in table 7-17, assuming worst case, increased surface temperatures would exceed 2°C across a total of 201.6ha, with 5.2ha at the ZoI exceeding the same threshold. The discharge of thermal effluent would result in changes in dissolved oxygen concentrations and, in combination with pH, the natural ratio of ionised to unionised ammonia. Increased temperatures would also influence the hydromorphology of coastal waters within the mixing zone. Individually, and combined, these changes could have an effect on fish.

7.3.239 An assessment of the potential effects of the discharge of heated water on fish has been made in chapter D13 (Application Reference Number: 6.4.13). The extent of the thermal plume has been shown to affect a small proportion of the overall waterbody (0.97% and 1.69% of Anglesey North and The Skerries water bodies (% waterbody exceeding 2ºC boundary at the surface).

7.3.240 The proposed absolute temperature threshold for coastal waters is 23°C based on the available evidence for optimum temperatures for fish. In the worst case at the surface an area of 14.6ha around the CW discharge would be greater than 23°C (based on the highest average summer temperature).

For much of the year the area at the surface would be smaller and it would also be considerably smaller at the seabed.

7.3.241 The thermal plume would be dispersed rapidly over both water bodies and in a constant state of flux; with the proportion of the plume in each water body changing through each tidal cycle. Migratory fish species would be able to avoid the thermal plume, which is at its largest extent at the surface and is restricted to the vicinity of the outfall at the seabed. The thermal plume would not result in a thermal barrier to migration and there would be no effect on migratory fish.

7.3.242 In relation to effects on the fish quality elements from discharge of heated water it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of riverine and transitional WFD water bodies that support migratory fish, nor compromise the achievement of their objectives.

### Effects on fish from changes in marine water quality due to biocide dosing

7.3.243 As identified in table 7-18, assuming worst case, surface concentrations of TRO would exceed 0.01mg/L across a total of 253.3ha, with 7.2ha at the ZoI exceeding the same threshold. TRO in the CW discharge would have the potential to affect fish in the area, with smaller benthic species inhabiting the biotopes close to the outfall (e.g. blennies) being most at risk of exposure.

7.3.244 An assessment of the potential effects of biocide dosing on biological quality elements has been made in chapter D13 (Application Reference Number: 6.4.13). Specific reference given to European eel is highlighted below.

7.3.245 TRO concentrations of 0.102mg/L have been found to result in 100% mortality of European eel elvers when exposed for seven days at 22ºC [RD40]. These concentrations would only just be reached at the point of discharge; therefore, if elvers remained in areas subject to maximum concentration (which is highly unlikely) then mortalities could, in theory, occur. In reality, fish would be able to avoid areas of increased TRO; therefore, mortalities are unlikely.

7.3.246 There is little published literature about the effects of TRO on other migratory species including river lamprey, Atlantic salmon and sea trout. However, considering the low abundance of these species within the coastal waters around the Wylfa Newydd Development Area, the small extent within which lethal or sub-lethal effects are likely to occur and their likely limited exposure (i.e. as they are migrating past), significant effects to these species would be unlikely.

7.3.247 In relation to effects on the fish quality elements from biocide dosing it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of riverine and transitional WFD water bodies that support migratory fish, nor compromise the achievement of their objectives.

### Effects on fish from changes in marine water quality from chemical changes in discharge water

7.3.248 During operations, chemicals such as sodium nitrite would be released into the marine environment via the CW discharge. Neither substance is listed as a specific pollutant or priority substance but these have been considered as both substances, given sufficient concentrations, are toxic to fish [RD38].

7.3.249 By comparison of published data with the anticipated operational conditions at Wylfa Newydd, the maximum concentration of sodium nitrite within the CW discharge would be over six times lower than the most sensitive example of a fish species (96 hour $LC_{50}$ Rainbow trout) [RD39] and therefore it has not been considered further in the assessment.

7.3.250 In relation to effects on the fish quality elements from chemical changes in discharge water it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of riverine and transitional WFD water bodies that support migratory fish, nor compromise the achievement of their objectives.

## *10. Potential risk to quantitative and chemical status of the Ynys Môn Secondary groundwater body from saline intrusion during construction*

### Classification of quality elements

7.3.251 The current classification of the quantitative and chemical status of the Ynys Môn Secondary groundwater body is provided in table 7-22.

**Table 7-22 Classification of the quantitative status of the Ynys Môn Secondary groundwater body (data provided by NRW)**

| | | Details |
|---|---|---|
| Overall status/potential | | Poor status |
| Current quantitative status | | Good |
| Current chemical status | | Poor |
| Quantitative status | Water balance test | Good |
| | Surface water test | Good |
| | Groundwater-Dependent Terrestrial Ecosystems (GWDTE) test | Good |
| | Saline intrusions test | Good |
| Chemical status | Saline intrusions test | Good |
| | Surface water chemistry and ecology test | Poor |
| | GWDTE test | Good |
| | Drinking Water Protected Area test | Good |

### Relevant activities

7.3.252 The activities relevant to this part of the assessment are outlined in table 7-23. This part of the assessment is relevant to the DCO and the construction water discharge permit (table 7-23).

**Table 7-23 Activities relevant to the risk of saline intrusion in the Ynys Môn Secondary groundwater body**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge permit | Operation water discharge permit |
| 1.17 | Construction of the CWS breakwaters and MOLF including dewatering | ✓ | | | |
| 1.25 | Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) including dewatering | ✓ | | ✓ | |

7.3.253 The groundwater modelling for construction which identified limited saline intrusion is based on one excavated and dewatered area which covers both the deep excavation, the excavation for the Unit 1 and Unit 2 and the CWS. Activity 1.17 and 1.25 are relevant to the risks of saline intrusion as this activity occurs simultaneously with deep excavation of Unit 1 and Unit 2.

### Basis of modelling and the worst case

7.3.254 Groundwater modelling studies were undertaken, principally to assess the effects of dewatering for deep basement construction and the effects of the Power Station on the groundwater levels in the bedrock for the long-term operation of the Power Station. Details of this groundwater modelling and the model results are provided in appendix D8-7 (Application Reference Number: 6.4.32).

7.3.255 The bedrock groundwater was modelled with MODFLOW. This was carried out in combination with the 4R model which combines 'surface routing, run off and superficial shallow groundwater interflow', the results of which are also provided in appendix D8-7 (Application Reference Number: 6.4.32). Therefore, the groundwater component of shallow base flow into surface water and shallow seepage and springs are addressed through the 4R model elements.

7.3.256 The combined model considered in this assessment is termed the ‘Central’ model as it uses the most likely parameter values with respect to the amount of rainfall (the recharge) reaching the bedrock and the permeability of the bedrock aquifer. Comparison of modelled to measured groundwater levels shows this model to represent actual conditions reasonably closely.

7.3.257 Two additional combined models were also constructed in order to test the sensitivity of the Central model to changes in recharge and permeability. The 'High' groundwater model included a four times increase in recharge to the bedrock and corresponding increase in permeability compared to the Central model. The 'Low' groundwater model has a four times reduction in recharge and permeability compared to the Central model. In both instances the modelled water levels do not compare well to the measured groundwater levels indicating that these models are not a good indication of reality and that the Central model uses broadly appropriate values for recharge and permeability.

### Effects on saline intrusion

7.3.258 The risk of saline intrusion may result from the temporary reversal of groundwater flow along the coast at the Wylfa Newydd Development Area due to dewatering. The likelihood of saline intrusion has been assessed based on the groundwater modelling during the construction period (see appendix D8-7, Application Reference Number: 6.4.32).

7.3.259 Groundwater contours in superficial deposits and bedrock in the baseline condition show a flow in a north-westerly direction towards the coast. There are no saline water inflow risks associated with the baseline. Monitoring of water quality in four ground investigation boreholes close to Porth-y-pistyll (BH518R, BH822, BH850, BH852) has not identified saline water (see appendix D8-03, Application Reference Number: 6.4.28). BH850 and BH852 are both within 50m of the coast, with screened sections down to -12 and -8mOD respectively (i.e. well below sea level) and with depths to groundwater of up to 6mAOD.

7.3.260 Considering this information together with the Ghyben Harzberg relationship, which gives the theoretical fresh water/saline water interface at a depth below sea level that is 40 times the height of fresh water above sea level, suggests that the fresh water/saline water interface is steep with a very limited or deep saline wedge. This is as expected from the combination of the recognised low permeability of the bedrock at these depths of >40m below OD. These suggest that it is highly unlikely there would be any significant saline water upconing during dewatering.

7.3.261 The land-based excavation phase of construction, when groundwater dewatering would be at its peak, would be in the region of two to three years' duration. Groundwater dewatering would continue after the excavation is completed, but following progressive shotcreting of the excavation walls the groundwater inflow is modelled to be very small. At the end of Phase 4 (Power Station Site construction) the concrete basements for Unit 1 and Unit 2 would be complete.

7.3.262 For much of the time during dewatering of the deep excavations two cofferdams would be present on the seaward side of the excavations within Porth-y-pistyll (figure D1-9, Application Reference Number: 6.4.101). The larger cofferdam is present to allow excavation of the seabed and construction of the MOLF in the dry. This would be in place for approximately 14 months. A second cofferdam would also be constructed in front of the intake channel

to allow for the construction of the cut-and-cover sections of the CW tunnels. Dewatering of this area would be required to remove water from rainfall, seawater and any groundwater seepages that would enter the excavation area during construction.

7.3.263 The groundwater model results show that during dewatering of the excavations (including excavations of Unit 1 and Unit 2, the MOLF and CWS), there would be local reversal of groundwater flow. It shows that along a narrow 200m length of coast, to the north of the MOLF, water would be drawn into the aquifer before that water discharges into the excavation (figure 5.5, Application Reference Number: 6.4.101).

7.3.264 Figure 5.6 (Application Reference Number: 6.4.101) maps the Phase 4 spatial distribution of flows from the bedrock out to the sea bed General Head Boundaries (in blue), and the boundary cells local to the excavation where flows are reversed – from the sea into the bedrock. Most of these potential saline inflow risk cells are located on the sea bed out in the bay and not under land.

7.3.265 There is therefore potential for minor saline intrusion in the 2 to 3-year period during excavation, until the maximum depth has been reached. The walls and floor of the excavation would be sealed to prevent any further inflows as the excavation progresses. The quantities of saline water drawn into the excavation would be small, at an estimated 6.5m$^3$ per day. In comparison, the groundwater model predicts that 160m$^3$ per day of groundwater would be abstracted from the excavations with typically a further 750m$^3$ per day of direct rainfall being removed from the excavation.

7.3.266 The modelling results show that there would be no saline water inflow risks associated with the Phase 5 in which inland heads return to above sea level and flows are always outwards at the coast. It is likely therefore that the aquifer would recover from any saline intrusion within several years when water levels re-establish above sea level and groundwater would flow towards the sea pushing out, or potentially riding over, any saline water. The models were steady state so precise times for this saline water flushing cannot be given but will be reversible in the longer term.

7.3.267 The model is considered to be conservative as:

- When dewatering starts there could be a period of time until the zone of depression around the excavation reaches its maximum extent, . The model is steady state which means that it predicts the extent of the zone of depression at its maximum extent. In reality, dewatering is likely to last for less than three years, and the modelled dewatering requirements and extent of drawdown are likely to be overestimates.
- The model assumes that the excavation is at its fullest lateral extent and fullest depth for the whole of the modelled scenario whereas in reality it will take time to reach its full size.
- The embedded mitigation of spraying concrete on to the walls of the excavation as the excavation deepens to seal any flows through fractures has not been included in the model during the construction phase (it is

included during Phase 5 – Operation). As such, the model will overestimate saline intrusion into the groundwater body.

7.3.268 The model results are likely to be an overestimate of the extent of drawdown and the groundwater volumes that would need to be abstracted. However, this would not change the volume of aquifer between the excavation and the sea that could be subject to saline intrusion, it will just reduce the period of time over which that intrusion occurs.

7.3.269 The predicted saline intrusion would be of a temporary nature and would only affect a very small volume of aquifer. The temporary nature is difficult to define but could be in the range of 5 to 10 years.

7.3.270 That part of the aquifer currently out at sea under the area proposed for excavations, will already be saline, even prior to excavation and dewatering. Due to all saline water being captured in the excavation, no saline groundwater would be drawn into the PWSs or fresh surface waters. The saline water would be discharged back to sea.

7.3.271 During the period when the cofferdam is present in Porth-y-pistyll and excavation is being carried out inland, the risk of saline intrusion is reduced by the presence of the cofferdam which will limit seawater movement inland.

7.3.272 NRW has stated that “if the dewatering at Wylfa causes a change in flow direction that is likely to result in any saline intrusion, then this would be considered to be deterioration” [RD41]. As such it is considered that the saline intrusion could cause deterioration of the Ynys Môn Secondary groundwater body and could compromise the ongoing achievement of its objectives (it is currently meeting the objective of good status for the saline intrusion test) with respect to this effect. The confidence of this assessment is low and the occurrence of saline intrusion is uncertain, but it would be limited in extent.

7.3.273 It is recognised that there is a temporal aspect to the effect of saline intrusion and NRW has advised that in some cases short-term deterioration may be allowed where works are considered temporary [RD3]. For works to be considered as temporary it must be demonstrated that the water body:

- is only impacted for a short period of time;
- recovers within a short period of time; and
- recovers without the need for any restoration measures [RD3].

7.3.274 There would therefore need to be a defined end date, beyond which the works (i.e. dewatering) should no longer impact the water body. It would also be imperative that the water body would fully recover once the source of the impact had been removed. As the predicted extent of saline intrusion is limited in both space and time, the conditions of temporary works are likely to apply. However, the dewatering during construction does not have a defined end date and the duration of the effect is uncertain. Although the extent of the effect would be small, it may take longer than one RBMP cycle (six years) to fully recover. It is possible that the Wylfa Newydd Project could jeopardise the ongoing attainment of good groundwater status as set out in the WFD objectives (see paragraph 1.4.5).

7.3.275 In relation to the saline intrusion (quantitative and chemical) tests it is concluded that further consideration is needed to determine whether the Wylfa Newydd Project could lead to deterioration of the Ynys Môn Secondary groundwater body and whether this effect could compromise the ongoing achievement of its objectives.

## *11. Potential risk to quantitative status of the Ynys Môn Secondary groundwater body from changes to Groundwater-Dependent Terrestrial Ecosystems during construction and operation*

### Classification of quality elements

7.3.276 The current classification of the quantitative status of the Ynys Môn Secondary groundwater body is provided in table 7-22.

### Relevant activities

The activities relevant to this part of the assessment are outlined in table 7-24. This part of the assessment is relevant to the DCO and the construction and operation water discharge permits (table 7-24).

**Table 7-24 Activities relevant to effects on the Ynys Môn Secondary groundwater body affecting Groundwater-Dependent Terrestrial Ecosystems**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 1.21 | Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | ✓ | | ✓ | |
| 1.22 | Installation and operation of a drainage system during Power Station construction | ✓ | | ✓ | |
| 1.25 | Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | ✓ | | ✓ | |
| 1.27 | Progressive mound creation | ✓ | | | |
| 1.32 | Main plant construction (Unit 1 and Unit 2) | ✓ | | | |
| 2.1 | Presence of buildings, hardstanding and roads | ✓ | | | |
| 2.2 | Presence of mounds | ✓ | | | |
| 2.6 | Drainage during operation | ✓ | | | |

7.3.277 The Tre'r Gof and Cae Gwyn SSSIs are in part GWDTEs and could potentially be affected by the following activities during Power Station Site construction: bulk earthworks, drainage, deep excavation, landscape mound creation and construction of the Site Campus. During Power Station operation effects may occur from the presence of buildings and foundations, roads and hardstanding, drainage and the presence of mounds.

### Effects on Groundwater-Dependent Terrestrial Ecosystems

7.3.278 The detailed assessment of these potential effects is informed by the surface and groundwater chapter D8 (Application Reference Number: 6.4.8), ecology in chapter D9 (Application Reference Number: 6.4.9) and in hydro-ecological reports for the Tre'r Gof and Cae Gwyn SSSIs (appendix D8-5, Application Reference Number: 6.4.30) and appendix D8-6, Application Reference Number: 6.4.31). These have been informed by groundwater monitoring and pumping tests and ecological surveys of the habitats.

7.3.279 The WFD groundwater body is defined collectively as all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. This includes all superficial, perched and bedrock groundwater layers. Step 3 (appendix D table 10) identified that there could be deterioration in water quality to springs and seepages such that the qualifying interests of the Tre'r Gof and Cae Gwyn SSSI GWDTEs may be affected. However, this would not be due to pollution but rather to a change in residence time and groundwater occurrence. As WFD Annex V Groundwater Chemical Status is concerned with failure due to pollutants, and as pollutants are not the issue, the potential water quality changes have been assessed under the quantitative category. This approach to the assessment was discussed with NRW on 28 June 2017 (see table 1-2).

### Tre'r Gof SSSI

7.3.280 The Tre'r Gof SSSI is a hydrologically complex GWDTE. Although there has been monitoring of the SSSI for several years, there are numerous uncertainties regarding how it functions and the routing and flows of surface and groundwater that maintain the feature. This notwithstanding, it is highly likely that the SSSI is partly dependent on groundwater from winter recharge, predominantly by shallow groundwater flows. Any actions that would reduce the amount or pattern of water entering the Tre'r Gof SSSI would be damaging to the site. Changes in water availability and routing within the Tre'r Gof SSSI could also have subsequent effects on the water quality of the SSSI.

7.3.281 For much of the year the SSSI is typically drying out, with a recharge/wetting-up season occurring at the onset of winter (November/December) and the commencement of the drying period varying from year to year. Groundwater within the shallow superficial deposits and emerging within 50-150m of the SSSI boundary was also identified as critical for maintaining base flow to seepages, drains and springs which discharge directly into the Tre'r Gof SSSI.

7.3.282 There would be substantial construction activities within the Tre'r Gof Catchment with earthworks including platform creation, drumlin removal and creation of landscape mounds with steep slopes. The new landforms will be

permanent. There will also be substantial changes to the drainage regime both during construction and operation.

7.3.283 The construction of the Site Campus in the northern part of the Wylfa Newydd Development Area is partly within the Tre'r Gof catchment. Drainage of the Site Campus includes two main discharge routes onto Tre'r Gof, the first into Tre'r Gof drains and the second via infiltration to ground. The embedded mitigation includes attenuation using a geocellular attenuation tank or similar in order to reduce the potential for flooding and to try to match baseline conditions. The second component would be to recharge rainfall runoff to the northern side of Tre'r Gof via infiltration trenches, 'reno mattress', swales or similar.

7.3.284 The hydro-ecology report (appendix D8-5, Application Reference Number: 6.4.30) identifies the complex conceptual hydrological model at Tre'r Gof SSSI as outlined in the following paragraphs.

7.3.285 Water inflow is from a surface water system of small ditches and streams, direct rainfall, springs and seepages.

7.3.286 Groundwater in bedrock is believed to largely flow directly to the sea and is considered to be a minor proportion of the total water balance for the SSSI. There are multiple lines of evidence, including an understanding of the geology of the SSSI, that suggest that deep bedrock groundwater is not significant in maintaining the wetland including:

- the rapid drop in groundwater head across Tre'r Gof SSSI;
- the findings of the water balance (appendix D8-5, Application Reference Number: 6.4.30); and
- inflows to the SSSI generally being greater than outflows.

7.3.287 That proportion of Tre'r Gof SSSI wetland which is fed by groundwater is estimated to be roughly one third and this largely derives from shallow groundwater spring and seepage throughflows from the catchment superficial deposits and from seasonal groundwater baseflow into the ditches which supply Tre'r Gof SSSI. These sources dry up except for inflow VN2 on the east of the SSSI immediately under Dame Sylvia Crow's mound and which is sustained by Spring G, the origins of which are not completely understood (see appendix D8-5, Application Reference Number: 6.4.30).

7.3.288 These flows of shallow groundwater into the SSSI and its peat deposits may bring mineral enriched (in comparison to rainwater) water into the SSSI. The minerals are believed to derive partly from the contact of groundwater with the underlying Irish Sea lodgement till, although there remains some uncertainty regarding the importance of this and there may be other sources of mineral enrichment from bedrock groundwater. An alternative and/or complementary origin for the calcium is that the peat soils bind the calcium allowing concentrations to build up over time. Whatever the origin, this water quality is an important supporting condition for the plant communities within the SSSI. Whilst nutrients such as nitrogen and phosphorous are also essential for maintenance of the characteristic assemblage of wetland plants and animals,

nutrient enrichment could lead to a change in species composition in several sensitive vegetation communities.

7.3.289 The 4R and MODFLOW models have been used to assess potential effects on the GWDTE and in particular any changes from reduction in groundwater levels and rainfall runoff recharge due to excavation dewatering and the change in surface topography and run-off characteristics. At the catchment scale the model provides sufficient detail on the groundwater flows associated with the small Tre'r Gof Catchment, although it is recognised that it does not provide any detail of flows associated with particular vegetation stands.

7.3.290 The model and the various reports based on extensive investigation and monitoring conclude that:

- Earthworks and mounding could reduce the amount of groundwater recharge and alter groundwater levels, flow directions, seepages, springs in both superficial and bedrock aquifers.
- There is also likely to be some alteration and reduction in baseflow to surface water.
- Whilst it is acknowledged that there is a degree of continuity between the shallow groundwater within the superficial deposits and deeper groundwater within the bedrock, the data suggest that this is not consistent across the site. Therefore, the conceptual model of the site identifies the two different groundwater units whilst accepting that there is interaction between them.
- Groundwater drawdown in bedrock would occur due to construction dewatering. It is also likely that groundwater levels would reduce around the Power Station during operation due to the passive drainage system, but the reduction in levels would be limited in extent. This would mostly affect the bedrock and base flow to any connected surface waters. This would be a minor component of the water balance.

Shallow groundwater throughflow/interflow inputs to the Tre'r Gof SSSI within the very small near surface superficial catchments would not be affected by dewatering. Bedrock flow would be affected, to the extent that Tre'r Gof is supported by groundwater bedrock.

- During Power Station Site construction, the drainage system would be installed around the landscape mounds and the perimeter drains would intercept shallow groundwater which may cut off groundwater seepages and springs which partially sustain the Tre'r Gof SSSI. Construction of the drainage system could also cause a reduction in water availability to Tre'r Gof SSSI due to the potential to affect shallow groundwater seepages and interlinkage with surface water, particularly in the west compartment where negative water availability has been modelled.
- Changes in shallow groundwater occurrence combined with the re-routing and change in residence time of groundwater could have effects

on the mineral (especially calcium and bicarbonate) enriched water maintaining plant communities within the SSSI.

- Modelling indicates that groundwater flow direction beneath the Tre'r Gof SSSI is not reversed during Power Station Site construction or operation with bedrock groundwater continuing to flow under the SSSI to the coast.

7.3.291 The conclusion of the hydrological and ecological assessments in chapters D8 (Application Reference Number: 6.4.8) and D9 (Application Reference Number: 6.4.9) combined with the model results are that the magnitude of change to groundwater levels, flow direction and quality would be relatively small in Tre'r Gof Catchment. However, due to the high sensitivity of SSSI plant communities to any changes water levels and water quality, the predicted small changes in groundwater levels and quality could cause loss or modification of notable species at the Tre’r Gof SSSI.

7.3.292 The drainage proposed around the landscape mounding to the south and east of the Tre’r Gof SSSI includes:

- The use of outflow pipes at 50m intervals in new drainage ditches to the north and west of Mound A such that water would flow from the ditches to the ground adjacent to the drain. This would allow surface water overland flow and shallow throughflow to the SSSI to be maintained. In addition, monitoring and control weirs in the outflow pipes would be used to control the flow to the SSSI.
- The landscape mounding has been designed to avoid changes in catchment boundaries as far as practical, although there are some changes in these areas.
- To preserve the baseline catchment draining towards the Tre’r Gof SSSI from the south and east the mounding in that area would be placed on a permeable inert rock drainage blanket. This is intended to promote infiltration of runoff from the south-eastern slopes of the mound so that it can flow north-westward within the drainage blanket under the mound, through the superficial deposits and back into the SSSI. The aim would be to make sure that the shallow groundwater chemistry does not change appreciably from the baseline condition.

7.3.293 This design has been simply represented in the model by displacements built into the 4R routing network incorporating simple linear stores to smooth flow relocated to the VN1 and VN5 inflow points to the Tre’r Gof SSSI such that their overall contributing catchment area remains close to the baseline situation.

7.3.294 However, there is uncertainty relating to the potential effectiveness of the drainage design in maintaining the quality and quantity of water sources that feed the SSSI. It is not possible to accurately predict the changes in the quality of shallow groundwater chemistry or to have certainty in the extent of changes to groundwater levels resulting from the mounding and drainage system. This is partly due to the natural complexity of the hydrology and hydrochemistry at Tre’r Gof SSSI and the difficulty mimicking the natural variations that currently

occur. Accordingly, a precautionary approach to the assessment has been adopted.

7.3.295 Due to the predominance of vegetation communities that are highly sensitive to water levels and chemistry (see table 4.1 in appendix D8-5, Application Reference Number: 6.4.30), a change in species composition would be expected if the potential changes in the levels and chemistry of shallow groundwater occurred. Such changes to notable vegetation communities could compromise the SSSI's conservation status. As Mound A and Mound B would be retained into the operational phase of the Power Station, any effect associated with water quantity change would potentially be experienced in the medium- and long-term. Any reversible vegetation change may also take several years to revert to baseline conditions (potentially assisted by additional mitigation), and so would be experienced in the long-term. It is therefore possible that there would be long-term deterioration in habitats within the SSSI.

7.3.296 To try to address this uncertainty, active management of the drainage system would be undertaken and the drainage system has been designed to be as flexible as possible, within the current landform constraints, to allow this to happen. This would include monitoring at every discharge point to determine if there is a significant departure from baseline conditions. If a change is detected, additional mitigation may be required.

7.3.297 To offset potential effects to the Tre'r Gof SSSI, a number of potentially suitable compensation sites have been identified and would be secured prior to construction commencing. Outline habitat creation and management measures for each site have been drafted. These would then inform the detailed design for the works required to create new wetland habitat. The management of these wetland sites would continue throughout the operation phase (see appendix D1-2, Application Reference Number: 6.4.18).

7.3.298 In relation to the GWDTE quantitative test it is concluded that the Wylfa Newydd Project could cause deterioration in the status of the Ynys Môn Secondary groundwater body. This conclusion is made on the basis that it could result in significant damage to Tre'r Gof SSSI GWDTE and thereby could compromise the ongoing achievement of the water body objectives with respect to this effect.

### Cae Gwyn SSSI

7.3.299 There has only been limited investigation and monitoring at the Cae Gwyn SSSI and so there is uncertainty regarding the hydrological functioning of the system and its complexity. However, it does appear to comprise a system of basin mires each of which operate under different hydrological regimes and separated by dry heathland habitat on a central rocky outcrop. The SSSI citation description is of an acid wetland with low concentrations of total dissolved solids and nutrients. Cae Gwyn SSSI sits at a high elevation, adjacent to bedrock outcrops and within shallower bedrock depressions. It contains deep peat deposits.

7.3.300 Cae Gwyn SSSI is underlain by bedrock with high groundwater levels and does not have strong local drainage control with informal overland flow occurring in several areas. There is variation between summer and winter water levels in basins where peat is present close to the surface and parts of the basins are water logged during winter and can dry out in summer. The catchment extends beyond the boundary of the SSSI and extends into the Wylfa Newydd Development Area.

7.3.301 The Cae Gwyn SSSI appears to be mostly surface water dependent. There is limited seasonal dependence on groundwater within the SSSI as shown by groundwater levels, water quality and ecology. This groundwater is potentially from seepages but may also come from the deeper bedrock. Groundwater inputs only significantly increase the area contributing to flows during wetter periods when groundwater levels are elevated.

7.3.302 The Primary Outflow Basin principally comprises a quaking bog which supports a range of grass and rush species typical of moderately base-rich conditions. As such, a change in groundwater level near the SSSI could affect groundwater inputs to the SSSI.

7.3.303 There are only thin superficial deposits surrounding the site and there is considered to be an insignificant shallow superficial groundwater flow.

7.3.304 A proposed landscape mound (Mound C) and Visitor Centre are located approximately 50m and 80m respectively to the east of the SSSI boundary.

7.3.305 The 4R/MODFLOW groundwater model has been used to predict the effects of dewatering of the excavations on groundwater levels at Cae Gwyn SSSI. However, the baseline calibration is based on limited data as access to Cae Gwyn SSSI has been challenging and the data set is limited in duration.

7.3.306 The model does not predict significant inflow change to the Cae Gwyn SSSI and concludes the following:

- Dewatering has the potential to reduce the bedrock groundwater levels by less than 0.02m at the north of the SSSI; given the annual fluctuations this change would not be detectable.
- Groundwater baseflow to surface water at the Cae Gwyn SSSI is partly from bedrock. This is low in the summer but increases significantly during the winter months. The critical period for the SSSI functioning is in the dry season when there is very little groundwater flow and any small changes in the groundwater baseflow is not considered to be important to the functioning of the Cae Gwyn SSSI. This notwithstanding, it is recognised that there is uncertainty in how Cae Gwyn functions and there could be areas of the site where this groundwater inflow is important.
- Effects on the Cae Gwyn SSSI during the Construction phase due to groundwater dewatering and changes to groundwater levels in the Secondary B aquifer due to construction of mounds and platforms are considered minimal.

7.3.307 In relation to the GWDTE quantitative test it is concluded that the Wylfa Newydd Project would not result in significant damage to Cae Gwyn SSSI

GWDTE. There would be no deterioration in the Ynys Môn Secondary groundwater body with respect to Cae Gwyn SSSI GWDTE, nor would it compromise the future achievement of its objectives.

### *12. Potential risk to quantitative status of the Ynys Môn Secondary groundwater body from changes to the surface water element during construction*

7.3.308 The current classification of the quantitative status of the Ynys Môn Secondary groundwater body is provided in table 7-22.

#### Relevant activities

7.3.309 The activities relevant to this part of the assessment are outlined in table 7-25. This part of the assessment is relevant to the DCO, and the construction and operation water discharge permits (table 7-25).

**Table 7-25 Activities relevant to effects on Ynys Môn Secondary groundwater body affecting surface water quantity**

| Activity no. | Activity | Relevant application | | | |
|---|---|---|---|---|---|
| | | DCO | Marine Licence | Construction water discharge | Operation water discharge permit |
| 1.21 | Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | ✓ | | ✓ | |
| 1.22 | Installation and operation of a drainage system during Power Station construction | ✓ | | ✓ | |
| 1.25 | Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | ✓ | | ✓ | |
| 1.27 | Progressive mound creation | ✓ | | | |
| 1.32 | Main plant construction (Unit 1 and Unit 2) | ✓ | | | |
| 2.1 | Presence of buildings, hardstanding and roads | ✓ | | | |
| 2.2 | Presence of mounds | ✓ | | | |
| 2.6 | Drainage during operation | ✓ | | | |

7.3.310 There are potential quantitative groundwater effects on surface water during Power Station Site construction from the following activities: construction of the CWS and MOLF, drumlin removal, platform development, excavation dewatering and landscape mound creation. There will be substantial dewatering of the excavations and substantial changes to the drainage regime during Power Station Site construction. During Power Station Site operation

effects may occur from the presence of buildings and foundations, roads and hardstanding, drainage and the presence of mounds.

### Effects on surface water quality

7.3.311 There are five small surface water catchments comprising small watercourses, some of which are ephemeral and/or culverted, and wetted and/or flushed ditches, which have the potential to be affected by changes in groundwater baseflow from activities associated with the Wylfa Newydd Project. These are the lower reaches of Afon Cafnan Catchment, part of the Cemlyn Catchment and the small Power Station Catchment, belonging to The Skerries water body and Tre'r Gof Catchment and Cemaes Catchment belonging to the Anglesey North water body.

7.3.312 Groundwater levels are often similar to watercourse elevations over parts of the Wylfa Newydd Development Area such that groundwater and surface water are in continuity. Typically, however, groundwater levels are higher than watercourse levels in winter and lower in summer such that in summer there is very little groundwater support of surface water.

7.3.313 Overall the hydrological and hydrogeology Environmental Statement (chapter D8 and associated appendices, Application Reference Number: 6.4.8) has concluded, supported by the 4R – MODFLOW models, that the base flow groundwater component to watercourses is small due to the low permeability of the superficial deposits, soils and bedrock. This is because the superficial aquifer units are isolated and small with regards to the catchments in which they are located and, as such, are only minor influences on the hydrological behaviour of the catchments. Where drumlins are absent, and where there is hydraulic continuity between groundwater and surface water, bedrock groundwater still provides only small amounts of baseflow to watercourses due to the low permeability of the bedrock. Accordingly, groundwater from bedrock has been considered a minor influence on surface water.

7.3.314 The exception to this is the Tre'r Gof Catchment where the Tre'r Gof SSSI site forms an inland inflow basin and the superficial aquifer, which covers the entire SSSI wetland area immediately upstream of the discharge into Porth y Wylfa, has a significant function in storing and regulating the flow.

7.3.315 The hydrological 4R modelling (Application Reference Number: 6.4.32) has considered the response of the surface waters over a long duration where flow regime changes are expected to be dominated by the modified catchments, slopes, land surface characteristics and managed drainage. It models the effects of the various activities in extreme wet or dry conditions and looks at shallow sub-surface flow pathways. Bedrock groundwater system impacts are simulated in MODFLOW.

7.3.316 The model contains a simulated time series of flows at surface flow receptor cells at points of interest in the catchments as construction proceeds through to completion and also for Phase 5 (Power Station operation). The main output from the model is flow duration curve impact plots which summarise the flow changes as percentage deviation from the natural river flow

represented. The model uses principles consistent with the Environmental Flow Indicator (EFI) [RD42].

7.3.317 From these outputs, the relevant effects to changes in groundwater baseflow to surface water are:

- Dewatering of the deep excavations would change groundwater levels and groundwater flow direction. This may result in effects to groundwater base flows to surface watercourses and water availability within the fluvial catchments.
- At some locations, groundwater levels would fall below the level of the stream bed leading to decrease in baseflow.
- The local increase in the steepness of land surfaces and the drainage and haul roads alter the rainfall/runoff response and provide preferential flow pathways for surface water with a potential decrease in the long-term base flow.
- Changes to the size of the catchments would change surface water flows.
- Overall the baseflow component is very small compared to the runoff.

7.3.318 The predicted model output effects on each surface water catchment are given in the following paragraphs.

7.3.319 For Cemlyn Catchment the flow regimes during Power Station Site construction and operation are comparable with the baseline conditions. The catchment is relatively distant from the dewatering location whose effects do not extend far from the excavation and the presence of glacial till will limit surface water/groundwater interactions and groundwater baseflow. The mounding and drainage would alter the rainfall/runoff response and result in a negligible change in the long-term base flow to Nant Cemlyn.

7.3.320 In the Afon Cafnan Catchment the works would only take place in approximately 12% of the catchment and based on the groundwater model predictions, the drawdown in bedrock groundwater level is minimal. The predicted decrease in flows in this catchment equate to a long-term change equivalent to between +/-10% of the $Q_{95}$.

7.3.321 For the Tre'r Gof Catchment the presence of landscape mounding and drainage is predicted to result in a decrease in the catchment for the operational phase of some 7%. However, given the small size of the Tre'r Gof drains and intermittent flows which range throughout the year from dry to flood conditions, variable flow conditions are a key hydrological function of the Tre'r Gof SSSI.

7.3.322 In the Cemaes Catchment the presence of landscape mounding and drainage is predicted to result in an increase in flows within Nant Cemaes equating to a change of between +/-10% of the $Q_{95}$.

7.3.323 The Power Station Catchment would be removed during the construction works and an artificial drainage scheme would take its place. The drainage system has been designed to accommodate the flows that would have been

received by Nant Porth-y-pistyll and any remaining surface flows would drain directly to the coast.

7.3.324 Overall, the assessments indicate that the changes to groundwater recharge and water levels would have a minimal effect on an already small groundwater baseflow component to the surface water.

7.3.325 In relation to the surface water quantity test it is concluded that the Wylfa Newydd Project would neither cause deterioration in the status of the Ynys Môn Secondary groundwater body, nor compromise the achievement of its objectives with respect to this effect.

## 7.4 Further assessment of cumulative effects

7.4.1 The effects of multiple activities on individual quality elements have been considered throughout the detailed assessment. To assess the cumulative effects on quality elements, some of which may be affected in both construction and operation phases, further cumulative assessment has been carried out. This section considers potential cumulative effects on the following quality elements:

1. Chemical and physico-chemical quality elements in The Skerries and Anglesey North water bodies, which would occur during both construction and operation.
2. Hydromorphological quality elements in The Skerries; where effects of loss of habitat and changes in coastal processes, waves and hydrodynamics begin in construction and continue during operation.
3. Biological quality elements in The Skerries from changes to chemical and physico-chemical quality elements, changes to hydromorphological quality elements, abstraction and discharge of CW, other operational discharges and potential effects from the introduction of non-native species
4. Fish in riverine and transitional water bodies which are affected during construction and then also in operation.

7.4.2 For the Ynys Môn Secondary groundwater body, the effects relating to each test are considered separately and the cumulative effects resulting from multiple activities have been assessed within section 7.3 (no. 10, 11 and 12).

### *1. Cumulative effects on chemical and physico-chemical quality elements in The Skerries and Anglesey North water bodies*

7.4.3 Chemical and physico-chemical quality elements would be affected during construction by activities including dredging and excavation, deep excavations, bulk earthworks, mound creation, surface water drainage, sewage discharge, and during operation including discharge of CW and other operational water discharges.

7.4.4 Dredging and excavation would be completed by the end of year two and the effects on physico-chemical quality elements (in particular suspended solids)

would peak over a period of 35 days during dredging of soft sediments at the start of the construction period. Surface water drainage would continue throughout the whole construction period, but the main effects which result from deep excavations, bulk earthworks and mound creation would be completed by the end of year three. Once the mounds have been seeded it is very unlikely that there would be any exceedances of EQSs or any detectable effect on suspended solids within coastal water bodies as the assessment made in section 7.3 (Potential effects on chemical and physio-chemical quality elements in The Skerries, Anglesey North and Cemlyn water bodies from water discharges and dredging during construction) considered the worst case when there would be bare soil.

7.4.5 Commissioning of Unit 1 would not begin until around year 7 and therefore there would be a period of around four years between the effects on chemical and physico-chemical quality elements from construction and operation phases.

7.4.6 When considered together the cumulative effects on chemical and physico-chemical quality elements in The Skerries and Anglesey north water bodies would not cause deterioration in the status of water bodies, nor compromise the ongoing achievement of their objectives.

### *2. Cumulative effects on hydromorphological quality elements in The Skerries*

7.4.7 The assessment of the effects on hydromorphological quality elements from habitat loss considered both direct footprint and indirect losses. The small changes in bed shear stress would not have any detectable effect on habitats (see paragraph 7.3.58) and the sediment deposited following dredging would be remobilised over several tidal cycles (see paragraph 7.3.61).

7.4.8 The direct loss of intertidal habitat may present a risk of deterioration in the status of the ‘morphological conditions’ quality element in The Skerries water body. This effect begins in construction but continues through operation as the structures remain in place and maintenance dredging would occur every three to five years (see table 6-1).

7.4.9 In addition to habitat loss the new marine structures would lead to changes in coastal processes, waves and hydrodynamics during construction and operation.

7.4.10 The gap at the end of the western breakwater would allow tidal currents to maintain a circulation of flow, resulting in minimal deposition (see paragraph 7.3.93). The changes to wave height would be within the range of natural variability. Modelling showed that the highest bed shear stress is predicted to occur inshore around headlands (e.g. Trwyn Cemlyn, to the west of Cemlyn Bay and west of Porth-y-pistyll). There would be a reduction in bed shear stress within Porth-y-pistyll, but this area has already been accounted for as part of the habitat loss calculations.

7.4.11 When considered together the cumulative effects on hydromorphological quality elements in The Skerries would not cause deterioration in the status of The Skerries water body, nor compromise the achievement of its objectives.

### *3. Cumulative effects on biological quality elements in The Skerries*

7.4.12 Biological quality elements in The Skerries may be affected during construction and operation by changes to chemical and physico-chemical quality elements and to the supporting hydromorphological quality elements. In addition, during operation biological quality elements may then be affected by abstraction of CW (direct losses of phytoplankton and benthic invertebrates) and CW discharge (effects on phytoplankton, macroalgae and benthic invertebrates).

7.4.13 The changes to chemical and physico-chemical quality elements are small and there would be no detectable change in biological quality elements, even when considered with other effects, as a result of changes to chemical and physico-chemical quality elements. Whilst there is a small possibility that phytoplankton production could be affected by an increase in suspended solids, this would be limited to the vicinity of the discharge points, and it would not affect the abundance and diversity of phytoplankton within The Skerries water body as a whole. An increase in nutrients (dissolved inorganic nitrogen is the key growth-limiting nutrient in marine waters) is not predicted (see 7.3.17 to 7.3.20).

7.4.14 Although the modified surface water drainage would continue throughout the whole construction period, the main effects which result from deep excavations, bulk earthworks and mound creation would be completed by the end of year 3 and commissioning of Unit 1 (and therefore discharge of warmer water) would not begin until around year 7.

7.4.15 During operation the increased temperature and light availability within the inner harbour as a result of reduced water circulation could promote phytoplankton growth and particularly that of harmful and/or toxic algae. A number of harmful/toxic algae are present within the Wylfa Newydd Development Area but their densities are considered to be very low compared to the number at which an individual taxon is considered to reach bloom densities (see section 13.3. in chapter D13, Application Reference Number: 6.4.13). Overall phytoplankton densities are also considered to be low in the area.

7.4.16 Increased light and nutrient availability as well as increased temperature are all considered to promote phytoplankton growth. While anthropogenic nutrient enrichment has been proposed as a principal causative factor of harmful algal blooms it is often the hydrodynamic processes that determine whether the blooms occur [RD43]. Porth-y-pistyll and the rest of the Wylfa Newydd Development Area are not subject to anthropogenic nutrient enrichment, though the temporary reduced water circulation in the inner harbour could promote algal growth including harmful algal blooms. The high dilution of construction related sewage discharges and naturally low nutrient concentrations in the area are not expected to support conditions favourable to extensive algal blooms in the inner harbour.

7.4.17 The direct loss of phytoplankton when considered cumulatively with the other effect on phytoplankton remains small in comparison to the overall community that would be entrained into the CWS.

7.4.18 There would be a direct loss of habitat with effects on benthic invertebrates and aquatic flora (macroalgae) in Porth-y-pistyll from the footprint of the marine works (30.5ha). The effect would begin in construction and continue through operation as the structures remain in place and maintenance dredging would occur every three to five years (see table 6-1). There would be additional effects on benthic invertebrates and aquatic flora (as well as phytoplankton) from the CW discharge from warmer water and discharge of TRO. Benthic invertebrates and aquatic flora would be affected at the seabed in the vicinity of the CW outfall (the area at the seabed that would be affected by temperature (greater than 2°C) and TRO (above 0.01mg/L) would be up to 5.6ha in the worst case (annual base case).

7.4.19 Benthic invertebrates would also be lost as a result of entrapment in the CW intake, however survival rates for invertebrates are high and the predicted numbers are low (see paragraph 7.3.179).

7.4.20 When considered together the additive effects on biological quality elements are still small in relation to the scale of The Skerries water body and would not cause deterioration in the status of biological quality elements in The Skerries water body nor compromise the achievement of its objectives.

### *4. Cumulative effects on fish in riverine and transitional water bodies*

7.4.21 The effects on migratory fish (Atlantic salmon, sea trout, river lamprey and European eel) have been assessed in relation to the combination of effects during construction (section 7.3, no. 4) and operation (section 7.3, no. 9).

7.4.22 During construction effects on migratory fish from changes in visual and acoustic stimuli and changes in water quality and hydrology would occur at the start of construction and the extent of effects would be greatly reduced by year 3. The effects on fish from habitat loss and changes to hydromorphological quality elements would begin in construction and continue through operation.

7.4.23 During operation migratory fish may also be affected by the abstraction of CW (direct loss of fish) and from the CW discharge from warmer water and discharge of TRO. Very low numbers of migratory species are predicted to be entrapped and considering the embedded mitigation to protect fish and the likely infrequent presence of migratory fish within the ZoI the effect on migratory species is not likely to be detectable on fish populations in riverine and transitional water bodies.

7.4.24 Migratory fish species are able to avoid the thermal and TRO plume, which is at its largest extent at the surface and is restricted to the vicinity of the outfall at the seabed. The exposure of migratory fish to this effect would be limited as they would only be passing by.

7.4.25 Considering the cumulative effects on migratory fish from all effects during construction and operation it is clear that the extent of each effect is so small that even when combined the effects would not cause deterioration in the status of the fish quality elements in riverine and transitional water bodies nor would it compromise the achievement of their objectives.

## 7.5 Summary of the detailed WFD assessment

7.5.1 The detailed WFD assessment identified that there were classification and quality elements in two water bodies at risk of deterioration (see table 7-26table 7-26).

**Table 7-26 Classification and quality elements at risk of deterioration**

| Water body | Classification/quality element at risk | Current element classification |
|---|---|---|
| The Skerries | Hydromorphology: Morphological conditions | High |
| Ynys Môn Secondary | Saline intrusion (component of both chemical and quantitative status) | Good |
| | Groundwater-Dependent Terrestrial Ecosystem (GWDTE) (quantitative status only) | Good |

# 8 Inter-project cumulative effects assessment (step 5)

## 8.1 Overview

8.1.1 Cumulative effects include intra-development, intra-project and inter-project effects. A description of these categories is provided in section 3.2. Intra-development and intra-project cumulative effects have been assessed in section 7.

8.1.2 This step addresses potential inter-project cumulative effects on water bodies from both the Wylfa Newydd Project and other developments which have been identified as reasonably foreseeable future projects. Whilst effects from a particular development may not cause deterioration alone, in combination the effects could prevent a water body from achieving WFD objectives.

## 8.2 Assessment

8.2.1 The list of reasonably foreseeable future projects, as provided in chapter I5 (Volume I – Cumulative effects I5 - Inter-project cumulative effects. Application Reference Number: 6.9.5) has been considered. Nineteen projects were identified that with reasonable certainty are likely to overlap in time and space with the Wylfa Newydd Project and are relevant to this WFD Compliance Assessment. The potential for cumulative effects is assessed in table 8-1.

8.2.2 Horizon is proposing to undertake additional developments which would be subject to applications for consent under the Town and Country Planning Act 1990. This includes the A5025 On-line Highway Improvements which has been considered within the inter-project cumulative assessment. There would also be a separate TCPA application for consent for Site Preparation and Clearance (SPC) works however this has not been considered here to avoid double-counting as these works are considered as part of the construction of the Power Station.

8.2.3 Sewage from the Site Campus would be treated at the existing Dŵr Cymru Welsh Water Cemaes Waste Water Treatment Works. Capacity issues at the treatment works are being addressed and any shortfall would be made up by use of an additional package plant. The addition of sewage from Site Campus will result in an increase of 17.5CFU/100ml in the Cemaes Bathing Water [RD44]. The details of the upgrade works required and the resulting quality of the discharge are not known at this time and therefore this has not been included in the inter-project cumulative assessment.

**Table 8-1 Consideration of projects relevant to the WFD assessment**

| Ref no. | Developer | Project title & description | Potential effects and relevant water bodies |
|---|---|---|---|
| N/A | Horizon | Horizon TCPA: A5025 On-line | Given the scale of the works there are no predicted cumulative effects on quality elements in any WFD water bodies as a result of this development. |
| AN01 | Magnox Limited | Wylfa Decommissioning<br>Decommissioning of the Existing Power Station (Wylfa) including care and maintenance of the existing facilities followed by decommissioning and final site clearance.<br>Decommissioning activities are understood to last between 2015 and 2025. | Potential effects on water quality in The Skerries and Anglesey North water bodies. However, these would be mitigated for as part of the decommissioning process, and therefore no cumulative effects are predicted. |
| AN05 | Conygar Stena Line Ltd | Holyhead Waterfront Redevelopment<br>A comprehensive mixed-use development on 1.2km of Holyhead waterfront at Newry Beach and Porth-y-Felin. | Although there is limited information available on this development it is noted that concerns have been raised about the potential for the non-native species carpet sea squirt (*Didemnum vexillum*) to spread.<br>The risks associated with the Wylfa Newydd Project and the Holyhead Waterfront Redevelopment are different as the location and potential pathways for transfer differ. The construction and operation of the Holyhead Waterfront Redevelopment would not increase the risk of transfer or establishment within the Wylfa Newydd Development Area.<br>The Holyhead Waterfront Redevelopment could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |

| Ref no. | Developer | Project title & description | Potential effects and relevant water bodies |
|---|---|---|---|
| AN07 | National Grid | North Wales Connection Project, Wylfa to Pentir<br>A new connection for new energy generation in North Wales. Potential new generation includes the proposed Wylfa Newydd Project as well as a number of renewable energy projects. | This development could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN08 | TPG Wind Limited (a joint venture between E.ON and Eurus Energy UK Ltd) | Rhyd-y-Groes Repower<br>The current Rhyd-y-Groes Wind Farm, located near the northern shores of Anglesey in Wales, has 22 turbines with a maximum total power output of 6.6MW. Proposals are to replace the current turbines with up to 11 modern turbines, which could produce up to 9.9MW of renewable energy. | This development could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN09 | M-SParc | Menai Science Park<br>A new science park located on the outskirts of Gaerwen. Being developed as a location for industry-facing research projects, Small-Medium Enterprises and Corporates, to drive growth in knowledge-based science in north-west Wales. | This development could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN11 | Minesto | Holyhead Deep 10MW (and phased development to 80MW)<br>Tidal kite installation off the coast of Holyhead, plus on-land elements and grid connection.<br>Minesto plans to start the installation of a 10MW marine energy array in 2017. Future proposals would increase this to 80MW. | The Holyhead Deep 10MW development may have a pathway to an effect on migratory fish species either from habitat loss, increase in underwater noise or physical presence of structures. At present there is no information on the extent of these effects. There are no predicted effects on migratory fish species that would result in a detectable change to fish populations during construction or operation of the Wylfa Newydd Project. Therefore, it is not considered likely that there would be any cumulative effects. |

| Ref no. | Developer | Project title & description | Potential effects and relevant water bodies |
|---|---|---|---|
| AN13 | IACC | Holyhead Primary School<br>New primary school planned to replace Ysgol Y Parchedig Thomas Ellis, Ysgol Y Parc and Ysgol Llaingoch schools, on the former Ysgol Cybi site in Holyhead. | This development could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN14 | IACC | Llanfaethlu Primary School<br>A new primary school to replace Ysgol Cylch Y Garn, Ysgol Ffrwd Win and Ysgol Llanfachraeth. | This development could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN15 | IACC | Llangefni Link Road Scheme<br>The IACC is proposing a new 2.5km link road around the eastern side of Llangefni to enable traffic to more freely access the industrial estate in Coleg Menai and reduce expected traffic in Llangefni town centre. | This development could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN20 | Utilities companies (various) | Removal (and in some instances replacement) of services currently in place on the Wylfa Newydd Development Area.<br>Plans are in place to remove or replace existing services, e.g. electrical cables, which are currently installed on the Wylfa Newydd Development Area. This work is expected to be carried out by the relevant utilities companies under Permitted Development Rights and funded by Horizon. | The removal of utilities services would be likely to lead to some compaction of soils around working areas and there is potential for fine sediment delivery to non-reportable fluvial water bodies. However, this work is small-scale and any effects would be localised within fluvial catchments. It is not considered that this would be likely to result in non-temporary effects on quality elements in any water bodies, and therefore no cumulative effects have been predicted.<br><br>This development could affect water resources. However, within the Ynys Môn Secondary groundwater |

| Ref no. | Developer | Project title & description | Potential effects and relevant water bodies |
|---|---|---|---|
| | | | body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN23 | Countryside Renewables | Llanbadrig Solar Farm<br>Development of 220 acres (89ha) of agricultural land at Llanbadrig for the installation of a solar farm with the potential to generate up to 50MW. | This development could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN24 | Grŵp Llandrillo Menai | Coleg Menai<br>Hybrid application applying for full planning permission for the creation of a new engineering centre, car parking, children's play area and associated works and applying for outline planning permission with some matters reserved for a residential development of 157 dwellings, a hotel and food and beverage facility along with associated car parking and works on land at Coleg Menai, Ffordd Y Coleg, Llangefni. | This development could affect water resources. However, within the Ynys Môn Secondary groundwater body there are no predicted effects on water balance from the Wylfa Newydd Project and therefore no cumulative effects have been predicted. |
| AN25 | Dŵr Cymru Welsh Water | Wylfa Newydd Potable Water Supply pipeline.<br>Provision of a potable water supply for the construction and operation of the Wylfa Newydd Power Station, involving abstraction, treatment and supply.<br>Abstraction of water is proposed to be from the existing supply at Llyn Alaw.<br>Treatment is expected to be at the existing Alaw Treatment Works. | It is understood that the requirement for potable water for the Wylfa Newydd Project can be met within the existing abstraction licence. As there are no predicted effects on water balance from the Wylfa Newydd Project no cumulative effects have been predicted. |

| Ref no. | Developer | Project title & description | Potential effects and relevant water bodies |
|---|---|---|---|
| | | The transport of water to the Wylfa Newydd Development Area would be predominantly through a new, dedicated pipeline route (either single or dual pipes), linked to the existing Dŵr Cymru Welsh Water distribution network. | |
| GW01 | Snowdonia Pumped Hydro Limited | Glyn Rhonwy Pumped Storage<br>Construction and operation of a 600MWh pumped storage scheme, with a generating capacity of 99.9MW, at the Glyn Rhonwy and Chwarel Fawr quarries, near Llanberis, Gwynedd. | There are no predicted effects on migratory fish species that would result in a detectable change to fish populations during construction or operation of the Wylfa Newydd Project. Therefore, it is not considered likely that there would be any cumulative effects. |
| GW02 | Welsh Government | A487 Caernarfon to Bontnewydd Bypass<br>A new 9.8km highway commencing at the Goat roundabout (A499/487 junction) and terminating at the Plas Menai roundabout. The new route would have 22 separate structures including seven bridges. | There are no predicted effects on migratory fish species that would result in a detectable change to fish populations during construction or operation of the Wylfa Newydd Project. Therefore, it is not considered likely that there would be any cumulative effects. |
| RI02 | Dublin Port Company | Alexandra Basin Redevelopment Project<br>Extension of infrastructure to open up Dublin Port to larger cruise and cargo ships.<br>The port will dredge the River Liffey to increase the depth of its berths and the entrance channel from 7m to at least 10m. This will eliminate access issues caused by tides and enable large cruise and cargo ships to turn in Alexandra Basin and dock at East Link Bridge, rather than reversing up the Liffey to their berth as they do now. | There are no predicted effects on migratory fish species that would result in a detectable change to fish populations during construction or operation of the Wylfa Newydd Project. Therefore, it is not considered likely that there would be any cumulative effects. |
| NU02 | EDF Energy | Hinkley Point C (Somerset) | There are no predicted effects on migratory fish species that would result in a detectable change to fish |

| Ref no. | Developer | Project title & description | Potential effects and relevant water bodies |
|---|---|---|---|
| | | Construction, operation and decommissioning of a new Nuclear Power Station using AREVA EPR technology. | populations during construction or operation of the Wylfa Newydd Project. Therefore, it is not considered likely that there would be any cumulative effects. |
| NU04 | NuGen | Moorside (Cumbria)<br>Construction, operation and decommissioning of a new Nuclear Power Station using Westinghouse AP1000 technology. | There are no predicted effects on migratory fish species that would result in a detectable change to fish populations during construction or operation of the Wylfa Newydd Project. Therefore, it is not considered likely that there would be any cumulative effects. |

## 8.3 Summary

8.3.1 The assessment did not identify any potential inter-project cumulative effects that could result in effects on the status of quality elements or could compromise the ongoing achievement of water body objectives.

# 9 Protected areas (step 6)

9.1.1 The purpose of this section is to consider the potential for effects on protected areas that are identified within the Western Wales RBMP and to address Article 4.9 of the WFD which states that *"…steps must be taken to ensure that the application of the new provisions, including the application of paragraphs 3, 4, 5, 6 and 7 [of Article 4] guarantees at least the same level of protection as the existing Community legislation…".*

9.1.2 The WFD specifies that areas requiring special protection under other Directives, and waters used for the abstraction of drinking water, be identified as protected areas. These areas have their own objectives and standards. Where water body boundaries overlap with protected areas, the most stringent objective applies – that is, the requirements of one particular Directive should not undermine the requirements of another. The types of protected area relevant to the Wylfa Newydd Project include bathing waters, Natura 2000 Sites (SPAs and SACs) and Drinking Water Protected Areas. There are no nitrate vulnerable zones, shellfish waters or sensitive areas (urban waste water) within or near the ZoI.

9.1.3 The closest shellfish protected water is located 20km to the east of the Wylfa Newydd Development Area near Benllech. This is beyond the ZoI and is not considered further.

9.1.4 There are no sensitive areas (urban waste water) within or near to the ZoI of the Wylfa Newydd Project and they are therefore not considered further.

9.1.5 NRW is currently reviewing the designation of nitrate vulnerable zones across Wales. There are three areas on Anglesey that could be designated as nitrate vulnerable zones in the south and east of Anglesey. None of these areas overlap with the ZoI of the Wylfa Newydd Project and they are therefore not considered further.

## 9.2 Bathing waters

9.2.1 Bathing waters are designated under the Bathing Water Directive (2006/7/EC). There are designated bathing waters in many of the coastal water bodies that are considered within the assessment. However, there is only one bathing water in proximity to the ZoI which is located at Cemaes Bay, within the Anglesey North water body.

9.2.2 In 2017 and 2016 the bathing water status of Cemaes Bay was classified as poor meaning the advice is not to bathe in this water due to pollution levels. There is an ongoing programme of work to reduce the bacterial and sediment loading from the freshwater inputs. A list of measures was provided by NRW which includes the following:

- working with farmers regarding cattle access to the river, fencing and storage of manure;
- working with property owners that have septic tanks;

- water quality monitoring in the river catchment and intensive sampling of bathing waters;
- working with Dŵr Cymru Welsh Water regarding their sewage works and pumping stations;
- identification of the source of coliforms using DNA analysis; and
- meetings with stakeholders and creation of an action plan.

9.2.3 The Wylfa Newydd Project would not prevent any of these measures from continuing or being put in place.

9.2.4 An assessment of potential effects on this bathing water has been carried out as part of the EIA including modelling of the sewage discharge in the north of Porth-y-pistyll [RD44]. Modelling showed that the sewage discharged in the north of Porth-y-pistyll would be quickly dispersed. Under the Bathing Water Directive, to achieve 'good' classification the faecal coliform concentration must not exceed 200CFU/100ml in 80% of samples. In the worst case scenario, the modelled concentration of faecal coliforms reaching the bathing water at Cemaes would result in an increase in 29.3CFU/100ml (Breakwater North outfall 11.8CFU/100ml, Site Campus outfall 17.5CFU/100ml). This contribution is likely to occur infrequently and the small addition is well below the maximum concentration required to achieve 'good' classification. As there are no effects predicted on the bathing water at Cemaes, the Wylfa Newydd Project is considered to be compliant with the Bathing Water Directive.

## 9.3 Special Protection Areas and Special Areas of Conservation

9.3.1 The following designated sites of national/international importance are considered to be relevant to the assessment of the Wylfa Newydd Project:

- Bae Cemlyn/Cemlyn Bay SAC;
- the North Anglesey Marine/Gogledd Môn Forol candidate SAC;
- the Anglesey Terns/Morwenoliaid Ynys Môn SPA, and
- Anglesey Fens /Corsydd Môn

9.3.2 A stage two report has been prepared as part of the HRA for the Wylfa Newydd Project, and this has concluded that there would be no adverse effect on the integrity of the European Designated Sites. Therefore, the Wylfa Newydd Project is considered to be compliant with the Habitats Directive (92/43/EEC) and Birds Directive (2009/147/EC).

## 9.4 Drinking water protected area

9.4.1 The Wylfa Newydd Project lies within a Drinking Water Protected Area. The Drinking Water Protected Area has been assessed in the groundwater compliance after the requirements of WFD Article 7(3) - Drinking Water Protected Areas and as one of the tests in line with UK TAG [RD19]. The test concluded that there would be no impact on existing private or public water

supplies. There would, however, be some minor impact on the available abstraction resource in proximity to the site which may have been used historically for abstraction. However, Horizon has no plans to use this in the future, and very little of this water would be readily accessible to landowners outside of the Wylfa Newydd Development Area. Therefore, the resource and historical abstractions have not been carried forward for detailed assessment. There are therefore no predicted effects on the protected area.

# 10 Enhancements

10.1.1 The Planning Inspectorate has issued guidance that states the requirement to consider enhancements "An explanation of any enhancements and/or positive contributions to the RBMP objectives proposed and how their delivery would be secured" [RD6]. The Well-being of Future Generations (Wales) Act 2015 also aims to enhance the natural environment.

10.1.2 The following aspects represent enhancements that would be implemented as part of the Wylfa Newydd Project:

- **Realignment of a section of the Nant Caerdegog Isaf**. Realignment of a section approximately 400m in length would provide opportunities to create a more natural sinuous planform, to increase the channel gradient and to restore flow diversity. The proposed changes would constitute an improvement of stream habitat and may increase abundance and diversity of aquatic flora and macroinvertebrates.
- **The incorporation of a 15m buffer zone during construction around Nant Cemlyn, Nant Cemaes and Afon Cafnan**. The current land use around these water bodies is livestock grazing; with significant poaching along some lengths leading to fine sediment input to the channel and bank slumping in some locations. Implementation of a buffer zone would prevent poaching and therefore bank erosion. This may also improve water quality within the water bodies, reducing the input of fine sediments and nutrients that are associated with cattle poaching.
- **The highway improvements may improve water quality within adjacent water bodies**. The road drainage system would be improved thereby increasing the attenuation of pollutants and improving the quality of road runoff. There would also be an improvement from a road safety perspective which would reduce the potential for accidents and associated spillages into water bodies.
- **Compensation by creating new areas of fen linking existing areas of SSSI and SAC fen.** Three compensation areas for wetland habitat management and enhancement have been identified as part of the Wylfa Newydd Project. One site lies wholly within the Ynys Môn Secondary groundwater body whilst the other sites lie across the Ynys Môn Secondary and Ynys Môn Central Carboniferous Limestone groundwater bodies.

# 11 Conclusions

11.1.1 With the exception of the Ynys Môn Secondary groundwater body and The Skerries coastal water body, the WFD Compliance Assessment determined that the Wylfa Newydd Project would not cause deterioration in WFD water bodies on a non-temporary basis and would not prevent WFD water bodies from attaining GES/GEP. The exceptions are described below.

11.1.2 The assessment determined that there is potential for the Wylfa Newydd Project to jeopardise the ongoing attainment of good status of the saline intrusion test in the Ynys Môn Secondary groundwater body. The predicted extent of saline intrusion is limited in both space and time. However, the dewatering during construction does not have a defined end date and the duration of the effect is uncertain. Although the extent of the effect would be small, it may take longer than one RBMP cycle (six years) to fully recover. This effect is relevant to both quantitative and chemical tests for saline intrusion. However, it is specifically related to a reversal of groundwater flow along the coast rather than an introduction of any chemicals into the groundwater body.

11.1.3 In relation to the GWDTE test, it was concluded that the Wylfa Newydd Project could cause deterioration in the status of the Ynys Môn Secondary groundwater body with respect to the effects on Tre'r Gof SSSI GWDTE. This effect is relevant only to the quantitative status test for GWDTE.

11.1.4 The changes to morphological conditions represent a small change proportionally in The Skerries water body, which are considered to result in a minor anthropogenic alteration to the hydromorphological quality elements from those normally associated with undisturbed conditions (less than 5%). The assessment determined that it was not possible to definitively conclude that new modifications within The Skerries water body would result in minor anthropogenic change, and therefore constitute within class, rather than between class deterioration. It is therefore concluded that there is a risk that the morphological conditions quality element could deteriorate from high to good status.

11.1.5 There is therefore a requirement to develop a case to support an application for derogation under Article 4.7 of the WFD. Article 4.7 makes provision for a situation where the objectives of the WFD cannot be met, thereby allowing derogation from its requirements.

11.1.6 For a derogation to be granted, the criteria in Article 4.7 must be satisfied. Article 4.7 states that:

*"Member States will not be in breach of this Directive when:*

- failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater; or

- failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities and all the following conditions are met:
- *(a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;*
- *(b) the reasons for those modifications or alterations are specifically set out and explained in the RBMP required under Article 13 and the objectives are reviewed every six years;*
- *(c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and*
- *(d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option."*

11.1.7 Horizon will provide the necessary information to support an application for derogation under Article 4.7. Horizon will discuss the timing for submission of such a report with the Planning Inspectorate and NRW in their respective roles in relation to the DCO, Marine Licence and Environmental Permit applications.

# 12 References

**Table 12-1 Schedule of references**


| ID | Reference |
|---|---|
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| ID | Reference |
|---|---|
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| RD20 | UK Technical Advisory Group on the Water Framework Directive. 2012. Paper 11b(i) Groundwater Chemical Classification for the purposes of the Water Framework Directive and the Groundwater Directive. |
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| ID | Reference |
|---|---|
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# Appendix A: List of activities

| Project Element | Activity no. | Activity | Approximate duration of activity | Relevant application | | | |
|---|---|---|---|---|---|---|---|
| | | | | DCO | Marine Licence | Construction water discharge permit | Operation water discharge permit |
| Power Station Site: construction | 1.1 | Targeted removal of vegetation, mostly above ground or to ground level | 1 year | ✓ | | | |
| Power Station Site: construction | 1.2 | Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only where these are inside the perimeter fence | 1 year | ✓ | | | |
| Power Station Site: construction | 1.3 | Management of vegetation after grazing ceases | 1 year | ✓ | | | |
| Power Station Site: construction | 1.4 | Invasive species management | 1 year | ✓ | | | |
| Power Station Site: construction | 1.5 | Species translocation from within the perimeter fence areas to on and off-site locations | 1 year | ✓ | | | |
| Power Station Site: construction | 1.6 | Remaining demolitions to ground level | 1 year | ✓ | | | |
| Power Station Site: construction | 1.7 | Realignment of a watercourse | 6 months | ✓ | | | |
| Power Station Site: construction | 1.8 | Waste management and material storage and management | 1 year | ✓ | | | |
| Power Station Site: construction | 1.9 | Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | 1.5 years | ✓ | | | |
| Power Station Site: construction | 1.10 | Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | 1 year | ✓ | | | |
| Power Station Site: construction | 1.11 | Remediation of known contaminated land | 1 year | ✓ | | | |
| Power Station Site: construction | 1.12 | Use of a rock outcrop and crushing of material for security tracks and compounds | 1 year | ✓ | | | |
| Power Station Site: construction | 1.13 | Site establishment, mobilisation for Construction works, location of temporary site offices, compounds and welfare facilities | 6 months | ✓ | | | |
| Power Station Site: construction | 1.14 | Construction and commissioning of concrete batching plant and associated surface water drainage | 1 year | ✓ | | ✓ | |
| Power Station Site: construction | 1.15 | Managed site-wide road network and security and access control | 1 year | ✓ | | | |
| Power Station Site: construction | 1.16 | Establishment of site perimeter fence | 6 months | ✓ | | | |
| Power Station Site: construction | 1.17 | Construction of the Cooling Water System breakwaters and MOLF including dewatering | 2 years | ✓ | ✓ | | |
| Power Station Site: construction | 1.18 | Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | 2 years for the section across the harbour<br>5 years for the causeway section to the west breakwater | ✓ | ✓ | ✓ | |

| Project Element | Activity no. | Activity | Approximate duration of activity | Relevant application | | | |
|---|---|---|---|---|---|---|---|
| | | | | DCO | Marine Licence | Construction water discharge permit | Operation water discharge permit |
| Power Station Site: construction | 1.19 | Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | 5 years intake cofferdam<br>2 years outfall cofferdam | ✓ | ✓ | ✓ | |
| Power Station Site: construction | 1.20 | Excavation and construction of Cooling Water intake and outfall, including tunnelling | 1.25 years | ✓ | ✓ | ✓ | |
| Power Station Site: construction | 1.21 | Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | 1.75 years | ✓ | | | |
| Power Station Site: construction | 1.22 | Installation and operation of a drainage system during Power Station construction | 6 months | ✓ | | ✓ | |
| Power Station Site: construction | 1.23 | Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Intermittently during construction | ✓ | | | |
| Power Station Site: construction | 1.24 | Construction of temporary buildings and infrastructure | 3.5 years | ✓ | | | |
| Power Station Site: construction | 1.25 | Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | ~3 years | ✓ | | ✓ | |
| Power Station Site: construction | 1.26 | Excavation of other features including building foundations including dewatering | Intermittently during construction | ✓ | | ✓ | |
| Power Station Site: construction | 1.27 | Progressive mound creation | 1 year | ✓ | | | |
| Power Station Site: construction | 1.28 | Construction of internal roads, car parking, security fencing and permanent lighting | Intermittently during construction | ✓ | | | |
| Power Station Site: construction | 1.28 | Construction of internal roads, car parking, security fencing and permanent lighting | 6 years | ✓ | | | |
| Power Station Site: construction | 1.29 | Operation of the MOLF | 6 years | ✓ | ✓ | | |
| Power Station Site: construction | 1.30 | Operation of concrete batching plant and associated surface water drainage | Intermittently during construction | ✓ | | ✓ | |
| Power Station Site: construction | 1.31 | Operation of heavy lifting crane, tower cranes, construction plant and equipment | 6 years | ✓ | | | |
| Power Station Site: construction | 1.32 | Main plant construction (Unit 1 and Unit 2) | Intermittently during construction | ✓ | | | |
| Power Station Site: construction | 1.33 | Construction of other buildings, structures and features | 1 year | ✓ | | | |
| Power Station Site: construction | 1.34 | Final landscaping - creation of final mounds | 1 year | ✓ | | | |
| Power Station Site: construction | 1.35 | Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | 8 years | ✓ | | | |
| Power Station Site: construction | 1.36 | Sewage discharge during construction | 6 months | ✓ | | ✓ | |
| Power Station Site: construction | 1.37 | Disposal of material (rock and soft sediment) from marine excavation (dredging) | 1 year | ✓ | ✓ | | |

| Project Element | Activity no. | Activity | Approximate duration of activity | Relevant application | | | |
|---|---|---|---|---|---|---|---|
| | | | | DCO | Marine Licence | Construction water discharge permit | Operation water discharge permit |
| Power Station Site: operation | 2.1 | Presence of buildings, hardstanding and roads | N/A | ✓ | | | |
| Power Station Site: operation | 2.2 | Presence of mounds | N/A | ✓ | | | |
| Power Station Site: operation | 2.3 | Maintenance dredging | Intermittently during operation | ✓ | ✓ | | |
| Power Station Site: operation | 2.4 | Abstraction of Cooling Water | 60 years | ✓ | | | ✓ |
| Power Station Site: operation | 2.5 | Discharge of Cooling Water and other operational water discharges | 60 years | ✓ | | | ✓ |
| Power Station Site: operation | 2.6 | Drainage during operation | 60 years | ✓ | | | |
| Power Station Site: operation | 2.7 | Occasional deliveries via the MOLF | Intermittently during operation | ✓ | ✓ | | |
| Power Station Site: operation | 2.8 | Operation of buildings (emissions to air, noise, light etc.) | 60 years | ✓ | | | |
| Power Station Site: decommissioning | 3.1 | Cessation of Cooling Water abstraction | N/A | ✓ | | | |
| Power Station Site: decommissioning | 3.2 | Cessation of Cooling Water discharge | N/A | ✓ | | | |
| Power Station Site: decommissioning | 3.3 | Removal of marine structures (MOLF etc., but not breakwaters) | 2 years | ✓ | ✓ | | |
| Highway improvements (off-line) | 4.1 | Earthworks | 1.25 years (all works completed) | ✓ | | | |
| Highway improvements (off-line) | 4.2 | Hard bank protection/ embankment structures | | ✓ | | | |
| Highway improvements (off-line) | 4.3 | Water body realignment or removal | | ✓ | | | |
| Highway improvements (off-line) | 4.4 | Water body crossings (culverts/bridge construction) | | ✓ | | | |
| Highway improvements (off-line) | 4.5 | New outfalls and discharges | | ✓ | | | |
| Construction of the AECC/MEEG/ESL | 5.1 | Contractors site compound including fuel storage area and welfare facilities | 1.25 years (all works completed) ) | ✓ | | | |
| Construction of the AECC/MEEG/ESL | 5.2 | Topsoil stripping and formation of landscaping areas | | ✓ | | | |
| Construction of the AECC/MEEG/ESL | 5.3 | New buildings would likely have pile foundations and a piling mat would be placed to facilitate construction | | ✓ | | | |
| Construction of the AECC/MEEG/ESL | 5.4 | Storage and use of granular materials for forming roads and building sub-base | | ✓ | | | |
| Construction of the AECC/MEEG/ESL | 5.5 | Storage and use of cement related materials | | ✓ | | | |
| Construction of the AECC/MEEG/ESL | 5.6 | Construction of an underground storm-water attenuation tank beneath the site to collect runoff from buildings and hardstanding, and to discharge into an existing watercourse | | ✓ | | | |
| Construction of the AECC/MEEG/ESL | 5.7 | Construction of roads and buildings | | ✓ | | | |
| Operation of the AECC/MEEG/ESL | 6.1 | Operation of a backup generator with associated fuel storage | 60 years | ✓ | | | |
| Operation of the AECC/MEEG/ESL | 6.2 | Management of storm water runoff during operations | | ✓ | | | |
| Operation of the AECC/MEEG/ESL | 6.3 | Operation of a laboratory with discharge of water after analysis of samples | | ✓ | | | |

| Project Element | Activity no. | Activity | Approximate duration of activity | Relevant application | | | |
|---|---|---|---|---|---|---|---|
| | | | | DCO | Marine Licence | Construction water discharge permit | Operation water discharge permit |
| Operation of the AECC/MEEG/ESL | 6.4 | Discharge of foul water to sewer or operation of a packaged treatment plant with discharge to surface water | | ✓ | | | |
| Decommissioning of the AECC/MEEG/ESL | 7.1 | Return of the site to agricultural land | 1 year | ✓ | | | |
| Construction of Park and Ride Facilities | 8.1 | Site clearance, including demolition of agricultural buildings and possible vegetation clearance | 1.25 years (all works completed) | ✓ | | | |
| Construction of Park and Ride Facilities | 8.2 | Locating and establishing site compound, welfare facilities (on the site of demolished agricultural buildings) and any storage of fuel and oil for plant and equipment | | ✓ | | | |
| Construction of Park and Ride Facilities | 8.3 | Topsoil strip to all areas outside buffer zones | | ✓ | | | |
| Construction of Park and Ride Facilities | 8.4 | Excavation of topsoil to allow placement of sub-base for all roads, bus drop-off areas and pedestrian footway | | ✓ | | | |
| Construction of Park and Ride Facilities | 8.5 | Permeable paving in car park areas, including a drainage layer which would be built from topsoil strip depth upwards | | ✓ | | | |
| Construction of Park and Ride Facilities | 8.6 | Excavation for foundations for new buildings (minimum of 900mm below ground level) | | ✓ | | | |
| Construction of Park and Ride Facilities | 8.7 | Landscaping activities that could include locating landscaping bunds to control surface water movement during flood events | | ✓ | | | |
| Construction of Park and Ride Facilities | 8.8 | The construction of site drainage channels, outfalls and a storm water attenuation tank | | ✓ | | | |
| Construction of Park and Ride Facilities | 8.9 | Construction of a clear span bridge across Nant Dalar Hir | 1.25 years (all works completed) | ✓ | | | |
| Operation of Park and Ride Facilities | 9.1 | Private cars parked on-site, staff using the facility building, staff being picked up from the bus parking area and the buses entering/exiting the facility | 7 years | ✓ | | | |
| Decommissioning of Park and Ride Facilities | 10.1 | Return of the site to agricultural land. The bridge would remain in situ across the Nant Dalar Hir and some culverts would remain along the watercourses | 1.25 years | ✓ | | | |
| Construction of logistics centre at Parc Cybi | 11.1 | Construction | 1 year | ✓ | | | |
| Operation of logistics centre at Parc Cybi | 11.2 | Operation | 7 years | ✓ | | | |
| Decommissioning of logistics centre at Parc Cybi | 11.3 | Decommissioning | 1 year | ✓ | | | |
| Compensation site enhancement | 12.1 | Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Up to 9 years (3 months in yr 1, 4 and 7) | ✓ | | | |
| Compensation site enhancement | 12.2 | Modification of site drainage features including attenuation, sediment treatment | | ✓ | | | |
| Compensation site enhancement | 12.3 | Seeding, fencing and landscaping to create wetland habitat | | ✓ | | | |

# Appendix B: Water Framework Directive water body monitoring data

Table 1: WFD surface water body element level classification data provided by NRW (29 June 2016). Contains Natural Resources Wales (NRW) information © Natural Resources Wales and database right. All rights reserved. Note that where information is not provided it is assumed that this quality element has not been assessed by NRW.

| Water body name | Cleifiog (Valley) | Crigyll | Alaw – down stream Llyn Alaw | Tan R'Allt | Ceint | Alaw | Cemlyn Lagoon | The Skerries | Caernarfon Bay North | Anglesey North |
|---|---|---|---|---|---|---|---|---|---|---|
| Water body ID | GB110102058930 | GB110102058970 | GB110102058981 | GB110102059100 | GB110102058940 | GB521010207600 | GB610100083000 | GB611010390000 | GB621010380000 | GB641010620000 |
| Water body type | River | River | River | River | River | Transitional | Coastal | Coastal | Coastal | Coastal |
| Overall Water Body | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Good | High | Good | Moderate |
| Ecological | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Good | High | Good | Good |
| Biological quality elements | Not assessed | Moderate | Good | Not assessed | High | Good | Not assessed | High | Good | Good |
| Phytoplankton | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed |
| Aquatic flora | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | See macroalgae | See macroalgae | See macroalgae | See macroalgae | See macroalgae |
| Fish | Not assessed | Good | High | Not assessed | High | Not assessed | N/A | N/A | N/A | N/A |
| Invertebrates | Not assessed | Moderate | Good | Not assessed | Not assessed | Not assessed | Not assessed | High | Good | Good |
| Infaunal Quality Index | N/A | N/A | N/A | N/A | N/A | Not assessed | Not assessed | Not assessed | Not assessed | Good |
| Imposex | N/A | N/A | N/A | N/A | N/A | Not assessed | Not assessed | High | Good | High |
| Macroalgae | N/A | N/A | N/A | N/A | N/A | Good | Not assessed | Not assessed | Not assessed | Not assessed |
| Opportunistic Macroalgae | N/A | N/A | N/A | N/A | N/A | Good | Not assessed | Not assessed | Not assessed | Not assessed |
| Physico-chemical quality elements | Moderate | Good | Good | Moderate | High | Moderate | Not assessed | High | High | High |
| Ammonia (Phys-chem) | High | High | High | High | High | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed |
| Biological oxygen demand | Not assessed | Not assessed | High | Not assessed | High | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed |
| Dissolved Inorganic Nitrogen | N/A | N/A | N/A | N/A | Not assessed | Moderate | Not assessed | Not assessed | Not assessed | High |
| Dissolved oxygen | Good | High | High | High | High | High | Not assessed | High | High | High |
| pH | High | High | High | High | High | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed |
| Phosphate | Moderate | Good | Good | Moderate | High | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed |
| Temperature | High | High | High | High | High | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed |
| Specific pollutants | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | High | High |
| Copper | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | High | High |
| Zinc | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | High | High |
| Hydromorphological Supporting Elements | Supports Good | Supports Good | Not assessed | Supports Good | Supports Good | Supports Good | Not assessed | High | Supports Good | High |
| Hydrological Regime | High | High | Not assessed | Supports Good | Supports Good | Supports Good | Not assessed | Not assessed | Not assessed | Not assessed |

| Water body name | Cleifiog (Valley) | Crigyll | Alaw – down stream Llyn Alaw | Tan R'Allt | Ceint | Alaw | Cemlyn Lagoon | The Skerries | Caernarfon Bay North | Anglesey North |
|---|---|---|---|---|---|---|---|---|---|---|
| Morphology | Supports Good | Supports Good | Not assessed | Supports Good | No assessed | Supports Good | Not assessed | High | Supports Good | High |
| Supporting elements (Surface Water) | Not assessed | Not assessed | Moderate | Not assessed | Moderate | Not assessed | Good (expert judgement) | Not assessed | Not assessed | Not assessed |
| Mitigation Measures Assessment | Not assessed | Not assessed | Moderate or less | Not assessed | Moderate or less | Not assessed | Good | Not assessed | Not assessed | Not assessed |
| Chemical | Good | Good | Good | Good | Good | Good | Good | Good | Good | Fail |
| Priority hazardous substances | Does not require assessment | | | | | Good | | Fail | | |
| Benzo(a)pyrene | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Good |
| Cadmium and Its Compounds | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Good | Good |
| Hexachlorobenzene | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Good |
| Hexachlorobutadiene | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Good |
| Mercury and Its Compounds | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Fail |
| Priority substances | Does not require assessment | | | | | Good | | Good | | |
| Fluoranthene | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Good |
| Lead and Its Compounds | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Good | Good |
| Nickel and Its Compounds | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Not assessed | Good | Good |
| Other Pollutants | Does not require assessment | | | | | | | | | |

Table 2: WFD groundwater body element level classification data provided by NRW (29 June 2016). Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

| **Water body name** | Ynys Môn Secondary | Ynys Môn Central Carboniferous Limestone |
|---|---|---|
| **Water body ID** | GB41002G204400 | GB41001G204200 |
| **Overall Water Body** | Poor | Poor |
| **Quantitative** | Good | Good |
| **Quantitative Status element** | Good | Good |
| **Quantitative GWDTEs test** | Good | Good |
| **Quantitative Dependent Surface Water Body Status** | Good | Good |
| **Quantitative Saline Intrusion** | Good | Good |
| **Quantitative Water Balance** | Good | Good |
| **Chemical (GW)** | Poor | Poor |
| **Chemical Status element** | Poor | Poor |
| **Chemical Drinking Water Protected Area** | Good | Good |
| **General Chemical Test** | Good | Good |
| **Chemical GWDTEs test** | Good | Poor |
| **Chemical Dependent Surface Water Body Status** | Poor | Good |
| **Chemical Saline Intrusion** | Good | Good |
| **Supporting elements (Groundwater)** | For information | For information |
| **Trend Assessment** | No trend | No trend |

# Appendix C: Migratory fish baseline figures

Figure C1: Freshwater Fish Data 2010 -2015

Figure C2: Salmon records for Anglesey

Figure C3: Trout records for Anglesey

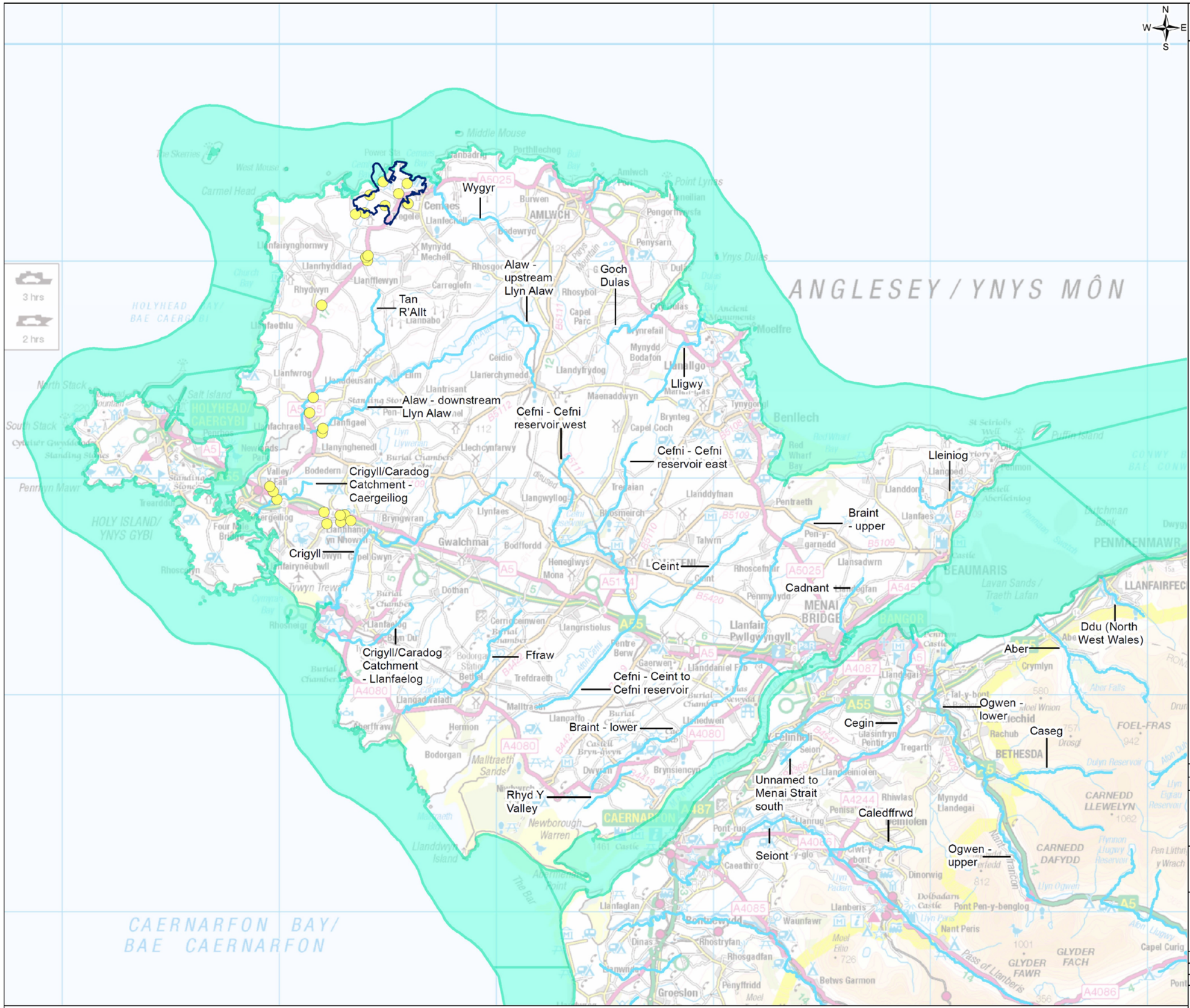
Figure C4: Eel records for Anglesey

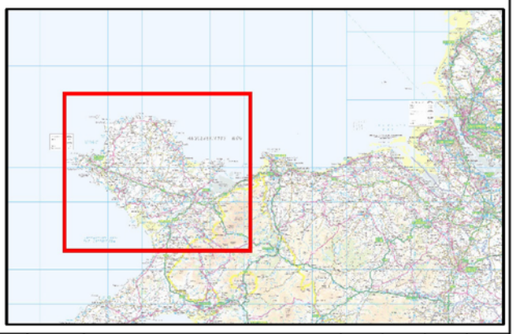
Figure C5: River lamprey records for Anglesey

# FIGURE C1

Legend

- Wylfa Newydd Development Area
- WFD coastal water body
- WFD river water body
- Freshwater fish monitoring locations 2010-2015



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

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

FRESHWATER FISH
DATA 2010-2015

| | | |
|---|---|---|
| Scale @ A3 | 1:170,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

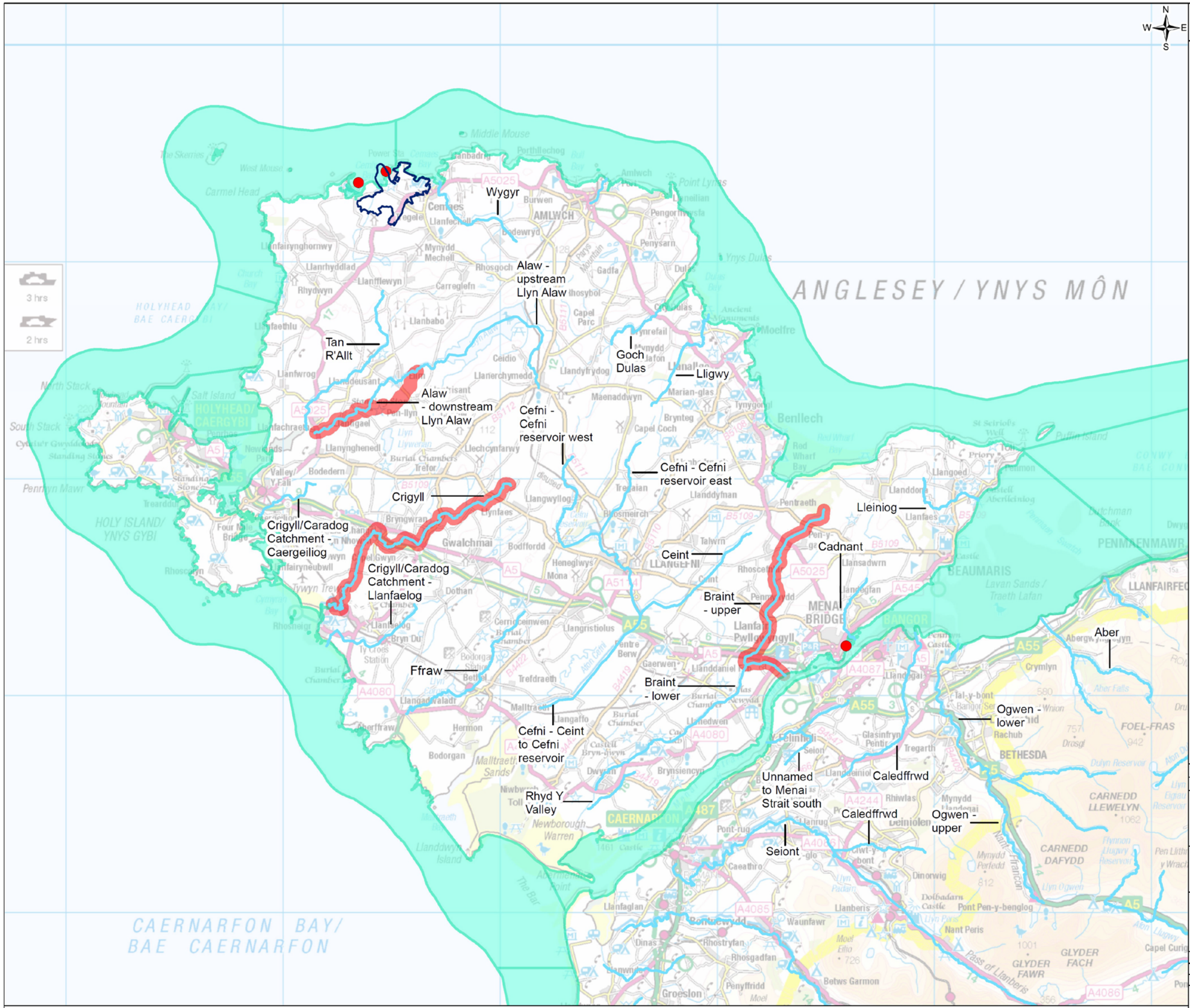
Drawing No.

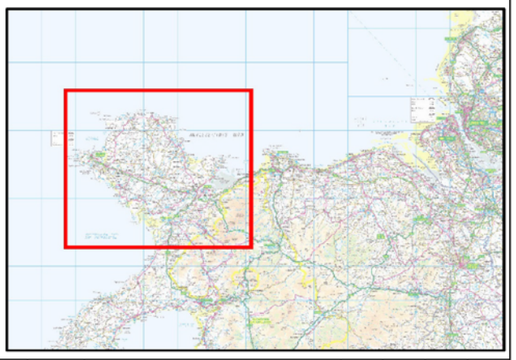
60PO8077_DCO_D_APP_08_07_C_01

# FIGURE C2

Legend

- Wylfa Newydd Development Area
- WFD coastal water body
- WFD river water body
- Water bodies containing salmon
- Salmon record



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

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

SALMON RECORDS
FOR ANGLESEY

| | | |
|---|---|---|
| Scale @ A3 | 1:170,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

60PO8077_DCO_D_APP_08_07_C_02

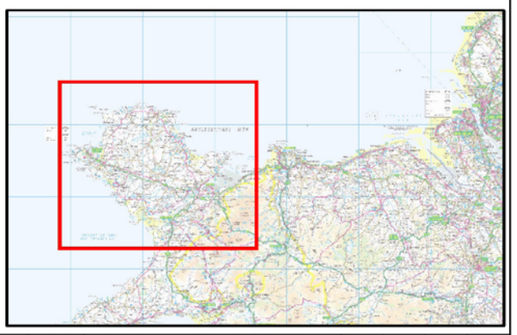
# FIGURE C3

Legend

- Wylfa Newydd Development Area
- WFD coastal water body
- WFD river water body
- Water bodies containing brown trout
- Water bodies containing sea trout
- Brown trout record
- Sea trout record

Wygyr
Alaw - upstream Llyn Alaw
Goch Dulas
Tan R'Allt
Lligwy
Alaw - downstream Llyn Alaw
Cefni - Cefni reservoir west
Cefni - Cefni reservoir east
Crigyll/Caradog Catchment - Caergeiliog
Lleiniog
Ceint
Braint - upper
Crigyll
Crigyll/Caradog Catchment - Llanfaelog
Cadnant
Aber
Ddu (Nort West Wale
Ffraw
Cefni - Ceint to Cefni reservoir
Ogwen - lower
Caseg
Braint - lower
Cegin
Unnamed to Menai Strait south
Caledffrwd
Rhyd Y Valley
Ogwen - upper
Seiont
Gwyrfai - downstream of Cwellyn
Nant Peris

ANGLESEY / YNYS MÔN
CAERNARFON BAY / BAE CAERNARFON
HOLY ISLAND / YNYS GYBI
HOLYHEAD / CAERGYBI
AMLWCH
LLANGEFNI
MENAI
BANGOR
BETHESDA
BEAUMARIS
PENMAENMAWR
CARNEDD LLEWELYN
CARNEDD DAFYDD
GLYDER FACH
GLYDER FAWR
FOEL-FRAS
Benllech
Moelfre
Llanfairpwllgwyngyll
Llanfairfechan
Caernarfon
Bangor
3 hrs
2 hrs



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

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title: TROUT RECORDS FOR ANGLESEY

| | | |
|---|---|---|
| Scale @ A3 | 1:170,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

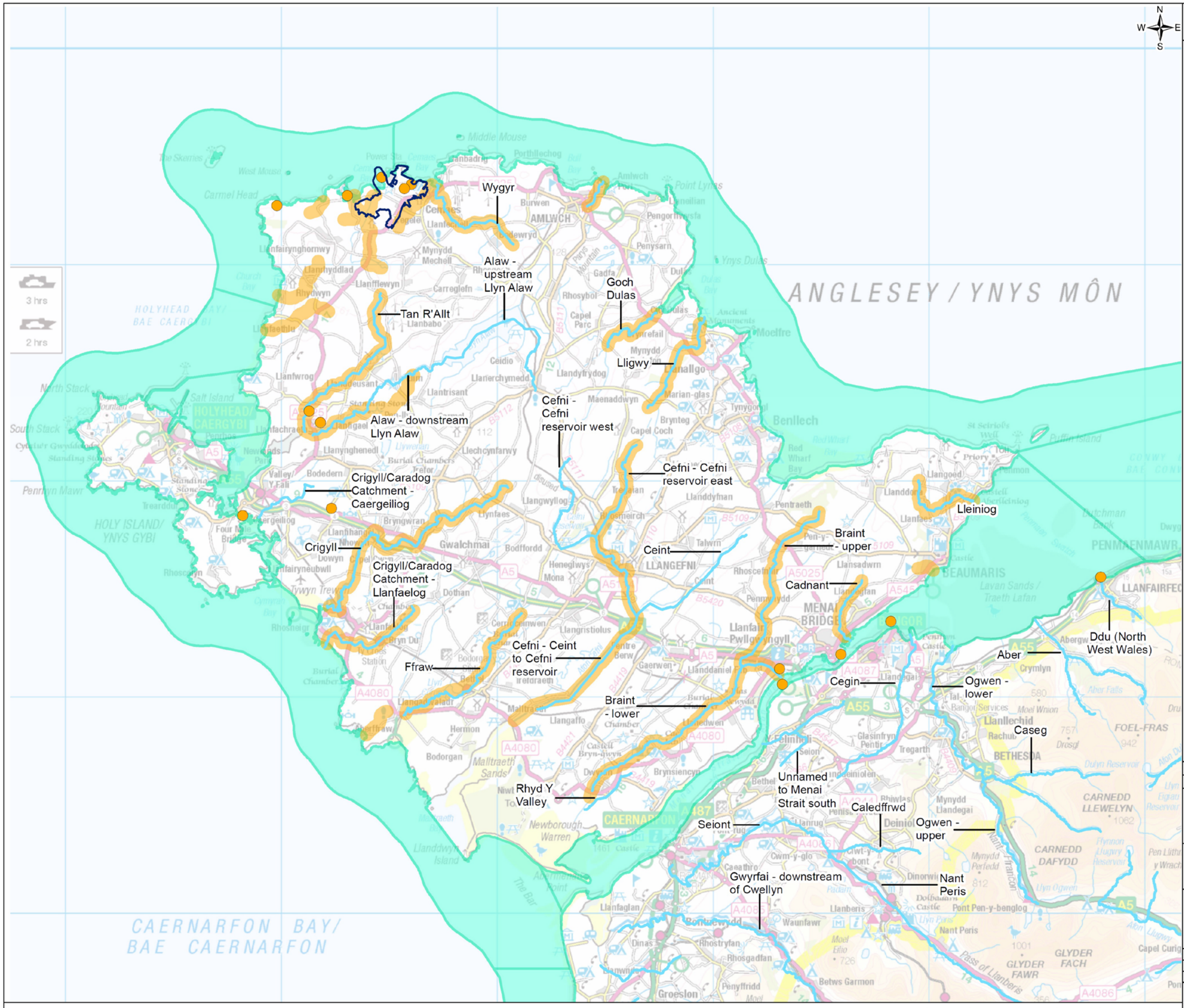
Drawing No. 60PO8077_DCO_D_APP_08_07_C_03





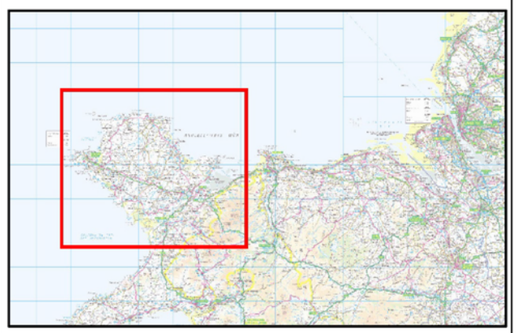
0 1 2 4 6 8 10 kilometres

# FIGURE C4




Legend

- Wylfa Newydd Development Area
- WFD coastal water body
- WFD river water body
- Water bodies containing European eel
- European eel record



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

Client

HORIZON NUCLEAR POWER

Project

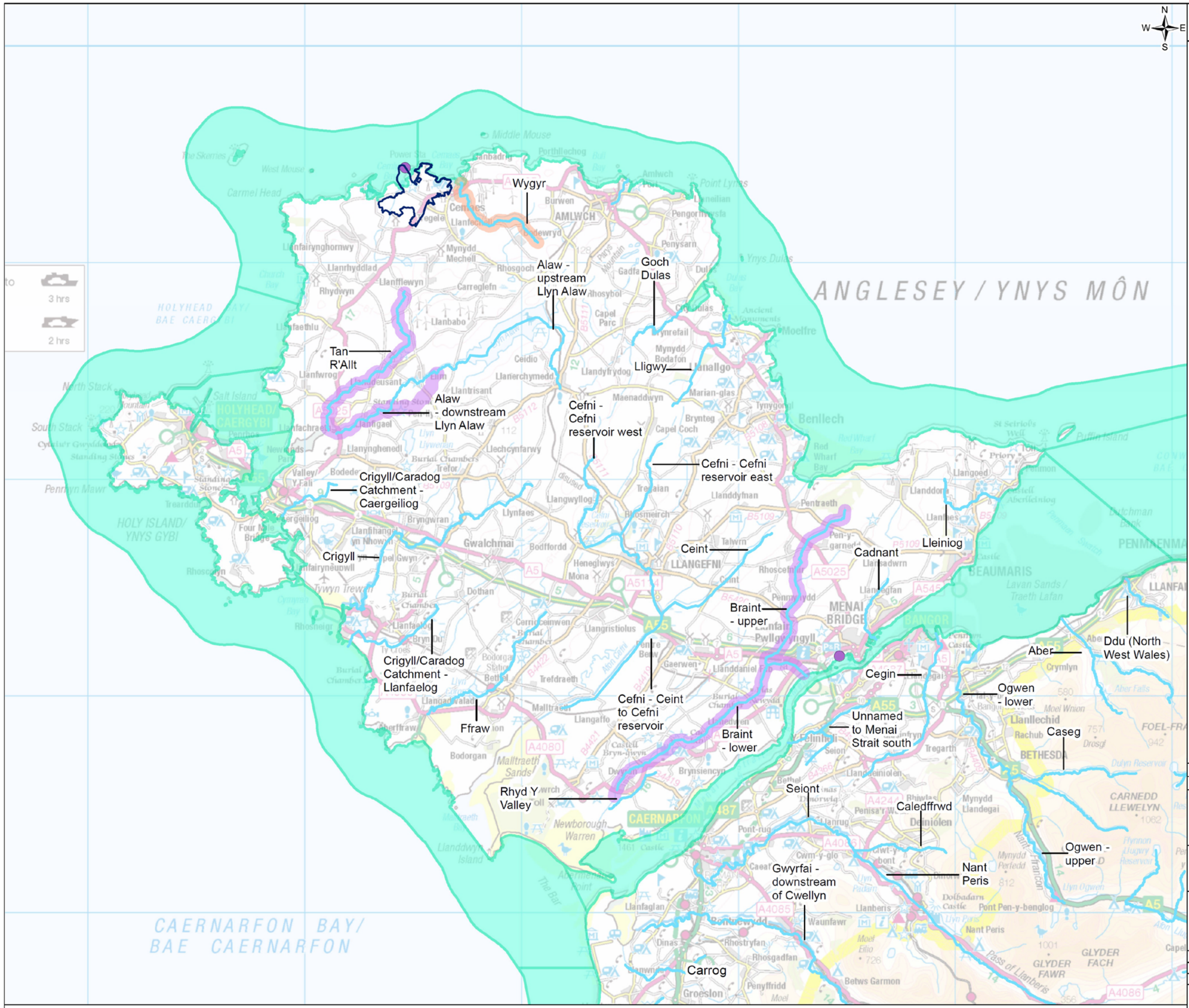
WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

EUROPEAN EEL RECORDS
FOR ANGLESEY

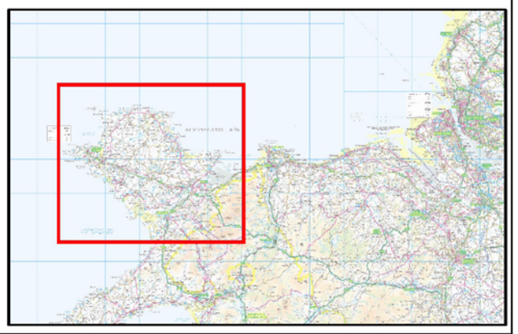
| | | |
|---|---|---|
| Scale @ A3 | 1:170,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |
| Drawing No. | 60PO8077_DCO_D_APP_08_07_C_04 | |

# FIGURE C5




Legend

- Wylfa Newydd Development Area
- WFD coastal water body
- WFD river water body
- Water bodies containing river lamprey
- Water bodies containing unidentified lamprey
- River lamprey record



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

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
WFD COMPLIANCE ASSESSMENT

Drawing Title

RIVER LAMPREY RECORDS
FOR ANGLESEY

| | | |
|---|---|---|
| Scale @ A3 | 1:170,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

60PO8077_DCO_D_APP_08_07_C_05

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# Appendix D: WFD water body assessment tables

| Table | WFD water body |
|---|---|
| Table 1a | The Skerries (non-reportable water bodies) |
| Table 1b | The Skerries (reportable water bodies) |
| Table 2a | Anglesey North (non-reportable water bodies) |
| Table 2b | Anglesey North (reportable water bodies) |
| Table 3a | Cemlyn Lagoon (non-reportable water bodies) |
| Table 3b | Cemlyn Lagoon (reportable water bodies) |
| Table 4 | Caernarfon Bay North |
| Table 5 | Alaw (transitional) |
| Table 6 | Alaw – downstream Llyn Alaw |
| Table 7 | Tan R'Allt |
| Table 8 | Cleifiog (Valley) |
| Table 9 | Crigyll |
| Table 10 | Ynys Môn Secondary |
| Table 11 | Migratory fish |
| Table 12 | Ynys Môn Central Carboniferous Limestone |
| Table 13 | Ceint |

| Key to Tables 1 - 13 | |
|---|---|
| No pathway to an effect on a quality element | |
| Pathway to an effect on a quality element identified, but the effect is unlikely to be detectable within the water body (certain) | 1 |
| Pathway to an effect on a quality element and potential effect that is detectable within the water body. Taken forward to Compliance Assessment | 2 |

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## Table 1a: The Skerries (Non reportable waterbodies)

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| Power Station Main Site: construction | 1.1-Targeted removal of vegetation, mostly above ground or to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | |
| | 1.2-Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only where these are inside the perimeter fence | Mobilisation of soil into watercourses, particularly if working close to the bank | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | |
| | 1.3-Management of vegetation after grazing ceases | No impact pathway. | None required. | N/A | Localised changes to riparian zone. Reduction in the potential for poaching (by sheep) along the watercourse edge. | | |
| | 1.4-Invasive species management | Mobilisation of soil into watercourses (caused by removal of invasive flora), particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | 1.5-Species translocation from within the perimeter fence areas to on and off-site locations | No impact pathway. | None required. | N/A | | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | 1.6-Remaining demolitions to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | 1.7-Realignment of a watercourse | Mobilisation of soil resulting in delivery of fine sediment from run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). For the river realignment works on the Nant Caerdegog Isaf a risk assessment method statement approach would be undertaken with relevant approval and consents for works from NRW. To reduce the potential for silt-laden runoff to impact the water environment, the watercourse realignment would be constructed using techniques to control sediment release (e.g. not connecting the new channel to the old until all work is complete, undertaking the connection in dry weather etc.). | Afon Cafnan (and Nant Caerdegog Isaf) | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Loss and creation of habitat and morphological features. | | Afon Cafnan (and Nant Caerdegog Isaf) | Localised modification of bed substrate, river width and depth and removal of riparian zone. Changes to flow and sediment processes as new channel is constructed and old channel is backfilled. Creation of a new channel with improved morphological features and processes. | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body. |
| | 1.8-Waste management and material storage and management | No impact pathway. | There would be engineered containment for fuel, oil and chemical storage areas (including waste oils) with the storage facilities following good practice guidance. | N/A | | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | 1.9-Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body. |
| | 1.10-Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | No impact pathway. | None required. | N/A | | | |
| | 1.11-Remediation of known contaminated land | Leaching of substances from contaminated soil (mainly asbestos contamination). | Appropriate controls would be in place to prevent the discharge of contamination to surface waters (e.g. testing and tankering off site if required). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | | | |
| | 1.12-Use of a rock outcrop and crushing of material for security tracks and compounds | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | N/A | Input of fine material to watercourse leading to smothering of the channel bed substrate. | | |
| | 1.13-Site establishment, mobilisation for Main Construction works, location of | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | temporary site offices, compounds and welfare facilities | Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body. |
| | 1.14-Construction and commissioning of concrete batching plant and associated surface water drainage | Mobilisation of soil or sediment resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | N/A | | | |
| | | Changes in water quality | | N/A | | | |
| | | Loss of intertidal zone. | Minimise the footprint of the marine works. | N/A | | | |
| | 1.15-Managed site-wide road network and security and access control | No impact pathway. | None required. | N/A | | | |
| | 1.16-Establishment of site perimeter fence | No impact pathway. | To protect surface waters, perimeter fencing would not cross the Afon Cafnan, Nant Caerdegog Isaf, Nant Cemlyn, Nant Cemaes and the Tre'r Gof SSSI drains, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | N/A | | | |
| | 1.17Construction of the Cooling Water System breakwaters and Marine Off-Loading Facility | Introduction of new structures with changes to coastal processes and hydrodynamics. | Minimise the footprint of marine structures | N/A | | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | (MOLF) including dewatering | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures. | | N/A | | | |
| | | Mobilisation of sediment from disturbance of the seabed. | | N/A | | | |
| | | Changes in water quality from dewatering: behind outfall cofferdam (note semi-dry cofferdam dewatering is covered in activity 1.18). | Over pumped seawater would be monitored to ensure suspended solids meet agreed standards. | N/A | | | |
| | | Changes in water quality from a reduction in mixing once breakwaters are in place. | Minimise the footprint of the marine works. | N/A | | | |
| | | Increase in underwater noise | | N/A | | | |
| | 1.18-Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | Changes in water quality (e.g. from dewatering). | Over pumped seawater would be monitored to ensure suspended solids meet agreed standards. | N/A | | | |
| | | Increase in underwater noise | None identified. | N/A | | | |
| | | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures. | | N/A | | | |
| | 1.19-Installation (and removal) of cofferdams for Cooling Water (CW) | Introduction of cofferdams, which could change coastal processes and hydrodynamics. | None identified. | N/A | | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | intake and outfall construction | Mobilisation of sediment from disturbance of the seabed. | | N/A | | | |
| | | Changes in water quality during installation (note dewatering covered under activity 1.17). | | N/A | | | |
| | 1.20-Excavation and construction of CW intake and outfall, including tunnelling | Loss of coastal bed and intertidal zone from excavation. | None identified. | N/A | | | |
| | | Introduction of new structures with changes to coastal processes and hydrodynamics. | | N/A | | | |
| | 1.21-Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body. Fish could experience a small change within fluvial catchments. |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | N/A | Input of fine material to watercourse leading to smothering of the channel bed substrate. | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | 1.22-Installation and operation of a drainage system during Power Station construction | Loss of riparian habitat | None identified. | Nant Porth-y-pistyll | Loss of the natural catchment of Nant Porth-y-pistyll and complete alteration of the channel, flow, bed structure and riparian zone. | | Loss of habitat for European eel. |
| | | Physical presence of structures (e.g. outfalls and sediment settlement ponds) in fluvial watercourses and at the coastline. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico-chemical process, including temperature. | Reduction in connectivity between upstream and downstream environments. Changes to channel shading and bank structure. |
| | | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment and changes to water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Increase in turbidity. Potential increase in orthophosphate and bioavailable lead concentrations in the Nant Caerdegog Isaf | Reduction in available light to the water column, localised smothering of habitats. |
| | 1.23-Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Presence of structures (e.g. culvert and bridges). | Sensitive siting of structures. To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico chemical process, including temperature. | Reduction in connectivity between up and down stream environments. Changes to channel shading and bank structure. |
| | | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, smothering of habitats. |
| | | Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Fish could experience a change within fluvial catchments. |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | | Increase in turbidity and changes to physico-chemical parameters (e.g. pH). | |
| | 1.24-Construction of temporary buildings and infrastructure, including Temporary Workers' Accommodation within the Wylfa Newydd Development Area for essential workers | Mobilisation of soil into watercourses, particularly if working close to the bank | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity | Reduction in available light to the water column, localised smothering of habitats |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Fish could experience a change within fluvial catchments. |
| | 1.25-Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | Changes in water quality (e.g. from dewatering). | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | N/A | | | |
| | 1.26-Excavation of other features including building foundations including dewatering | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Changes in water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | N/A | | | |
| | 1.27-Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater | None required. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of water quantity with effects on flow processes and subsequently morphological features.<br>Changes in connectivity to groundwater bodies. | | |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | N/A | Input of fine material to watercourse leading to smothering of the channel bed substrate. | | |
| | 1.28-Construction of internal roads, car parking, security fencing and permanent lighting | Presence of structures (security fencing) within fluvial watercourses. | To protect surface waters, perimeter fencing would not cross the Afon Cafnan and Nant Caerdegog Isaf, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)Nant Porth-y-pistyll | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico chemical process, including temperature. | Reduction in connectivity between up and down stream environments. Changes to channel shading and bank structure. |
| | | Lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | | | Increase in artificial lighting could disrupt fish behaviour and spawning. |
| | | Change in surface type (more hardstanding) leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Increase in rate of runoff into watercourses could alter flow processes and lead to effects on morphological features. | | |
| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | | Increase in turbidity and changes to physico-chemical parameters (e.g. pH). | |
| | 1.29-Operation of the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | N/A | | | |
| | 1.30-Operation of concrete batching plant and associated surface water drainage | Changes in water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | N/A | | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | 1.31-Operation of heavy lifting crane, tower cranes, construction plant and equipment | No impact pathway. | None required. | N/A | | | |
| | 1.32-Main plant construction (Unit 1 and Unit 2) | No impact pathway (platform for units 1 and 2 and laydown areas are already constructed under activity 1.21). | None required. | N/A | | | |
| | 1.33-Construction of other buildings, structures and features | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Ground compaction by vehicles and machinery, presence of buildings and other structures leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | |
| | 1.34-Final landscaping - creation of final mounds | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)Nant Porth-y-pistyll | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Changes to vegetation cover. Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | 1.35-Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | No impact pathway (effects relating to landscaping are covered under activity 1.34). | None required. | N/A | | | |
| | 1.36-Sewage discharge during construction | Changes in water quality from discharge of sewage effluent. | Sewage effluent would be treated prior to discharge to meet standards agreed with NRW. | N/A | | | |
| | 1.37-Disposal of material (rock and soft sediment) from marine excavation (dredging) | No impact pathway. | None required. | N/A | | | |
| | 1.38-Beach landing facility | Footprint on the foreshore. | None required. | N/A | | | |
| Power Station Main Site: operation | 2.1-Presence of buildings, hardstanding and roads | Change in surface type (more hardstanding) leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Increase in rate of run-off into watercourses could alter flow processes and subsequent geomorphological features | | |
| | 2.2-Presence of mounds | No impact pathway. | None required. | N/A | | | |
| | 2.3-Maintenance dredging | Changes to the sea bed from dredging. | None required. | N/A | | | |
| | | Changes in water quality (e.g. during dredging operation). | None required. | N/A | | | |
| | 2.4-Abstraction of Cooling Water | Change in flows with water being directed into the intake. | None required. | N/A | | | |
| | | Loss of flora and fauna in abstracted water. | Fish and invertebrate protection measures including screens, acoustic deterrents and a recovery and return channel, all designed to best practice. | N/A | | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | 2.5-Discharge of Cooling Water and other operational water discharges | Change in flows with water being directed away from the outfall potentially leading to scour. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | N/A | | | |
| | | Discharge of warmer water as a thermal plume. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | N/A | | | |
| | | Discharge of chemicals including total residual oxidants (TRO). | The biocide dosing regime would be designed to reduce biofouling risk. In line with best practice, continuous dosing would be applied during a higher fouling risk period, typically between April and December, when sea temperatures are above 10°C. | N/A | | | |
| | 2.6-Drainage during operation | Presence of structures throughout operation. | Design of structures to follow good practice guidelines. Structure size to be kept to a minimum. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | | |
| | | Changes in water quality. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | | Increase in turbidity and changes to physico-chemical parameters (e.g. pH). | |
| | 2.7-Occasional deliveries via the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | N/A | | | |
| | 2.8-Operation of buildings (emissions to air, noise, light etc.) | Permanent lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs)<br>Nant Porth-y-pistyll | | | Increase in artificial lighting could disrupt fish behaviour and spawning. |
| Power Station Main Site: | 3.1-Cessation of CW abstraction | No flow into the cooling water intake (removal of a pathway to an effect) | None required. | N/A | | | |
| | 3.2-Cessation of CW discharge | Changes in water quality. | None required. | N/A | | | |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | 3.3-3.3 - Removal of marine structures (MOLF etc., but not breakwaters) | Mobilisation of sediment from disturbance of the seabed. | None required. | N/A | | | |
| | | Removal of structures, which could change coastal processes and hydrodynamics. | None required. | N/A | | | |
| Highway improvements (off-line) | 4.1 - Earthworks | Mobilisation of soil into watercourses, particularly if working close to the bank. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs) | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs) | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Fish could experience a change within fluvial catchments. |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | N/A | | | |
| | 4.2 - Hard bank protection/ embankment structures | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater. | Reduction, as far as practicable, of structures along the fluvial watercourses as part of design. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs) | Localised changes to water quantity within the channel potentially with effects on flow processes and morphological features. Connection to groundwater bodies could be altered. | | |
| | 4.3 - Water body realignment or removal | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Retain, wherever possible, all watercourses identified on-site. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs) | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. Changes to flow processes from new realigned channel courses. | Increase in turbidity. | Reduction in available light to the water column, smothering of habitats. Modification of submerged habitats. |

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | | Loss and creation of habitat and morphological features. | Retain, wherever possible, all watercourses identified on-site. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs) | Localised modification of small channels (depth, width, structure etc.) however these channels only occasionally have flow within them so wider effects on the main channel are not likely to be detectable. | | Very small scale loss of habitats and species. |
| | 4.4 - Water body crossings (culverts/bridge construction) | Presence of structures (e.g. culvert and bridges). | Sensitive siting of structures. To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs) | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico chemical process, including temperature. | Reduction in connectivity between up and down stream environments. Changes to channel shading and bank structure. |
| | 4.5 - New outfalls and discharges | Changes in water quality (e.g. introduction of new discharge). | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs) | | Increase in turbidity, changes to dissolved oxygen levels, nutrients and possibly other pollutants. | |
| | | Physical presence of structures (e.g. outfalls) in fluvial watercourses. | Sensitive siting of structures. To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | Afon Cafnan (and Nant Caerdegog Isaf, and other tribs) | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico chemical process, including temperature. | Reduction in connectivity between up and down stream environments. Changes to channel shading and bank structure. |

## Table 1b. The Skerries (reportable water bodies)

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects upon hydromorphological quality elements | | | | | Chemical and physico-chemical quality elements | | | | | | Biological quality elements | | | Fish | Priority substances | Water body mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure of the intertidal zone | Direction of dominant current | Wave exposure | Transparency | Thermal conditions | Oxygenation conditions | Salinity | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Aquatic flora | | | | | | |
| Power Station Main Site: construction | 1.1-Targeted removal of vegetation, mostly above ground or to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.2-Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only where these are inside the perimeter fence | Mobilisation of soil into watercourses, particularly if working close to the bank | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.3-Management of vegetation after grazing ceases | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| 1.4-Invasive species management | Mobilisation of soil into watercourses (caused by removal of invasive flora), particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to the location immediately surrounding the invasive species management activity. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.5-Species translocation from within the perimeter fence areas to on and off-site locations | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |

| | | | | | | | | | | | | | | | | | | | | | | |
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| | 1.6-Remaining demolitions to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.7-Realignment of a watercourse | Mobilisation of soil resulting in delivery of fine sediment from run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). For the river realignment works on the Nant Caerdegog Isaf a risk assessment method statement approach would be undertaken with relevant approval and consents for works from NRW. To reduce the potential for silt-laden runoff to impact the water environment, the watercourse realignment would be constructed using techniques to control sediment release (e.g. not connecting the new channel to the old until all work is complete, undertaking the connection in dry weather etc.). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | During realignment works there would be an increase in turbidity and deposition of sediment on the bed within the fluvial channel. This change would be restricted to the area of the realigned channel (approximately 400m of the Nant Caerdegog Isaf) and to the reach immediately downstream. The realignment is located over 2km from the coast and the effects of increased turbidity are not likely to be detectable within more than a couple of hundred metres downstream. Sediment may be deposited on the stream bed up to a few hundred metres downstream at most as mitigation will be used to control sediment release. Embedded and good practice mitigation would reduce the effects such that there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the location of the works from the coastal water body, the embedded and good practice mitigation and the duration of this activity alone, there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| Realignment of a watercourse | Loss and creation of habitat and morphological features. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). For the river realignment works on the Nant Caerdegog Isaf a risk assessment method statement approach would be undertaken with relevant approval and consents for works from NRW. | | | | | | | | | | | | | | 1 | | N/A | Change in hydromorphological features within the Nant Caerdegog Isaf resulting in changes to benthic invertebrates and aquatic flora composition within approximately 400m of the fluvial channel of the Nant Caerdegog Isaf. Potential for migratory fish to experience a minor change, although very few fish were recorded on this stretch and it is not considered important habitat for migratory fish. The overall permanent change would lead to an improvement (benefit) to habitat and morphological processes. | No | No - given the location of the works from the coastal water body, the embedded and good practice mitigation and the duration of this activity alone, there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.8-Waste management and material storage and management | No impact pathway. | There would be engineered containment for fuel, oil and chemical storage areas (including waste oils) with the storage facilities following good practice guidance. | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| 1.9-Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies. There may be a small effect on flows that would be detectable compared to baseline conditions, but the effects would be confined to changes within the fluvial water bodies and there would be no detectable changes in freshwater input or to any other quality elements within the coastal WFD water body. | No | No - changes to flows relating to this activity would not have an effect alone and there is no potential for this aspect of the activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.10-Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | No impact pathway. | None required. | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |

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| 1.11Remediation of known contaminated land | Leaching of substances from contaminated soil (mainly asbestos contamination). | Appropriate controls would be in place to prevent the discharge of contamination to surface waters (e.g. testing and tankering off site if required). | | | | | | | | | | | 1 | | | | | 1 | N/A | Leaching of substances could lead to an effect; however, the embedded and good practice mitigation would significantly reduce the risk of this occurring and therefore no effect is predicted. | No | No |
| 1.12-Use of a rock outcrop and crushing of material for security tracks and compounds | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | | | | | | | | | | | | | | | | | N/A | Potential for some input of fine sediment into fluvial water bodies local to works. However, with dust suppression in place there are no pathways to an effect on coastal WFD water body quality elements. | No | No |
| 1.13-Site establishment, mobilisation for Main Construction works, location of temporary site offices, compounds and welfare facilities | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | During site establishment there could be some small scale groundworks to install offices/compounds and tracking of vehicles around the facilities. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.14-Construction and commissioning of concrete batching plant and associated surface water drainage | Mobilisation of soil or sediment resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Drainage from the concrete batching plant would be managed to prevent high levels of sediment entering the sea. There could be localised increases in turbidity from surface water drainage, although any effects are likely to be restricted to the location immediately surrounding the concrete batching plant. There would be no other discharges relating to the concrete | Yes | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| | | Changes in water quality | | | | | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Embedded mitigation would ensure that the discharge quality would be carefully controlled. The effect would be localised and there would be no detectable effects on quality elements within the coastal WFD water body from this activity alone. | No | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | | Loss of intertidal zone. | Minimise the footprint of the marine works. | 2 | 2 | 2 | | 1 | | | | | | | 2 | | 2 | 2 | | N/A | Loss of approximately 2ha of mainly intertidal habitat under the footprint of the concrete batching plant would result in small-scale changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (0.04%) and would not affect the status of these quality elements within the coastal WFD water body from this activity alone. | No | Yes - the combined losses of intertidal and subtidal habitats requires consideration. |
| | 1.15-Managed site-wide road network and security and access control | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| | 1.16-Establishment of site perimeter fence | No impact pathway. | To protect surface waters, perimeter fencing would not cross the Afon Cafnan, Nant Caerdegog Isaf, Nant Cemlyn, Nant Cemaes and the Tre'r Gof SSSI drains, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |

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| | 1.17-Construction of the Cooling Water System breakwaters and Marine Off-Loading Facility (MOLF) including dewatering | Introduction of new structures with changes to coastal processes and hydrodynamics. | Minimise the footprint of marine structures | 2 | 2 | 2 | 2 | 2 | | | | | | | 2 | 1 | 2 | 2 | | N/A | Effects upon hydrodynamics and waves from nearshore changes to depth variation and loss of intertidal zone structure leading to changes in processes and hydrodynamics (note: this includes potential effects upon Esgair Gemlyn which are subject of more detailed investigations). Effects upon direction of dominant waves within the new harbour area from localised changes to wave transformation. Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Yes | Yes - the combined effects of all structures on hydromorphological quality elements requires consideration. |
| | | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures. | | 2 | 2 | 2 | | | | | | | | | 2 | 1 | 2 | 2 | | | The loss of the coastal bed and intertidal area in The Skerries from the footprint of the Cooling Water System (intake and outfall), breakwaters and MOLF would be approximately 13.1ha (this excludes dredging – see activity 1.18).<br>This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and an area of fish habitat. In comparison to the size of the water body this loss would be very small (0.28%). Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Yes | Yes - the combined losses of intertidal and subtidal habitats requires consideration. |
| | | Mobilisation of sediment from disturbance of the seabed. | | 2 | 2 | 2 | | | | | | | | | 2 | | 2 | 2 | | | Excavation and dredging during the construction phase could lead to the mobilisation of suspended sediments with effects on hydromorphological quality elements in The Skerries water body. | Yes | Yes |
| | | Changes in water quality from dewatering: behind outfall cofferdam (note semi-dry cofferdam dewatering is covered in activity 1.18). | Over pumped seawater would be monitored to ensure suspended solids meet agreed standards. | | | | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Dewatering of the cofferdam takes a few days at most (short-term effect on turbidity). If longer term dewatering is required then it would be treated, so no predicted effect on quality elements. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | | Changes in water quality from a reduction in mixing once breakwaters are in place. | Minimise the footprint of the marine works. | | | | 1 | | | | 1 | | 1 | | | | | 1 | | N/A | The presence of breakwater could have localised effects on currents. However, the gap in the southern end of the western breakwater and strong tidal flows would allow flushing to take place and water within the breakwaters to remain well mixed and there would be no detectable effects on quality elements within the WFD water body. | No | No |
| | | Increase in underwater noise | | | | | | | | | | | | | | | | 2 | | | Potential for fish (present in the Skerries but a quality element of other WFD water bodies) to be affected by underwater noise from rock cutting and drilling. | Yes - effects on fish from underwater noise | Yes - the combined effects on fish require consideration |
| | 1.18-Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | Changes in water quality (e.g. from dewatering). | Over pumped seawater would be monitored to ensure suspended solids meet agreed standards. | | | | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Dewatering of the semi-dry cofferdam takes around 10 days (short-term effect). Longer-term dewatering to be treated so there would be no detectable effects on quality elements within the coastal WFD water body from this activity. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Increase in underwater noise | None identified. | | | | | | | | | | | | | | | 2 | | N/A | Potential for fish (present in the Skerries but a quality element of another WFD water body) to be affected by underwater noise from dredging, rock breaking, rock cutting and drilling. . | Yes - effects on fish from underwater noise | Yes - the combined effects on fish require consideration |
| | | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures. | | 2 | 2 | 2 | | | | | | | | | 2 | | 2 | 2 | | | Loss of approximately 17ha from excavation in Porth-y-pistyll (this includes excavation in both wet and dry). This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and an area of fish habitat. In comparison to the size of the water body this loss would be very small (0.36%). Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Yes | Yes - the combined losses of intertidal and subtidal habitats requires consideration. |

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| | 1.19-Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | Introduction of cofferdams, which could change coastal processes and hydrodynamics. | None identified. | 2 | 2 | 2 | 2 | 2 | | | | | | | 1 | 1 | 1 | 1 | | N/A | Cofferdam structures are temporary and are placed on rock, rather than on soft sediment. Potential for localised scour around structures but this is predicted to only be detectable within a few tens of metres of the structures. Effects upon hydrodynamics and waves from nearshore changes to depth variation, and, effects upon structure and substrate of near shore coastal bed due to changes in flow patterns. Localised loss of intertidal zone structure leading to changes in processes and hydrodynamics. Effects upon direction of dominant waves around coffer dam area due to localised changes to wave transformation. Once removed conditions would reach an equilibrium. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Mobilisation of sediment from disturbance of the seabed. | | 2 | 2 | 1 | | | 2 | | | | | | 1 | | 1 | 1 | | N/A | Cofferdam structures are temporary and are placed on rock, rather than on soft sediment. Potential for localised mobilisation of sediment during installation but rapid dispersion of sediments would occur and this would not result in a change in status of any quality element. Effects upon local depth variation due to dredging activities disturbing and mobilising seabed sediments. Once removed conditions would reach an equilibrium. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality during installation (note dewatering covered under activity 1.17). | | | | | | | 1 | | | | | | 1 | 1 | 1 | 1 | | N/A | A minor effect that is highly localised around the area of the outfall cofferdam (the intake is installed in the dry). There would be no detectable effects on quality elements within the WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | 1.20-Excavation and construction of CW intake and outfall, including tunnelling | Loss of coastal bed and intertidal zone from excavation. | None identified. | 2 | 2 | 2 | | | | | | | | | 2 | | 2 | 2 | | N/A | Approximate loss of 0.1ha at the Cooling Water outfall within The Skerries water body. Losses associated with the intake are covered in activity 1.17. This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (<0.01%) and would not affect the status of these quality elements within the coastal WFD water body from this activity alone. | No | Yes - the combined losses of intertidal and subtidal habitats requires consideration. |
| | | Introduction of new structures with changes to coastal processes and hydrodynamics. | | 2 | 2 | 2 | 2 | 2 | | | | | | | 1 | 1 | 1 | 1 | | N/A | Excavation is carried out behind the cofferdams so there are no pathways to effects on physico-chemical parameters. The new intake and outfall structures would have localised effects on hydromorphology quality elements, including effects upon: hydrodynamics and waves from nearshore changes to depth variation; structure and substrate of near shore coastal bed; intertidal zone structure; and, dominant wave type. However, these effects are localised and conditions would return to an equilibrium within a short period of time. | No | No |
| | 1.21-Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 2 | | | | 2 | 2 | 1 | 1 | 1 | 1 | | N/A | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies although the effects are likely to be restricted to the location immediately surrounding the ground works. However there remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes - the results of the H1 assessment for construction would provide the details of any exceedances of EQSs. | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - changes to flows relating to this activity would not have an effect alone and there is no potential for this aspect of the activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | | | | | | | | | | | | | | | | | N/A | Potential for some input of fine sediment into fluvial water bodies local to works. However, with dust suppression in place there are no pathways to an effect on coastal WFD water body quality elements. | No | No |
| | 1.22-Installation and operation of a drainage system during Power Station construction | Loss of riparian habitat | None identified. | | | | | | | | | | | | | | | 2 | | | The Nant Porth-y-pistyll (approximately 200m long) would be lost during the installation of drainage. Although this would lead to complete removal of the channel, the non-reportable water body is of low fluvial geomorphological value and has been extensively artificially modified for land drainage purposes and during the construction of the Existing Power Station. The Nant Porth-y-pistyll supports European eel however the upper reaches are culverted and therefore the channel is of limited value to European eel populations. | No | No |
| | | Physical presence of structures (e.g. outfalls and sediment settlement ponds) in fluvial watercourses and at the coastline. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | 2 | | 2 | | | | | | 2 | | 2 | 1 | | N/A | Within fluvial catchments the physical presence of outfalls and sediment settlement ponds could encroach on the floodplain. Effects on fluvial hydromorphology elements would be localised and sensitive siting of structures would minimise the effects. For outfalls located in the intertidal zone there could be pipes across the foreshore. The effect would not affect the structure of the intertidal rocky shore and whilst there could be some localised effects on benthic invertebrates and aquatic flora that would be detectable during installation, once removed the communities would quickly recover and return to baseline conditions. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment and changes to water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 2 | | | | 2 | 2 | 1 | 1 | 1 | 1 | 2 | N/A | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies although the effects are likely to be restricted to the location immediately surrounding the discharge points. However there remains potential for effects on transparency, nutrients, specific pollutant and priority substance concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes - the results of the H1 assessment for construction would provide the details of any exceedances of EQSs. | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | 1.23-Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Presence of structures (e.g. culvert and bridges). | Sensitive siting of structures. To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | | | | | | | | | | | | | | | 1 | | N/A | Construction of haul roads and bridge could require either open span bridges or possibly culverts on some of the small drains. These structures would be present through the duration of construction. The use of culverts would be restricted and confined to small drains which are of low value to fish and other BQEs. There would be no detectable effect on quality elements of the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | | Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows could occur, however, this effect would be localised within fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | 2 | | | | 1 | | 1 | 1 | 1 | 1 | | N/A | Once constructed vehicles will be using the haul roads. All runoff will be directed into the drainage system and the discharge quality will be carefully controlled. There remains potential for effects on turbidity, changes to nutrients and specific pollutant concentrations. These effects are would be localised so effects on BQEs would be possible but are not likely to be detectable. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.24-Construction of temporary buildings and infrastructure, including Temporary Workers' Accommodation within the Wylfa Newydd Development Area for essential workers | Mobilisation of soil into watercourses, particularly if working close to the bank | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be a localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies; however, any effects would be restricted to the location immediately surrounding the groundworks and conditions would quickly return to baseline. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | 1.25-Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | Changes in water quality (e.g. from dewatering). | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | 2 | | | 1 | | 2 | 1 | 1 | 1 | 1 | | N/A | Groundwater seepage into the deep excavation would be dewatered and discharged into the coastal WFD water body. This could include specific pollutants which may be components of the groundwater. The discharge would be fresh and could contain suspended solids. Groundwater would be diluted and dispersed by strong tidal currents. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes (for specific pollutants) | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | 1.26-Excavation of other features including building foundations including dewatering | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the excavation works. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | 2 | | | 1 | | 2 | 1 | 1 | 1 | 1 | | N/A | This would be managed via the surface water drainage system but discharge could include specific pollutants which may be components of the groundwater. The discharge would be fresh and could contain suspended solids. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes (for specific pollutants) | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| | 1.27-Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 2 | | | | 2 | 2 | 1 | 1 | 1 | 1 | | N/A | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies, although the effects are likely to be restricted to the location immediately surrounding the ground works. However there remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes - the results of the H1 assessment for construction would provide the details of any exceedances of EQSs. | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater | None required. | | | | | | | | | | | | | | | | | N/A | A minor effect predicted on fluvial water body. There would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | | | | | | | | | | | | | | | | | N/A | Potential for some input of fine sediment into fluvial water bodies local to works. However, with dust suppression in place there are no pathways to an effect on coastal WFD water body quality elements. | No | No |
| | 1.28-Construction of internal roads, car parking, security fencing and permanent lighting | Presence of structures (security fencing) within fluvial watercourses. | To protect surface waters, perimeter fencing would not cross the Afon Cafnan and Nant Caerdegog Isaf, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | | | | | | | | | | | | | | | 2 | | N/A | Reduction in connectivity within the non-reportable fluvial water bodies could affect fish including migratory species. No effects on quality elements within the coastal WFD water body. | No | No |

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| | | Lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | | | | | | | | | | | | | | | 2 | | N/A | Fish could be affected by lighting in both fluvial and coastal waters. Lighting could attract some species and deter other and can disrupt feeding, migration and spawning. However, with embedded mitigation to minimise light spill and avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | No | Yes - the combined effects on fish require consideration |
| | | Change in surface type (more hardstanding) leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Once constructed large numbers of vehicles would be using the internal roads. All runoff would be directed into the drainage system and the discharge quality would be carefully controlled but may contain suspended solids. With embedded mitigation there would be no effects on physico-chemical parameters and although there is a pathway to effects on biological quality elements there would be no detectable effect on quality elements within the coastal WFD water body alone. | No | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | 1.29-Operation of the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | | | | | | | | | | | | 2 | 2 | 2 | 1 | | N/A | Risk that non-native species could be introduced with effects on benthic invertebrates, phytoplankton and aquatic flora. | Yes | Yes |
| | 1.30-Operation of concrete batching plant and associated surface water drainage | Changes in water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Embedded mitigation would ensure that the discharge quality would be carefully controlled. The effect would be localised and there would be no detectable effects on quality elements within the coastal WFD water body from this activity alone. There would be no other discharges relating to the concrete batching plant other than drainage of surface water as any excess process water would be tankered off site. | No | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| 1.31-Operation of heavy lifting crane, tower cranes, construction plant and equipment | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| 1.32-Main plant construction (Unit 1 and Unit 2) | No impact pathway (platform for units 1 and 2 and laydown areas are already constructed under activity 1.21). | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| 1.33-Construction of other buildings, structures and features | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | Ground compaction by vehicles and machinery, presence of buildings and other structures leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | | | N/A | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| 1.34-Final landscaping - creation of final mounds | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | Changes to vegetation cover. Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.35-Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | No impact pathway (effects relating to landscaping are covered under activity 1.34). | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| 1.36-Sewage discharge during construction | Changes in water quality from discharge of sewage effluent. | Sewage effluent would be treated prior to discharge to meet standards agreed with NRW. | | | | | | 2 | | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | | N/A | With embedded mitigation the effluent quality would be carefully controlled. There remains potential for effects on turbidity, changes to nutrients and specific pollutant concentrations. These effects would be localised around the point of discharge and dispersion and dilution would occur rapidly within the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes (nutrient conditions and specific pollutants) | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| | 1.37-Disposal of material (rock and soft sediment) from marine excavation (dredging) | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | Holyhead Deep lies out with the coastal WFD waterbodies (1.9km from Caernarfon Bay North to edge of Holyhead Deep, 3.5km from location of disposal to Caernarfon Bay North). No effects on quality elements in the coastal WFD water body. | No | No |
| | 1.38-Beach landing facility | Footprint on the foreshore. | None required. | | | 2 | | | | | | | | | 2 | | 2 | 2 | | N/A | The beach landing facility would have a temporary effect on the intertidal zone, although it would not change the structure. The footprint would be approximately 0.24ha. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (0.01%) and once the facility is removed conditions would quickly return to baseline. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| Power Station Main Site: operation | 2.1-Presence of buildings, hardstanding and roads | Change in surface type (more hardstanding) leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | | | N/A | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - changes to flows relating to this activity would not have an effect alone and there is no potential for this aspect of the activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 2.2-Presence of mounds | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway (effects occur during construction). | No | No |
| | 2.3-Maintenance dredging | Changes to the sea bed from dredging. | None required. | 2 | 2 | | | | | | | | | | 1 | | | 1 | | N/A | Maintenance dredging would be infrequent and the effects would be localised over an area approximately 22ha (0.47% of the water body area). This would be a temporary activity likely to be days or weeks in duration. This would affect water depth and structure of the coastal bed, but the effects are localised and given the duration would not affect the quality elements in the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality (e.g. during dredging operation). | None required. | | | | | | 1 | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | N/A | Assessment of capital dredge determined that there would be no effect on quality elements. Maintenance dredging occurs infrequently and on a smaller scale to the capital dredge and there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to |

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| | | | | | | | | | | | | | | | | | | | | | | | effects on quality elements at the coastal WFD water body scale. |
| | 2.4-Abstraction of Cooling Water | Change in flows with water being directed into the intake. | None required. | | 1 | | 1 | | | | | | | | | | | | | N/A | Changes to hydromorphological quality elements are driven by the presence of structures, rather than the flow into the intake, which is relatively slow at less than 0.3m/s. Prior to operation the structure and substrate of the coastal bed would stabilise and current/tidal conditions would be established (following completion of the construction of the marine works) and, therefore, there would be no further effects on quality elements. | No | No - the limited extent of the effect of this activity and pathway mean there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Loss of flora and fauna in abstracted water. | Fish and invertebrate protection measures including screens, acoustic deterrents and a recovery and return channel, all designed to best practice. | | | | | | | | | | | | 2 | 2 | | 2 | | N/A | Long term effects from the continuous loss of plankton, invertebrates and fish which would be entrapped during operation. | Yes | Yes - the combined effects on phytoplankton, fish and benthic invertebrates require consideration |
| | 2.5-Discharge of Cooling Water and other operational water discharges | Change in flows with water being directed away from the outfall potentially leading to scour. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | 2 | 2 | 2 | 1 | 1 | | | | | | | 2 | | | 2 | | N/A | Scour of the seabed would occur around the outfall area at the onset of operation. This effect would be localised to the vicinity of the outfall. | No | No |
| | | Discharge of warmer water as a thermal plume. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | | | | | | | 2 | 2 | | | | 2 | 2 | 2 | 2 | | N/A | Long term changes to thermal conditions (and associated effects on dissolved oxygen). Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects on phytoplankton, fish and benthic invertebrates require consideration |

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| | | Discharge of chemicals including total residual oxidants (TRO). | The biocide dosing regime would be designed to reduce biofouling risk. In line with best practice, continuous dosing would be applied during a higher fouling risk period, typically between April and December, when sea temperatures are above 10°C. | | | | | | | | | | 2 | 2 | 2 | 2 | 2 | | N/A | Long-term changes to release of a specific pollutant (chlorine measured as TRO) and from sodium nitrite. Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects on phytoplankton, fish and benthic invertebrates require consideration |
| | 2.6-Drainage during operation | Presence of structures throughout operation. | Design of structures to follow good practice guidelines. Structure size to be kept to a minimum. | | | | | | | | | | | | | | | | | | Localised changes to fluvial water bodies, with no pathways to impacts at a coastal WFD water body scale. | No | No |
| | | Changes in water quality. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | 1 | | | | 1 | | 1 | 1 | 1 | 1 | | N/A | During operation a drainage system would be in place to manage the water from site. Treatment would be applied if required and discharge quality would be carefully controlled. Agreed standards would be met and there would be no detectable change in physico-chemical quality elements or biological quality elements within the coastal WFD water body. | No | No |
| | 2.7-Occasional deliveries via the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | | | | | | | | | | | | 1 | 1 | 1 | 1 | | N/A | During Power Station operation the risk that non-native species could be introduced is very small as there would be less than one delivery per year. | No | No |
| | 2.8-Operation of buildings (emissions to air, noise, light etc.) | Permanent lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | | | | | | | | | | | | | | | 2 | | N/A | Fish could be affected by lighting in both fluvial and coastal waters however during operation light spill would be limited and would avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | No | No |
| Power Station Main Site: | 3.1-Cessation of CW abstraction | No flow into the cooling water intake (removal of a pathway to an effect) | None required. | | | | | | | | | | | | 1 | 1 | | 1 | | N/A | Positive effect on benthic invertebrates, phytoplankton and fish, but changes in communities are not predicted and therefore there would not be a detectable effect on the quality elements. | No | No |
| | 3.2-Cessation of CW discharge | Changes in water quality. | None required. | | | | | | | 1 | 1 | | | 1 | | | | | | N/A | Positive effect on physico-chemical QEs, but no detectable effect on quality elements within the coastal WFD water body. | No | No |

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| | 3.3 - Removal of marine structures (MOLF etc., but not breakwaters) | Mobilisation of sediment from disturbance of the seabed. | None required. | 1 | 1 | 1 | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Mobilisation of sediment during removal but rapid dispersion of sediments would occur with effects on transparency. Once works are complete conditions would reach an equilibrium. Pathway to effects on BQEs but only on a small scale. | No | No |
| | | Removal of structures, which could change coastal processes and hydrodynamics. | None required. | 2 | 2 | 2 | 2 | 2 | | | | | | | 1 | | 1 | 1 | | N/A | Effects on hydromorphology quality elements, including effects of structure removal on depth variation, dominant current direction and tidal regime, due to earlier modifications and remnant elements e.g. cut down sheet piling. However, these effects are localised and conditions would return to an equilibrium within a short period of time. | No | No |
| Highway improvements (off-line) | 4.1 - Earthworks | Mobilisation of soil into watercourses, particularly if working close to the bank. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be a small localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. However, any effects would be restricted to the location immediately surrounding the earthworks and conditions would quickly return to baseline. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows could occur, however, this effect would be localised within fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | | | | | | | | | | | | | | | | | N/A | With dust suppression in place there are no pathways to an effect on quality elements. | No | No |

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| 4.2 - Hard bank protection/ embankment structures | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater. | Reduction, as far as practicable, of structures along the fluvial watercourses as part of design. | | | | | | | | | | | | | | | | | N/A | The effects would be small scale and restricted to non-reportable fluvial water bodies. There would be no detectable effect on quality elements of the coastal WFD water body. | No | No |
| 4.3 - Water body realignment or removal | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Retain, wherever possible, all watercourses identified on-site. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | Only very small drains (many of which have no flow) could be realigned or removed and the effects would be highly localised. Potential effects include the input of fine sediment into the fluvial water bodies. Embedded mitigation reduces the effect such that there would be no detectable effect on quality elements of the coastal WFD water body. | No | No |
| | Loss and creation of habitat and morphological features. | Retain, wherever possible, all watercourses identified on-site. | | | | | | | | | | | | | | | 1 | | N/A | A minor effect predicted on fluvial water bodies. There would be no detectable effect on quality elements of the coastal WFD water body. | No | No |
| 4.4 - Water body crossings (culverts/bridge construction) | Presence of structures (e.g. culvert and bridges). | Sensitive siting of structures. To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | | | | | | | | | | | | | | | 1 | | N/A | Construction could require either open span bridges or possibly culverts on some of the small drains (which are of low value to fish and other BQEs). These structures would be present through the duration of construction. There would be no detectable effect on quality elements of the coastal WFD water body. | No | No |
| 4.5 - New outfalls and discharges | Changes in water quality (e.g. introduction of new discharge). | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | | | | | | | | | | 1 | | N/A | The effects would be small scale and restricted to non-reportable fluvial water bodies. Given the distance of the road and the new outfalls to the coast there would be no detectable effect on quality elements of the coastal WFD water body. | No | No |

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| | | Physical presence of structures (e.g. outfalls) in fluvial watercourses. | Sensitive siting of structures. To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | | | | | | | | | | | | | | | | N/A | Within fluvial catchments the physical presence of outfalls could encroach on the floodplain. Effects on fluvial hydromorphology elements would be localised and sensitive siting of structures would minimise the effects. There would be no detectable effect on quality elements of the coastal WFD water body. | No | No |

## Table 2a. Anglesey North (non reportable water bodies)

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
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| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| Power Station Main Site: construction | 1.1 - Targeted removal of vegetation, mostly above ground or to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | |
| | 1.2 - Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only | Mobilisation of soil into watercourses, particularly if working close to the bank | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |

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| | where these are inside the perimeter fence | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | |
| | 1.3 - Management of vegetation after grazing ceases | No impact pathway. | None required. | N/A | | | |
| | 1.4 - Invasive species management | Mobilisation of soil into watercourses (caused by removal of invasive flora), particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | 1.5 - Species translocation from within the perimeter fence areas to on and off-site locations | No impact pathway. | None required. | N/A | | | |
| | 1.6 - Remaining demolitions to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | 1.7 - Realignment of a watercourse | No impact pathway. | N/A | N/A | | | |
| | 1.8 - Waste management and material storage and management | No impact pathway. | There would be engineered containment for fuel, oil and chemical storage areas (including waste oils) with the storage facilities following good practice guidance. | N/A | | | |
| | 1.9 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | Tre'r Gof drainsNant Cemaes | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body. |
| | 1.10 - Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | No impact pathway. | None required. | N/A | | | |

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| | 1.11 - Remediation of known contaminated land | Leaching of substances from contaminated soil (mainly asbestos contamination). | Appropriate controls would be in place to prevent the discharge of contamination to surface waters (e.g. testing and tankering off site if required). | Tre'r Gof drains Nant Cemaes | | | |
| | 1.12 - Use of a rock outcrop and crushing of material for security tracks and compounds | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | N/A | Input of fine material to watercourse leading to smothering of the channel bed substrate. | | |
| | 1.13 - Site establishment, mobilisation for Main Construction works, location of temporary site offices, compounds and welfare facilities | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body. |
| | 1.14 - Construction and commissioning of concrete batching plant and associated surface water drainage | No impact pathway. | N/A | N/A | | | |
| | 1.15 - Managed site-wide road network and security and access control | No impact pathway. | None required. | N/A | | | |
| | 1.16 - Establishment of site perimeter fence | No impact pathway. | To protect surface waters, perimeter fencing would not cross the Afon Cafnan, Nant Caerdegog Isaf, Nant Cemlyn, Nant Cemaes and the Tre'r Gof SSSI drains, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | N/A | | | |
| | 1.17 - Construction of the Cooling Water System breakwaters and Marine Off-Loading Facility | Introduction of new structures with changes to coastal processes and hydrodynamics. | Minimise the footprint of marine structures | N/A | | | |

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| | (MOLF) including dewatering | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures. | | | | | |
| | | Changes in water quality from dewatering: behind outfall cofferdam. | Over pumped seawater would be monitored to ensure suspended solids meet agreed standards. | | | | |
| | 1.18 - Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | No impact pathway. | None required. | N/A | | | |
| | 1.19 - Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | Introduction of cofferdams, which could change coastal processes and hydrodynamics. | None identified. | N/A | | | |
| | | Mobilisation of sediment from disturbance of the seabed. | | | | | |
| | | Changes in water quality during installation (note dewatering covered under activity 1.17). | | | | | |
| | 1.20 - Excavation and construction of CW intake and outfall, including tunnelling | Loss of coastal bed and intertidal zone from excavation. | None identified. | N/A | | | |
| | | Introduction of new structures with changes to coastal processes and hydrodynamics. | | | | | |
| | 1.21 - Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |

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| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body. Fish could experience a change within fluvial catchments. |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | N/A | Input of fine material to watercourse leading to smothering of the channel bed substrate. | | |
| | 1.22 - Installation and operation of a drainage system during Power Station construction | Physical presence of structures (e.g. outfalls and sediment settlement ponds) in fluvial watercourses and at the coastline. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico-chemical process, including temperature. | Reduction in connectivity between upstream and downstream environments. Changes to channel shading and bank structure. |
| | | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment and changes to water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Increase in turbidity.Potential increase in bioavailable copper, iron and lead concentrations in Tre'r Gof drains. | Reduction in available light to the water column, localised smothering of habitats. |
| | 1.23 - Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Presence of structures (e.g. culvert and bridges). | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico chemical process, including temperature. | Reduction in connectivity between up and down stream environments. Changes to channel shading and bank structure. |
| | | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, smothering of habitats. |
| | | Ground compaction by vehicles and machinery leading to changes in run-off. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Fish could experience a change within fluvial catchments. |

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| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | Increase in turbidity and changes to physico-chemical parameters (e.g. pH). | |
| | 1.24 - Construction of temporary buildings and infrastructure, including Temporary Workers' Accommodation within the Wylfa Newydd Development Area for essential workers | Mobilisation of soil into watercourses, particularly if working close to the bank | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity | Reduction in available light to the water column, localised smothering of habitats |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | Fish could experience a change within fluvial catchments. |
| | 1.25 - Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | No impact pathway. This activity does not take place in this water body. | N/A | N/A | | | |
| | 1.26 - Excavation of other features including building foundations including dewatering | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Changes in water quality | | N/A | | | |
| | 1.27 - Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater | None required. | | Localised modification of water quantity with effects on flow processes and subsequently morphological features.<br>Changes in connectivity to groundwater bodies. | | |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | N/A | Input of fine material to watercourse leading to smothering of the channel bed substrate. | | |

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| | 1.28 - Construction of internal roads, car parking, security fencing and permanent lighting | Presence of structures (security fencing) within fluvial watercourses. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre’r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico chemical process, including temperature. | Reduction in connectivity between up and down stream environments. Changes to channel shading and bank structure. |
| | | Lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | | | | Increase in artificial lighting could disrupt fish behaviour and spawning. |
| | | Change in surface type (more hardstanding) leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre’r Gof SSSI drains, where practicable and possible. | | Increase in rate of runoff into watercourses could alter flow processes and lead to effects on morphological features. | | |
| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | Increase in turbidity and changes to physico-chemical parameters (e.g. pH). | |
| | 1.29 - Operation of the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | N/A | | | |
| | 1.30 - Operation of concrete batching plant and associated surface water drainage | No impact pathway. | N/A | N/A | | | |
| | 1.31 - Operation of heavy lifting crane, tower cranes, construction plant and equipment | No impact pathway. | None required. | N/A | | | |
| | 1.32 - Main plant construction (Unit 1 and Unit 2) | No impact pathway (platform for units 1 and 2 and laydown areas are already constructed under activity 1.21). | None required. | N/A | | | |
| | 1.33 - Construction of other buildings, structures and features | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre’r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Ground compaction by vehicles and machinery, presence of buildings and other structures leading to changes in run-off. | | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | |

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| | 1.34 - Final landscaping - creation of final mounds | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | Tre'r Gof drains Nant Cemaes | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity. | Reduction in available light to the water column, localised smothering of habitats. |
| | | Changes to vegetation cover. Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified. | | |
| | 1.35 - Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | No impact pathway (effects relating to landscaping are covered under activity 1.34). | None required. | N/A | | | |
| | 1.36 - Sewage discharge during construction | No impact pathway. | None required. | N/A | | | |
| | 1.37 - Disposal of material (rock and soft sediment) from marine excavation (dredging) | No impact pathway. | None required. | N/A | | | |
| | 1.38 - Beach landing facility | No impact pathway. | None required. | N/A | | | |
| Power Station Main Site: operation | 2.1 - Presence of buildings, hardstanding and roads | Change in surface type (more hardstanding) leading to changes in run-off. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | Tre'r Gof drains Nant Cemaes | Increase in rate of run-off into watercourses could alter flow processes and subsequent geomorphological features | | |
| | 2.2 - Presence of mounds | No impact pathway. | None required. | N/A | | | |
| | 2.3 - Maintenance dredging | No impact pathway. | None required. | N/A | | | |
| | 2.4 - Abstraction of Cooling Water | No impact pathway. | None required. | N/A | | | |
| | 2.5 - Discharge of Cooling Water and other operational water discharges | Change in flows with water being directed away from the outfall potentially leading to scour. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | N/A | | | |
| | | Discharge of warmer water as a thermal plume. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | N/A | | | |
| | | Discharge of chemicals including total residual oxidants (TRO). | The biocide dosing regime would be designed to reduce biofouling risk. In line with best practice, continuous dosing would be applied during a higher fouling risk period, typically between April and December, when sea temperatures are above 10°C. | N/A | | | |

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| | 2.6 - Drainage during operation | Presence of structures throughout operation. | Design of structures to follow good practice guidelines. Structure size to be kept to a minimum. | Tre'r Gof drains Nant Cemaes | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | | |
| | | Changes in water quality. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | Increase in turbidity and changes to physico-chemical parameters (e.g. pH). | |
| | 2.7 - Occasional deliveries via the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | N/A | | | |
| | 2.8 - Operation of buildings (emissions to air, noise, light etc.) | Permanent lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | Tre'r Gof drains Nant Cemaes | | | Increase in artificial lighting could disrupt fish behaviour and spawning. |
| Power Station Main Site: | 3.2 - Cessation of CW discharge | Changes in water quality. | None required. | N/A | | | |

## Table 2b. Anglesey North (reportable water bodies)

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects upon hydromorphological quality elements | | | | | Chemical and physico-chemical quality elements | | | | | | Biological quality elements | | | Fish | Priority substances | WB mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure of the intertidal zone | Direction of dominant current | Wave exposure | Transparency | Thermal conditions | Oxygenation conditions | Salinity | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Aquatic flora | | | | | | |

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| Power Station Main Site: construction | 1.1 - Targeted removal of vegetation, mostly above ground or to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.2 - Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only where these are inside the perimeter fence | Mobilisation of soil into watercourses, particularly if working close to the bank | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.3 - Management of vegetation after grazing ceases | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| | 1.4 - Invasive species management | Mobilisation of soil into watercourses (caused by removal of invasive flora), particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to the location immediately surrounding the invasive species management activity. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.5 - Species translocation from within the perimeter fence areas to on and off-site locations | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |

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| 1.6 - Remaining demolitions to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.7 - Realignment of a watercourse | No impact pathway. | N/A | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| 1.8 - Waste management and material storage and management | No impact pathway. | There would be engineered containment for fuel, oil and chemical storage areas (including waste oils) with the storage facilities following good practice guidance. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| 1.9 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies. There may be a small effect on flows that would be detectable compared to baseline conditions, but the effects would be confined to changes within the fluvial water bodies and there would be no detectable changes in freshwater input or to any other quality elements within the coastal WFD water body. | No | No - changes to flows relating to this activity would not have an effect alone and there is no potential for this aspect of the activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| 1.10 - Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| 1.11 - Remediation of known contaminated land | Leaching of substances from contaminated soil (mainly asbestos contamination). | Appropriate controls would be in place to prevent the discharge of contamination to surface waters (e.g. testing and tankering off site if required). | | | | | | | | | | | 1 | | | | | 1 | N/A | Leaching of substances could lead to an effect; however, the embedded and good practice mitigation would significantly reduce the risk of this occurring and therefore no effect is predicted. | No | No |
| 1.12 - Use of a rock outcrop and crushing of material for security tracks and compounds | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | | | | | | | | | | | | | | | | | N/A | Potential for some input of fine sediment into fluvial water bodies local to works. However, with dust suppression in place there are no pathways to an effect on coastal WFD water body quality elements. | No | No |
| 1.13 - Site establishment, mobilisation for Main Construction works, location of temporary site offices, compounds and welfare facilities | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | During site establishment there could be some small scale groundworks to install offices/compounds and tracking of vehicles around the facilities. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | | Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.14 - Construction and commissioning of concrete batching plant and associated surface water drainage | No impact pathway. | N/A | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| | 1.15 - Managed site-wide road network and security and access control | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| | 1.16 - Establishment of site perimeter fence | No impact pathway. | To protect surface waters, perimeter fencing would not cross the Afon Cafnan, Nant Caerdegog Isaf, Nant Cemlyn, Nant Cemaes and the Tre'r Gof SSSI drains, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |

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| | 1.17 - Construction of the Cooling Water System breakwaters and Marine Off-Loading Facility (MOLF) including dewatering | Introduction of new structures with changes to coastal processes and hydrodynamics. | Minimise the footprint of marine structures | 2 | 2 | 2 | 2 | 2 | | | | | | | 1 | | 1 | 1 | | N/A | During installation of the cooling water outfall behind a temporary cofferdam there may be localised effects on hydrodynamics and waves. There would be a change in depth variation to the intertidal zone, but once the outfall structure is completed and the cofferdam is removed the hydrodynamics in this area would stabilise. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | No | No |
| | | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures. | | 2 | 2 | 2 | 2 | 2 | | | | | | | 2 | | 2 | 2 | | | Loss of approximately 0.5ha at the cooling water outfall in Anglesey North water body. This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and an area of fish habitat. In comparison to the size of the water body this loss is very small (<0.01%). | No | No - no other loss of intertidal zone or coastal bed in this water body |
| | | Changes in water quality from dewatering: behind outfall cofferdam. | Over pumped seawater would be monitored to ensure suspended solids meet agreed standards. | | | | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Dewatering of the cofferdam takes a few days at most (short-term effect on turbidity). If longer term dewatering is required then it would be treated, so no predicted effect on quality elements. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.18 - Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |

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| | 1.19 - Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | Introduction of cofferdams, which could change coastal processes and hydrodynamics. | None identified. | 2 | 2 | 2 | 2 | 2 | | | | | | | 1 | | 1 | 1 | | N/A | Cofferdam structures are temporary and are placed on rock, rather than on soft sediment. Potential for localised scour around structures but this is predicted to only be detectable within a few tens of metres of the structures. Effects upon hydrodynamics and waves from nearshore changes to depth variation, and, effects upon structure and substrate of near shore coastal bed due to changes in flow patterns. Localised loss of intertidal zone structure leading to changes in processes and hydrodynamics. Effects upon direction of dominant waves around cofferdam area due to localised changes to wave transformation. Once removed conditions would reach an equilibrium. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Mobilisation of sediment from disturbance of the seabed. | | 2 | 2 | 1 | | | 2 | | | | | | 1 | | 1 | 1 | | N/A | Cofferdam structures are temporary and are placed on rock, rather than on soft sediment. Potential for localised mobilisation of sediment during installation but rapid dispersion of sediments would occur and this would not result in a change in status of any quality element. Effects upon local depth variation due to dredging activities disturbing and mobilising seabed sediments. Once removed conditions would reach an equilibrium. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality during installation (note dewatering covered under activity 1.17). | | | | | | | 1 | | | | | | 1 | 1 | 1 | 1 | | N/A | A minor effect that is highly localised around the area of the outfall cofferdam (the intake is installed in the dry). There would be no detectable effects on quality elements within the WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | 1.20 - Excavation and construction of CW intake and outfall, including tunnelling | Loss of coastal bed and intertidal zone from excavation. | None identified. | 2 | 2 | 2 | | | | | | | | | 2 | | 2 | 2 | | N/A | Approximate loss of 0.6ha at the Cooling Water outfall. Losses associated with the intake are covered in activity 1.17. This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (0.01%) and would not affect the status of these quality elements within the coastal WFD water body from this activity alone. | No | No - this is the only loss of habitat within this water body. |
| | | Introduction of new structures with changes to coastal processes and hydrodynamics. | | 2 | 2 | 2 | 2 | 2 | | | | | | | 1 | | 1 | 1 | | N/A | Excavation is carried out behind the cofferdams so there are no pathways to effects on physico-chemical parameters. The new intake and outfall structures would have localised effects on hydromorphology quality elements, including effects upon: hydrodynamics and waves from nearshore changes to depth variation; structure and substrate of near shore coastal bed; intertidal zone structure; and, dominant wave type. However, these effects are localised and conditions would return to an equilibrium within a short period of time. | No | No |

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| | 1.21 - Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 2 | | | | 2 | 2 | 1 | 1 | 1 | 1 | | N/A | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies although the effects are likely to be restricted to the location immediately surrounding the ground works. However there remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes - the results of the H1 assessment for construction would provide the details of any exceedances of EQSs. | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - changes to flows relating to this activity would not have an effect alone and there is no potential for this aspect of the activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | | | | | | | | | | | | | | | | | N/A | Potential for some input of fine sediment into fluvial water bodies local to works. However, with dust suppression in place there are no pathways to an effect on coastal WFD water body quality elements. | No | No |

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| 1.22 - Installation and operation of a drainage system during Power Station construction | Physical presence of structures (e.g. outfalls and sediment settlement ponds) in fluvial watercourses and at the coastline. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | 2 | | 2 | | | | | | | 2 | | 2 | | | N/A | Within fluvial catchments the physical presence of outfalls and sediment settlement ponds could encroach on the floodplain. Effects on fluvial hydromorphology elements would be localised and sensitive siting of structures would minimise the effects. For outfalls located in the intertidal zone there could be pipes across the foreshore. The effect would not affect the structure of the intertidal rocky shore and whilst there could be some localised effects on benthic invertebrates and aquatic flora that would be detectable during installation, once removed the communities would quickly recover and return to baseline conditions. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment and changes to water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 2 | | | | 2 | 2 | 1 | 1 | 1 | 1 | 2 | N/A | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies although the effects are likely to be restricted to the location immediately surrounding the discharge points. However there remains potential for effects on transparency, nutrients, specific pollutant and priority substance concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes - the results of the H1 assessment for construction would provide the details of any exceedances of EQSs. | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| | 1.23 - Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Presence of structures (e.g. culvert and bridges). | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | 1 | | N/A | Construction of haul roads and bridge could require either open span bridges or possibly culverts on some of the small drains. These structures would be present through the duration of construction. The use of culverts would be restricted and confined to small drains which are of low value to fish and other BQEs. There would be no detectable effect on quality elements of the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Ground compaction by vehicles and machinery leading to changes in run-off. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows could occur, however, this effect would be localised within fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | 2 | | | | 1 | | 1 | 1 | 1 | 1 | | N/A | Once constructed vehicles will be using the haul roads. All runoff will be directed into the drainage system and the discharge quality will be carefully controlled. There remains potential for effects on turbidity, changes to nutrients and specific pollutant concentrations. These effects are would be localised so effects on BQEs would be possible but are not likely to be detectable. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.24 - Construction of temporary buildings and infrastructure, including Temporary Workers' Accommodation within the Wylfa Newydd Development Area for essential workers | Mobilisation of soil into watercourses, particularly if working close to the bank | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be a localised increase in turbidity and deposition of sediment on the bed within the fluvial water bodies; however, any effects would be restricted to the location immediately surrounding the groundworks and conditions would quickly return to baseline. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.25 - Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | No impact pathway. This activity does not take place in this water body. | N/A | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |

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| | 1.26 - Excavation of other features including building foundations including dewatering | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the excavation works. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality | | | | | | | 2 | | | 1 | | 2 | 1 | 1 | 1 | 1 | | N/A | This would be managed via the surface water drainage system but discharge could include specific pollutants which may be components of the groundwater. The discharge would be fresh and could contain suspended solids. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes (for specific pollutants) | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| | 1.27 - Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | 2 | | | | 2 | 2 | 1 | 1 | 1 | 1 | | N/A | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies, although the effects are likely to be restricted to the location immediately surrounding the ground works. However there remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. Although there is a pathway to an effect on BQEs, given the size of the Zone of Influence in relation to the size of the water body, based on professional judgement it is considered that there would be no detectable effect on BQEs. | Yes - the results of the H1 assessment for construction would provide the details of any exceedances of EQSs. | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater | None required. | | | | | | | | | | | | | | | 1 | | N/A | Changes in flows in non-reportable fluvial water bodies may result in localised effects on instream habitats but this is not likely to have a detectable effect on macroinvertebrates or fish within fluvial catchments. There would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash facilities (see chapter D5 (air quality) for further details) | | | | | | | | | | | | | | | | | N/A | Potential for some input of fine sediment into fluvial water bodies local to works. However, with dust suppression in place there are no pathways to an effect on coastal WFD water body quality elements. | No | No |
| | 1.28 - Construction of internal roads, car parking, security fencing and permanent lighting | Presence of structures (security fencing) within fluvial watercourses. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | 2 | | N/A | Reduction in connectivity within the non-reportable fluvial water bodies could affect fish including migratory species. No effects on quality elements within the coastal WFD water body. | No | No |

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| | | Lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | | | | | | | | | | | | | | | 2 | | N/A | Fish could be affected by lighting in both fluvial and coastal waters. Lighting could attract some species and deter other and can disrupt feeding, migration and spawning. However, with embedded mitigation to minimise light spill and avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | No | Yes - the combined effects on fish require consideration |
| | | Change in surface type (more hardstanding) leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | 1 | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | 2 | | | | | | 1 | 1 | 1 | 1 | | N/A | Once constructed large numbers of vehicles would be using the internal roads. All runoff would be directed into the drainage system and the discharge quality would be carefully controlled but may contain suspended solids. With embedded mitigation there would be no effects on physico-chemical parameters and although there is a pathway to effects on biological quality elements there would be no detectable effect on quality elements within the coastal WFD water body alone. | No | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | 1.29 - Operation of the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | | | | | | | | | | | | 2 | 1 | 2 | 1 | | N/A | Risk that non-native species could be introduced to The Skerries WFD water body but could potentially affect benthic invertebrates and aquatic flora in the Anglesey North WFD water body. | Yes | Yes |
| | 1.30 - Operation of concrete batching plant and associated surface water drainage | No impact pathway. | N/A | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |

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| 1.31 - Operation of heavy lifting crane, tower cranes, construction plant and equipment | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| 1.32 - Main plant construction (Unit 1 and Unit 2) | No impact pathway (platform for units 1 and 2 and laydown areas are already constructed under activity 1.21). | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| 1.33 - Construction of other buildings, structures and features | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | Ground compaction by vehicles and machinery, presence of buildings and other structures leading to changes in run-off. | | | | | | | | | | | | | | | | | | N/A | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.34 - Final landscaping - creation of final mounds | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes to vegetation cover. Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.35 - Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | No impact pathway (effects relating to landscaping are covered under activity 1.34). | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| | 1.36 - Sewage discharge during construction | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| | 1.37 - Disposal of material (rock and soft sediment) from marine excavation (dredging) | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| | 1.38 - Beach landing facility | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Power Station Main Site: operation | 2.1 - Presence of buildings, hardstanding and roads | Change in surface type (more hardstanding) leading to changes in run-off. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along Nant Cemaes and the Tre'r Gof SSSI drains, where practicable and possible. | | | | | | | | | | | | | | | | | N/A | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - changes to flows relating to this activity would not have an effect alone and there is no potential for this aspect of the activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 2.2 - Presence of mounds | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway (effects occur during construction). | No | No |
| | 2.3 - Maintenance dredging | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway (effects occur during construction). | No | No |
| | 2.4 - Abstraction of Cooling Water | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No impact pathway. | No | No |
| | 2.5 - Discharge of Cooling Water and other operational water discharges | Change in flows with water being directed away from the outfall potentially leading to scour. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | 2 | 2 | 2 | 1 | 1 | | | | | | | 2 | | | 2 | | N/A | Scour of the seabed would occur around the outfall area at the onset of operation. This effect would be localised to the vicinity of the outfall. | No | No |
| | | Discharge of warmer water as a thermal plume. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | | | | | | | 2 | 2 | | | | 2 | 2 | 2 | 2 | | N/A | Long term changes to thermal conditions (and associated effects on dissolved oxygen). Associated effects on phytoplankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects on phytoplankton, fish and benthic invertebrates require consideration |
| | | Discharge of chemicals including total residual oxidants (TRO). | The biocide dosing regime would be designed to reduce biofouling risk. In line with best practice, continuous dosing would be applied during a higher fouling risk period, typically between April and December, when sea temperatures are above 10°C. | | | | | | | | | | 2 | 2 | 2 | 2 | 2 | | | N/A | Long-term changes to release of a specific pollutant (chlorine measured as TRO) and from sodium nitrite. Associated effects on phytoplankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects on phytoplankton, fish and benthic invertebrates require consideration |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.6 - Drainage during operation | Presence of structures throughout operation. | Design of structures to follow good practice guidelines. Structure size to be kept to a minimum. | | | | | | | | | | | | | | | | | | Localised changes to fluvial water bodies, with no pathways to impacts at a coastal WFD water body scale. | No | No |
| | | Changes in water quality. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | 1 | | | | 1 | | 1 | 1 | 1 | 1 | | N/A | During operation a drainage system would be in place to manage the water from site. Treatment would be applied if required and discharge quality would be carefully controlled. Agreed standards would be met and there would be no detectable change in physico-chemical quality elements or biological quality elements within the coastal WFD water body. | No | No |
| | 2.7 - Occasional deliveries via the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | | | | | | | | | | | | 1 | 1 | 1 | 1 | | N/A | During Power Station operation the risk that non-native species could be introduced is very small as there would be less than one delivery per year. | No | No |
| | 2.8 - Operation of buildings (emissions to air, noise, light etc.) | Permanent lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | | | | | | | | | | | | | | | 2 | | N/A | Fish could be affected by lighting in both fluvial and coastal waters however during operation light spill would be limited and would avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | No | No |
| Power Station | 3.2 - Cessation of CW discharge | Changes in water quality. | None required. | | | | | | | 1 | 1 | | | 1 | | | | | | N/A | Positive effect on physico-chemical QEs, but no detectable effect on quality elements within the coastal WFD water body. | No | No |
| Compensation sites | 12.1 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Interception of shallow groundwater in the perimeter drains associated with the soil strip and soil mound Potential changes to groundwater recharge rates, water levels, groundwater flow direction and associated groundwater | As part of the construction method statement an adaptive management approach would be adopted, including but not limited to: Phasing of works, with incremental changes to topsoil stripping, drainage and other works, over two seasons; Treatment of suspended sediment in runoff water; | | | | | | | | | | | | | | | | | | Removal of topsoil will expose calcareous subsoil and facilitate rich-fen habitat creation by enhancing seepage zone along valley slope and creating fen meadow on valley slopes with topogenous communities in valley bottom. Diversion of calcareous water onto pasture will create spring source. Alkaline fen to be created in areas flushed with water from stream, and on areas of strong groundwater influence, within mosaic of fen meadow. Drainage will be beneficially modified by use of small dams or plank weirs, topography and lower | No | No |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | discharge. Increased rainwater leaching of substances such as metals and nutrients leading to deterioration in groundwater quality | Monitoring on and off-site before, during and following works; Adaptive management of water flows; and Enhanced revegetation, for example by planting or using nursery crops. | | | | | | | | | | | | | | | | | ground level to raise relative groundwater levels. Modification of drainage also to restore shallow groundwater flows presently intercepted by ditches. | | |
| | 12.2 - Modification of site drainage features - attenuation, sediment treatment | Changes to groundwater recharge, level, flow direction. Changes to groundwater quality from infiltrating water contact with geology Changes to groundwater baseflow to streams and ditches Changes to seepages and springs | | | | | | | | | | | | | | | | | | | No | No |
| | 12.3 - Seeding, fencing and landscaping to create wetland habitat | Changes to groundwater recharge, level, flow direction Changes to groundwater baseflow to streams and ditches | | | | | | | | | | | | | | | | | | | No | No |

## Table 3a. Cemlyn Lagoon (non reportable water bodies)

| Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|
| | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| 1.1 - Targeted removal of vegetation, mostly above ground or to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | Nant Cemlyn (and tribs) | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity | Reduction in available light to the water column, localised smothering of habitats |
| | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | Nant Cemlyn (and tribs) | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised. | | |
| 1.2 - Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only where these are inside the perimeter fence | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | Nant Cemlyn (and tribs) | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity | Reduction in available light to the water column, localised smothering of habitats |
| | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | Nant Cemlyn (and tribs) | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised. | | |
| 1.3 - Management of vegetation after grazing ceases | No impact pathway. | None required. | N/A | | | |
| 1.4 - Invasive species management | No impact pathway. | None required. | N/A | | | |
| 1.5 - Species translocation from within the perimeter fence areas to on and off-site locations | No impact pathway. | None required. | N/A | | | |
| 1.6 - Remaining demolitions to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | Nant Cemlyn (and tribs) | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity | Reduction in available light to the water column, localised smothering of habitats |
| 1.7 - Realignment of a watercourse | No impact pathway | None required. | N/A | | | |
| 1.8 - Waste management and material storage and management | No impact pathway | None required. | N/A | | | |

| Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|
| | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| 1.9 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. Run-off collected in sediment lagoons and diverted away from Nant Cemlyn | Nant Cemlyn (and tribs) | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised. | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body.Fish could experience a change within fluvial catchments. Fish could experience a change within fluvial catchments. |
| 1.10 - Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | No impact pathway. | None required. | N/A | | | |
| 1.11 - Remediation of known contaminated land | No impact pathway (activity does not take place within the Cemlyn catchment). | Appropriate controls would be in place to prevent the discharge of contamination to surface waters (e.g. testing and tankering off site if required). | N/A | | | |
| 1.12 - Use of a rock outcrop and crushing of material for security tracks and compounds | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash faculties (see chapter D5 (air quality) for further details) | N/A | Input of limited amounts of fine material to watercourse - unlikely to result in any detectable effects on channel bed substrate. | | |
| 1.13 - Site establishment, mobilisation for Main Construction works, location of temporary site offices, compounds and welfare facilities | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | Nant Cemlyn (and tribs) | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Increase in turbidity | Reduction in available light to the water column, localised smothering of habitats |

| Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|
| | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | Ground compaction by vehicles and machinery leading to changes in run-off. | None required. | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified | | Observed LIFE scores indicate that the macroinvertebrate assemblage is not characterised by species which are flow sensitive. In addition, the channel has been resectioned and managed for drainage, creating flow conditions which do not vary in response to small-scale changes in flow. It is therefore concluded that this small change in flow is unlikely to have significant consequences on the fluvial ecology of the water body.Fish could experience a change within fluvial catchments. Fish could experience a change within fluvial catchments. |
| 1.14 - Construction and commissioning of concrete batching plant and associated surface water drainage | No impact pathway | None required. | N/A | | | |
| 1.15 - Managed site-wide road network and security and access control | No impact pathway | None required. | N/A | | | |
| 1.16 - Establishment of site perimeter fence | No impact pathway | To protect surface waters, perimeter fencing would not cross the Afon Cafnan, Nant Caerdegog Isaf, Nant Cemlyn, Nant Cemaes and the Tre'r Gof SSSI drains, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | N/A | | | |
| 1.17 - Construction of the Cooling Water System breakwaters and Marine Off-Loading Facility (MOLF) including dewatering | Introduction of new structures with changes to coastal processes and hydrodynamics. | Minimise the footprint of the marine works. | N/A | | | |
| | Mobilisation of sediment from disturbance of the seabed. | | N/A | | | |

| Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|
| | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| 1.18 - Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | No impact pathway | None required. | N/A | | | |
| 1.19 - Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | No impact pathway | None required. | N/A | | | |
| 1.20 -Excavation and construction of CW intake and outfall, including tunnelling | No impact pathway | None required. | N/A | | | |
| 1.21 - Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | No impact pathway | None required. | N/A | | | |
| | Generation of dust and fine particulate matter | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash faculties (see chapter D5 (air quality) for further details) | N/A | Input of limited amounts of fine material to watercourse - unlikely to result in any detectable effects on channel bed substrate. | | |
| 1.22 - Installation and operation of a drainage system during Power Station construction | No impact pathway | None required. | Nant Cemlyn (and tribs) | | | |
| | Intrusive ground works leading to mobilisation and of soil and delivery of fine sediment. | No discharges will be made to the Nant Cemlyn | Nant Cemlyn (and tribs) | | | |
| 1.23 - Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Presence of structures (e.g. culvert and bridges)No impact pathway for Cemlyn as no culverts or bridge within the catchment. | Sensitive siting of structures. Avoidance of culverts where possible (TBC). To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | Nant Cemlyn (and tribs) | | | |
| | Mobilisation of soil into watercourses, particularly if working close to the bank | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity | Reduction in available light to the water column, localised smothering of habitats |
| | Ground compaction by vehicles and machinery leading to changes in run-off | | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised along the fluvial systems which are already modified | | Increase in flows may affect macroinvertebrates and macrophytes locally |

| Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|
| | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | Changes in water quality from drainage from roads | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | Increase in turbidity and changes to physico-chemical parameters (e.g. pH) | |
| 1.24 - Construction of temporary buildings and infrastructure, including Temporary Workers' Accommodation within the Wylfa Newydd Development Area for essential workers | No impact pathway (activity does not take place within the Cemlyn catchment) | None required. | N/A | | | |
| 1.25 - Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | Change in groundwater flows into Cemlyn Lagoon | None required. | N/A | | | |
| 1.26 - Excavation of other features including building foundations including dewatering | No impact pathway (activity does not take place within the Cemlyn catchment) | None required. | N/A | | | |
| 1.27 - Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off | Drainage would be via sediment settlement lagoons and water treatment facilities. Runoff diverted away from the Nant Cemlyn. | Nant Cemlyn (and tribs) | | | |
| | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater | | | Localised modification of water quantity with effects on flow processes and subsequently morphological features.<br>Changes in connectivity to groundwater bodies. | | |
| | Generation of dust and fine particulate matter | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash faculties | N/A | Input of limited amounts of fine material to watercourse - unlikely to result in any detectable effects on channel bed substrate. | | |
| 1.28 - Construction of internal roads, car parking, security fencing and permanent lighting | No impact pathway | To protect surface waters, perimeter fencing would not cross the Afon Cafnan, Nant Caerdegog Isaf, Nant Cemlyn, Nant Cemaes and the Tre'r Gof SSSI drains, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could | N/A | | | |

| Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|
| | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | | be crossed by the perimeter fence. | | | | |
| | Lighting shining into water bodies | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | Nant Cemlyn (and tribs) | | | Increase in artificial lighting could have very localised effects on fish behaviour and spawning |
| | No impact pathway (no hardstanding within the Cemlyn catchment) | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | | | | |
| | No impact pathway (no hardstanding within the Cemlyn catchment) | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | |
| 1.29 - Operation of the MOLF | No impact pathway | Biosecurity risk assessment, adherence to ballast water convention protocol. | N/A | | | |
| 1.30 - Operation of concrete batching plant and associated surface water drainage | No impact pathway | None required. | N/A | | | |
| 1.31 - Operation of heavy lifting crane, tower cranes, construction plant and equipment | No impact pathway | None required. | N/A | | | |
| 1.32 - Main plant construction (Unit 1 and Unit 2) | No impact pathway | None required. | N/A | | | |
| 1.33 - Construction of other buildings, structures and features | No impact pathway - no other buildings, structures or features in the Cemlyn catchment | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | N/A | | | |
| 1.34 - Final landscaping - creation of final mounds | Mobilisation of soil into watercourses, particularly if working close to the bank. Modification of flow pathways | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. Run-off diverted away from Nant Cemlyn | Nant Cemlyn (and tribs) | Localised modification of natural flows. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. | Localised intermittent increase in turbidity | Reduction in available light to the water column, localised smothering of habitats |

| Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | |
|---|---|---|---|---|---|---|
| | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology |
| | Changes to vegetation cover. Ground compaction by vehicles and machinery leading to changes in run-off | | | Changes in flow processes, altering existing morphological features. Alteration of existing riparian zone where vegetation is removed. However, impacts considered to be primarily localised. | | |
| 1.35 - Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | No impact pathway (effects relating to landscaping are covered under activity 1.34) | None required. | N/A | | | |
| 1.36 - Sewage discharge during construction | No impact pathway | None required. | N/A | | | |
| 1.37 - Disposal of material (rock and soft sediment) from marine excavation (dredging) | No impact pathway | None required. | N/A | | | |
| 1.38 - Beach landing facility | No impact pathway | None required. | N/A | | | |

## Table 3b. Cemlyn Lagoon (reportable water bodies)

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| Power Station Main Site: construction | 1.1 - Targeted removal of vegetation, mostly above ground or to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | 1 | 1 | | | | | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water body. With a 15m buffer in place very little sediment is likely to reach fluvial water body and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water body and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water body and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | | | | | | | 1 | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water body and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | 1.2 - Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only where these are inside the perimeter fence | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | 1 | 1 | | | | | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water body. With a 15m buffer in place very little sediment is likely to reach fluvial water body and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water body and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water body and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | | | | | | 1 | | | | | | | | | | | | | | N/A | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water body and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.3 - Management of vegetation after grazing ceases | No impact pathway. | None required. | | | | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| | 1.4 - Invasive species management | No impact pathway. | None required. | | | | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |

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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.5 - Species translocation from within the perimeter fence areas to on and off-site locations | No impact pathway. | None required. | | | | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| | 1.6 - Remaining demolitions to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | 1 | 1 | | | | | | | 1 | | | | | | | | | 1 | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water body. With a 15m buffer in place very little sediment is likely to reach fluvial water body and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water body and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water body and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.7 - Realignment of a watercourse | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| | 1.8 - Waste management and material storage and management | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No impact pathway | No | No |
| | 1.9 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. Run-off collected in sediment lagoons and diverted away from Nant Cemlyn | | | | | | 1 | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | | N/A | The collection of runoff from the topsoil mounds prior to vegetation will be treated, and diverted away from the Nant Cemlyn. the removal of flow from the catchment may result in a potential effect on quantity and dynamics of freshwater input. Given the small scale nature of the change this would not affect biological quality elements. | No | No |

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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.10 - Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | No impact pathway. | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.11 - Remediation of known contaminated land | No impact pathway (activity does not take place within the Cemlyn catchment). | Appropriate controls would be in place to prevent the discharge of contamination to surface waters (e.g. testing and tankering off site if required). | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.12 - Use of a rock outcrop and crushing of material for security tracks and compounds | Generation of dust and fine particulate matter. | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash faculties | | | | | | | | | | | | | | | | | | | | N/A | With dust suppression in place there are no pathways to an effect on quality elements in the coastal WFD water body. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | 1.13 - Site establishment, mobilisation for Main Construction works, location of temporary site offices, compounds and welfare facilities | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | 1 | 1 | | | | | | 1 | | | | | | | | | 1 | | N/A | During site establishment there could be some small scale groundworks to install offices/compounds and tracking of vehicles around the facilities. This could lead to localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies; however, any effects would be restricted to the location immediately surrounding the groundworks and conditions would quickly return to baseline. Embedded and good practice mitigation (drainage) would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | | Ground compaction by vehicles and machinery leading to changes in run-off. | None required. | | | | | | 1 | | 1 | | | | | | | | | | | | N/A | Changes to flows could occur; however, this effect would be localised within fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.14 - Construction and commissioning of concrete batching plant and associated surface water drainage | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.15 - Managed site-wide road network and security and access control | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.16 - Establishment of site perimeter fence | No impact pathway | Perimeter fencing would not cross the Afon Cafnan, Nant Caerdegog Isaf, Nant Cemlyn, Nant Cemaes and the Tre'r Gof SSSI drains, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.17 - Construction of the Cooling Water System breakwaters and Marine Off-Loading Facility (MOLF) including dewatering | Introduction of new structures with changes to coastal processes and hydrodynamics. | Minimise the footprint of the marine works. | | | 2 | | | | | | | | | | | | | | | | | N/A | Potential for a change in wave height as a result of the breakwaters with detectable effects in Cemlyn Bay. This could have an effect on the shingle ridge and therefore could affect overtopping. | Yes | Yes |
| | | Mobilisation of sediment from disturbance of the seabed. | | | | 2 | | | | | | | | | | | | | | | | | N/A | Excavation and dredging during the construction phase could lead to the mobilisation of suspended sediments in Cemlyn Bay which could affect Esgair Gemlyn. | Yes | Yes |
| | 1.18 - Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.19 - Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.20 -Excavation and construction of CW intake and outfall, including tunnelling | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.21 - Bulk earthworks, | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Generation of dust and fine particulate matter | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash faculties | | | | | | | | | | | | | | | | | | | | N/A | With dust suppression in place there are no pathways to an effect on quality elements in the coastal WFD water body. | No | No |
| | 1.22 - Installation and operation of a drainage system during Power Station construction | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | | Intrusive ground works leading to mobilisation and of soil and delivery of fine sediment. | No discharges will be made to the Nant Cemlyn | | | | | | | | | | | | | | | | | | | | N/A | With embedded mitigation (i.e. the diversion of run off away from the Nant Cemlyn) effects are likely to be restricted to the location immediately surrounding the ground works. | No | No |

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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.23 - Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Presence of structures (e.g. culvert and bridges) No impact pathway for Cemlyn as no culverts or bridge within the catchment. | Sensitive siting of structures. Avoidance of culverts where possible (TBC). To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | | Mobilisation of soil into watercourses, particularly if working close to the bank | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | 1 | 1 | | | | | | | 1 | | | | | | | | | 1 | | N/A | Localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies; however, any effects would be restricted to the location immediately surrounding the groundworks and conditions would quickly return to baseline. Embedded and good practice mitigation would reduce the effect such that there would be no | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
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| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | detectable effect on quality elements within the coastal WFD water body. | | |
| | | Ground compaction by vehicles and machinery leading to changes in run-off | | | | | | | 1 | | 1 | | | | | | | | | | | | N/A | Changes to flows could occur; however, this effect would be localised within fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | | Changes in water quality from drainage from roads | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | | | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | N/A | Once constructed vehicles would be using the haul roads. All runoff would be directed into the drainage system and the discharge quality would be carefully controlled. There remains potential for effects on turbidity, changes to nutrients and specific pollutant concentrations. These effects are would be localised so effects on BQEs would be possible but are not likely to be detectable. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.24 - Construction of temporary buildings and infrastructure, including Temporary Workers' Accommodation within the Wylfa Newydd Development Area for essential workers | No impact pathway (activity does not take place within the Cemlyn catchment) | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.25 - Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | Change in groundwater flows into Cemlyn Lagoon | None required. | | | | | | 1 | | | | | | | | | | | | | | N/A | Deep excavation includes dewatering of basements for unit 1 and unit 2 which could affect the quantity of groundwater reaching Cemlyn Lagoon. However, the lagoon is over 1km from the deep excavations and the reduction in groundwater reaching the lagoon has been modelled and is predicted to be <1m3 per day. This loss is very small in comparison to the surface water fluvial input from Nant Cemlyn (recorded in baseline monitoring as between 112m3 per day to 27,994m3 per day (see appendix D8-1)). There would be no detectable change in the input from groundwater into this WFD water body. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.26 - Excavation of other features including building foundations including dewatering | No impact pathway (activity does not take place within the Cemlyn catchment) | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.27 - Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off | Drainage would be via sediment settlement lagoons and water treatment facilities. Runoff diverted away | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect | No | No - given the diversion of run off away from Nant Cemlyn there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater | from the Nant Cemlyn. | | | | | | | | | | | | | | | | | | | | N/A | Localised effect on the fluvial water body. There would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | | Generation of dust and fine particulate matter | Good practice mitigation to reduce emissions of dust including the use of water suppression and wheel-wash faculties (see chapter D5 (air quality) for further details) | | | | | | | | | | | | | | | | | | | | N/A | With dust suppression in place there are no pathways to an effect on quality elements in the coastal WFD water body. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.28 - Construction of internal roads, car parking, security fencing and permanent lighting | No impact pathway | To protect surface waters, perimeter fencing would not cross the Afon Cafnan, Nant Caerdegog Isaf, Nant Cemlyn, Nant Cemaes and the Tre'r Gof SSSI drains, and would be sited 15m from the edge of these watercourses. Minor watercourses and ditches could be crossed by the perimeter fence. | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | | Lighting shining into water bodies | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | | | | | | | | | | | | | | | | | | 1 | | N/A | Fish could be affected by lighting in both fluvial and coastal waters. Lighting could attract some species and deter other and can disrupt feeding, migration and spawning. However, there are limited works within the Cemlyn catchment and with embedded mitigation to minimise light spill and avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | No | No |
| | | No impact pathway (no hardstanding within the Cemlyn catchment) | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | | No impact pathway (no hardstanding within the Cemlyn catchment) | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.29 - Operation of the MOLF | No impact pathway | Biosecurity risk assessment, adherence to ballast water convention protocol. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.30 - Operation of concrete batching plant and associated surface water drainage | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.31 - Operation of heavy lifting crane, tower cranes, construction plant and equipment | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.32 - Main plant construction (Unit 1 and Unit 2) | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.33 - Construction of other buildings, structures and features | No impact pathway - no other buildings, structures or features in the Cemlyn catchment | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | 1.34 - Final landscaping - creation of final mounds | Mobilisation of soil into watercourses, particularly if working close to the bank. Modification of flow pathways | To protect surface waters, a 15m buffer would be in place along the Nant Cemlyn. Run-off diverted away from Nant Cemlyn | 1 | 1 | | | | | | | 1 | | | | | | | | | | | N/A | Localised variation in deposition of sediment on the bed within the fluvial water body; however, any effects would be restricted to the location immediately surrounding the landscaping works and given the small scale nature of the works (restricted to landscaping rather than moving large volumes of material) conditions would quickly return to baseline. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | | |
| | | Changes to vegetation cover. Ground compaction by vehicles and machinery leading to changes in run-off | | | | | | | 1 | | | | | | | | | | | | | | N/A | Changes to flows could occur; however, this effect would be localised within fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.35 - Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | No impact pathway (effects relating to landscaping are covered under activity 1.34) | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.36 - Sewage discharge during construction | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Consideration of potential effects upon TRAC hydromorphological quality elements (selected ones applicable to Cemlyn Lagoon) | | Consideration of potential effects upon saline lagoon hydromorphological quality elements | | | | | Consideration of potential effects chemical and physico-chemical quality elements | | | | | Consideration of potential effects biological quality elements | | | | | Fish | Priority substances | Water body measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Depth variation | Structure and substrate of the coastal bed | Structure and integrity of the lagoon banks i.e. intertidal zone | Structure and integrity of the saline-water inlet/outlet | Quantity and dynamics of saline water exchange | Quantity and dynamics of freshwater input and output | Turbulence (water-mixing) | Salinity, including range | Turbidity | pH | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Nektonic crustaceans | Submerged aquatic flora | Fauna associated with the submerged aquatic flora | | | | | | |
| | 1.37 - Disposal of material (rock and soft sediment) from marine excavation (dredging) | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 1.38 - Beach landing facility | No impact pathway | None required. | | | | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

## Table 4. Caernarfon Bay North

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects on non-reportable fluvial water bodies that are connected to the WFD water body | | | | Consideration of potential effects upon hydromorphological quality elements | | | | | Chemical and physico-chemical quality elements | | | | | | Biological quality elements | | | Fish | Priority substances | Water body mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Relevant non-reportable fluvial water bodies | Potential effects on hydromorphology | Potential effects on chemistry and physico-chemical parameters | Potential effects on biology/ecology | Depth variation | Structure and substrate of the coastal bed | Structure of the intertidal zone | Direction of dominant current | Wave exposure | Transparency | Thermal conditions | Oxygenation conditions | Salinity | Nutrient conditions | Specific pollutants | Benthic inverts | Phytoplankton | Aquatic flora | | | | | | |
| Power Station Main Site: construction | 1.37 - Disposal of material (rock and soft sediment) from marine excavation (dredging) | Release of soft sediment at the Disposal Site | None required. | | | | | | | | | | 1 | | | | | 1 | | | | 1 | | N/A | Increases in SSCs beyond typical background concentrations are highly transitory. More than three hours following a single disposal event all sediment would have dispersed to such a degree that SSCs would be within typical background concentrations. The maximum dissolved concentration of contaminants resulting from dredging and excavation is several orders of magnitude below the EQS and there would be no effect on physico-chemical quality elements. To assess the potential coincidence of the proposed sediment disposal with ongoing maintenance dredging a scenario was modelled soft sediment from the Wylfa Newydd Project was released at the same time as maintenance dredging disposal from Holyhead Port. The cumulative effect from the addition of the proposed sediment disposal was not readily discernible from that of the much larger port releases. The largest extent of the sediment plume is shown in Figure 8. The predicted increase is below 1.5mg/L above background which is likely to be below the limit of detection and would be a temporary effect. | No | No |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Highway improvements (off-line) | 4.2 - Hard bank protection/ embankment structures | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | Nant Carrelgwyd | Localised changes to water quantity within the channel potentially with effects on flow processes and morphological features. Connection to groundwater bodies could be altered. | | | | | | | | | | | | | | | | | | | N/A | Changes in water quantity within the Nant Carrelgwyd, conveyance and morphological processes. There would be no detectable effects on quality elements within the coastal water body | No | No |
| | 4.3 - Water body realignment or removal | Mobilisation of soil into watercourses, particularly if working close to the bank. | None required. | Nant Carrelgwyd | Localised modification of bed substrates from fine sediment input due to smothering. Potential localised changes to sediment processes, with potential for deposition which could lead to channel change. Changes to flow processes from new realigned channel courses. | Increase in turbidity. | Reduction in available light to the water column, smothering of habitats. Modification of submerged habitats. | | | | | | | | | | | | | | | | | N/A | Change in hydromorphological features within the Nant Carrelgwyd resulting in changes to benthic invertebrates and aquatic flora composition The overall permanent change would lead to an improvement (benefit) to habitat and morphological processes. | No | No - given the location of the works from the coastal water body, the embedded and good practice mitigation and the duration of this activity alone, there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 4.4 - Water body crossings (culverts/bridge construction) | Mobilisation of soil into watercourses, particularly if working close to the bank | None required. | Nant Carrelgwyd | Localised modification to hydromorphological processes including removal of natural bed and banks. Changes to flow and sediment processes as a result of new structures and new discharges. Changes to lateral and longitudinal connectivity locally. | Shading of watercourse could modify local physico chemical process, including temperature. | Reduction in connectivity between up and down stream environments. Changes to channel shading and bank structure. | | 1 | | | | | | | | | | | | | | | N/A | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water body. However very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the excavation works. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4.5 - New outfalls and discharges | Discharges from new outfalls | Following good practice guidance for structure design. Discharges released at greenfield runoff rates. | Nant Carrelgwyd | | Increase in turbidity, changes to dissolved oxygen levels, nutrients and possibly other pollutants. | | | | | | | | | | | | | | | | | | N/A | Localised changes to water quality within the Carrelgwyd, with no pathways to impacts at a coastal WFD water body scale. | No | No |

## Table 5. Alaw (transitional)

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects upon hydromorphological quality elements | | | | | Chemical and physico-chemical quality elements | | | | | | Biological quality elements | | | Priority substances | Water body mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Morphological conditions: depth | Morphological conditions: quantity, structure and substrate | Morphological conditions: structure of the intertidal zone | Tidal regime: freshwater flow | Tidal regime: wave exposure | Transparency | Thermal conditions | Oxygenation conditions | Salinity | Nutrient conditions | Specific pollutants | Fish | Benthic invertebrates | Aquatic flora | | | | | |
| Highway improvements (off-line) | 4.1 - Earthworks | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Implementation of a CoCP. | | 1 | | | | 1 | | | | | | 1 | 1 | 1 | | N/A | Works are 240m upstream over the Alaw-downstream Llyn Alaw water body. This could potentially result in Increased fine sediment loading reaching the Alaw (transitional). However, given the extent of the works and the effects predicted upstream, there would be no detectable effect on bed substrate, transparency or on BQEs. | No | No |
| | 4.2 - Hard bank protection/ embankment structures | No impact pathway. | None required. | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 4.3 - Water body realignment or removal | No impact pathway. | None required. | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 4.4 - Water body crossings (culverts/bridge construction) | Fine sediment input from in-channel working | Implementation of a CoCP. | | | | 1 | 1 | | 1 | | | | 1 | 1 | 1 | 1 | | N/A | Works are 240m upstream over the Alaw-downstream Llyn Alaw water body. This could potentially result in Increased fine sediment loading reaching the Alaw (transitional). However, given the extent of the works and the effects predicted upstream, there would be no detectable effect on bed substrate, transparency or on BQEs. | No | No |
| | | Physical presence of a structure across a watercourse | Following good practice guidance for structure design | | | | | | 1 | | | | | | | | | | N/A | No direct works in the Alaw (transitional). Physical presence of a viaduct over the Alaw-downstream Llyn Alaw locally removing riparian vegetation in the fluvial WFD water body. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 4.5 - New outfalls and discharges | Fine sediment input from in-channel working | Implementation of a CoCP. | | | | 1 | 1 | | 1 | | | | 1 | 1 | 1 | 1 | | N/A | Works are 240m upstream over the Alaw-downstream Llyn Alaw water body. This could potentially result in Increased fine sediment loading reaching the Alaw (transitional). However, given the extent of the works and the effects predicted upstream, there would be no detectable effect on bed substrate, transparency or on BQEs. | No | No |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | | | | 1 | | | | | | | | | | N/A | No direct works in the Alaw (transitional). Physical presence of a viaduct over the Alaw-downstream Llyn Alaw locally removing riparian vegetation in the fluvial WFD water body. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | | Discharges from new outfalls | Following good practice guidance for structure design. Discharges released at greenfield runoff rates. | | 1 | | | | 1 | 1 | | | | 1 | | | | 1 | N/A | No direct works in the Alaw (transitional). However, changes in discharges upstream have the potential to influence physiochemical quality elements and increase the availability to priority substances draining the road. Discharges from new outfalls would be at greenfield runoff rates and potential impacts from discharges anticipated to be localised and minimal. | No | No |

## Table 6. Alaw - downstream Llyn Alaw

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects upon hydromorphological quality elements | | | | | | Chemical and physico-chemical quality elements | | | | | Biological quality elements | | | | Priority substances | Water body mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Quantity and dynamics of flow | Connection to groundwater | River continuity | River depth and width variation | Bed substrate | Riparian zone | Thermal conditions | Oxygenation conditions | Salinity | Acidification status | Nutrient conditions | Fish | Macroinvertebrates | Phytobenthos | Macrophytes | | | | | |
| Highway improvements (off-line) | 4.1 - Earthworks | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Removal of riparian corridor | Implementation of a CoCP. | | | | | | 1 | | | | | | | | | | | N/A | Removal of existing riparian vegetation along the watercourses. However, the existing vegetation is currently of low quality (typically grasses and shrubs) and there would not be a significant effect at a WFD water body scale. | No | No |
| | 4.2 - Hard bank protection/ embankment structures | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | | | | | 1 | 1 | | | | N/A | Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 4.3 - Water body realignment or removal | In-channel working and removal of riparian vegetation for construction of realignment | Implementation of a CoCP. | | | 1 | 1 | 1 | 1 | | | | | | 1 | 1 | | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Release of flow into realignment and use of new channel | Good practice design. | | | 1 | 1 | | | | | | | | | | | | | N/A | Realignments would only take place on very small ditches or drains and would be designed to mimic the existing channel conditions and would maintain longitudinal connectivity. Local changes, but no effects anticipated at a WFD water body scale. | No | No |
| | 4.4 - Water body crossings (culverts/bridge construction) | Fine sediment input from in-channel working | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | | | | | 1 | 1 | | | | N/A | Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | | Physical presence of a structure across a watercourse | Following good practice guidance for structure design | | | 1 | | | 1 | 1 | | | | | | | | | | N/A | Physical presence of a viaduct over the WFD water body locally removing riparian vegetation. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 4.5 - New outfalls and discharges | Fine sediment input from in-channel working | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Removal of riparian corridor | Implementation of a CoCP. | | | | | | 1 | | | | | | | | | | | N/A | Removal of existing riparian vegetation along the watercourses. However, the existing vegetation is currently of low quality (typically grasses and shrubs) and there would not be a significant effect at a WFD water body scale. | No | No |
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | | | | | 1 | 1 | | | | N/A | Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Discharges from new outfalls | Following good practice guidance for structure design. Discharges released at greenfield runoff rates. | 1 | 1 | | | | | 1 | 1 | | | | | | | | 1 | N/A | Changes in discharge have the potential to influence physiochemical quality elements and increase the availability to priority substances draining the road. Discharges from new outfalls would be at greenfield runoff rates and potential impacts from discharges anticipated to be localised and minimal. | No | No |

## Table 7. Tan R'Allt

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects upon hydromorphological quality elements | | | | | | Chemical and physico-chemical quality elements | | | | | Biological quality elements | | | | Priority substances | Water body mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Quantity and dynamics of flow | Connection to groundwater | River continuity | River depth and width variation | Bed substrate | Riparian zone | Thermal conditions | Oxygenation conditions | Salinity | Acidification status | Nutrient conditions | Fish | Macroinvertebrates | Phytobenthos | Macrophytes | | | | | |
| Highway improvements (off-line) | 4.1 - Earthworks | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Removal of riparian corridor | Implementation of a CoCP. | | | | | | 1 | | | | | | | | | | | N/A | Removal of existing riparian vegetation along the watercourses. However, the existing vegetation is currently of low quality (typically grasses and shrubs) and there would not be a significant effect at a WFD water body scale. | No | No |
| | 4.2 - Hard bank protection/ embankment structures | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | | | | | 1 | 1 | | | | N/A | Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 4.3 - Water body realignment or removal | In-channel working and removal of riparian vegetation for construction of realignment | Implementation of a CoCP. | | | 1 | 1 | 1 | 1 | | | | | | 1 | 1 | | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Release of flow into realignment and use of new channel | Good practice design. | | | 1 | 1 | | | | | | | | | | | | | N/A | Realignments would only take place on very small ditches or drains and would be designed to mimic the existing channel conditions and would maintain longitudinal connectivity. Local changes, but no effects anticipated at a WFD water body scale. | No | No |
| | 4.4 - Water body crossings (culverts/bridge construction) | Fine sediment input from in-channel working | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | 1 | | | | 1 | 1 | 1 | 1 | | N/A | Physical presence of a culvert in the watercourses locally removing bed and bank material. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 4.5 - New outfalls and discharges | Fine sediment input from in-channel working | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Removal of riparian corridor | Implementation of a CoCP. | | | | | | 1 | | | | | | | | | | | N/A | Removal of existing riparian vegetation along the watercourses. However, the existing vegetation is currently of low quality (typically grasses and shrubs) and there would not be a significant effect at a WFD water body scale. | No | No |
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | 1 | | | | 1 | 1 | 1 | 1 | | N/A | Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Discharges from new outfalls | Following good practice guidance for structure design. Discharges released at greenfield runoff rates. | 1 | 1 | | | | | 1 | 1 | | | | | | | | 1 | N/A | Changes in discharge have the potential to influence physiochemical quality elements and increase the availability to priority substances draining the road. Discharges from new outfalls would be at greenfield runoff rates and potential impacts from discharges anticipated to be localised and minimal. | No | No |
| Construction of the AECC/MEEG/ESL | 5.1 - Contractors site compound including fuel storage area and welfare facilities | | | | | | | | | | | | | | | | | | | N/A | | | |
| | 5.2 - Topsoil stripping and formation of landscaping areas | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 5.3 - New buildings would likely have pile foundations and a piling mat would be placed to facilitate construction | Potential interaction with groundwater | - | | 1 | | | | | | | | | | | | | | | N/A | Addressed under the Ynys Mon Secondary tab. | No | No |
| | 5.4 - Storage and use of granular materials for forming roads and building sub-base | Potential fine sediment runoff from storage areas | Implementation of a CoCP and construction drainage | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 5.5 - Storage and use of cement related materials | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5.6 - Construction of an underground storm-water attenuation tank beneath the site to collect runoff from buildings and hardstanding, and to discharge into an existing watercourse | Potential fine sediment runoff from storage areas | Implementation of a CoCP and construction drainage | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 5.7 - Construction of roads and buildings | Potential fine sediment runoff from storage areas | Implementation of a CoCP and construction drainage | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| Operation of the AECC/MEEG/ESL | 6.1 - Operation of a backup generator with associated fuel storage | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | No | No |
| | 6.2 - Management of storm water runoff during operations | No impact pathway. | None required. | | | | | | | | | | | | | | | | | N/A | No pathway to effect. | | |
| | 6.3 - Operation of a laboratory with discharge of water after analysis of samples | Discharges from new outfalls | Following good practice guidance for structure design. Discharges released at greenfield runoff rates. | 1 | 1 | | | | | 1 | 1 | | | | | | | | 1 | N/A | Changes in discharge have the potential to influence physiochemical quality elements and increase the availability to priority substances draining the site. Discharges from new outfalls would be at greenfield runoff rates and potential impacts from discharges anticipated to be localised and minimal. | No | No |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | 1 | | | | 1 | 1 | 1 | 1 | | N/A | Physical presence of a culvert in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 6.4 - Discharge of foul water to sewer or operation of a packaged treatment plant with discharge to surface water | Discharges from new outfalls | Following good practice guidance for structure design. Discharges released at greenfield runoff rates. | 1 | 1 | | | | | 1 | 1 | | | | | | | | 1 | N/A | Changes in discharge have the potential to influence physiochemical quality elements and increase the availability to priority substances draining the site. Discharges from new outfalls would be at greenfield runoff rates and potential impacts from discharges anticipated to be localised and minimal. | No | No |
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | 1 | | | | 1 | 1 | 1 | 1 | | N/A | Physical presence of a culvert in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| Decommissioning of the AECC/MEEG/ESL | 7.1 - Return of the site to agricultural land | Potential fine sediment runoff from storage areas | Implementation of a CoCP and construction drainage | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Decommissioning works are not known in detail at this stage, but it is anticipated that the works will be similar to those undertaken during construction. The structures that would remain in situ have been assessed as part of the operation of the Park and Ride Facilities and are not considered as part of the decommissioning. There would be no impacts at a WFD water body scale. | No | No |

## Table 8. Cleifiog (Valley)

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects upon hydromorphological quality elements | | | | | | Chemical and physico-chemical quality elements | | | | | Biological quality elements | | | | Priority substances | Water body mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Quantity and dynamics of flow | Connection to groundwater | River continuity | River depth and width variation | Bed substrate | Riparian zone | Thermal conditions | Oxygenation conditions | Salinity | Acidification status | Nutrient conditions | Fish | Macroinvertebrates | Phytobenthos | Macrophytes | | | | | |
| Highway improvements (off-line) | 4.1 - Earthworks | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Removal of riparian corridor | Implementation of a CoCP. | | | | | | 1 | | | | | | | | | | | N/A | Removal of existing riparian vegetation along the Afon Cleifiog and smaller watercourses. However, the existing vegetation is currently of low quality (typically grasses and shrubs) and there would not be a significant effect at a WFD water body scale. | No | No |
| | 4.2 - Hard bank protection/ embankment structures | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | | | | | 1 | 1 | | | | N/A | Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 4.3 - Water body realignment or removal | In-channel working and removal of riparian vegetation for construction of realignment | Implementation of a CoCP. | | | 1 | 1 | 1 | 1 | | | | | | 1 | 1 | | 1 | | N/A | Disturbance of fine sediment from in-channel working. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Release of flow into realignment and use of new channel | Good practice design. | | | 1 | 1 | | | | | | | | | | | | | N/A | Realignments would only take place on very small ditches or drains and would be designed to mimic the existing channel conditions and would maintain longitudinal connectivity. Local changes, but no effects anticipated at a WFD water body scale. | No | No |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4.4 - Water body crossings (culverts/bridge construction) | Fine sediment input from in-channel working | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | 1 | | | | 1 | 1 | 1 | 1 | | N/A | Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 4.5 - New outfalls and discharges | Fine sediment input from in-channel working | Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Removal of riparian corridor | Implementation of a CoCP. | | | | | | 1 | | | | | | | | | | | N/A | Removal of existing riparian vegetation along the watercourses. However, the existing vegetation is currently of low quality (typically grasses and shrubs) and there would not be a significant effect at a WFD water body scale. | No | No |
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | | 1 | 1 | 1 | | 1 | 1 | | | | 1 | 1 | 1 | 1 | | N/A | Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | | Discharges from new outfalls | Following good practice guidance for structure design. Discharges released at greenfield runoff rates. | 1 | 1 | | | | | 1 | 1 | | | | | | | | 1 | N/A | Changes in discharge have the potential to influence physiochemical quality elements and increase the availability to priority substances draining the road. Discharges from new outfalls would be at greenfield runoff rates and potential impacts from discharges anticipated to be localised and minimal. | No | No |

## Table 9. Crigyll

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects upon hydromorphological quality elements | | | | | | Chemical and physico-chemical quality elements | | | | | Biological quality elements | | | | Priority substances | Water body mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Quantity and dynamics of flow | Connection to groundwater | River continuity | River depth and width variation | Bed substrate | Riparian zone | Thermal conditions | Oxygenation conditions | Salinity | Acidification status | Nutrient conditions | Fish | Macroinvertebrates | Phytobenthos | Macrophytes | | | | | |
| Construction of Park and Ride Facilities at Dalar Hir | 8.1 - Site clearance, including demolition of agricultural buildings and possible vegetation clearance | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | | | | 1 | 1 | | | | | | | | | | | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Removal of riparian vegetation | | 1 | | | | | 1 | | | | | | | | | | | N/A | Removal of existing riparian vegetation along the Nant Dalar Hir and smaller watercourses. However, the existing vegetation is currently of low quality (typically grasses and shrubs) and there would not be a significant effect at a WFD water body scale. | No | No |
| | 8.2 - Locating and establishing site compound, welfare facilities (on the site of demolished agricultural buildings) and any storage of fuel and oil for plant and equipment | Increase impermeable areas leading to changes in flow pathways | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | 1 | 1 | | | | | | | | | | | | | | | N/A | The construction of the Park and Ride would lead to increased impermeable areas and changes to existing flow pathways due to the construction of compounds and compaction of the ground in the short term, prior to drainage being installed. This could lead to changes in the flows in the watercourses altering both the morphology and fluvial processes. Taking into account the embedded mitigation to control flood risk, there is not anticipated to be an impact at a WFD water body scale. | No | No |

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| | 8.3 - Topsoil strip to all areas outside buffer zones | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 8.4 - Excavation of topsoil to allow placement of sub-base for all roads, bus drop-off areas and pedestrian footway | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 8.5 - Permeable paving in car park areas, including a drainage layer which would be built from topsoil strip depth upwards | Increase impermeable areas leading to changes in flow pathways | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | 1 | 1 | | | | | | | | | | | | | | | N/A | The construction of the Park and Ride would lead to increased impermeable areas and changes to existing flow pathways due to the construction of compounds and compaction of the ground in the short term, prior to drainage being installed. This could lead to changes in the flows in the watercourses altering both the morphology and fluvial processes. Taking into account the embedded mitigation to control flood risk, there is not anticipated to be an impact at a WFD water body scale. | No | No |
| | 8.6 - Excavation for foundations for new buildings (minimum of 900mm below ground level) | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |

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| | 8.7 - Landscaping activities that could include locating landscaping bunds to control surface water movement during flood events | Landscaping | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | | | | | | 1 | | | | | | | | | | | N/A | Localised removal of some vegetation leading to changes in the riparian zone. | No | No |
| | 8.8 - The construction of site drainage channels, outfalls and a storm water attenuation tank | Mobilisation of fine sediment | Implementation of Code of Construction Practice. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Localised additional mobilisation of sediment from the channel bed and disruption to the natural bed and banks of the watercourses. This could potentially result in changes to the sediment regime and flow processes as well as leading to channel adjustment through erosion. No impact anticipated at a WFD water body scale. | No | No |
| | | Removal of riparian vegetation | Implementation of Code of Construction Practice. | | | | | | 1 | | | | | | | | | | | N/A | Localised removal of vegetation around outfalls, leading to changes in the riparian zone. However, these are very localised and there would not be an impact at a WFD water body scale. | No | No |
| | 8.9 - Construction of a clear span bridge across Nant Dalar Hir | Removal of riparian vegetation | Buffer zone around Nant Dalar Hir. | | | | | | 1 | | | | | | | | | | | N/A | Localised removal of vegetation around outfalls, leading to changes in the riparian zone. However, these are very localised and there would not be an impact at a WFD water body scale. | No | No |
| | | Works within the channel margins leading to fine sediment mobilisation. | Buffer zone around Nant Dalar Hir. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Localised additional mobilisation of sediment from disruption to the natural banks of the watercourse. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. This could potentially result in changes to the sediment regime and flow processes as well as leading to channel adjustment through erosion. No impact anticipated at a WFD water body scale. | No | No |
| Operation of Park and Ride Facilities at Dalar Hir | 9.1 - Private cars parked on-site, staff using the facility building, staff being picked up from the bus parking area and the buses entering/exiting the facility | Fine sediment input to watercourses from site runoff | Installation of a drainage system with treatment of runoff prior to discharge to watercourses | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Localised additional mobilisation of sediment from disruption to the natural banks of the watercourse. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. This could potentially result in changes to the sediment regime and flow processes as well as leading to channel adjustment through erosion. No impact anticipated at a WFD water body scale. | No | No |
| | | Changes in overland flow paths | Installation of a drainage system with treatment of runoff prior to discharge to watercourses | 1 | 1 | | 1 | | | | | | | | | | | | | N/A | Changes in the flows in the watercourses altering both the morphology and fluvial processes. With the inclusion of embedded mitigation in the form of using permeable paving (where possible) and the presence of geo-cellular storage discharging at existing greenfield runoff rates, there would be no impacts at a WFD water body scale. | No | No |

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| Decommissioning of Park and Ride Facilities at Dalar Hir | 10.1 -Return of the site to agricultural land. The bridge would remain in situ across the Nant Dalar Hir and some culverts would remain along the watercourses | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. | | | | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | 1 | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | In-channel working for removal of structures leading to fine sediment mobilisation and disturbance of the bed and banks | Implementation of Code of Construction Practice. | | | | 1 | 1 | 1 | | | | | | | | | | | N/A | Decommissioning works are not known in detail at this stage, but it is anticipated that the works will be similar to those undertaken during construction. The structures that would remain in situ have been assessed as part of the operation of the Park and Ride Facilities and are not considered as part of the decommissioning. There would be no impacts at a WFD water body scale. | No | No |

## Table 10. Ynys Môn Secondary

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Quantitative status | | | | Chemical status | | | | | Summary of potential effects and risks identified, to groundwater in Ynys Mon Secondary Aquifer | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Saline or other intrusion | Surface water | GWDTE | Water Balance | Saline or other intrusion | Surface water | GWDTE | Drinking Water protected areas | General quality assessment | | | |
| Power Station Main Site: construction | 1.1-Targeted removal of vegetation, mostly above ground or to ground level | Altered rainwater runoff with changed groundwater recharge rates and groundwater levels Potential for changes to groundwater quality from the ongoing leaching (primarily nutrients) of exposed soils from rainwater infiltration. | Specific activities within the CoCP including monitoring of groundwater and surface water levels/flow.<br>No works would take place within the Tre'r Gof or Cae Gwyn SSSI boundary. | | | | | | | | | | There will be some small changes to recharge but the quantitative effect is considered to be negligible.<br>The short period of implementation and embedded mitigation rule out any significant quality change from leaching. | No | No |
| | 1.2 - Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only where these are inside the perimeter fence | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.3 - Management of vegetation after grazing ceases | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.4 - Invasive species management | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.5 - Species translocation from within the perimeter fence areas to on and off-site locations | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.6 - Remaining demolitions to ground level | Changes to groundwater quality from the disturbance of ground could occur as rainwater percolates through the exposed soils and contamination. | CoCP | | | | | | | | | | With monitoring to identify and trigger remediation of any contaminated ground, the effects on groundwater quality will be negligible | No | No |
| | 1.7 - Realignment of a watercourse | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.8 - Waste management and material storage and management | see 1.13 | N/A | | | | | | | | | | N/A | No | No |

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| | 1.9 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Interception of shallow groundwater in the perimeter drains associated with the soil strip and soil mound<br>Potential changes to groundwater recharge rates, water levels, groundwater flow direction and associated groundwater discharge.<br>Increased rainwater leaching of substances such as metals and nutrients leading to deterioration in groundwater quality | Grassing of topsoil storage areas immediately after completion of soil placement.<br>Targeted remediation of contaminated land identified in ground investigations.<br>No works would take place within the Tre'r Gof or Cae Gwyn SSSI boundary.<br>Drainage works | | 1 | 1 | | | 1 | 1 | 1 | | Change in the recharge to the aquifer would be largely unaffected. Any effects on associated receptors such as PWS, baseflow to local streams or GWDTE are likely to be localised and so small as to be unobservable. | No | Very closely associated with mound creation |
| | 1.10 - Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.11 - Remediation of known contaminated land | Leaching of substances by rainfall infiltration could be enhanced in areas where contaminated land is exposed and lead to deterioration in groundwater quality and effects on associated receptors such as local streams or groundwater-dependent ecosystems. | Investigations to determine contaminated land would be undertaken prior to site enabling works proceeding.<br>Areas of contaminated land would be remediated and managed prior to the Main Construction works or during the Enabling Works.<br>To protect groundwater quality and to maintain the existing flow regime, no rock would be removed from the rock winning area from beneath the water table. | | | | | | | 1 | 1 | | Any contamination identified would be pre-existing and overall there would be a net benefit to groundwater quality from contaminated land remediation. | No | No |
| | 1.12 - Use of a rock outcrop and crushing of material for security tracks and compounds | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.13 - Site establishment, mobilisation for Main Construction works, location of temporary site offices, compounds and welfare facilities | Changes to groundwater quality from the disturbance of ground, fuel or oil leaks from construction plant<br>Perimeter drains to the soil strip and mounding areas has the potential to intercept water which would have previously recharged | Permeable surfacing to tracks, haul roads, compounds and laydown areasEngineered containment for the fuel storage area.<br>Construction phase drainage would be installed prior to works and fitted with spills or leaks pollution control structures, such as oil interceptors. Baseline monitoring of surface and groundwater receptors will continue. Details of the storage and use of oils, fuels and cement-based materials set out in the CoCP including Environmental Emergency Preparedness and Response Procedure. | | | | | | | | 1 | | With embedded mitigation and best practice no quality or quantitative impacts are predicted. | No | No |

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| | 1.14 - Construction and commissioning of concrete batching plant and associated surface water drainage | Migration of cement in water could cause deterioration in the pH and alkalinity of water quality | Bunding<br>Fractures below ground in bedrock would be dewatered prior to concrete pours<br>Specific CoCP activities including: storage, use of cement-based materials - pre-cast concrete pipes and outfall structures, etc., emergency management and monitoring of water quality.<br>Drainage water treatment facilities around the Tre'r Gof SSSI | | | | | | | 1 | 1 | | With embedded mitigation and best practice, there would be no complete impact pathways for cement contamination to enter into groundwater, therefore no effect of the construction works on water quality. | No | No |
| | 1.15 - Managed site-wide road network and security and access control | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.16 - Establishment of site perimeter fence | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.17 - Construction of the Cooling Water System breakwaters and Marine Off-Loading Facility (MOLF) including dewatering | The dewatering associated with the CWS breakwaters and MOLF excavations may include a small amount of local groundwater dewatering during construction of the semi dry and wet marine area and could:<br><br>• cause groundwater levels to fall in local groundwater abstractions and water-dependent ecosystems.<br>• cause groundwater flow direction reversal with the result that sea water would be drawn into the aquifer<br>• could affect local PWS<br>• could affect baseflow to surface waters | Groundwater level and surface water flow and quality monitoring<br>Shotcreting of walls and water bearing fractures if encountered<br>Other engineering interventions<br>Extensive drainage system<br>Groundwater and surface water level, flow and quality monitoring<br>Application for Permit for dewatering and drainage | 2 | 1 | 1 | 1 | 2 | | 1 | 1 | | The groundwater model predicts that saline intrusion of very limited extent (6.5 $m^3$/d) could occur on the seaward side of a small 200m length of coast north of the MOLF. There are no predicted effects on PWS from the CW/MOLF dewatering drawdown.<br>There will be no effect from the CW/MOLF dewatering induced drawdown on the Tre'r Gof SSSI groundwater interest.<br>There will be non-observable effects on surface waters | Yes. Further assessment of the duration and extent of saline intrusion from this activity is required | Yes, with Power Station excavation and dewatering |
| | 1.18 - Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | See 1.17 | See 1.17 | | | | | | | | | | see 1.17 | Yes, see 1,17 | No |
| | 1.19 - Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | see 1.20 | see 1.20 | | | | | | | | | | see 1.20 | See 1.20 | No |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.20 - Excavation and construction of CW intake and outfall, including tunnelling | Excavation of the cooling water outfall tunnel would be cut-and-cover for a 200m section of tunnel closest to the excavation for the generating units and at the outfalls to the north of the Existing Power Station. The remaining section of cooling water outfall tunnel would be a bored tunnel constructed by road header and drill and blast methods depending on depth and ground conditions. The northern cut and cover part of the cooling water outfall tunnel would be constructed within the Gwna Group bedrock where groundwater flow is greatest. There would be limited inflows of groundwater into the tunnel during construction with local dewatering down to an elevation of approximately -13.5mAOD for the cooling water intakes. The remainder of the tunnel is in the New Harbour Group and as such, the majority of the cooling water outfall tunnel is likely to be constructed beneath the higher permeability fractured zone with little dewatering. Potential pathways could:• cause groundwater levels to fall in local groundwater abstractions and water-dependent ecosystems. • cause groundwater flow direction reversal with the result that sea water would be drawn into the aquifer • could affect baseflow to surface watersAs the tunnel would only be some 5m to 7m in diameter, groundwater could easily move over and below it, such that it would not form a significant barrier to groundwater flow. | The construction technique of the tunnel would include the use of shotcreting to ensure tunnel wall stability and reduce groundwater inflow to the tunnel during construction and also the use of in situ cast permanent concrete lining. With this construction method, the tunnel is unlikely to form a high permeability flowpath for groundwater movement or act as a drain for groundwater. A drain would be installed around this shotcreted excavation for passive drainage, with the drains at an elevation of 6mAOD | | 1 | 1 | 1 | | | | | | If dewatering of the bedrock aquifer is required for the northern cut-and-cover section of the tunnel, where the greatest risk from dewatering is, drawdowns of groundwater levels in the bedrock at the Tre'r Gof SSSI could occur as within catchment. However, as dewatering would be short-term (inflows would be sealed as tunnelling progresses) and only have a local effect (approximately 10m drawdown at the tunnel) and as deep groundwater inputs to the SSSI are a minor component of the SSSI's water balance, tunnel construction would not affect the Tre'r Gof SSSI water balance. Based on the groundwater level contours for the superficial deposits, these excavations are also unlikely to affect shallow groundwater flows which may be input to the SSSI. The effects of the cooling water outfall tunnel construction dewatering on the water levels and flow direction in the aquifer are considered to be local with no reversal of flow and therefore no saline intrusion risk. | No | No |

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| | 1.21 - Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Changes to groundwater recharge (both increase and decrease), water levels, flow direction and discharge points<br>Potential consequent change in local surface water baseflow<br>Interception of shallow groundwater by perimeter drains, cutting off groundwater seepages and springs which partially sustain the Tre'r Gof SSSI.<br>Alteration of the bedrock aquifer groundwater regime in the longer term at Cae Gwyn<br>Changes to groundwater quality on local streams or GWDTE from contamination and increased leaching of nutrients and metals from the soils and rock | Construction phase drainage would be installed prior to any topsoil strip or major earthworks occurring<br>A drainage system would be maintained throughout the works<br>Buffer zones would be established around the SSSIs:<br>Water Quality monitoring and other CoCP activities would be implemented | | 2 | 2 | | | 1 | 1 | | | • Platform construction may result in change to groundwater recharge rates (both up and down) with a subsequent change in the groundwater level.<br>• Low permeability materials overlying the bedrock (which encourage surface water runoff) would be removed. In some cases, this may result in local perched aquifers being removed such that recharge would then reach the bedrock aquifer.<br>• There will be some consequent changes to surface water baseflow within the superficial deposits, including those supporting Tre'r Gof SSSI.<br>• Quantitative effects are unlikely at Cae Gwyn SSSI due to distance of works and the lack of superficial deposit groundwater throughflow.<br>• There will be no effect on PWS as all are upgradient of main activities.<br>• There may be some water quality changes in the superficial groundwater due to different flow paths and residence time of groundwater.<br>• Good practice and mitigation will ensure that no pollutants will reach the groundwater body. | Yes. Further assessment of earthworks, particularly platforming changes to surface water baseflow and catchment areas is advised, particularly whether and how this affects Tre'r Gof SSSI. The quality implications at Tre'r Gof GWDTE should also undergo detailed assessment. Other quality implications likely to be minor. These should be assessed in conjunction with the other pressures on surface water and GWDTE identified. | Yes, very closely associated with mound creation |

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| | 1.22 - Installation and operation of a drainage system during Power Station construction | Changes to groundwater recharge, level, flow direction Changes to groundwater quality from infiltrating water contact with geologyChanges to groundwater baseflow to streams and ditchesChanges to seepages and springs | Phased treatment train of sustainable drainage system (SuDS) features in advance of any major works to include sediment settlement lagoons, treatment ponds, silt traps, silt curtains, silt fences and vegetated/straw lined channels, mechanical sediment removal and/or chemical dosing and run offs into infiltration every 50mParticular attention will be paid to drainage of the mounds S and E of Tre'r Gof SSSI to mimic natural in-flows to the SSSI as far as possibleDrainage blankets will be emplaced underlying soil mounds to mimic mineralogy of infiltration and groundwater to GWDTEBuffer strips identified including watercourses and around SSSI boundaries | | 2 | 2 | | | 1 | 1 | | | Changes in groundwater flow and recharge would be likely although would be relatively small to bedrock as much of the area has low permeability drift which limits recharge to bedrock. Shallow surface water baseflow quantities could also be affected. There could be a reduction in water availability to Tre'r Gof SSSI due to the potential to affect shallow groundwater seepages and interlinkage with surface water. Tre'r Gof and Cae Gwyn SSSIs could also be affected by changes in quality due to different areal distribution of drainage. | Yes. Impact of drainage on spring and seepage flow in Tre'r Gof and groundwater changes to surface water baseflow should undergo detailed assessment as should potential for drainage to alter groundwater quality in Tre'r Gof SSSI.GWDTE interests at Tre'r Gof and Cae Gwyn SSSIs could also be affected and should undergo detailed assessment. | Yes, especially with regard to dewatering and earthwork activities |
| | 1.23 - Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Reductions in groundwater levels and flow rates.<br>Changes to groundwater quality from exposed contaminated fuel or oil leaks from plant used for the construction works; | Buffer zones around specific watercourses and ponds<br>Detailed drainage design with SuDS, swales etc. to retain as closely as possible existing runoff, infiltration and drainage and attenuation to prevent increases in flooding | | | 1 | | | | 1 | | | With good drainage and construction environmental management, no effects are predicted | No | No |
| | 1.24 - Construction of temporary buildings and infrastructure, including Temporary Workers' Accommodation within the Wylfa Newydd Development Area for essential workers | No impact pathway | N/A | | | | | | | | | | N/A | No | No |
| | 1.25 - Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) including dewatering | The excavations for reactor and turbine building basements down to an elevation of approximately -16.5mAOD , will be within a single excavation will include groundwater dewatering. The removal of aquifer and groundwater dewatering ~~could~~ lead to:<br><br>• changes in run off, groundwater levels and groundwater flow direction in the aquifer<br>• changes in surface water baseflow.<br>• draw in of groundwater from areas outside of the Wylfa Newydd | Shotcreting of walls and fractures<br>No works within the boundary of Tre'r Gof SSSI or Cae Gwyn SSSI.<br>Extensive drainage system<br>Groundwater and surface water level, flow and quality monitoring<br>Application for Permit for dewatering and drainage | 1 | 2 | 2 | 1 | 1 | | 1 | 1 | | Lowering of groundwater levels for basement construction will cause the bedrock groundwater levels to fall and cause a change to the groundwater flow direction. Model predicts that a small quantity of saline water could be drawn into the excavation (6.5m3/day), which is a relatively small quantity of the total abstraction from the seaward and inland excavations of 175 m3/day. Modelling indicates that the change in groundwater level does not extend greatly from the area | Yes. Further examination of the impact of pump dewatering on bedrock groundwater baseflow to GWDTE at Tre'r Gof and Cae Gwyn SSSIs and saline intrusion is advised. | Yes, together with drainage, earthwork platforming and mound creation. Also for landward and seaward excavations to be considered together as in groundwater model. |

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| | | Development Area where there is ground or groundwater contamination. | | | | | | | | | | | being dewatered. Therefore, water balance not affected.<br>All PWS are to the south and up hydraulic gradient. Changes in groundwater levels at existing PWS are unlikely to be more than recorded for seasonal fluctuations. There may be small construction dewatering quantitative effects on shallow superficial deposit groundwater inputs. These may affect the Tre’r Gof SSSI.<br>Dewatering has the potential to draw down bedrock groundwater levels at Tre'r Gof and Cae Gwynn. However, bedrock groundwater flow is not reversed and continues to flow under the Tre'r Gof SSSI to the coast, although there may be some water level declines which could affect that small portion of Tre'r Gof fed by bedrock. Similarly, there will be only a small reduction in groundwater levels at Cae Gwynn which may not be discernible.<br>Changes in water availability within the Tre’r Gof SSSI over the long term period could have subsequent long term effects on the calcium concentrations within the SSSI. There may be some quality changes due to different groundwater occurrence and residence times.<br>Groundwater discharging to Cemlyn Bay SSSI does not significantly change during the construction phase, with the model showing a reduction in groundwater discharge flow of only 0.1m3/day, which compares to a total modelled groundwater inflow into the Cemlyn Bay SSSI of between 81.6m3/day and 170m3/day so a change of less than 0.2% of the total inflow. There will only no discernible impact on groundwater inflow into Cemlyn Bay SSSI and as there is no GWDTE interest in the SSSI, there are no predicted effects and no further detailed assessment is required on this account | | |

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| 1.26 - Excavation of other features including building foundations including dewatering | See 1.25 | A drainage system would be in place and appropriately maintained throughout the works to prevent any effects on groundwater levels or quality. Inclusion and implementation of specific activities within the CoCP includingMonitoring of groundwater and surface water quality and levels/flow. | | | | | | | | | | See 1.25 | No | No |
| 1.27 - Progressive mound creation | Increased leaching of substances such as nutrients from the soils and rock leading to deterioration in groundwater quality and effects on associated receptors such as local streams or groundwater-dependent ecosystems.<br>Change in recharge run off relationships due to compaction, steep slopes and the interception of shallow groundwater by perimeter drains.<br>Consequent changes to groundwater levels due to the changes in surface water baseflow and groundwater occurrence. | Grassing of mound areas immediately after completion of soil placement.<br>No works would take place within the Tre'r Gof, Cae Gwyn or Cemlyn Bay SSSI boundaries.<br>Extensive system of drainage works.<br>Baseline monitoring of surface and groundwater receptors will continue.<br>Placement of a drainage blanket under mounds.<br>Buffer zones around watercourses and SSSIs.<br>Works will be completed under the direction of an ECoW. | | 2 | 2 | | | 1 | 1 | 1 | | In Tre'r Gof catchment, there will be localised changes to superficial and to a lesser extent bedrock groundwater levels and flow direction, seepages, springs and surface water baseflow in both superficial and bedrock aquifers. Change in bedrock groundwater input and its support to GWDTE interests at Tre'r Gof will be limited. However, given the Tre'r Gof vegetation communities are highly sensitive to water level and groundwater derived from the superficial deposits, the change in groundwater availability from the superficial deposits could be significant, especially when combined with changes to surface water availability and water quality. Changes in groundwater occurrence within the Tre'r Gof SSSI could have effects on the water quality of the SSSI. The inflow of shallow groundwater brings mineral (especially calcium) enriched water into the SSSI, with these being a particularly important supporting condition for the plant communities within the SSSI.<br><br>At Cae Gwynn SSSI high water table is essential for the survival of wetland plants and animals, the proposed landscape mound could reduce winter water recharge rates and water flows into the northern part of the SSSI and contribute to a partial drying of the SSSI, thereby affecting the vegetation assemblages present.<br><br>With regards to Cemlyn Bay SSSI, the 4 R and MODFLOW model shows that groundwater | Yes. Effects on GWDTE in Tre'r Gof and to a lesser extent Cae Gwyn from direct groundwater in superficials and as baseflow to surface water should undergo detailed assessment, bedrock water less so, but nonetheless should be included.<br>Changes to chemical quality should also be addressed but this would be addressed under the quantitative test rather than chemical and there is no introduction of pollutants. | Yes, with changes due to construction of mounds and platforms, and hardstanding and building construction and also in association with Surface water changes and drainage |

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| | | | | | | | | | | | | | discharging to Cemlyn Bay SSSI via the Nant Cemlyn does not significantly change during the construction phase despite the altered mound run off characteristics. The model shows there would be no discernible effect for Nant Cemlyn in terms of drawdown at this watercourse. Also during construction, surface water from Nant Cemlyn would be diverted to Afon Cafnan such that the very small groundwater baseflow component is not relevant.<br>Embedded mitigation and best practice and drainage management and treatment should ensure that no pollutants enter the groundwater body. | | |
| | 1.28 - Construction of internal roads, car parking, security fencing and permanent lighting | | see 1.23 | | | | | | | | | | see 1.23 | No | No |
| | 1.29 - Operation of the MOLF | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 1.30 - Operation of concrete batching plant and associated surface water drainage | | see 1.14 | | | | | | | | | | see 1.14 | No | No |
| | 1.31 - Operation of heavy lifting crane, tower cranes, construction plant and equipment | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 1.32 - Main plant construction (Unit 1 and Unit 2) | Spills and leaks of fuel, oils or chemicals leading to deterioration of groundwater quality.<br>The use of cementitious material below ground leading to migration of cement in water and changes in groundwater quality.<br>Dewatering to ensure that groundwater inflow into deep excavations is controlled during building is dealt with in 1.25 above<br>Construction activities could significantly reduce groundwater levels beneath the Existing Power Station.<br>Changes to groundwater recharge rates and areas due to the interception of shallow groundwater | Permeable surfacing to tracks, haul roads, compounds and laydown areas<br>Secure area of the main contractor's compound as this includes engineered containment for fuel storage and refuelling area.<br>Drainage installed prior to work and fitted with pollution control structures<br>Baseline monitoring of surface and groundwater receptors will continue.<br>CoCP and EcoWs | | 2 | | | | 1 | 1 | 1 | | Groundwater dewatering during this phase is dealt with in 1.25 above. As construction progresses, there is the potential that structures constructed below the groundwater table would form a barrier to flow. This could potentially lead to higher groundwater levels up hydraulic gradient and lower levels down hydraulic gradient and locally alter the groundwater flow direction. Inputs of groundwater to surface water features could then be affected, although this is unlikely to have a significant effect when considering the aquifer as a whole. | Yes, linked to deep excavation dewatering and changes in flow due to buried structures | Yes, this is linked to the excavation and dewatering in Activity 1.25 |

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| | | in the perimeter drains associated with the construction works. | | | | | | | | | | | | |
| | 1.33 - Construction of other buildings, structures and features | | see 1.32 | | | | | | | | | | See 1.32 | No | No |
| | 1.34 - Final landscaping - creation of final mounds | | see 1.27 | | | | | | | | | | see 1,27 | No | No |
| | 1.35 - Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | see 1,27 | | | | | | | | | | | see 1.27 | No | No |
| | 1.36 - Sewage discharge during construction | see 1.13 | Construction sewerage would be dealt with by the construction sewerage package plant. There would be no discharges of foul sewage to fresh surface water or groundwater and all discharges would be to the sea. | | | | | | | | | | see 1.13 | No | No |
| | 1.37 - Disposal of material (rock and soft sediment) from marine excavation (dredging) | No impact pathways | | | | | | | | | | | N/A | No | No |
| | 1.38 - Beach landing facility | No impact pathways | | | | | | | | | | | N/A | No | No |

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| Power Station Main Site: operation | 2.1 - Presence of buildings, hardstanding and roads | Although there will be no dewatering during operation, passive drainage, the presence of buildings and hardstanding, below ground structures and large area of increased permeable fill there are likely changes to groundwater recharge rates, groundwater flow direction and groundwater contribution to surface water and springs and seepages. | Post construction completion, the Site Campus, security plaza and associated parking would be removed, landscaped and reinstated to grassland.<br>During operation of the Power Station, no active groundwater dewatering of the ground outside of basements would be required. There may be some dewatering of basements ongoing.<br>A passive (gravity) drainage system would be installed around the deep basements with this water being directed to the sea. Power Station drainage would divert all water to the marine environment following appropriate treatment and would not discharge to the surface water environment.<br>Drainage from roads, car parking areas or other areas of hardstanding would incorporate attenuation and appropriate pollution treatment.<br>A site EMP will be in operation governed by permits<br>Monitoring of groundwater levels between the dewatered excavations and the Existing Power Station would be undertaken to determine if there is a significant reduction from baseline conditions. | 1 | 2 | 2 | | 1 | 1 | 1 | | | Dewatering of basements would cause the groundwater levels in the Tre'r Gof Catchment to fall, which could affect surface water baseflow. This is likely to be limited in extent with no saline intrusion.<br>Changes in water availability within the Tre'r Gof SSSI over the long term period could have subsequent long term effects on the calcium concentrations within the SSSI.<br>Drainage will remove water from the catchment which might otherwise have been groundwater but the embedded mitigation and best practice will ensure no pollutant impact on groundwater quality. | Yes, for surface water baseflow and supply of groundwater to Tre'r Gof | Yes, landward and seaward excavations to be considered cumulatively |
| | 2.2 - Presence of mounds | Change in recharge run off relationships due to compaction, steep slopes and the interception of shallow groundwater by perimeter drains.<br>Consequent changes to groundwater levels due to the changes in surface water baseflow and groundwater occurrence. | Following completion of the mounds, all haul roads would be removed.<br>The construction mound drainage would be converted to a passive drainage system including SUDS schemes and pollution control structures designed to reduce significant effects on water availability.<br>Ongoing monitoring of surface and groundwater receptors would continue. | | 2 | 2 | | | | 1 | 1 | | The mounding and associated drainage would reduce the catchment area resulting in slightly lower flows within the catchments in which they are situated.<br>Mounding would locally increase the steepness of land surfaces and the rainfall runoff response and result in a change in the long-term base flow to watercourses and springs and changes in recharge rates and the occurrence of groundwater. These are very small changes and effects would only occur when there are sensitive groundwater vegetation receptor interests, such as at Tre'r Gof and Cae Gwyn, but not at Cemlyn Bay SSSIs. The effects on groundwater due to the presence of mounds are likely to be localised. to the Tre'r Gof SSSI. | Yes, associated with 1.27. Impacts on surface water and GWDTE should be further assessed for Cae Gwyn and Tre'r Gof SSSI groundwater interests. | Yes, with construction and operation of the Power Station |
| | 2.3 - Maintenance dredging | No impact pathways | N/A | | | | | | | | | | N/A | No | No |

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| | 2.4 - Abstraction of Cooling Water | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 2.5 - Discharge of Cooling Water and other operational water discharges | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 2.6 - Drainage during operation | Addressed under 2.1 and 2.2 | N/A | | 2 | 2 | | | | | | | Any fall in groundwater levels caused by permanent drainage could affect surface water baseflow quantities and alter the groundwater flow direction although likely to be limited in extent, especially to bedrock as much of the area is low permeability drift which limits recharge to bedrock. Low likelihood of changes in water availability within the Tre'r Gof SSSI over the long term. There could be a reduction in water availability to Tre'r Gof SSSI due to the potential of drainage to affect shallow groundwater seepages and interlinkage with surface water. Tre'r Gof SSSI GWDTE interests could also be affected by changes in quality due to different areal distribution of drainage.<br>As Cae Gwyn is upstream of any outfalls from the drainage system and has a relatively small catchment, dominated by direct rainfall, it is not considered to be at risk from drainage during Power Station operation. | No, will be addressed as part of detailed assessment of 2.2 | No |
| | 2.7 - Occasional deliveries via the MOLF | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 2.8 - Operation of buildings (emissions to air, noise, light etc.) | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| Power Station Main Site: decommissioning | 3.1 - Cessation of CW abstraction | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 3.2 - Cessation of CW discharge | No impact pathways | N/A | | | | | | | | | | ditto | No | No |
| | 3.3 - Removal of marine structures (MOLF etc., but not breakwaters) | No impact pathways | N/A | | | | | | | | | | N/A | No | No |

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| Highway improvements (off-line) | 4.1 - Earthworks | Change to aquifer recharge rates which could lead to local reductions in groundwater levels and flow rates.<br>Reduction in flow supporting GWDTE and PWS adjacent to the proposed scheme<br>Changes to groundwater quality could occur from any fuel or oil leaks from plant used during the construction works. In the event of a leak or spill, potential contamination could migrate into the bedrock aquifer and/or the alluvium and affect groundwater quality<br>No requirement for dewatering | Designed to the appropriate DMRB standard, including water quality calculations and discharge to the environment from the completed works<br>Detailed drainage design, appropriate drainage ditches and SuDS to maintain as closely as possible existing drainage features whilst they undergo re-alignment.<br>Design of the final offline layout to avoid wetland habitats which may have groundwater dependency to avoid direct effects<br>Follow guidance on pollution prevention and good construction practice<br>CoCP for the water environment | | | 1 | | | | 1 | 1 | | In areas of underlain by low permeability glacial till and tidal flat deposits, only a small proportion of the existing recharge is currently reaching the bedrock aquifer and any change in water reaching groundwater re3cptors would be negligible. In areas of alluvium or exposed bedrock, there may be slightly more effect, but still considered to be negligible due to the relatively small areas affected and the discontinuity and low permeability of the water-bearing horizons in the bedrock. Changes to groundwater quality from spills, leaks and contaminated soils will be managed due to control of discharge and drainage. | No | No |
| | 4.2 - Hard bank protection/ embankment structures | No impact pathways | engineered containment of fuel storage o site | | | | | | | | | | N/A | No | No |
| | 4.3 - Water body realignment or removal | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 4.4 - Water body crossings (culverts/bridge construction) | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 4.5 - New outfalls and discharges | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| Construction of the AECC/MEEG/ESL | 5.1 - Contractors site compound including fuel storage area and welfare facilities | Potential changes to groundwater recharge rates, water levels, groundwater flow direction and associated groundwater discharge.<br>Potential changes in water quality due to spills and leaks of polluting materials | Engineered and secondary containment for the fuel storage area.<br>Construction phase drainage would be installed prior to works and fitted with spills or leaks pollution control structures, such as oil interceptors.<br>Details of the storage and use of oils, fuels and cement-based materials set out in the CoCPs including Environmental Emergency Preparedness and Response Procedure.<br>Fuel spill kits, and a spill-response plan | | | | | | | | 1 | | Change in the recharge to the aquifer would be unaffected. Site already substantially hardstanding.<br>No effects anticipated on groundwater receptors given embedded and good practice mitigation. | No | No |
| | 5.2 - Topsoil stripping and formation of landscaping areas | Potential changes to groundwater recharge rates and water levels | Targeted remediation of contaminated land identified in ground investigations.<br>Drainage works<br>CoCP in accordance with Horizon CoCP, Guidance | | | | | | | | 1 | | N/A | No | No |

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| | 5.3 - New buildings would likely have pile foundations and a piling mat would be placed to facilitate construction | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 5.4 - Storage and use of granular materials for forming roads and building sub-base | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 5.5 - Storage and use of cement related materials | Spills and leaks and migration of cement in water could cause deterioration in the pH and alkalinity of water quality | Wherever possible and practicable, batching of concrete off -site and delivered as requiredSpecific CoCP activities including: storage, use of cement-based materials - pre-cast concrete pipes and outfall structures, etc., emergency management and monitoring of water quality. | | | | | | | | 1 | | Although migration of cement in water could cause deterioration in the pH and alkalinity of water quality, embedded mitigation and good practice will ensure this will not happen. | No | No |
| | 5.6 - Construction of an underground storm-water attenuation tank beneath the site to collect runoff from buildings and hardstanding, and to discharge into an existing watercourse | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 5.7 - Construction of roads and buildings | Potential changes to groundwater recharge rates, water levels and groundwater flow direction | Use of a class 1 full retention oil/water separator on drainage from hardstanding areas | | | | | | | | 1 | | Area is already substantially covered in hardstanding with no effects on groundwater so no further effect anticipated | No | No |
| Operation of the AECC/MEEG/ESL | 6.1 - Operation of a backup generator with associated fuel storage | No impact pathways following mitigation | Storage tanks would be double skinned and fitted with an appropriate leak detection system, engineered and secondary containment | | | | | | | | | | N/A | No | No |
| | 6.2 - Management of storm water runoff during operations | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 6.3 - Operation of a laboratory with discharge of water after analysis of samples | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| | 6.4 - Discharge of foul water to sewer or operation of a packaged treatment plant with discharge to surface water | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| Decommissioning of the AECC/MEEG/E | 7.1 - Returned to its pre-development state (minus buildings) or the buildings would be retained for re-use | No impact pathways | | | | | | | | | | | N/A | No | No |

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| Construction of Park and Ride Facilities at Dalar Hir | 8.1 - Site clearance, including demolition of agricultural buildings and possible vegetation clearance | Change in rainwater reaching groundwater table, potentially altering local recharge rates and resource availability for PWS, groundwater levels and groundwater flow directions possible pollutant entry from construction works | No large-scale fuel storage or vehicle refuelling on-site. Vegetated buffer strips have been incorporated into the design, with a buffer of 15m either side of Nant Dalar Hir and a 10m buffer around wet ditches. Good practice for working in or near water<br>Management of silt pollution, including control techniques such as settlement lagoons or tanks, filtration, pumping to grassland<br>planned response to extreme weather (such as very heavy rainfall) | | | | | | | | 1 | | The Park and Ride would be underlain by low permeability glacial till, which limits recharge to the underlying bedrock. There would be negligible change to groundwater receptors in the aquifer, any wells or abstractions. | No | No |
| | 8.2 - Locating and establishing site compound, welfare facilities (on the site of demolished agricultural buildings) and any storage of fuel and oil for plant and equipment | Increased impermeable areas, including construction compounds and compacted ground, could reduce rainwater reaching the groundwater table, potentially altering local recharge rates and resource availability for PWS, groundwater levels and groundwater flow directions. Potential migration of leaks and/or spills of fuel or other polluting material into bedrock aquifer would affect water quality | Specific good practice mitigation to include: provision of fuel spill kits, a spill-response plan to manage any vehicle/plant leaks, all plant refuelling to take place off-site, no on-site fuel storage, emergency response procedures for any spills. | | | | | | | | 1 | | The Park and Ride would be underlain by low permeability glacial till, which limits recharge to the underlying bedrock. The superficial deposits will also limit contaminant migration into the underlying bedrock. There would be negligible change to groundwater receptors in the aquifer, any wells or abstractions. | No | No |
| | 8.3 - Topsoil strip to all areas outside buffer zones | Change in rainwater reaching groundwater table, potentially altering local recharge rates and resource availability for PWS, groundwater levels and groundwater flow directions Pollutant entry to aquifer | provision of a sediment management plan | | | | | | | | | | a/a | No | No |
| | 8.4 - Excavation of topsoil to allow placement of sub-base for all roads, bus drop-off areas and pedestrian footway | a/a | N/A | | | | | | | | | | a/a | No | No |
| | 8.5 - Permeable paving in car park areas, including a drainage layer which would be built from topsoil strip depth upwards | Increased impermeable areas, including construction compounds and compacted ground, could reduce rainwater reaching the groundwater table, potentially altering local recharge rates and resource availability for PWS, groundwater levels and groundwater flow directions. | Drainage system with aggregate on impermeable membrane to be implemented as early as practicable | | | | | | | | | | The impermeable areas created during the construction period would form only a very small portion of the wider groundwater catchment and magnitude of change to groundwater receptors would be negligible. | No | No |

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| | 8.6 - Excavation for foundations for new buildings (minimum of 900mm below ground level) | It has been assumed that there would not be a requirement for dewatering as part of any construction activity, or if there is a requirement it would be small-scale, localised and short-term so no impact pathways<br>Possibility for leaks/spills of pollutants to reach the groundwater table | No dewatering anticipated as part of any construction activity, or if there is a requirement it would be small-scale, localised and short-term<br>CoCP | | | | | | | | | | Superficial deposits would limit contaminant migration into the underlying bedrock. The effectiveness of this would depend on the thickness of the superficial deposits and the bedrock water level but the superficial deposits would limit contaminant migration into the underlying bedrock. | No | No |
| | 8.7 - Landscaping activities that could include locating landscaping bunds to control surface water movement during flood events | Change in rainwater reaching groundwater table, potentially altering local recharge rates and resource availability for PWS, groundwater levels and groundwater flow directions | N/A | | | | | | | | | | a/a | No | No |
| | 8.8 - The construction of site drainage channels, outfalls and a storm water attenuation tank | Potential for altering rainwater infiltration to groundwater table | CoCP | | | | | | | | | | a/a | No | No |
| | 8.9 - Construction of a clear span bridge across Nant Dalar Hir | No impact pathways | CoCP | | | | | | | | | | N/A | No | No |
| Operation of Park and Ride Facilities at Dalar Hir | 9.1 - Private cars parked on-site, staff using the facility building, staff being picked up from the bus parking area and the buses entering/exiting the facility | No impact pathways | N/A | | | | | | | | | | N/A | No | No |
| Decommissioning of Park and Ride Facilities at Dalar Hir | 10.1 - Return of the site to agricultural land. The bridge would remain in situ across the Nant Dalar Hir and some culverts would remain along the watercourses | No impact pathways | As for combined construction and operation as appropriate | | | | | | | | | | N/A | No | No |
| Construction of logistics centre at Parc Cybi | 11.1 - Construction of logistics centre at Parc Cybi | No impact pathways | Not required. | | | | | | | | | | N/A | No | No |
| Operation of logistics centre at Parc Cybi | 11.2 - Operation of logistics centre at Parc Cybi | No impact pathways | Not required. | | | | | | | | | | N/A | No | No |

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| Decommissioning of logistics centre at Parc Cybi | 11.3 - Decommissioning of logistics centre at Parc Cybi | No impact pathways | Not required. | | | | | | | | | | N/A | No | No |
| Compensation site enhancement | 12.1 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | No impact pathways | Not required. | | | 1 | | | | 1 | | | N/A | No | No |
| | 12.2 - Modification of site drainage features - attenuation, sediment treatment | No impact pathways | Not required. | | | 1 | | | | 1 | | | | No | No |
| | 12.3 - Seeding, fencing and landscaping to create wetland habitat | No impact pathways | Not required. | | | 1 | | | | 1 | | | | No | No |

## Table 11. Migratory Fish

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Fish | Relevant water bodies | Summary of potential effects and risks identified (taken from assessment tables for other water bodies) | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
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| Power Station Main Site: construction | 1.1 - Targeted removal of vegetation, mostly above ground or to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries Anglesey North | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.2 - Targeted removal of above-ground features, e.g. gates and poles and clearance of walls to ground level and only where these are inside the perimeter fence | | | 1 | | | No | |
| | 1.3 - Management of vegetation after grazing ceases | No impact pathway. | None required. | | n/a | No impact pathway | No | No |
| | 1.4 - Invasive species management | Mobilisation of soil into watercourses (caused by removal of invasive flora), particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries Anglesey North | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to the location immediately surrounding the invasive species management activity. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.5 - Species translocation from within the perimeter fence areas to on and off-site locations | No impact pathway. | None required. | | n/a | No impact pathway | No | No |

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| 1.6 - Remaining demolitions to ground level | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The SkerriesAnglesey North | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.7 - Realignment of a watercourse | Mobilisation of soil resulting in delivery of fine sediment from run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. For the river realignment works on the Nant Caerdegog Isaf a risk assessment method statement approach would be undertaken with relevant approval and consents for works from NRW. To reduce the potential for silt-laden runoff to impact the water environment, the watercourse realignment would be constructed using techniques to control sediment release (e.g. not connecting the new channel to the old until all work is complete, undertaking the connection in dry weather etc.). | 1 | The Skerries | During realignment works there would be an increase in turbidity and deposition of sediment on the bed within the fluvial channel. This change would be restricted to the area of the realigned channel (approximately 400m of the Nant Caerdegog Isaf) and to the reach immediately downstream. The realignment is located over 2km from the coast and the effects of increased turbidity are not likely to be detectable within more than a couple of hundred metres downstream. Sediment may be deposited on the stream bed up to a few hundred metres downstream at most as mitigation will be used to control sediment release. Embedded and good practice mitigation would reduce the effects such that there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the location of the works from the coastal water body, the embedded and good practice mitigation and the duration of this activity alone, there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | Loss and creation of habitat and morphological features. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. For the river realignment works on the Nant Caerdegog Isaf a risk assessment method statement approach would be undertaken with relevant approval and consents for works from NRW. | 1 | | Change in hydromorphological features within the Nant Caerdegog Isaf resulting in changes to benthic invertebrates and aquatic flora composition within approximately 400m of the fluvial channel of the Nant Caerdegog Isaf. Potential for migratory fish to experience a minor change, although very few fish were recorded on this stretch and it is not considered important habitat for migratory fish. The overall permanent change would be an improvement to habitat and morphological processes. | No | |
| 1.8 - Waste management and material storage and management | No impact pathway. | There would be engineered containment for fuel, oil and chemical storage areas (including waste oils) with the storage facilities following good practice guidance. | | n/a | No impact pathway. | No | No |
| 1.9 - Removal and storage of the topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | | The Skerries | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies. There may be a small effect on flows that would be detectable compared to baseline conditions, but the effects would be confined to changes within the fluvial water bodies and there would be no detectable changes in freshwater input or to any other quality elements within the coastal WFD water body. | No | No - changes to flows relating to this activity would not have an effect alone and there is no potential for this aspect of the activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | 1.10 - Temporary closures of footpaths and provision of diversions and the short-duration temporary closures of Cemlyn Road to enable boundary wall/fence removal | No impact pathway. | None required. | | n/a | No impact pathway. | No | No |
| | 1.11 - Remediation of known contaminated land | Leaching of substances from contaminated soil (mainly asbestos contamination). | Appropriate controls would be in place to prevent the discharge of contamination to surface waters (e.g. testing and tankering off site if required). | | The Skerries | Leaching of substances could lead to an effect; however, the embedded and good practice mitigation would significantly reduce the risk of this occurring and therefore no effect is predicted. | No | No |
| | 1.12 - Use of a rock outcrop and crushing of material for security tracks and compounds | Generation of dust and fine particulate matter. | Dust and Air Quality Management Plan. This would include using measures such as dust suppression on haul roads and implementation of appropriate controls on emissions from construction plant. | | The Skerries | Potential for some input of fine sediment into fluvial water bodies local to works. However, with dust suppression in place there are no pathways to an effect on coastal WFD water body quality elements. | No | No |
| | 1.13 - Site establishment, mobilisation for Main Construction works, location of temporary site offices, compounds and welfare facilities | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | During site establishment there could be some small scale groundworks to install offices/compounds and tracking of vehicles around the facilities. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.14 - Construction and commissioning of concrete batching plant and associated surface water drainage | Mobilisation of soil or sediment resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | Drainage from the concrete batching plant would be managed to prevent high levels of sediment entering the sea. Any potential effects (including fine sediment input to coastal areas) would be localised within the immediate area and the strong tidal currents would disperse sediment very quickly and there would be no detectable effects on quality elements within the coastal WFD water body from this activity alone. | No | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | | Changes in water quality (e.g. from cementitious materials). | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | | Embedded mitigation would ensure that the discharge quality would be carefully controlled. The effect would be localised and there would be no detectable effects on quality elements within the coastal WFD water body from this activity alone. | No | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| | | Loss of intertidal zone. | Minimise the footprint of the marine works. | 2 | | Loss of approximately 2ha of mainly intertidal habitat under the footprint of the concrete batching plant would result in small-scale changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (0.04%) and would not affect the status of these quality elements within the coastal WFD water body from this activity alone. | No | Yes - the combined losses of intertidal and subtidal habitats requires consideration. |
| | 1.15 - Managed site-wide road network and security and access control | No impact pathway. | None required. | | n/a | No impact pathway | No | No |
| | 1.16 - Establishment of site perimeter fence | No impact pathway. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. Minor watercourses and ditches could be crossed by the perimeter fence. | | n/a | No impact pathway | No | No |
| | 1.17 - Construction of the Cooling Water System breakwaters and Marine Off-Loading Facility (MOLF) including dewatering | Introduction of new structures with changes to coastal processes and hydrodynamics. | Minimise the footprint of marine structures | 2 | The Skerries | Effects upon hydrodynamics and waves from nearshore changes to depth variation and loss of intertidal zone structure leading to changes in processes and hydrodynamics (note: this includes potential effects upon Esgair Gemlyn which are subject of more detailed investigations). Effects upon direction of dominant waves within the new harbour area from localised changes to wave transformation. Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Yes | Yes - the combined effects of all structures on hydromorphological quality elements requires consideration. |
| | | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures. | Minimise the footprint of the marine works. | 2 | | The loss of the coastal bed and intertidal area in The Skerries from the footprint of the Cooling Water System (intake and outfall), breakwaters and MOLF would be approximately 13.1ha (this excludes dredging – see activity 1.18).<br>This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and an area of fish habitat. In comparison to the size of the water body this loss would be very small (0.28%). Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Yes | Yes - the combined losses of intertidal and subtidal habitats requires consideration. |

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| | | Changes in water quality from dewatering: behind outfall cofferdam (note semi-dry cofferdam dewatering is covered in activity 1.18). | Over pumped seawater would be monitored to ensure suspended solids meet agreed standards. | 1 | | Dewatering of the cofferdam takes a few days at most (short-term effect on turbidity). If longer term dewatering is required then it would be treated, so no predicted effect on quality elements. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality from a reduction in mixing once breakwaters are in place. | Minimise the footprint of the marine works. | 1 | | The presence of breakwater could have localised effects on currents. However, the gap in the southern end of the western breakwater and strong tidal flows would allow flushing to take place and water within the breakwaters to remain well mixed and there would be no detectable effects on quality elements within the WFD water body. | No | No |
| | | Increase in underwater noise | Minimise the footprint of the marine works. | 2 | | Potential for fish (present in the Skerries but a quality element of other WFD water bodies) to be affected by underwater noise from rock cutting and drilling. | Yes - effects on fish from underwater noise | Yes - the combined effects on fish require consideration |
| | 1.18 - Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | Changes in water quality (e.g. from dewatering). | Over pumped seawater would be monitored to ensure suspended solids meet agreed standards. | 1 | The Skerries | Dewatering of the semi-dry cofferdam takes around 10 days (short-term effect). Longer-term dewatering to be treated so there would be no detectable effects on quality elements within the coastal WFD water body from this activity. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.18 - Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | Increase in underwater noise | None identified. | 2 | The Skerries | Potential for fish (present in the Skerries but a quality element of another WFD water body) to be affected by underwater noise from dredging, rock breaking, rock cutting and drilling.<br>. | Yes - effects on fish from underwater noise | Yes - the combined effects on fish require consideration |
| | 1.18 - Semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering | Introduction of new structures with loss of coastal bed and intertidal zone from dredging and footprint of structures. | None identified. | 2 | The Skerries | Loss of approximately 17ha from excavation in Porth-y-pistyll (this includes excavation in both wet and dry). This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and an area of fish habitat. In comparison to the size of the water body this loss would be very small (0.36%). Potential to affect hydromorphological quality element (currently at high status) with subsequent effects on biological quality elements. | Yes | Yes - the combined losses of intertidal and subtidal habitats requires consideration. |

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| 1.19 - Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | Introduction of cofferdams, which could change coastal processes and hydrodynamics. | None identified. | 1 | The Skerries | Cofferdam structures are temporary and are placed on rock, rather than on soft sediment. Potential for localised scour around structures but this is predicted to only be detectable within a few tens of metres of the structures. Effects upon hydrodynamics and waves from nearshore changes to depth variation, and, effects upon structure and substrate of near shore coastal bed due to changes in flow patterns. Localised loss of intertidal zone structure leading to changes in processes and hydrodynamics. Effects upon direction of dominant waves around coffer dam area due to localised changes to wave transformation. Once removed conditions would reach an equilibrium. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.19 - Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | Mobilisation of sediment from disturbance of the seabed. | None identified. | 1 | The Skerries | Cofferdam structures are temporary and are placed on rock, rather than on soft sediment. Potential for localised mobilisation of sediment during installation but rapid dispersion of sediments would occur and this would not result in a change in status of any quality element. Effects upon local depth variation due to dredging activities disturbing and mobilising seabed sediments. Once removed conditions would reach an equilibrium. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.19 - Installation (and removal) of cofferdams for Cooling Water (CW) intake and outfall construction | Changes in water quality during installation (note dewatering covered under activity 1.17). | None identified. | 1 | The Skerries | A minor effect that is highly localised around the area of the outfall cofferdam (the intake is installed in the dry). There would be no detectable effects on quality elements within the WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.20 - Excavation and construction of CW intake and outfall, including tunnelling | Loss of coastal bed and intertidal zone from excavation. | None identified. | 2 | The Skerries | Approximate loss of 0.1ha at the Cooling Water outfall within The Skerries water body. Losses associated with the intake are covered in activity 1.17. This would result in changes to hydromorphological quality elements including changing the seabed depth, structure of the seabed and the intertidal zone. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (<0.01%) and would not affect the status of these quality elements within the coastal water body from this activity alone. | Yes | Yes - the combined losses of intertidal and subtidal habitats requires consideration. |
| 1.20 - Excavation and construction of CW intake and outfall, including tunnelling | Introduction of new structures with changes to coastal processes and hydrodynamics. | None identified. | 1 | The Skerries | Excavation is carried out behind the cofferdams so there are no pathways to effects on physico-chemical parameters. The new intake and outfall structures would have localised effects on hydromorphology quality elements, including effects upon: hydrodynamics and waves from nearshore changes to depth variation; structure and substrate of near shore coastal bed; intertidal zone structure; and, dominant wave type. However, these effects are localised and conditions would return to an equilibrium within a short period of time. | No | No |

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| 1.21 - Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies; however, any effects would be restricted to the location immediately surrounding the ground works and conditions would quickly return to baseline. There remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. These effects would be localised (so effects on biological quality elements would be possible but only on a small scale and would not affect populations). | Yes - the results of the H1 assessment for construction would provide the details of any exceedances of EQSs. | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| 1.21 - Bulk earthworks, including site levelling and grading, building platforms for Unit 1 and Unit 2 and construction and laydown areas | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - changes to flows relating to this activity would not have an effect alone and there is no potential for this aspect of the activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.22 - Installation and operation of a drainage system during Power Station construction | Loss of riparian habitat | None identified. | 2 | The Skerries | The Nant Porth-y-pistyll (approximately 200m long) would be lost during the installation of drainage. Although this would lead to complete removal of the channel, the non-reportable water body is of low fluvial geomorphological value and has been extensively artificially modified for land drainage purposes and during the construction of the Existing Power Station. The Nant Porth-y-pistyll supports European eel however the upper reaches are culverted and therefore the channel is of limited value to European eel populations. | No | No |
| 1.22 - Installation and operation of a drainage system during Power Station construction | Physical presence of structures (e.g. outfalls and sediment settlement ponds) in fluvial watercourses and at the coastline. | Sensitive siting of structures. To protect surface waters, a 15m buffer would be in place along the Afon Cafnan and its main tributary (Nant Caerdegog Isaf). | 1 | The Skerries | Within fluvial catchments the physical presence of outfalls and sediment settlement ponds could encroach on the floodplain. Effects on fluvial hydromorphology elements would be localised and sensitive siting of structures would minimise the effects. For outfalls located in the intertidal zone there could be pipes across the foreshore. The effect would not affect the structure of the intertidal rocky shore and whilst there could be some localised effects on benthic invertebrates and aquatic flora that would be detectable during installation, once removed the communities would quickly recover and return to baseline conditions. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.22 - Installation and operation of a drainage system during Power Station construction | Intrusive ground works leading to mobilisation of soil and delivery of fine sediment and changes to water quality | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | With embedded mitigation (i.e. the drainage system) the discharge quality would be carefully controlled. There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies; however, any effects would be restricted to the location immediately surrounding the ground works and conditions would quickly return to baseline. There remains potential for effects on transparency, nutrients and specific pollutant concentrations in the coastal WFD water body. These effects would be localised (so effects on biological quality elements would be possible but only on a small scale and would not affect populations). | Yes | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |

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| 1.23 - Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Presence of structures (e.g. culvert and bridges). | Sensitive siting of structures. To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | 1 | The Skerries | Construction of haul roads and bridge could require either open span bridges or possibly culverts on some of the small drains. These structures would be present through the duration of construction. The use of culverts would be restricted and confined to small drains which are of low value to fish and other BQEs. There would be no detectable effect on quality elements of the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.23 - Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries | Changes to flows could occur, however, this effect would be localised within fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.23 - Construction of Power Station Site Access Road and junction from A5025 and construction of haul roads and bridges | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | Once constructed vehicles will be using the haul roads. All runoff will be directed into the drainage system and the discharge quality will be carefully controlled. There remains potential for effects on turbidity, changes to nutrients and specific pollutant concentrations. These effects are would be localised so effects on BQEs would be possible but are not likely to be detectable. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.24 - Construction of temporary buildings and infrastructure, including Temporary Workers' Accommodation within the Wylfa Newydd Development Area for essential workers | Mobilisation of soil into watercourses, particularly if working close to the bank | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | There could be a localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies; however, any effects would be restricted to the location immediately surrounding the groundworks and conditions would quickly return to baseline. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries | Changes to flows within non-reportable fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | |

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| | 1.25 - Deep excavation (Unit 1 and Unit 2) and construction of base mat (concrete section at the bottom of the reactor building) for each unit including dewatering | Changes in water quality (e.g. from dewatering). | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | Groundwater seepage into the deep excavation would be dewatered and discharged into the coastal WFD water body. This could include specific pollutants which may be components of the groundwater. The discharge would be fresh and could contain suspended solids. Groundwater would be diluted and dispersed by strong tidal currents. The effects are likely to be small scale (so effects on biological quality elements would be possible but only on a small scale). | Yes (for specific pollutants) | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | 1.26 - Excavation of other features such as culverts and building foundations | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the excavation works. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.26 - Excavation of other features such as culverts and building foundations | Changes in water quality (e.g. from dewatering) | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | Groundwater seepage into the building foundations would be dewatered and discharged into the coastal WFD water body. This could include specific pollutants which may be components of the groundwater. The discharge would be fresh and could contain suspended solids. Groundwater would be diluted and dispersed by strong tidal currents. The effects are likely to be small scale (so effects on biological quality elements would be possible but only on a small scale). | Yes (for specific pollutants) | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | Progressive mound creation | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | There could be a localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies; however, any effects would be restricted to the location immediately surrounding the excavation works and conditions would quickly return to baseline. Embedded mitigation (drainage system) would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 1.27 - Progressive mound creation | Change in catchment area leading to an increase in overland flow rates and altering base flow from groundwater | None required. | | Anglesey North | Changes in flows in non-reportable fluvial water bodies may result in localised effects on instream habitats but this is not likely to have a detectable effect on macroinvertebrates or fish within fluvial catchments. There would be no detectable effect on quality elements within the coastal WFD water body. | No | No |

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| | | Presence of structures (security fencing) within fluvial watercourses. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. Minor watercourses and ditches could be crossed by the perimeter fence. | 2 | | Reduction in connectivity within the non-reportable fluvial water bodies could affect fish including migratory species. No effects on quality elements within the coastal WFD water body. | No | No |
| | | Lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | 2 | | Fish could be affected by lighting in both fluvial and coastal waters. Lighting could attract some species and deter other and can disrupt feeding, migration and spawning. However, with embedded mitigation to minimise light spill and avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | No | Yes - the combined effects on fish require consideration |
| | 1.28 - Construction of internal roads, car parking, security fencing and permanent lighting | Change in surface type (more hardstanding) leading to changes in run-off. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries | Changes to flows could occur, leading to changes in sediment processes; however, this effect would be localised within fluvial water bodies and is not likely to result in a change that is detectable compared to baseline conditions. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality from drainage from roads. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | | Once constructed large numbers of vehicles would be using the internal roads. All runoff would be directed into the drainage system and the discharge quality would be carefully controlled but may contain suspended solids. With embedded mitigation there would be no effects on physico-chemical parameters and although there is a pathway to effects on biological quality elements there would be no detectable effect on quality elements within the coastal WFD water body alone. | No | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | 1.29 - Operation of the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | 2 | The Skerries | Risk that non-native species could be introduced with effects on benthic invertebrates and aquatic flora. | Yes | Yes |
| | 1.30 - Operation of concrete batching plant and associated surface water drainage | Changes in water quality (e.g. from cementitious materials). | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | Embedded mitigation would ensure that the discharge quality would be carefully controlled. The effect would be localised and there would be no detectable effects on quality elements within the coastal WFD water body from this activity alone. | No | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| | 1.31 - Operation of heavy lifting crane, tower cranes, construction plant and equipment | No impact pathway. | None required. | | n/a | No impact pathway. | No | No |

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| 1.32 - Main plant construction (Unit 1 and Unit 2) | No impact pathway (platform for units 1 and 2 and laydown areas are already constructed under activity 1.21). | None required. | | n/a | No impact pathway. | No | No |
| 1.33 - Construction of other buildings, structures and features | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.34 - Final landscaping - creation of final mounds | Mobilisation of soil into watercourses, particularly if working close to the bank. | To protect surface waters, a 15m buffer would be in place along the Afon Cafnan, its main tributary (Nant Caerdegog Isaf), Nant Cemaes, Nant Cemlyn and the Tre'r Gof SSSI drains. | 1 | The Skerries | There could be localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. With a 15m buffer in place very little sediment is likely to reach fluvial water bodies and any effects would be of limited extent and short duration. The effects would be restricted to fluvial water bodies and to the location immediately surrounding the targeted groundworks. Conditions would quickly return to baseline in the fluvial water bodies and there would be no detectable effects on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| 1.35 - Final landscaping - (progressively delivered through Main Construction, in accordance with the Landscape Environmental Masterplan) | No impact pathway (effects relating to landscaping are covered under activity 1.34). | None required. | | n/a | No impact pathway. | No | No |
| 1.36 - Sewage discharge during construction | Changes in water quality from discharge of sewage effluent. | Sewage effluent would be treated prior to discharge to meet standards agreed with NRW. | 1 | The Skerries | With embedded mitigation the effluent quality would be carefully controlled. There remains potential for effects on turbidity, changes to nutrients and specific pollutant concentrations. These effects would be localised around the point of discharge and dispersion and dilution would occur rapidly within the coastal WFD water body. Effects on biological quality elements would be possible but only on a small scale around the point of discharge. | Yes (nutrient conditions and specific pollutants) | Yes - the combined effects of the discharges that input directly into the coastal WFD water body require consideration. |
| 1.37 - Disposal of material (rock and soft sediment) from marine excavation (dredging) | No impact pathway. | None required. | | Caernarfon Bay North | Increases in SSCs beyond typical background concentrations are highly transitory. More than three hours following a single disposal event all sediment would have dispersed to such a degree that SSCs would be within typical background concentrations<br><br>The maximum dissolved concentration of contaminants resulting from dredging and excavation is several orders of magnitude below the EQS and there would be no effect on | No | No |

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| | | | | | | physico-chemical quality elements.<br><br>To assess the potential coincidence of the proposed sediment disposal with ongoing maintenance dredging a scenario was modelled soft sediment from the Wylfa Newydd Project was released at the same time as maintenance dredging disposal from Holyhead Port. The cumulative effect from the addition of the proposed sediment disposal was not readily discernible from that of the much larger port releases. | | |
| | 1.3 - Beach landing facility | Footprint on the foreshore. | None required. | 2 | The Skerries | The beach landing facility would have a temporary effect on the intertidal zone, although it would not change the structure. The footprint would be approximately 0.24ha. There would be localised losses of benthic invertebrates and aquatic flora and loss of a small area of fish habitat. In comparison to the size of the water body this loss is very small (0.01%) and once the facility is removed conditions would quickly return to baseline. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| Power Station Main Site: operation | 2.1 - Presence of buildings, hardstanding and roads | No impact pathway | None required. | | n/a | No impact pathway. | No | No |
| | 2.2 - Presence of mounds | No impact pathway. | None required. | | n/a | No impact pathway (effects occur during construction). | No | No |
| | 2.3 - Maintenance dredging | Changes to the sea bed from dredging. | None required. | 1 | The Skerries | Assessment of capital dredge determined that there would be no effect on quality elements. Maintenance dredging occurs infrequently and on a smaller scale to the capital dredge and there would be no detectable effect on quality elements within the coastal WFD water body. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | | Changes in water quality (e.g. during dredging operation). | None required. | 1 | | Assessment of capital dredge determined that there would be no effect on quality elements. Maintenance dredging occurs infrequently and on a smaller scale to the capital dredge and there would be no detectable effect on quality elements within the coastal WFD water body. | No | |
| | 2.4 - Abstraction of Cooling Water | Loss of flora and fauna in abstracted water. | Fish and invertebrate protection measures including screens, acoustic deterrents and a recovery and return channel, all designed to best practice. | 2 | The Skerries | Long term effects from the continuous loss of plankton, invertebrates and fish which would be entrapped during operation. | Yes | Yes - the combined effects on plankton, fish and benthic invertebrates require consideration |
| | 2.5 - Discharge of Cooling Water and other operational water discharges | Change in flows with water being directed away from the outfall potentially leading to scour. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | 2 | The Skerries | Scour of the seabed would occur around the outfall area at the onset of operation. This effect would be localised to the vicinity of the outfall. | No | Yes - the combined effects of all structures on hydromorphological quality elements requires consideration. |
| | | Discharge of warmer water as a thermal plume. | The cooling water outfall is designed to direct the discharge away from the seabed to maximise dispersion. | 2 | | Long term changes to thermal conditions (and associated effects on dissolved oxygen). Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Yes | Yes - the combined effects on plankton, fish and |

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| | | Discharge of chemicals including total residual oxidants (TRO). | The biocide dosing regime would be designed to reduce biofouling risk. In line with best practice, continuous dosing would be applied during a higher fouling risk period, typically between April and December, when sea temperatures are above 10°C. | 2 | | Long term changes to release of a specific pollutant (chlorine measured as Total Residual Oxidant) (and associated effects on dissolved oxygen). Associated effects on plankton, aquatic flora, invertebrates and fish throughout operation. | Yes | benthic invertebrates require consideration |
| | 2.6 - Drainage during operation | Changes in water quality. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | The Skerries | During operation a drainage system would be in place to manage the water from site. Treatment would be applied if required and discharge quality would be carefully controlled. Agreed standards would be met and there would be no detectable change in physico-chemical quality elements or biological quality elements within the coastal WFD water body. | No | No |
| | 2.7 - Occasional deliveries via the MOLF | Introduction of non-native species. | Adherence to ballast water convention protocol. | 1 | The Skerries | During Power Station operation the risk that non-native species could be introduced is very small as there would be less than one delivery per year. | No | No |
| | 2.8 - Operation of buildings (emissions to air, noise, light etc.) | Permanent lighting shining into water bodies. | Sensitive siting of lighting, directional lighting to avoid shining into water bodies. | 2 | The Skerries | Fish could be affected by lighting in both fluvial and coastal waters however during operation light spill would be limited and would avoid shining light into water bodies this effect would be very localised and would not have a detectable effect on fish communities. | No | No |
| Power Station Main Site: decommissioning | 3.1 - Cessation of CW abstraction | No flow into the cooling water intake (removal of a pathway to an effect) | None required. | 1 | The Skerries | Positive effect on benthic invertebrates, plankton and fish, but changes in communities are not predicted and therefore there would not be a detectable effect on the quality elements. | No | No |
| | 3.3 - Removal of marine structures (MOLF etc., but not breakwaters) | Mobilisation of sediment from disturbance of the seabed. | None required. | 1 | The Skerries | Mobilisation of sediment during removal but rapid dispersion of sediments would occur with effects on transparency. Once works are complete conditions would reach an equilibrium. Pathway to effects on BQEs but only on a small scale. | No | No |
| | 3.3 - Removal of marine structures (MOLF etc., but not breakwaters) | Removal of structures, which could change coastal processes and hydrodynamics. | None required. | 1 | The Skerries | Effects on hydromorphology quality elements, including effects of structure removal on depth variation, dominant current direction and tidal regime, due to earlier modifications and remnant elements e.g. cut down sheet piling. However, these effects are localised and conditions would return to an equilibrium within a short period of time. | No | No |

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| Highway improvements (off-line) | 4.1 - Earthworks | Mobilisation of soil into watercourses, particularly if working close to the bank. | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | Pathway - but effects unlikely to be detectable:The SkerriesAlaw (transitional)Alaw-downstream Llyn AlawTan R'AlltCleifiog | There could be a small localised increases in turbidity and deposition of sediment on the bed within the fluvial water bodies. However, any effects would be restricted to the location immediately surrounding the earthworks and conditions would quickly return to baseline. Embedded and good practice mitigation would reduce the effect such that there would be no detectable effect on quality elements within the coastal WFD water body.Effects in the Alaw:Works are 240m upstream over the Alaw-downstream Llyn Alaw water body. This could potentially result in Increased fine sediment loading reaching the Alaw (transitional). However, given the extent of the works and the effects predicted upstream, there would be no detectable effect on bed substrate, transparency or on BQEs. Effects in the Alaw downstream Llyn Alaw: Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale.Tan R'Allt:Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale.Cleifiog:Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |

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| | 4.1 - Earthworks | Loss of vegetation and ground compaction by vehicles and machinery leading to changes in run-off. | To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | 1 | The Skerries | Changes to flows could occur, however, this effect would be localised within fluvial water bodies. Embedded and good practice mitigation would reduce the effect such that there is no detectable effect on quality elements within the coastal WFD water body. It is noted that fish could experience a change within fluvial catchments. | No | No - given the limited extent and duration of the effects of this activity alone there is no potential for this activity to contribute to effects on quality elements at the coastal WFD water body scale. |
| | 4.2 - Hard bank protection/ embankment structures | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | Pathway - but effects unlikely to be detectable:Alaw-downstream Llyn AlawTan R'AlltCleifiog | Effects in Alaw downstream Llyn Alaw: Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale.Tan R'AlltPhysical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale.Cleifiogas above | No | No |
| | Water body realignment or removal | Mobilisation of soil resulting in delivery of fine sediment from run-off. | Retain, wherever possible, all watercourses identified on-site. | 1 | Pathway - but effects unlikely to be detectable: Alaw-downstream Llyn Alaw | Only very small drains (many of which have no flow) could be realigned or removed and the effects would be highly localised. Potential effects include the input of fine sediment into the fluvial water bodies. Embedded mitigation reduces the effect such that there would be no detectable effect on quality elements of the coastal WFD water body. | No | No |
| | | Loss and creation of habitat and morphological features. | Retain, wherever possible, all watercourses identified on-site. | 1 | | A minor effect predicted on fluvial water bodies. There would be no detectable effect on quality elements of the coastal WFD water body. | No | No |

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| | | In-channel working and removal of riparian vegetation for construction of realignment | Implementation of a CoCP. | 1 | Pathway - but effects unlikely to be detectable:Alaw-downstream Llyn AlawCleifiog | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale.Cleifiog:Disturbance of fine sediment from in-channel working. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | | |

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| | 4.4 - Water body crossings (culverts/bridge construction) | Presence of structures (e.g. culvert and bridges). | Sensitive siting of structures. To protect surface waters, where practicable and possible a 15m buffer would be set from the banks of watercourses and no works would take place within these areas without additional risk assessment. | 1 | Pathway - but effects unlikely to be detectable: The Skerries<br>Alaw (transitional)<br>Alaw downstream<br>Llyn Alaw<br>Tan R'Allt<br>Cleifiog | Construction could require either open span bridges or possibly culverts on some of the small drains (which are of low value to fish and other BQEs). These structures would be present through the duration of construction. There would be no detectable effect on quality elements of the coastal WFD water body.<br><br>Effects in the Alaw: Works are 240m upstream over the Alaw-downstream Llyn Alaw water body. This could potentially result in Increased fine sediment loading reaching the Alaw (transitional). However, given the extent of the works and the effects predicted upstream, there would be no detectable effect on bed substrate, transparency or on BQEs.<br><br>Effects in Alaw downstream Llyn Alaw: Physical presence of a viaduct over the WFD water body locally removing riparian vegetation. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale.<br><br>Tan R'Allt: Physical presence of a culvert in the watercourses locally removing bed and bank material. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale.<br><br>Cleifiog: Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |

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| | | Fine sediment input from in-channel working | Implementation of a CoCP. | 1 | | Effects in Alaw downstream Llyn Alaw: Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale.Tan R'AlltIncreased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale.Cleifiog as above | | |
| | 4.5 - New outfalls and discharges | Fine sediment input from in-channel working | Implementation of a CoCP. | | Cleifiog | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | Changes in water quality (e.g. introduction of new discharge). | Drainage would be via sediment settlement lagoons and water treatment facilities. Discharge water quality to meet agreed standards. | 1 | Pathway - but effects unlikely to be detectable:The SkerriesAlaw (transitional) | The effects would be small scale and restricted to non-reportable fluvial water bodies. Given the distance of the road and the new outfalls to the coast there would be no detectable effect on quality elements of the coastal WFD water body. Effects in the Alaw:Works are 240m upstream over the Alaw-downstream Llyn Alaw water body. This could potentially result in Increased fine sediment loading reaching the Alaw (transitional). However, given the extent of the works and the effects predicted upstream, there would be no detectable effect on bed substrate, transparency or on BQEs. | No | No |

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| | | Discharges from new outfalls | Following good practice guidance for structure design. Discharges released at greenfield runoff rates. | 1 | Alaw<br>Tan R'Allt | Alaw: No direct works in the Alaw (transitional). However, changes in discharges upstream have the potential to influence physiochemical quality elements and increase the availability to priority substances draining the road. Discharges from new outfalls would be at greenfield runoff rates and potential impacts from discharges anticipated to be localised and minimal.<br><br>Tan R'Allt: Changes in discharge have the potential to influence physiochemical quality elements and increase the availability to priority substances draining the road. Discharges from new outfalls would be at greenfield runoff rates and potential impacts from discharges anticipated to be localised and minimal. | No | No |
| | | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | 1 | Pathway - but effects unlikely to be detectable: Alaw downstream Llyn Alaw Cleifiog | Alaw downstream Llyn Alaw: Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale.<br><br>Cleifiog: Physical presence of an outfall headwall in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| Construction of the AECC/MEEG/ESL | 5.1 - Contractors site compound including fuel storage area and welfare facilities | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |
| | 5.2 - Topsoil stripping and formation of landscaping areas | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Implementation of a CoCP. | | Tan R'Allt | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |

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| | 5.3 - New buildings would likely have pile foundations and a piling mat would be placed to facilitate construction | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |
| | 5.4 - Storage and use of granular materials for forming roads and building sub-base | Potential fine sediment runoff from storage areas | Implementation of a CoCP and construction drainage | | Tan R'Allt | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 5.5 - Storage and use of cement related materials | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |
| | 5.6 - Construction of an underground storm-water attenuation tank beneath the site to collect runoff from buildings and hardstanding, and to discharge into an existing watercourse | Potential fine sediment runoff from storage areas | Implementation of a CoCP and construction drainage | | Tan R'Allt | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 5.7 - Construction of roads and buildings | Potential fine sediment runoff from storage areas | Implementation of a CoCP and construction drainage | | Tan R'Allt | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| Operation of the | 6.1 - Operation of a backup generator with associated fuel storage | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |

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| | 6.2 - Management of storm water runoff during operations | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |
| | 6.3 - Operation of a laboratory with discharge of water after analysis of samples | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | Tan R'Allt | Physical presence of a culvert in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| | 6.4 - Discharge of foul water to sewer or operation of a packaged treatment plant with discharge to surface water | Physical presence of a structure within a watercourse | Following good practice guidance for structure design | | Tan R'Allt | Physical presence of a culvert in the watercourses locally removing bed and bank material. In channel structures may result in a barrier to natural movement of aquatic species and may influence water temperature through shading of the channel. However, with good practice mitigation it is not anticipated that there would be an impact at a WFD water body scale. | No | No |
| Decommissioning of the AECC/MEEG/ESL | 7.1 - Return of the site to agricultural land | Potential fine sediment runoff from storage areas | Implementation of a CoCP and construction drainage | | Tan R'Allt | Decommissioning works are not known in detail at this stage, but it is anticipated that the works will be similar to those undertaken during construction. The structures that would remain in situ have been assessed as part of the operation of the Park and Ride Facilities and are not considered as part of the decommissioning. There would be no impacts at a WFD water body scale. | No | No |
| Construction of Park and Ride Facilities at Dalar Hir | 8.1 - Site clearance, including demolition of agricultural buildings and possible vegetation clearance | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |
| | 8.2 - Locating and establishing site compound, welfare facilities (on the site of demolished agricultural buildings) and any storage of fuel and oil for plant and equipment | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |

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| | 8.3 - Topsoil strip to all areas outside buffer zones | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | | Crigyll | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 8.4 - Excavation of topsoil to allow placement of sub-base for all roads, bus drop-off areas and pedestrian footway | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | | Crigyll | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 8.5 - Permeable paving in car park areas, including a drainage layer which would be built from topsoil strip depth upwards | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |
| | 8.6 - Excavation for foundations for new buildings (minimum of 900mm below ground level) | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. Implementation of a CoCP. | | Crigyll | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 8.7 - Landscaping activities that could include locating landscaping bunds to control surface water movement during flood events | No impact pathway. | None required. | | n/a | No pathway to effect. | No | No |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 8.8 - The construction of site drainage channels, outfalls and a storm water attenuation tank | Mobilisation of fine sediment | Implementation of Code of Construction Practice. | | Crigyll | Localised additional mobilisation of sediment from the channel bed and disruption to the natural bed and banks of the watercourses. This could potentially result in changes to the sediment regime and flow processes as well as leading to channel adjustment through erosion. No impact anticipated at a WFD water body scale. | No | No |
| | 8.9 - Construction of a clear span bridge across Nant Dalar Hir | Works within the channel margins leading to fine sediment mobilisation. | Buffer zone around Nant Dalar Hir. | | Crigyll | Localised additional mobilisation of sediment from disruption to the natural banks of the watercourse. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. This could potentially result in changes to the sediment regime and flow processes as well as leading to channel adjustment through erosion. No impact anticipated at a WFD water body scale. | No | No |
| Operation of Park and Ride Facilities at Dalar Hir | 9.1 - Private cars parked on-site, staff using the facility building, staff being picked up from the bus parking area and the buses entering/exiting the facility | Fine sediment input to watercourses from site runoff | Installation of a drainage system with treatment of runoff prior to discharge to watercourses | | Crigyll | Localised additional mobilisation of sediment from disruption to the natural banks of the watercourse. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. This could potentially result in changes to the sediment regime and flow processes as well as leading to channel adjustment through erosion. No impact anticipated at a WFD water body scale. | No | No |
| Decommissioning of Park and Ride Facilities at Dalar Hir | 10.1 - Return of the site to agricultural land. The bridge would remain in situ across the Nant Dalar Hir and some culverts would remain along the watercourses | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Buffer zone around Nant Dalar Hir. | | Crigyll | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |

## Table 12. Ynys Mon Central Carboniferous Limestone (GW)

| Project Element | Activity | Pathways | Key embedded or good practice mitigation | Quantitative status | | | | Chemical status | | | | | Summary of potential effects and risks identified, to groundwater in Ynys Mon Carboniferous Limestone Aquifer | Quality elements at risk from this activity alone? | Requires consideration in cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Saline or other intrusion | Surface water | GWDTE | Water Balance | Saline or other intrusion | Surface water | GWDTE | Drinking Water protected areas | General quality assessment | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Compensation site enhancement | 12.1 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Interception of shallow groundwater in the perimeter drains associated with the soil strip and soil mound<br>Potential changes to groundwater recharge rates, water levels, groundwater flow direction and associated groundwater discharge.<br>Increased rainwater leaching of substances such as metals and nutrients leading to deterioration in groundwater quality | As part of the construction method statement an adaptive management approach would be adopted, including but not limited to:<br>Phasing of works, with incremental changes to topsoil stripping, drainage and other works, over two seasons;<br>Treatment of suspended sediment in runoff water;<br>Monitoring on and off-site before, during and following works;<br>Adaptive management of water flows; and<br>Enhanced revegetation, for example by planting or using nursery crops. | | | | | | | | | | Removal of topsoil will expose calcareous subsoil and facilitate rich-fen habitat creation by enhancing seepage zone along valley slope and creating fen meadow on valley slopes with topogenous communities in valley bottom. Diversion of calcareous water onto pasture will create spring source. Alkaline fen to be created in areas flushed with water from stream, and on areas of strong groundwater influence, within mosaic of fen meadow. Drainage will be beneficially modified by use of small dams or plank weirs, topography and lower ground level to raise relative groundwater levels. Modification of drainage also to restore shallow groundwater flows presently intercepted by ditches. | No | No |
| | 12.2 - Modification of site drainage features - attenuation, sediment treatment | Changes to groundwater recharge, level, flow direction.<br>Changes to groundwater quality from infiltrating water contact with geology<br>Changes to groundwater baseflow to streams and ditches<br>Changes to seepages and springs | | | | | | | | | | | | No | No |
| | 12.3 - Seeding, fencing and landscaping to create wetland habitat | Changes to groundwater recharge, level, flow direction Changes to groundwater baseflow to streams and ditches | | | | | | | | | | | | No | No |

## Table 13. Ceint

| Project Element | Activity | Potential pathways | Key embedded or good practice mitigation | Consideration of potential effects upon hydromorphological quality elements | | | | | | Chemical and physico-chemical quality elements | | | | | Biological quality elements | | | | | Water body mitigation measures assessment | Summary of potential effects and risks identified | Quality elements at risk from this activity alone? | Requires consideration in WFD cumulative assessment? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Quantity and dynamics of flow | Connection to groundwater | River continuity | River depth and width variation | Bed substrate | Riparian zone | Thermal conditions | Oxygenation conditions | Salinity | Acidification status | Nutrient conditions | Fish | Macroinvertebrates | Phytobenthos | Macrophytes | Priority substances | | | | |
| Compensation site enhancement | 12.1 - Removal and storage of topsoil and the preparation of targeted topsoil storage areas and topsoil mounding | Exposed bare earth surfaces leading to fine sediment loading in runoff to watercourses | Implementation of a CoCP. | | | | | | | | 1 | | | 1 | | | | | | N/A | Increased fine sediment loading in runoff to the watercourses. This could have potential effects downstream through sedimentation and smothering of the natural bed substrate and associated habitats. Increased run off may increase nutrient availability to the watercourse. Fine sediment may result in increased turbidity, localised loss of habitat or feeding success. Additional fine sediment deposits within the system also have the potential to reduce channel capacity, particularly close to channel margins or near structures. It is anticipated that the with embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |
| | 12.2 - Modification of site drainage features - attenuation, sediment treatment | Changes in hydrology to receiving waterbody | Implementation of a CoCP | 1 | | 1 | | 1 | | | 1 | | | 1 | | | | | | N/A | Changes in discharge have the potential to influence physiochemical and hydromorphological quality elements. It is anticipated that with the embedded and good practice mitigation there would not be an impact on a WFD water body scale. | No | No |

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# Glossary

| Full title | Abbreviation | Description |
|---|---|---|
| A | | |
| A5025 Off-line Highway Improvements | - | Highway improvements that involve the construction of new sections of the A5025.<br>The A5025 Off-line Highway Improvements would be implemented through Sections 1, 3, 5 and 7. These would involve the construction of bypasses, the formation of new junction arrangements (including the provision of the proposed Power Station access road junction), and localised improvements to existing bends. |
| A5025 On-line Highway Improvements | - | Highway improvements that are made to the existing A5025 road, generally within the existing highway corridor. The A5025 On-line Highway Improvements are being consented under the TCPA.<br><br>Improvements to the existing A5025 between the A5 east of Valley junction to the proposed Power Station Access Road Junction, to include reconstruction and localised widening of the existing pavement and application of a surface dressing. The proposals also comprise a Temporary Construction Compound including a temporary pavement recycling facility, and other associated works such as drainage infrastructure, boundary treatments, planting, new signage and road markings. |
| Abnormal Indivisible Loads | AILs | A load that cannot be divided for the purpose of being carried on a road without undue expense or risk of damage. |
| Above Ordnance Datum | Above Ordnance Datum | Above Ordnance Datum |
| Additional mitigation | | Additional mitigation refers to measures applied where avoidance or reduction of an environmental effect through design measures (embedded mitigation) or good practice mitigation is not possible, or is only partly effective. |

| Full title | Abbreviation | Description |
|---|---|---|
| Advanced Boiling Water Reactor | ABWR | A third generation evolution of the boiling water reactor design. The Power Station will use the ABWR design provided by Hitachi-GE, adapted for use in the UK. |
| Alternative Emergency Control Centre | AECC | A facility that is physically separate from but local to the Power Station and forms part of the Power Station. This would provide back-up command and communications facilities that would be used to manage an incident at the Power Station Site in the extremely unlikely event that the primary facilities on the Power Station Site were not available. |
| Annual Average | - | Average over a year. |
| Aquifer | - | A subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater. |
| Article 4.9 | | A provision in the Water Framework Directive which requires water schemes to be consistent with the implementation of other European environmental legislation. |
| Artificial Water Body | AWB | A water body that has been artificially created, such as a canal. |
| Associated Development | | Meaning works included in the DCO which facilitate the delivery of the Nationally Significant Infrastructure Project, and which principally include: the Site Campus; a temporary Park and Ride facility at Dalar Hir for construction workers; A temporary Logistics Centre at Parc Cybi; A5025 Off-line Highway Improvements; and an electrical connection to the National Grid substation. |
| B | | |
| Bad Ecological Status/Potential | - | WFD term denoting a complete deviation from the 'reference condition' in a water body, for hydromorphological, physico-chemical and biological quality elements. |

| Full title | Abbreviation | Description |
|---|---|---|
| Baseline | | A reference level of existing environmental conditions against which a project is measured and controlled. |
| Bedrock | | Solid bedrock formations underlying superficial deposits (if present). |
| Below ground level | - | A term typically accompanied by a depth in metres to denote a point that occurs beneath the surface of the ground. |
| Benthic | | Living on or in the seabed. |
| Biological quality element | - | Parameters that form the biology in both coastal and fluvial waters; for example, fish, aquatic flora and phytoplankton. |
| Biotope | - | An area defined by characterising species and associated physical characteristics. |
| Birds Directive | - | Directive on the conservation of wild birds (2009/147/EC). This EU Directive gives effect to the EU's obligations for bird species under the Bern Convention and Bonn Convention and provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. |
| Borehole | BH | A vertical hole of small diameter bored into the earth to ascertain the nature of the underlying strata or to obtain water. |
| British Geological Survey | BGS | A partly publicly-funded body that provides technical advice to public and private sectors and aims to advance geological knowledge of the United Kingdom. |
| C | | |
| Candidate Special Area of Conservation | cSAC | Sites that have been submitted to the European Commission to be considered for designation under the Habitats Directive but not yet formally adopted. |
| Catchment | | A drainage/basin area within which precipitation drains into a river system and eventually into the sea. |
| Chemical status | - | A measure of the overall chemical quality of the water body (surface water or groundwater). Reported as either a ‘pass’ or ‘fail’ and assessed from |

| Full title | Abbreviation | Description |
|---|---|---|
| | | compliance with environmental standards for chemicals that are priority substances and/or priority hazardous substances. The status is determined by the worst-scoring chemical. |
| Coastal processes | | The processes of erosion, transportation and deposition within the coastal margin contained within sediment cells or littoral cells. |
| Cofnod | - | This is the North Wales Environmental Information Service. One of four local record centres in Wales which support the observation and recording of wildlife. |
| Compliance | - | Adherence to the requirements of legislation, in this case the WFD. |
| Construction Compound | | TBC |
| Cooling water | CW | The water used to remove heat from the Unit. |
| Cooling Water System | CWS | The once-through system that removes, using CW, the proportion of heat energy produced by the Units which cannot be converted into electricity, and includes the intakes, pumphouses, breakwaters, seal pits and outfall structures as well as connecting pipelines and tunnels for each Unit |
| Cumulative effect | - | An environmental effect caused by the interactions of the effects on the environment from different aspects of the same project and from other projects. |
| Cumulative Effects Assessment | - | An assessment to identify the potential significant effects caused by the interactions of the effects on the environment from different aspects of the same project and from other projects. |
| D | | |
| Department for Environment, Food and Rural Affairs | Defra | The UK Government department responsible for the environment, food and rural affairs. |
| Deposition (sediment) | | The laying down of part, or all, of the sediment load of a stream on the bed, banks or floodplain which forms various sediment features such as bars, berms and floodplain deposits. |

| Full title | Abbreviation | Description |
|---|---|---|
| Development Consent Order | DCO | The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008. |
| Disposal Site | | The newly licensed Holyhead North (IS043) site for the disposal of material from Dredging. |
| Drawdown | - | A change in head or water level relative to background condition. |
| Dŵr Cymru Welsh Water | DCWW | A company which supplies drinking water and wastewater services to most of Wales and parts of western England which is regulated under the Water Industry Act 1991 as amended by the Water Act 2014. |
| E | | |
| Ecological Potential | - | Those surface waters identified as Heavily Modified Water Bodies or Artificial Water Bodies must achieve Good Ecological Potential (Good Ecological Potential is a recognition that changes to morphology could make Good Ecological Status very difficult to meet). |
| Ecological Quality Ratio | | A ratio which incorporates the key WFD requirements for ecological classification: typology, reference conditions and class boundary settings. |
| Ecological Status | - | This is an expression of the quality of the structure and functioning of aquatic ecosystems associated with surface waters, classified in accordance with Annex V of the WFD. |
| Effluent | - | Effluents are liquid discharges from plant processes. Effluents can be fed into other treatment processes or discharged directly. |
| EIA Regulations | - | Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2016 |
| Embedded mitigation | - | Measures to avoid or reduce environmental effects are directly incorporated into the design of the development. Embedded mitigation can be developed through iterative design cycles. The current proposals have been |

| Full title | Abbreviation | Description |
|---|---|---|
| | | prepared using this iterative process to ensure that embedded mitigation measures become a fundamental element of the design that will avoid or limit adverse effects arising. |
| Enabling Works | - | Comprise the A5025 On-line Highway Improvements and SPC Proposals which are being consented through the TCPA. |
| Environment Agency | - | The executive non-departmental public body with responsibility for environmental regulation in England. |
| Environmental Impact Assessment | EIA | The process through which the likely significant effects of a development on the environment are identified and assessed. |
| Environmental Permit | - | A permit required under the Environmental Permitting Regulations for carrying out regulated activities. |
| Environmental Quality Standard | EQS | Directive 2008/105/EC sets out EQSs. The standards set out in Directive 2008/105/EC which concerns the presence in surface water of certain pollutants and substances or groups of substances identified as priority or “priority hazardous”, on account of the substantial risk they pose to or via the aquatic environment. Priority substances are defined by the Water Framework Directive (Directive 2000/60/EC). |
| Environmental Statement | - | The document(s) setting out the EIA process and the findings of the EIA as required under the EIA Regulations. |
| Environmental Survey Laboratory | ESL | A facility that is physically separate from but local to the Power Station and forms part of the Power Station. The ESL would perform a normal operating function for environmental monitoring and, as such, would contain facilities such as monitoring equipment to conduct radiological surveys in the local area. |
| Erosion | | Removal of sediment or bedrock from the bed or banks of the channel by flowing water. Mostly occurs during high flows and flood events. Forms various river features such as scour holes and steep outer banks. |

| Full title | Abbreviation | Description |
|---|---|---|
| Estuary | | Downstream part of a river where it widens to enter the sea. |
| European Designated Site | - | The generic term in the Environmental Statement to describe the sites considered by the Habitats Regulations Assessment, namely:<br>Special Areas of Conservation (SACs) and Special Protection Areas (SPAs);<br>sites that are in the process of designation as SACs and SPAs; these are known as proposed SACs (pSACs), candidate SACs (cSACs), potential SPAs (pSPAs) and Sites of Community Importance (SCIs), depending on the type of designation and point of progression through the designation process; and Ramsar Sites. |
| European Union | EU | The European Union is a unique economic and political partnership between 28 European countries that together cover much of the continent. |
| Examination | - | A stage of no more than 6 months during which the Examining Authority examines the application having regard to written and oral submissions made by Interested Parties. |
| Examining Authority | ExA | Examining Authority appointed by the Secretary of State to examine the application and make a recommendation. |
| Excavation | - | A programme of controlled, intrusive fieldwork which examines and records archaeological deposits, features and structures and retrieves artefacts and ecofacts and other remains within a specified area. |
| Existing Power Station | - | The existing Magnox nuclear power station at Wylfa. |
| F | | |
| Flood Consequence Assessment | FCA | The process of assessing potential flood risk to a site and identifying whether there are any flooding or surface water management issues that may warrant further consideration or may affect the feasibility of a development. Assessment requirements are set out in Planning |

| Full title | Abbreviation | Description |
|---|---|---|
| | | Policy Wales Technical Advice Note 15: Development and Flood Risk (TAN 15). Flood Consequence Assessments may assess the risk of flooding from fluvial sources, groundwater, surface water runoff and sewer water. |
| Floodplain | | A floodplain is flat or nearly flat land adjacent to a stream or river, stretching from the banks of its channel to the base of the enclosing valley walls and (under natural conditions) experiences flooding periods of high discharge. |
| Fluvial | | A term that relates to rivers and streams and the processes that occur within them. |
| Fluvial geomorphology | | The study of landforms and the processes that create them in relation to rivers, lakes, coasts and estuaries. |
| G | | |
| Geomorphology | | The study of landforms and the processes which create them. |
| Good chemical status | | Good chemical status is achieved in a water body in which concentrations of pollutants do not exceed the environmental quality standards established in Annex IX and under Article 16(7) for surface waters and table 2.3.2 of Annex V for groundwater. |
| Good Ecological Potential | GEP | Those surface waters identified as HMWBs must achieve Good Ecological Potential. Good Ecological Potential is a recognition that changes to morphology could make Good Ecological Status very difficult to meet. |
| Good Ecological Status | GES | Good Ecological Status is a WFD term denoting a slight deviation from 'natural reference conditions' in a water body or the hydromorphological, physico-chemical and biological conditions associated with little or no human pressure. |
| Good practice mitigation | - | Mitigation measures that would occur with or without input from EIA feeding into the design process (for example, |

| Full title | Abbreviation | Description |
|---|---|---|
| | | mitigation that represents established industry practice or legal compliance). |
| Groundwater | | All water which is below the surface of the ground in the saturation zone (below the water table) and in direct contact with the ground or subsoil. |
| Groundwater Status | | The status of a body of groundwater, determined by the poorer of its quantitative status and its chemical status. |
| Groundwater-Dependent Terrestrial Ecosystem | GWDTE | A terrestrial ecosystem that is directly dependent on the water level in or flow of water from a groundwater body (that is, in or from the saturated zone). |
| H | | |
| Habitats Directive | | Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna. |
| Habitats Regulations | | Conservation of Habitats and Species Regulations 2017. |
| Habitats Regulations Assessment | HRA | The process by which plans and projects are assessed for whether they are likely to have a significant effect on a European Designated Site either alone or in combination with other plans or projects, pursuant to the Habitats Directive and the Habitats Regulations. |
| Heavily Modified Water Body | HMWB | A water body not considered to be able to achieve 'natural reference conditions' as a result of its physical modification to support a defined use. The WFD recognises the important uses of HMWBs (e.g. from past engineering works). |
| High Ecological Status | - | WFD term used for natural water bodies denoting only very minor or no deviation from undisturbed 'natural reference conditions' in a water body, for hydromorphological, physico-chemical and biological quality elements. |
| Hydraulic gradient | - | A measure of the change in groundwater head over a given distance. |
| Hydrology | | The science that deals with the processes governing the depletion and |

| Full title | Abbreviation | Description |
|---|---|---|
| | | replenishment of the water resources of the land areas of the earth. |
| Hydromorphological quality element | - | Parameters that define the hydrology and geomorphology of both coastal and fluvial waters. Examples for coastal water bodies include the structure of the intertidal zone and wave exposure; and, for fluvial water bodies include the riparian zone, structure of the bed and banks and lateral and longitudinal connectivity. |
| Hydromorphology | | An interdisciplinary science that focuses on the fluvial interaction with surrounding landforms and sediment processes. |
| I | | |
| Ichthyoplankton | - | Early life stages of fish present within marine plankton. |
| Important Hedgerow | - | A hedgerow defined as being important under the Hedgerow Regulations 1997. |
| Interested Party | | A person who has registered a relevant representation by the deadline set by the applicant, after the application has been accepted. |
| Intertidal | | The area of land between mean high water and mean low water. |
| Intertidal zone | - | Intertidal zones lie between the high and low tide marks. Rocky shores, mudflats and sandy beaches fall within this area (part of seabed). |
| Invasive Non-Native Species | INNS | Non-native UK fauna and flora that are invasive, for example Japanese Knotweed. |
| Invertebrates | | Animals without backbones. |
| Isle of Anglesey County Council | IACC | The local authority governing the area within which the Wylfa Newydd Project is intended to be constructed. |
| L | | |
| Land use | - | What land is used for, based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry. |
| Landform | | The shape and form of the land surface which has resulted from combinations of |

| Full title | Abbreviation | Description |
|---|---|---|
| | | geology, geomorphology, slope, elevation and physical processes. |
| Limit of Detection | - | The smallest concentration of a substance that can be detected with a reasonable level of confidence for the given analytical procedure. |
| Local | - | Within 6km. |
| Long-Term | - | Change that would last for between 10 years and 25 years. |
| Lotic-invertebrate Index for Flow Evaluation | - | An index categorising invertebrate families into flow groups depending on their flow/velocity preference. A high LIFE score represents a higher number of taxa with a preference for high-velocity habitats and vice versa. |
| M | | |
| Macroalgae | | Another term for seaweed, comprising red, green and brown algae. |
| Macrophyte | | Aquatic plants that grow in or near water. |
| Main Construction | - | Construction activities within the Wylfa Newydd Development Area that would result in the completion of the Power Station, including final levelling and deep excavations for the Power Station foundations, civil construction activities, commissioning of both Units and site finishing. |
| Marine Licence | | TBC |
| Marine Off-Loading Facility | MOLF | A facility comprising three purpose built quays: one mainly for the delivery of large construction components including AILs, and two mainly for bulk materials such as aggregates and cement. |
| Marine Works | - | The construction and operation of the Permanent Marine Works and Temporary Marine Works. |
| Maximum Ecological Potential | | WFD term used for HMWBs or AWBs to reflect, as far as possible, the hydromorphological and associated physico-chemical conditions of the closest comparable surface water body type. |

| Full title | Abbreviation | Description |
|---|---|---|
| Mean High Water Springs | MHWS | The average level of high-water springs over a period of time. |
| Metre | m | Unit of length. |
| Microgram | µg | One millionth of a gram. |
| Milligram | mg | One thousandth of a gram. |
| Mitigation measure (specific to WFD) | - | A specific activity assigned to a WFD water body catchment or specific HMWB to help to address any modifications or pressures on the quality elements preventing the achievement of Good Status or Potential. The mitigation measures are assessed as being 'in place' or 'not in place' and contribute towards the achievement of Good Potential. |
| Mixing zone | - | A mixing zone is designated by the competent authority as the part of a body of surface water which is adjacent to the point of discharge and within which the concentrations of one or more contaminants of concern may exceed the relevant environmental quality standard, provided that compliance of the rest of the surface water body with the environmental quality standard is not affected. |
| Mobile Emergency Equipment Garage | MEEG | An Off-Site facility for the managed storage of vehicles and equipment for responding to any incidents that might arise during the operational phase of the Power Station. |
| Moderate Ecological Status/Potential | - | WFD term denoting a moderate deviation from the 'reference condition' in a water body, for hydromorphological, physico-chemical and biological quality elements. |
| Moderate status | - | Water Framework Directive term denoting a moderate deviation from the 'reference condition' in a water body, for hydromorphological, chemical/physico-chemical and biological quality elements. |
| Morphology | | Describes the physical form and condition of a water body, for example the width, depth and perimeter of a river channel, and the structure and condition of the riverbed and bank. |

| Full title | Abbreviation | Description |
|---|---|---|
| N | | |
| Nationally Significant Infrastructure Projects | NSIP | A type of project listed in the Planning Act 2008, which must be consented by a development consent order. |
| Natura 2000 Sites | - | Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) are of European importance. They have been created under the Birds Directive 2009/147/EC and Habitats Directive 92/43/EEC. They form part of a larger European network of protected sites called Natura 2000. |
| Natural Resources Wales | NRW | The public body whose stated purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future. It absorbed the regulatory and advisory duties of the Environment Agency Wales, Countryside Council for Wales and the Forestry Commission in Wales. |
| Nitrate Vulnerable Zone | | A Nitrate Vulnerable Zone is designated where land drains and contributes to the nitrate found in “polluted” waters. |
| Non-temporary | - | A non-temporary effect is one from which recovery is expected, but recovery may or may not occur within the duration of one RBMP cycle (six years). |
| Non-reportable water bodies | | Stretches of water that are too small to be a formal WFD water body, or are too small to show up on a map of the water body. Examples are reens, ditches, streams or brackish lagoons. It is likely that these stretches of water are not monitored by Natural Resources Wales (NRW) and their status is not reported. NRW has provided a briefing note which set out how these water bodies should be considered within the WFD Compliance Assessment [RD7]. |
| O | | |
| Off-Site | - | Areas of land needed for the Wylfa Newydd Project that are outside the Wylfa Newydd Development Area. |

| Full title | Abbreviation | Description |
|---|---|---|
| Off-site Power Station Facilities | - | Comprising the Alternative Emergency Control Centre (AECC), Environmental Survey Laboratory (ESL) and a Mobile Emergency Equipment Garage (MEEG). |
| Ordnance Survey | OS | The official map making body of the United Kingdom. |
| P | | |
| Park and Ride facility | - | The park and ride is a temporary facility where workers can park their vehicles securely and transfer to our shuttle buses, which will take them to the Power Station Site. The site is designed to include a zone for buses to collect and drop off passengers, with a management office and parking for staff (working at the park and ride facility). |
| Permanent | - | A permanent effect is one from which recovery is not possible. |
| Permanent Marine Works | - | The CWS, the Marine Off-loading Facility, breakwater structures, shore protection works, surface water drainage outfalls, waste water effluent outfall (and associated drainage of surface water and waste water effluent to the sea), fish recovery and return system, fish deterrent system, navigation aids and Dredging. |
| Permeability/Hydraulic Conductivity | - | Measure of a rock's ability to transmit water when submitted to a hydraulic gradient. |
| Physico-chemical quality element | - | Parameters that support the assessment of the water quality in surface and groundwaters; for example, transparency, thermal conditions, salinity, pH, nutrient conditions and specific pollutants. |
| Phytobenthos | | Microscopic algae found attached to submerged surfaces such as stones and plant stems. |
| Planform | | The shape of a river channel as viewed from the air (such as meandering or braided). |
| Planning Act 2008 | - | The Planning Act 2008 is the primary legislation that establishes the legal framework for applying for, examining |

| Full title | Abbreviation | Description |
|---|---|---|
| | | and determining Development Consent Order applications for Nationally Significant Infrastructure Projects. |
| Planning Inspectorate | - | The body that accepts and examines applications for Development Consent Orders and makes recommendations to the Secretary of State in support of determining whether to grant consent. |
| Plant | - | The machinery or infrastructure used to construct or support the operation of a given development or facility. |
| Pool | | A topographic low point in the bed of a channel providing a relatively deep area of water. |
| Poor Ecological Status/Potential | - | WFD term denoting a relatively significant deviation from the 'reference condition' in a water body, for hydromorphological, physico-chemical and biological quality elements. |
| Power Station | | The proposed new nuclear power station, including two UK Advanced Boiling Water the CWS, supporting facilities, buildings, plant and structures, radioactive waste and spent fuel storage buildings and the Grid Connection. |
| Power Station Access Road | - | The proposed new access road linking the A5025 to the Power Station Site. |
| Power Station Site | - | The indicative areas of land and sea within which the majority of the permanent Power Station, Marine Works and other on-site development would be situated, as shown on Figure 2<br>For Clarity - This does not include the Site Campus as this forms part of the WNDA |
| Pre-Application Consultation | - | Pre-Application Consultation involves engagement with the local community and is a key requirement in applications for Development Consent Orders for major infrastructure projects. |
| Private Water Supply | PWS | A water supply that is not subject to licensing due to its small size and which is not used for public water supply. |

| Full title | Abbreviation | Description |
|---|---|---|
| Process Contribution | - | The predicted concentration due to the emissions from the modelled sources. |
| Proportion of Sediment-sensitive Invertebrates (PSI) | | Macroinvertebrate families within a sample are assigned a score based on their sensitivity to sediment. The resulting PSI scores indicate how sedimented the watercourse is, from minimally accreted to heavily accreted. |
| Pumping test | - | A field experiment in which a well is pumped at a controlled rate and water-level response (drawdown) is measured to estimate hydraulic properties. |
| R | | |
| Ramsar Sites | - | Wetlands of international importance, designated under the Ramsar Convention 1971. |
| Reach | | A length of channel which, for example, may have a homogeneous morphology (river type) or restoration solution. |
| Reasonably Foreseeable Future Projects | RFFP | Projects that can reasonably be expected to progress, and whose effects would overlap spatially and/or temporally with those of the lead project. Projects meeting these criteria have the potential to act together with the lead project to cause one or more cumulative effects. |
| Recharge | - | The replenishment of an aquifer by the infiltration of water, typically rainfall but can be from streams or rivers. |
| Reference conditions | | Type-specific conditions that are established by Member States for biological, physico-chemical and hydromorphological quality elements. |
| Reversible | - | Change that could reasonably be reversed within 25 years, by undertaking reinstatement activities to return the area to the baseline conditions. Replanting and establishing a hedgerow that has been removed, is an example. |
| Riffle | - | A riffle is a short, relatively shallow and coarse-bedded length of stream. It is a natural topographical high point in the bed of the channel and riffles commonly alternate with deeper pools. |

| Full title | Abbreviation | Description |
|---|---|---|
| Riparian zone (or area) | | The riparian zone or riparian area is the interface between land and a stream or river. |
| River Basin District | - | The area of land and sea, made up of one or more adjacent river basins together with their associated groundwaters and coastal waters. |
| River Basin Management Plan | RBMP | The preparation of an RBMP is required under the WFD for each River Basin District. The RBMP should outline the current status of all water bodies and identify measures for achieving the protection, improvement and sustainable use of water within a river's catchment area. |
| River Basin Management Plan (Western Wales) | RBMP | A plan required to be prepared under the WFD which outlines the current statuses of all water bodies. The 2015 Western Wales RBMP outlines a plan for achieving the protection, improvement and sustainable use of water within a river's catchment area in the period 2015 – 2021. A RBMP sets out how organisations, stakeholders and communities will work together to protect and improve the quality of the water environment. |
| River Invertebrate Classification Tool | RICT | A method which enables the assessment of the condition of the quality element, 'benthic invertebrates', listed in Table 1.2.1 of Annex V of the WFD. |
| Runoff | | Precipitation that flows as surface water from a site, catchment or region to the sea. |
| Run-off | - | Precipitation that flows as surface water from a site, catchment or region |
| S | | |
| Scoping | - | The process of identifying the issues to be addressed by the EIA process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered unlikely to be significant. |
| Screening | | The formal process undertaken to determine whether it is necessary to |

| Full title | Abbreviation | Description |
|---|---|---|
| | | carry out a statutory EIA and publish an Environmental Statement in accordance with the EIA Regulations. |
| Secondary B aquifer | - | Predominantly lower permeability rock or soil layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. |
| Secretary of State | SoS | The cabinet minister who (among other things) ultimately determines an application for Development Consent Orders; for the Wylfa Newydd Project the SoS for BEIS. |
| Sediment | | Organic and inorganic material that has precipitated from water to accumulate on the floor of a water body, watercourse or trap. |
| Setting | - | The surroundings in which a place is experienced, whilst embracing an understanding of perceptible evidence of the past in the present landscape. |
| Short-term | - | An effect lasting for the duration of the activity only. |
| Site Campus | | The Site Campus is a temporary facility that would house up to 4,000 construction workers in modular type accommodation blocks, providing an independent living space for each worker, with shared campus-style amenities. |
| Site of Special Scientific Interest | SSSI | Sites designated as being of special interest for their flora, fauna or geological or physiographical features and protected under the Wildlife and Countryside Act 1981. |
| Site Preparation and Clearance works | SPC works | The SPC works and associated proposals for methods of working and temporary road closures. The SPC works will be consented under the TCPA and form part of the DCO application. |
| Special Area of Conservation | SAC | An area which has been identified as being important for a range of vulnerable habitats, plant and animal species within the European Union and are designated under the Habitats Directive. |

| Full title | Abbreviation | Description |
|---|---|---|
| Special Protection Area | SPA | A site designated under the Birds Directive due to their international importance for the breeding, feeding, wintering, or the migration of, rare and vulnerable species of birds. |
| Stakeholder | - | An organisation or individual with a particular interest in a project. |
| Stakeholder engagement | - | An inclusive process of consultation and engagement with stakeholders to obtain information, views and opinions. |
| Straightening (also known as realignment) | | Artificial relocation of a river channel within a river valley/floodplain. |
| Study area | | The spatial area within which environmental effects are assessed (i.e. extending a distance from the development footprint in which significant environmental effects are anticipated to occur). This area varies between different environmental topic areas. |
| Subtidal | - | A zone lying below the low-tide mark but still shallow and close to shore (part of seabed). |
| Superficial deposits | | Unconsolidated (loose) deposits overlying the bedrock. |
| T | | |
| Temporary | - | An effect is defined as temporary if it persists for only a short period of time without the need for further restoration measures. A 'short period of time' is not defined in the Directive but can be taken to be the frequencies mentioned for the monitoring programmes (Annex V 1.3.4 and 2.2.3). |
| Temporary Threshold Shift | TTS | A temporary threshold shift is a temporary shift in the auditory threshold. A temporary threshold shift results in temporary hearing loss. |
| Town and Country Planning Act 1990 | TCPA | The Act that forms part of the land use planning regime in the UK and (among other things) establishes the legal framework in respect of applications for, and determination of, planning permissions. |
| U | | |

| Full title | Abbreviation | Description |
|---|---|---|
| UK Advanced Boiling Water Reactor | UK ABWR | The UK ABWR derives from the generic design of the ABWR. The standard design of the first ABWRs (Kashiwazaki-Kariwa units 6 & 7 in Japan) together with improvements and optimisation from subsequent ABWR plants (Ohma and Shimane 3) and implementation of learning from the Fukushima-Daichii represent the reference plant for Wylfa Newydd Power Station. |
| UK Technical Advisory Group | UKTAG | UKTAG is a partnership of the UK environment and conservation agencies which was created to provide coordinated advice on the science and technical aspects of the Water Framework Directive. |
| Unit | - | All plant and systems, nuclear and non-nuclear, associated with a single nuclear reactor and connected steam turbine generator. |
| W | | |
| Water body | - | A discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water (estuary) or a stretch of coastal water. Groundwater bodies are defined as distinct volumes of groundwater within an aquifer or aquifers. |
| Water Framework Directive | WFD | Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. |
| Wylfa Newydd Project | | The elements of the Wylfa Newydd Project for which consent is being sought through the DCO comprising the construction and operation of the Power Station, other on-site development, the Marine Works, the Off-Site Power Station Facilities and the Associated Development. |
| Wylfa Newydd Development Area | | The term used to describe the elements of the Wylfa Newydd DCO Project within the Wylfa Newydd Development Area, namely the Power Station, other on-site |

| Full title | Abbreviation | Description |
|---|---|---|
| | | development, the Marine Works and the Site Campus. |
| Wylfa Newydd Project | | The Wylfa Newydd DCO Project, the Licensable Marine Activities and the Enabling Works. |
| Z | | |
| Zone of Influence | ZoI | The area(s) over which ecological features may be affected by the biophysical changes caused by the proposed Wylfa Newydd Project and associated activities. |

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HORIZON
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WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

# Wylfa Newydd Project

## 8.27 Water Framework Directive Information to Support Article 4(7) Derogation

PINS Reference Number: EN010007

Application Reference Number: 8.27

June 2018

Revision 1.0

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

Horizon Internal DCRM Number: WN0902-JAC-PAC-REP-00065

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# Executive Summary

The Water Framework Directive (WFD) Compliance Assessment (Application Reference Number 8.26) concluded that the Wylfa Newydd Project may not comply with the environmental objectives of the WFD. This report therefore provides the information required to support a derogation under Article 4(7) of the WFD.

The WFD Compliance Assessment concluded that there is a risk of deterioration of WFD status in two water bodies as a result of the Wylfa Newydd project; details are provided in table 1.

**Table 1: Classification and quality elements at risk of deterioration**

| Water body | Classification/quality element at risk | Current element classification |
|---|---|---|
| The Skerries | Hydromorphology: Morphological conditions | High |
| Ynys Môn Secondary | Saline intrusion (component of both chemical and quantitative status) | Good |
| | Groundwater-Dependent Terrestrial Ecosystem (GWDTE) (quantitative status only) | Good |

For a derogation to be granted, the criteria in Article 4(7) must be satisfied. Article 4(7) states that "Member States will not be in breach of this Directive when:

- failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or
- failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities

  - and all the following conditions are met:

  (a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;

  (b) the reasons for those modifications or alterations are specifically set out and explained in the River Basin Management Plan required under Article 13 and the objectives are reviewed every six years;

  (c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and

(d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option."

Information is provided in relation to each of these tests for the relevant classification and quality elements in both water bodies.

For test (a) mitigation for the effects relating to saline intrusion and effects on Groundwater-Dependent Terrestrial Ecosystem (GWDTE) in the Ynys Môn Secondary Ground water body is outlined, which mainly focuses on mitigation relating to design and construction. For The Skerries water body, mitigation for the effects on hydromorphology (in particular the loss of intertidal habitat) is presented. Each mitigation measure is considered with respect to technical feasibility and disproportionate cost.

For test (b) this report outlines how Horizon will work with Natural Resources Wales to include the water body modifications when the Western Wales River Basin Management Plan is updated.

To address test (c) the case for overriding public interest for the Wylfa Newydd Project is presented with links made with national policy and legislation.

Test (d) considers the alternative solutions and locations of the relevant elements of the Wylfa Newydd Project. This includes consideration of different designs and alternative means of achieving the same outcome. For both The Skerries and Ynys Môn Secondary water bodies the relevant design-related options are investigated to determine whether there was a significantly better environmental option.

The requirements of Article 4(8) and Article 4(9) are also considered.

# 1 Introduction

## 1.1 Background

1.1.1 Horizon Nuclear Power Wylfa Limited (Horizon) is applying to the Secretary of State for a Development Consent Order (DCO) under the Planning Act 2008, to construct, operate and maintain a new nuclear power station on land west of Cemaes on Anglesey.

1.1.2 Development of the Wylfa Newydd Project requires a number of applications to be made under different legislation to different regulators. In addition to an application for development consent, applications will also be made for a Marine Licence and Environmental Permits.

1.1.3 To support these applications an assessment has been carried out to consider the effects of the Wylfa Newydd Project in respect of compliance with WFD which is implemented in Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the 2017 Regulations). The applications are also supported by assessments carried out in accordance with the Town and Country Planning (Environment Impact Assessment) Regulations 2017 and the Conservation (of Habitats and Species Regulations (2010). The Enabling Works, which are the subject of Town and Country Planning Act 1990 (as amended) applications, are supported by separate WFD Compliance Assessments.

1.1.4 A WFD Compliance Assessment (Application Reference Number: 8.26) for the Wylfa Newydd Project was produced to inform Natural Resources Wales (NRW) and the Secretary of State in relation to their duties to have regard to the River Basin Management Plan (Western Wales) (RBMP) and any supplementary plans (Regulation 33 of the 2017 Regulations). The Compliance Assessment determined that there are aspects of the Wylfa Newydd Project that may not comply with the environmental objectives of the WFD and therefore require further consideration. The purpose of this report is to the WFD Compliance Assessment (Application Reference Number: 8.26) in order to provide the decision makers with the necessary information in relation to derogation under Article 4(7) of the WFD. This report should be read in conjunction with the WFD Compliance Assessment (Application Reference Number: 8.26).

## 1.2 Water Framework Directive terminology

1.2.1 Table 1-1 provides a definition of key terms associated with the WFD that are used throughout this report.

**Table 1-1 Water Framework Directive terminology**

| Term | Abbreviation | Explanation |
|---|---|---|
| General | | |
| Artificial Water Body | AWB | A water body that has been artificially created, such as a canal. |

| Term | Abbreviation | Explanation |
|---|---|---|
| Compliance | - | Adherence to the requirements of legislation, in this case the WFD. |
| Chemical status | - | A measure of the overall chemical quality of the water body (surface water or groundwater). Reported as either a 'pass' or 'fail' and assessed from compliance with environmental standards for chemicals that are priority substances and/or priority hazardous substances. The status is determined by the worst-scoring chemical. |
| Ecological Potential | - | Those surface waters identified as Heavily Modified Water Bodies or Artificial Water Bodies must achieve Good Ecological Potential. Good Ecological Potential is a recognition that changes to morphology could make Good Ecological Status very difficult to meet. |
| Ecological Status | - | This is an expression of the quality of the structure and functioning of aquatic ecosystems associated with surface waters, classified in accordance with Annex V of the WFD. |
| Groundwater-dependent terrestrial ecosystem | GWDTE | A terrestrial ecosystem that is directly dependent on the water level in or flow of water from a groundwater body (that is, in or from the saturated zone). |
| Heavily Modified Water Body | HMWB | A water body not considered to be able to achieve 'natural reference conditions' as a result of its physical modification to support a defined use. The WFD recognises the important uses of HMWBs (e.g. from past engineering works). |
| Mitigation measure (specific to WFD) | - | A specific activity assigned to a WFD water body catchment or specific HMWB to help to address any modifications or pressures on the quality elements preventing the achievement of Good Status or Potential. The mitigation measures are assessed as being 'in place' or 'not in place' and contribute towards the achievement of Good Potential. |
| Non-reportable water bodies | | Catchments and associated water features that are too small to be a formal WFD water body. Examples are reens, ditches, streams or brackish lagoons. It is likely that these stretches of water are not monitored by Natural Resources Wales (NRW) and their status is not reported. NRW has confirmed |

| Term | Abbreviation | Explanation |
|---|---|---|
| | | that these water bodies must be considered as part of the WFD Compliance Assessment. |
| River Basin District | - | The area of land and sea, made up of one or more adjacent river basins together with their associated groundwaters and coastal waters. |
| River Basin Management Plan | RBMP | The preparation of an RBMP is required under the WFD for each River Basin District. The RBMP should outline the current status of all water bodies and identify measures for achieving the protection, improvement and sustainable use of water within a river's catchment area. |
| Water body | - | A discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water (estuary) or a stretch of coastal water. Groundwater bodies are defined as distinct volumes of groundwater within an aquifer or aquifers. |
| Status/potential classes | | |
| High Ecological Status | - | WFD term used for natural surface water bodies denoting only very minor or no deviation from undisturbed 'natural reference conditions' in a water body, for hydromorphological, physico-chemical and biological quality elements. |
| Good Ecological Status | GES | Good Ecological Status is a WFD term denoting a slight deviation from 'natural reference conditions' in a surface water body or the hydromorphological, physico-chemical and biological conditions associated with little or no human pressure. |
| Good Ecological Potential | GEP | Those surface waters identified as HMWBs must achieve Good Ecological Potential. Good Ecological Potential is a recognition that changes to morphology could make Good Ecological Status very difficult to meet. |
| Poor Ecological Status/Potential | - | Poor Ecological Status/Potential is not described by the WFD. In terms of this document Poor Ecological Status/Potential denotes a relatively significant deviation (major alteration) from the 'reference condition' in a surface water body, for hydromorphological, physico-chemical and biological quality elements. |

| Term | Abbreviation | Explanation |
|---|---|---|
| Good chemical status | - | Good chemical status is achieved in a surface or groundwater body in which concentrations of pollutants do not exceed the environmental quality standards established in Annex IX and under Article 16(7) for surface waters and table 2.3.2 of Annex V for groundwater. |
| Good quantitative status | - | Quantitative status is an expression of the degree to which a body of groundwater is affected by direct and indirect abstractions.<br>Good quantitative status is achieved in a groundwater body when:<br>the level of groundwater in the groundwater body is such that the available groundwater resource is not exceeded by the long-term annual average rate of abstraction;<br>the groundwater is not subject to anthropogenic alterations that could result in: a) failure to achieve environmental objectives for associated surface waters; b) any significant diminution in the status of such waters; c) any significant damage to terrestrial ecosystems which depend directly on the groundwater body; and<br>there are no alterations in flow direction that could result in a sustained anthropogenically induced saline intrusion. |
| Groundwater Status | - | The status of a body of groundwater, determined by the poorer of its quantitative status and its chemical status. |
| Quality and classification elements | | |
| Biological quality element | - | Ecological receptors that form the biology in both coastal and fluvial waters; for example, fish, aquatic flora and phytoplankton. |
| Hydromorphological quality element | - | Parameters that define the hydrology and geomorphology of both coastal and fluvial waters. Examples for coastal water bodies include the structure of the intertidal zone and wave exposure; and, for fluvial water bodies include the riparian zone, structure of the bed and banks and lateral and longitudinal connectivity. |
| Physico-chemical quality element | - | Parameters that support the assessment of the water quality in surface waters; for example, transparency, thermal conditions, salinity, pH, nutrient conditions and specific pollutants. |

| Term | Abbreviation | Explanation |
|---|---|---|
| Groundwater classification elements | - | The four component parameters that comprise groundwater quantitative status - saline intrusion, surface water, GWDTE and water balance; and the five component parameters that comprise groundwater chemical status - saline intrusion, surface water, GWDTE, drinking water protected areas and general quality assessment. |
| Nature of effects | | |
| Temporary | - | An effect is defined as temporary if it persists for only a short period of time without the need for further restoration measures. A 'short period of time' is not defined in the Directive but can be taken to be the frequencies mentioned for the monitoring programmes (Annex V 1.3.4 and 2.2.3). |
| Non-temporary | - | A non-temporary effect is one from which recovery is expected, but recovery may or may not occur within the duration of one RBMP cycle (six years). |
| Permanent | - | A permanent effect is one from which recovery is not possible. |

## 1.3 Compliance with the Water Framework Directive

1.3.2 The primary aim of the WFD, as set out in Article 1, is to establish a framework for the protection of inland surface waters, transitional waters, coastal water and groundwaters. This framework will prevent further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystem (Article 1(a)). Article 4(1)(a)(i) and Article 4.1(b)(i) of the WFD requires Member States to implement the necessary measures to prevent deterioration of the status (surface waters) and take the measures necessary to prevent or limit the input of pollutants into groundwater and to prevent deterioration of the status of all bodies of groundwater.

1.3.3 The WFD Compliance Assessment (Application Reference Number: 8.26) identified that the Wylfa Newydd Project may be at risk of non-compliance with one or more of the environmental objectives of the WFD as set out in Article 4(1) of the Directive. Quality elements in two water bodies, The Skerries and Ynys Môn Secondary, were identified as being at risk of deterioration and the reasons for this are discussed in section 3.

1.3.4 Following this conclusion, a decision was made to consider the relevant aspects of the Wylfa Newydd Project potentially resulting in non compliance against the requirements of Article 4(7).

## 1.4 Requirements of Article 4(7)

1.4.2 Article 4(7) of the WFD makes provision for a situation where the environmental objectives in Article 4(1) cannot be met, thereby allowing derogation from its requirements. For a derogation to be granted, the criteria in Article 4(7) must be satisfied. Article 4(7) states that "Member States will not be in breach of this Directive when:

- failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or
- failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities and all the following conditions (tests) are met:

  (a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;

  (b) the reasons for those modifications or alterations are specifically set out and explained in the RBMP required under Article 13 and the objectives are reviewed every six years;

  (c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and

  (d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option."

1.4.3 Under Article 4(7) exemptions can be applied for "new modifications" or "new sustainable human development activities". The Wylfa Newydd Project qualifies under both these criteria; this is discussed further in section 4.2.

## 1.5 Consultation in relation to Article 4(7)

1.5.2 A WFD working group was set up which included representatives from Horizon, NRW and the Isle of Anglesey County Council (IACC). Regular working group meetings were held between December 2016 and December 2017. A full list of consultation undertaken to date is provided in the WFD Compliance Assessment (Application Reference Number: 8.26). The consultation specific to Article 4(7) derogation is summarised in table 1-2.

**Table 1-2 Stakeholder consultation relating to Article 4(7) of the WFD for the Wylfa Newydd Project**

| Date | Stakeholder | Title | Description |
|---|---|---|---|
| 23 February 2017 | NRW | WFD working group meeting 1 | Discussion of comments on the first Horizon technical memo on Article 4(7) (setting out the need for Horizon to consider Article 4(7)). |
| 22 August 2017 | NRW<br>IACC | WFD working group meeting 6 | Teleconference to discuss the second Horizon memo on Article 4(7) titled 'Development of a case under Article 4(7) of the WFD for the Wylfa Newydd Power Station'. |
| 12 October 2017 | NRW | WFD working group meeting 7 | Further discussion of the content of the Article 4(7) report. |
| 2 November 2017 | NRW | WFD working group meeting 8 | Presentation of Horizon's approach to the '*Information to Support Article 4(7) Derogation'* report. |
| 19 December 2017 | NRW | WFD working group meeting 9 | Discussion of comments on the first draft of the Article 4(7) report |

## 1.6 Report aims and objectives

1.6.2 The aim of this report is to provide regulators with sufficient information to inform tests in line with the requirements of Article 4(7) for the Ynys Môn Secondary and The Skerries water bodies. The specific objectives of this report are to:

- summarise the results of the WFD Compliance Assessment (Application Reference Number: 8.26) and identify the water bodies and the component classification and quality elements at risk of not meeting the WFD objectives as set out in Article 4(1);
- explain the approach to the provision of information relating to derogation for the Wylfa Newydd Project; and
- present the information required in respect of each condition test of Article 4(7).

1.6.3 This is a factual report and is not intended to conclude whether a case for derogation has been made. The responsibility for determining the derogation case lies with the competent authority (NRW).

## 1.7 Report structure

1.7.2 The report structure is outlined in table 1-3.

**Table 1-3 Report structure**

| Section | Title | Description |
|---|---|---|
| 1 | Introduction | Introduces the Wylfa Newydd Project, sets out relevant WFD terminology and details consultation. |
| 2 | Project description | Provides an overview of the Wylfa Newydd Project and key activities forming the Power Station and Associated Development. |
| 3 | Summary of the Water Framework Directive Compliance Assessment | Summarises the results of the WFD Compliance Assessment (Application Reference Number: 8.26) and identifies the water bodies and component classification and quality elements at risk. |
| 4 | Approach to derogation for the Wylfa Newydd Project | Explains the approach taken to presenting the information relating to derogation for the Wylfa Newydd Project. |
| 5 | Information to support Article 4(7) derogation criteria assessment for the Ynys Môn Secondary water body | Presents the information to inform tests for the Ynys Môn Secondary water body. |
| 6 | Information to support Article 4(7) derogation criteria assessment for The Skerries water body | Presents the information to inform tests for The Skerries water body. |
| 7 | Articles 4(8) and 4(9) | Provides the information in relation to Articles 4(8) and 4(9). |
| 8 | Summary | Outlines the conclusions of this report. |

# 2 Project description

## 2.1 The Wylfa Newydd Project

2.1.1 Horizon is proposing to construct and operate the Wylfa Newydd Project, which comprises the Wylfa Newydd DCO Project, the Licensable Marine Activities and the Enabling Works. Each of these elements is described further below. The Wylfa Newydd DCO Project will be consented under a DCO and the Licensable Marine Activities will be consented under a Marine Licence. There is some overlap between the two; the Marine Works (see below) will be consented under both the DCO and the Marine Licence.

### *Wylfa Newydd DCO Project*

2.1.2 The Wylfa Newydd DCO Project comprises those parts of the Wylfa Newydd Project which are to be consented by a DCO, namely:

#### The Nationally Significant Infrastructure Project (NSIP)

- Power Station: the proposed new nuclear power station at Wylfa, including two UK Advanced Boiling Water Reactors, the Cooling Water System, supporting facilities, buildings, plant and structures, radioactive waste and spent fuel storage buildings and the Grid Connection.
- other on-site development: including landscape works and planting, drainage, surface water management systems, public access works including temporary and permanent closures and diversions of public rights of way, new Power Station Access Road and internal site roads, car parking, construction works and activities including construction compounds and temporary parking areas, laydown areas, working areas and temporary works and structures, temporary construction viewing area, diversion of utilities, perimeter and construction fencing, and electricity connections;
- Marine Works comprising.
  - Permanent Marine Works: the Cooling Water System, the Marine Off-loading Facility, breakwater structures, shore protection works, surface water drainage outfalls, waste water effluent outfall (and associated drainage of surface water and waste water effluent to the sea), fish recovery and return system, fish deterrent system, navigation aids and Dredging;
  - Temporary Marine Works: temporary cofferdams, a temporary access ramp, temporary navigation aids, temporary outfalls and a temporary barge berth;
- Off-site Power Station Facilities: comprising the Alternative Emergency Control Centre (AECC), Environmental Survey Laboratory (ESL) and a Mobile Emergency Equipment Garage (MEEG);

### Associated Development

- the Site Campus within the Wylfa Newydd Development Area;
- temporary Park and Ride facility at Dalar Hir for construction workers (Park and Ride);
- temporary Logistics Centre at Parc Cybi (Logistics Centre);
- the A5025 Off-line Highway Improvements;
- Wetland habitat creation and enhancement works as compensation for any potential impacts on the Tre'r Gof Site of Special Scientific Interest (SSSI) at the following sites:
  - Tŷ Du;
  - Cors Gwawr;
  - Cae Canol-dydd

2.1.3 The following terms are used when describing the geographical areas related to the Wylfa Newydd DCO Project and the Licensable Marine Activities:

- Power Station Site – the indicative areas of land and sea within which the majority of the permanent Power Station, Marine Works and other on-site development would be situated; and
- Wylfa Newydd Development Area – the indicative areas of land and sea including the Power Station Site and the surrounding areas that would be used for the construction and operation of the Power Station, the Marine Works, the Site Campus and other on-site development (WNDA Development).

### Licensable Marine Activities

2.1.4 The Licensable Marine Activities comprise the Marine Works and the disposal of material from Dredging at the Disposal Site.

### Enabling Works

2.1.5 The Enabling Works comprise the Site Preparation and Clearance Proposals (SPC Proposals) and the A5025 On-line Highway Improvements.

2.1.6 Horizon has submitted applications for planning permission for the Enabling Works under the Town and Country Planning Act 1990 to the IACC.

2.1.7 In order to maintain flexibility in the consenting process for the Wylfa Newydd DCO Project, the SPC Proposals have also been included in the DCO application. The A5025 On-line Highway Improvements are not part of the DCO application.

# 3 Summary of the Water Framework Directive Compliance Assessment

## 3.1 Overview

3.1.1 A Compliance Assessment was carried out to consider the effects of the Wylfa Newydd Project in respect of the WFD (Application Reference Number: 8.26). The report considered all project activities in relation to the objectives set out in Article 4(1). The WFD water bodies on Anglesey are shown in figure 3-1 and outlined in table 3-1.

**Table 3-1 Summary of WFD water bodies screened into the Compliance Assessment (Application Reference Number: 8.26)**

| Water body type | WFD water body Name | WFD water body number |
|---|---|---|
| Coastal | The Skerries | GB611010390000 |
| | Anglesey North | GB641010620000 |
| | Cemlyn Lagoon | GB610100083000 |
| | Caernarfon Bay North | GB621010380000 |
| Transitional (included for all quality elements) | Alaw | GB521010207600 |
| Transitional (included only for fish) | Cefni | GB521010207500 |
| Fluvial (included for all quality elements) | Alaw - downstream Llyn Alaw | GB110102058981 |
| | Tan R'Allt | GB110102059100 |
| | Afon Cleifiog | GB110102058930 |
| | Afon Crigyll | GB110102058970 |
| Fluvial (included only for fish) | Wygyr | GB110102059170 |
| | Goch Amlwch | GB110102059230 |
| | Goch Dulas | GB110102059000 |
| | Lligwy | GB110102059070 |
| | Ddrydwy | GB110102058860 |
| | Ffraw | GB110102058680 |
| | Cefni – Ceint to Cefni reservoir | GB110103058770 |
| | Cefni – Cefni reservoir east | GB110102058780 |
| | Cefni – Cefni reservoir west | GB110103058790 |
| | Ceint | GB110102058940 |

| Water body type | WFD water body Name | WFD water body number |
|---|---|---|
| Groundwater | Ynys Môn Secondary | GB41002G204400 |
| | Ynys Môn Central Carboniferous Limestone | GB41001G204200 |

3.1.2 The assessment identified that there were quality elements in two water bodies at risk of deterioration; this would also result in deterioration at a water body level (see table 3-2). Further details on the risks to these water bodies are outlined in sections 3.2 and 3.4. Following this conclusion, it was required that the Wylfa Newydd Project would need to have due regard to the WFD and therefore consider the requirements of Article 4(7).

**Table 3-2 Classification and quality elements at risk of deterioration**

| Water body | Classification/quality element at risk | Current element classification |
|---|---|---|
| The Skerries | Hydromorphology: Morphological conditions | High |
| Ynys Môn Secondary | Saline intrusion (component of both chemical and quantitative status) | Good |
| | Groundwater-Dependent Terrestrial Ecosystem (GWDTE) (quantitative status only) | Good |

# FIGURE 3-1


Legend

- Wylfa Newydd Development Area
- SSSI Compensation Sites
- Associated development/off-site power station facilities
- A5025 Off-line Highway Improvements 1km buffer
- WFD groundwater body
- WFD river water body
- WFD transitional water body
- WFD lake water body
- WFD coastal water body
- A5025

| Rev | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
ARTICLE 4(7) DEROGATION

Drawing Title

WFD WATER BODIES
ON ANGLESEY

| | | |
|---|---|---|
| Scale @ A3 | 1:160,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

60PO8077_AQE_REP_009_03_01

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## 3.2 The Bund Case

3.2.1 In its judgement on the Bund case [RD1], the Court of Justice of the European Union (CJEU) clarified the way in which compliance with the Directive's key environmental objectives should be interpreted in the assessment of new developments and scheme proposals. The clarifications were:

- *"deterioration of the status"* of the relevant body of surface water includes a fall by one class of any element of the "quality elements" within the meaning of Annex V of the WFD even if the fall does not result in a fall of the classification of the body of surface water as a whole;
- consent for development must not be granted by an appropriate authority, unless a derogation is granted, where the project may cause a deterioration in the status of a body of surface water or where it jeopardises the attainment of good surface water status or of good ecological potential and good surface water chemical status by the date laid down in the directive; and
- if the quality element is already in the lowest class, any deterioration of that element represents deterioration of status within the meaning of Article 4(1)(a)(i).

3.2.2 The judgement states that where there may be a risk of deterioration (i.e. where the status of any quality element could be jeopardised) that consent may not be granted.

3.2.3 Although the ruling was specific to surface water bodies NRW has stated that the ruling would also apply to the classification elements which comprise the status of groundwater bodies [RD2].

## 3.3 Ynys Môn Secondary groundwater body

3.3.1 The WFD Compliance Assessment (Application Reference Number: 8.26) identified potential deterioration of the Ynys Môn Secondary groundwater body (GB41002G20440) status caused by quantitative pressure.

3.3.2 The published data state that the Ynys Môn Secondary groundwater body is currently achieving poor status overall, as the current chemical status is poor due to failure of the chemical dependent surface water body status test [RD3]. The reason for failure is due to diffuse local discharges of metals from abandoned mines. As there is no known technical solution to resolving this problem a less stringent objective (less than good) has been set. There are no measures identified in the Western Wales RBMP for the Ynys Môn Secondary groundwater body.

### *Saline intrusion*

3.3.3 Activities which could potentially cause deterioration in the status of saline intrusion are:

- dewatering to -13.5m Above Ordnance Datum (AOD) associated with the deep excavation and construction of the Cooling Water System;
- dewatering associated with the deep excavation to -18mAOD and construction of the reactor building.

3.3.4 The potential adverse impacts of dewatering are a local reversal of groundwater flow along a very small length of coast at Porth-y-pistyll, during the construction period (see figure 3-3).

3.3.5 As a consequence, there could be a very small volume of sea water drawn into the aquifer (6.5m$^3$/d). This is compared to the groundwater model results which show that for the most likely modelled scenario, an estimated 175m$^3$/day of groundwater would be abstracted from the excavations (45m$^3$/day from the seaward excavation and 130m$^3$/day from the inland excavation), with typically a further 750m$^3$/day of direct rainfall being abstracted (see appendix D8-7, Surface water and groundwater modelling results, Application Reference Number: 6.4.32).

3.3.6 The model predicts that seawater might flow into the bedrock aquifer where it meets the coast at Porth-y-pistyll (see appendix D8-7, Application Reference Number: 6.4.32). Much of the seawater, when the excavation is at -18mAOD, will enter the seaward end of the excavation. In addition, any locally significant saline inflows would end up in the excavation, rather than in the bedrock surrounding it, being pumped out as part of the dewatering management.

3.3.7 The key considerations relating to the potential for saline intrusion which in turn determine the potential for deterioration of the water body are:

- Groundwater contours in superficial deposits and bedrock in the baseline condition flow in a NW direction towards the coast. There are no saline water inflow risks associated with the baseline. Monitoring of water quality in four ground investigation boreholes close to Porth-y-pistyll (BH518R, BH822, BH850, BH852) has not identified saline water (appendix D8-3, Application Reference Number: 6.4.28). BH850 and BH852 are both within 50m of the coast, with screened sections down to -12 and -8mOD respectively (i.e. well below sea level) and with depths to groundwater of up to 6mAOD.
- The Ghyben Harzberg relationship gives the theoretical fresh water/saline water interface at a depth below sea level as 40 times the height of fresh water above sea level. The lack of salinity in the monitoring data above suggests that the fresh water/saline water interface is steep with a very limited and deep saline wedge. This is as expected from the recognised low permeability of the bedrock at these depths of >40m below OD. These suggest that it is highly unlikely there would be any significant saline water upcoming during dewatering.

3.3.8 The duration of the land-based excavation phase of construction could last several years with active groundwater dewatering lasting for approximately two to three years.

3.3.9 The location of the reversal of flow and therefore saline intrusion at the start of construction is likely to be within Porth-y-pistyll due to the presence of the semi-dry cofferdam, but once the cofferdam is removed the location of inflow may be closer to the coastline (figure 3-2 and figure 3-3). It is noted that the model, as depicted in figure 3-3, shows dewatering of one large excavation (see appendix D8-7, Application Reference Number 6.4.32).

3.3.10 The effects of the cooling water outfall tunnel construction dewatering on the water levels and flow direction in the aquifer are considered to be local with no reversal of flow and therefore no saline intrusion risk.

3.3.11 The extent of the saline intrusion effect would be small in comparison to the area of the groundwater body and the groundwater body would recover without further intervention, following completion of land-based excavation.

3.3.12 During operation of the Power Station, inland groundwater heads will remain above sea level and flows will always be towards the coast so there will be no saline intrusion.

3.3.13 The prediction of saline intrusion is derived from groundwater modelling and is a worst case. This is because the model does not take into account any mitigating factors, in particular:

- the model is state steady and assumes permanent dewatering whereas the dewatering will be non-permanent and saline intrusion will not occur until late in the construction and will be reversed, and
- the model for the construction phase did not take into account that the excavation walls will be shotcreted which will limit groundwater ingress and will therefore overestimate inflow of groundwater to the excavation.

3.3.14 The dewatering is not permanent and saline intrusion would recover. The duration of recovery is uncertain and therefore it is not possible to define an end date beyond which the dewatering works would no longer impact the water body. However, in the worst case it may take longer than one RBMP cycle (six years) to fully recover and therefore the predicted saline intrusion effect has been classified as non-temporary. The WFD Compliance Assessment (Application Reference Number: 8.26) therefore concluded that the Wylfa Newydd Project could jeopardise the status of the Ynys Môn Secondary groundwater body as a result of saline intrusion.

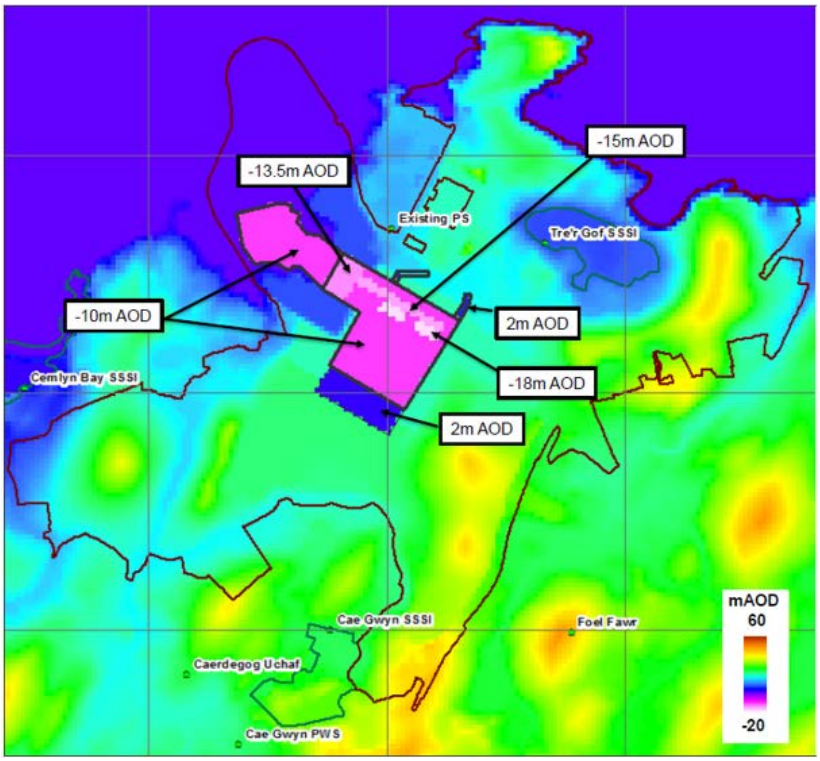


**Figure 3-2 Extent of excavations during construction (phase 4) (see appendix D8-7, Application Reference Number: 6.4.32)**

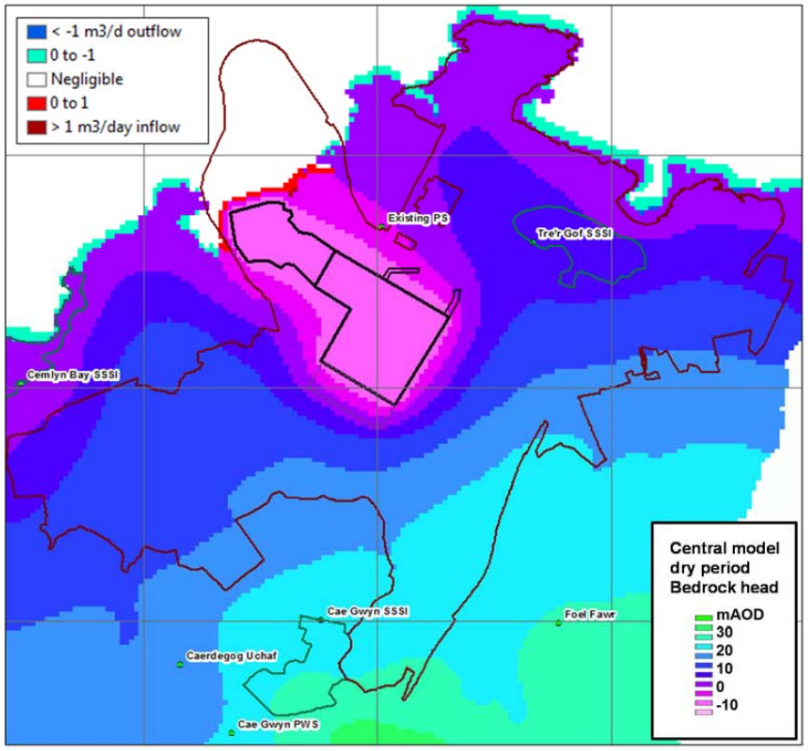


**Figure 3-3 Simulated General Head Boundary flow map during construction (see appendix D8-7, Application Reference Number: 6.4.32)**

### *Tre'r Gof Site of Special Scientific Interest (SSSI)*

3.3.15 Tre'r Gof SSSI is a GWDTE. The activities which could potentially cause deterioration to Tre'r Gof SSSI are:

- Power Station Site construction:
  - bulk earthworks including platform creation, drumlin removal and creation of landscape Mound A, and to a lesser degree Mound B, with steeper slopes than currently present;
  - drainage systems; and
  - dewatering of excavations (figure 3-4).
- Site Campus construction and operation:
  - drainage into Tre'r Gof drains and changes to rainwater infiltration to ground.
- Power Station operation:
  - drainage system; and
  - altered landscape (Mound A and B).

3.3.16 The effects on Tre'r Gof SSSI which relate to these activities are only relevant to the DCO application.

3.3.17 These activities could result in the following effects on the groundwater regime at Tre'r Gof SSSI:

- greater runoff rate from the higher, steeper and temporarily un-vegetated catchment compared to that generated from the current less steep and vegetated slope surface;
- different hydraulic characteristics of the soils and rock used for the new landforms;
- changed drainage which may alter the existing interaction between surface water and groundwater in the vicinity of Tre'r Gof SSSI;
- reduced groundwater recharge due to the presence of the Site Campus and the potential for the ground to become compacted during construction works;
- altered groundwater levels, flow, seepage and spring flow in both superficial and bedrock; and
- changes in groundwater base flow to surface water ditches inflowing into Tre'r Gof SSSI.

3.3.18 Dewatering during construction on the Power Station Site may affect the groundwater flow although this is considered a minor effect with reference to Tre'r Gof SSSI.

3.3.19 The altered groundwater regime combined with the re-routing and change in residence time of groundwater could also have effects on the mineral (especially calcium and bicarbonate) groundwater quality. Due to the predominance of vegetation communities in Tre'r Gof SSSI that are highly

sensitive to groundwater levels and chemistry, a change in species composition may occur if the potential changes in the levels and chemistry of shallow groundwater occurred. Such changes to notable vegetation communities could compromise the conservation status of Tre'r Gof SSSI.

3.3.20 The duration of the potential deterioration is summarised below.

- Hydrological changes due to landscaping would occur relatively early in the construction period and settle down into a new altered status when mounds are revegetated during operation.
- It is possible that there would be long-term permanent changes in habitats within Tre'r Gof SSSI.

3.3.21 The Wylfa Newydd Project would result in a high degree of uncertainty around the predicted future state of Tre'r Gof SSSI because:

- its function is only partly understood due to the natural complexity of the hydrology and hydrochemistry; and
- due to the substantial change in landform and drainage that is proposed within the Tre'r Gof catchment.

3.3.22 The WFD Compliance Assessment (Application Reference Number: 8.26) concluded that in relation to the GWDTE quantitative test, the potential damage to Tre'r Gof SSSI could cause deterioration in the status of the Ynys Môn Secondary groundwater body.

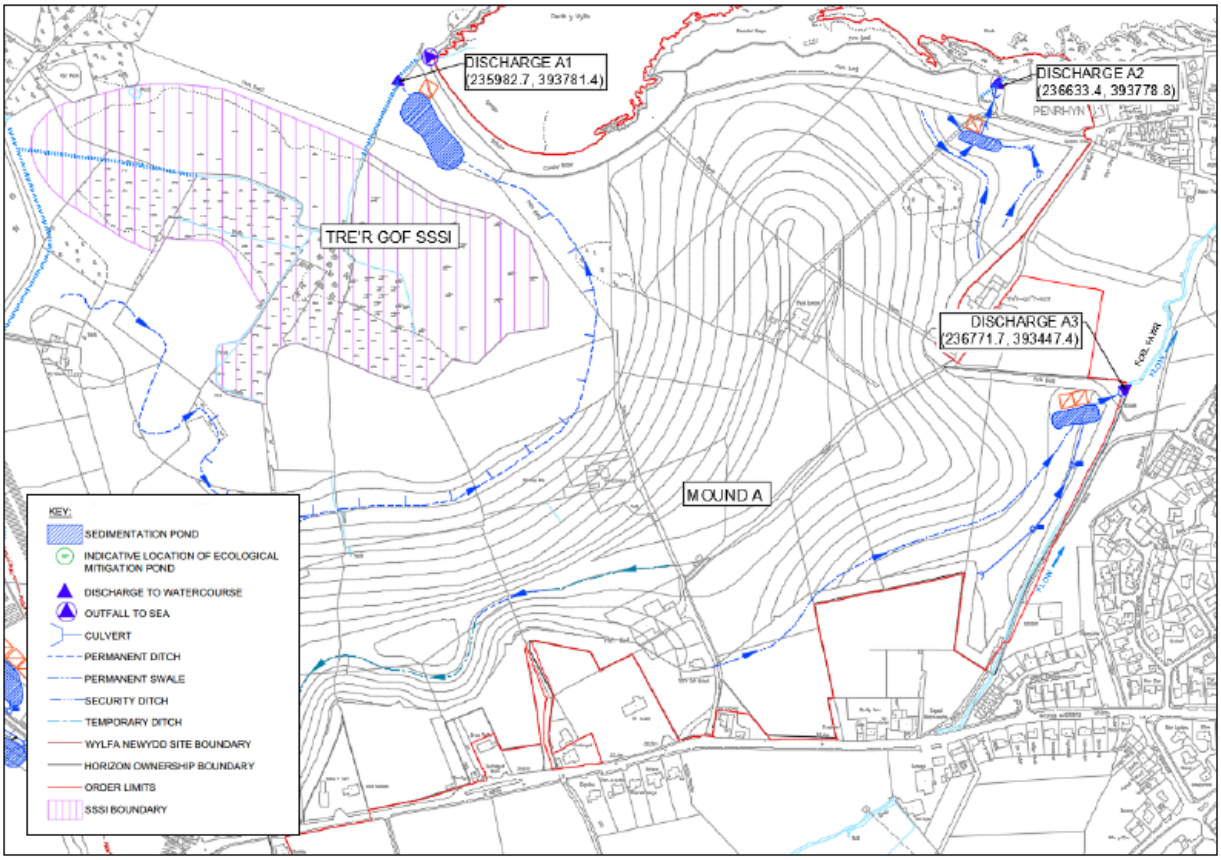


**Figure 3-4 Indicative layout of Mound A and drainage around Tre'r Gof SSSI**

## 3.4 The Skerries water body

3.4.1 The morphological conditions quality element in The Skerries water body is currently achieving high status. The normative definition of high status is given in Annex V:1.2 as *"There are no, or only very minor, anthropogenic alterations to the values of the physico-chemical and hydromorphological quality elements for the surface water body type from those normally associated with that type under undisturbed conditions."*

3.4.2 The activities which could potentially cause deterioration to the hydromorphological status of The Skerries water body are:

- construction and commissioning of concrete batching plant and associated surface water drainage;
- construction of the Cooling Water System, breakwaters and Marine Off-loading Facility (MOLF) including dewatering;
- semi-dry and wet marine excavation including construction and removal of cofferdam, piling and dewatering; and
- excavation and construction of Cooling Water intake and outfall, including tunnelling.

3.4.3 The effects on the morphological conditions quality element which relate to these activities are relevant to the DCO application and the Marine Licence application.

3.4.4 The main effect on the morphological conditions is from the loss of the coastal bed (subtidal area) and intertidal zone under the footprint of the Marine Works. The shoreline structures assessment for The Skerries water body assigned a reporting category of '2a'. This is a low risk score which takes into consideration both the presence and influence of structures on the morphology of the water body [RD4]. Although there are structures within the water body (e.g. the Cooling Water intake of the Existing Power Station), these are small and therefore exert very limited hydromorphological pressure on the water body. These structures were present at the time of the High status classification and are therefore considered part of the baseline.

3.4.5 The footprint of the Marine Works within The Skerries water body would be 30.5ha which includes all permanent and temporary structures as well as the excavated and dredged area. Given the duration that temporary structures are in place and the requirement for maintenance dredging, the footprint was assessed as being permanent.

3.4.6 Of the 30.5ha footprint in The Skerries water body, 7.3ha would be lost in the intertidal zone equating to 3.47% of the total intertidal area (210ha) within the water body. The remaining 23.2ha would represent coastal bed equating to 0.24% of the total subtidal area (9,560ha) in The Skerries water body.

3.4.7 In this instance, compliance with the objectives of the WFD was informed by the interpretation of case law, namely the 'Bund case' (see section 3.2).

3.4.8 The judgement states that where there may be a risk of deterioration (i.e. where the status of any quality element could be jeopardised) that consent may not be granted. It is not possible to definitively conclude that the new modifications would only result in minor anthropogenic change and would therefore constitute within-class rather than between-class deterioration. Considering the wording of the judgement it is concluded that there is a risk that the morphological conditions quality element could deteriorate from high to good status.

# 4 Approach to derogation for the Wylfa Newydd Project

## 4.1 Guidance

4.1.1 The key guidance documents used to inform this report are:

- NRW, 2017. Derogation Determination for Water Framework Directive Article 4(7). Reference number: OGN077 [RD5].
- European Commission, 2009. *Common Implementation Strategy for the Water Framework Directive (2000/60/EC).* Technical Report – 2009 – 027. Guidance document No. 20. Guidance document on exemptions to the environmental objectives [RD6].
- European Commission, 2017. *Common Implementation Strategy for the Water Framework Directive (2000/60/EC).* Guidance document No.36. Exemptions to the Environmental Objectives according to Article 4(7). Revision 4. [RD7].
- Dworak, T., Kampa, E. and Berglund, M. 2016. *Exemptions under Article 4(7) of the Water Framework Directive: Common Implementation Strategy Workshop*. 13-14 December 2016, Brussels [RD8].
- The Planning Inspectorate. 2017. *The Water Framework Directive. Advice note eighteen, version 1*. Issued June 2017 [RD9].
- NRW, 2017. Guidance for assessing activities and projects for compliance with the Water Framework Directive. Ref: OGN 072 [RD10].
- NRW, 2017. Water Framework Directive: deterioration in water body status. Ref: OGN 073 [RD11].

## 4.2 Article 4(7) condition tests and definitions

4.2.1 This report provides information in relation to derogations under Article 4(7) without prejudice as to whether there is a legal requirement to do so for a derogation in all instances.

4.2.2 The exemptions under Article 4.7 of the WFD can be applied to (1) new modifications to the physical characteristics of water bodies and (2) new sustainable human development activities. To benefit from an exemption, all of the following conditions must be met:

- all practicable steps are taken to mitigate the adverse impact (Test (a));
- the reasons for modifications are set out in the River Basin Management Plan and reviewed every 6 years (Test (b));
- the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in the WFD are outweighed by the benefits of the new modifications or alterations to human health, to the

maintenance of human safety or to sustainable development (Test (c)); and

- the objectives of the WFD cannot, for reasons of technical feasibility or disproportionate cost be achieved by other means which are a significantly better environmental option (Test (d)).

4.2.3 The approach taken to addressing each test and an explanation of the terms and how these have been interpreted is outlined below. Sections 5 and 6 consider these tests for the Ynys Mon Secondary and Skerries water bodies respectively.

### *New modifications and new sustainable human development activities*

4.2.4 Under Article 4(7) exemptions can be applied for "new modifications" or "new sustainable human development activities". These terms are defined in the European Commission Common Implementation Strategy for the Water Framework Directive [RD6]. New modifications are changes to the physical (i.e. hydromorphological) characteristics of a water body. The effects on and risk of deterioration to a classification and/or quality element may be either a direct or indirect result of the new modification. Provision is also made for alterations in the level of groundwater which may result from new groundwater abstractions or modifications to surface waters which can lead to alterations to the level of groundwater [RD7].

4.2.5 The second limb of Article 4(7) relates to a failure as a result of deterioration from high status to good status which is a result of "new sustainable human development activities". The latest Common Implementation Strategy guidance suggests that this would only be applied in relation to an input of pollutants, and that the first limb would be used where physical modifications are the aspect requiring derogation, including for water bodies at high status [RD7]. Deterioration for groundwater bodies is not covered under "new sustainable human development activities" [RD7]. The application of Article 4(7) is still evolving and therefore information has been provided in relation to "new sustainable human development activities" as it may become relevant in the future. The Common Implementation Strategy guidance is a working draft and has not been formally adopted.

4.2.6 The definition of what constitutes "new sustainable human development activities" is framed by the relevant decision making process and will be dependent on time, scale, involved stakeholders and information available [RD6].

4.2.7 Sustainable development is also considered within the Well-being of Future Generations (Wales) Act 2015 which states that *"sustainable development means the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals."*.

4.2.8 The Wylfa Newydd Project meets both the criteria for a new modification and a new sustainable human development activity. The changes to physical

characteristics of the Ynys Môn Secondary groundwater body include the deep excavations (physical modification of the aquifer itself), non-permanent dewatering of Unit 1 and Unit 2 and from the creation of landscape mounds and installation of the drainage system (resulting in changes to groundwater recharge).

4.2.9 Changes to the physical characteristics of The Skerries water body would result from the construction of the Cooling Water System, breakwaters and MOLF. Physical changes are described in chapter D13 (the marine environment) (Application Reference Number: 6.4.13) of the Environmental Statement. Changes include the loss of intertidal and subtidal habitats under the foot print of structures and modification of marine habitats resulting from changes to scour.

4.2.10 The Wylfa Newydd Project also meets the criteria for being a new sustainable human development activity and this is evidenced by the relevant National Policy Statements. Nuclear power is one of the key elements of the Government's strategy for moving towards a sustainable low carbon electricity sector [RD12]. The Sustainable Development Commission set out the potential long-term contribution of nuclear power to the target for reductions of emissions of carbon dioxide [RD13]. This is discussed further under test (c).

### *(a) all practicable steps are taken to mitigate the adverse impacts on the water body concerned*

4.2.11 The European Commission advises that the wording "all practicable steps" is analogous with the term "practicable" used in other legislation. It suggests mitigation measures should be technically feasible; do not lead to disproportionate costs; and are compatible with the new modification or sustainable human development activity [RD6].

4.2.12 Mitigation relevant to Article 4(7) is only that which aims to minimise or even cancel the adverse impact on the status of the body of water to which the derogation applies [RD5]. The European Commission's guidance on WFD exemptions states that any measures can be considered as mitigation under the WFD as long as the benefits are experienced in the water body to which the Article 4(7) assessment is being applied [RD7].

4.2.13 The information provided in relation to test (a), has considered all mitigation measures relevant to each classification and/or quality element at risk in the two water bodies. It has taken account of the whole lifecycle of the Wylfa Newydd Project (design, construction and operation), where this is relevant to the effect on the quality element. Maintenance activities are included within operation. The guidance requires that the means of securing the proposed mitigation measures is outlined [RD9]; [RD5].

4.2.14 Relevant mitigation measures have been identified throughout the project (Mitigation Route Map, Application reference Number 8.14). Much of the embedded mitigation has come from the iterative process of Environmental Impact Assessment (EIA), WFD assessment and options appraisal and has been incorporated to overcome or reduce potentially significant adverse

environmental effects. The consideration of mitigation included proposed monitoring where this links to the success of the implementation of mitigation measures.

4.2.15 Mitigation measures would be secured through a number of ‘control documents’ which are an integral component of Horizon's DCO strategy and will be certified as part of the DCO.

4.2.16 The control documents include the following:

- Construction Method Statement (Appendix D1-1, Application Reference Number: 6.4.17): The CMS sets out the construction methodologies, works, and types of machinery required for works on the Power Station Site.
- Phasing Plans (Application Reference Number: 8.29): The Phasing Plans identify when key mitigation (such as the Site Campus and Park and Ride facility) will be constructed.
- Design and Access Statement (DAS) (Volume 1, project wide, Application Reference Number: 8.2.1), (Volume 2, power station site, Application Refrence Number: 8.2.2), (Volume 3, associated developments and offsite facilities, Application Reference Number: 8.2.3): The DAS sets out the "design principles" that will guide how Horizon will construct the authorised development, and illustrative design concepts which demonstrate how the Wylfa Newydd Project could be brought forward in accordance with those principles.
- The Wylfa Newydd Code of Construction Practice (CoCP) (Application Reference Number: 8.6) and sub-CoCPs (Application Reference Number: 8.7, 8.8, 8.9, 8.10, 8.11, and 8.12). The Wylfa Newydd CoCP, together with location-specific sub-CoCPs, sets out how construction activities will be managed and controlled.
- Mitigation commitments identified in the Environmental Statement as well as other assessment processes undertaken (e.g. the WFD Compliance Assessment).
- The Wylfa Newydd Code of Operational Practice (Application Reference Number: 8.13): Similar to the CoCPs, the Wylfa Newydd CoOP sets out the controls that will apply during the operation of the Project (e.g. operating hours).

4.2.17 Other measures that are proposed in EIA assessments will be secured through other mechanisms, such as planning obligations.

4.2.18 A Mitigation Route Map (Application Reference Number: 8.14) will also be submitted with the DCO application. This document will set out all of the mitigation (embedded, good practice and additional) identified through the relevant assessment processes. Specific mitigation measures are set out in chapters 5 and 6 (Ynys Mon Secondary and Skerries respectively).

### *(b) the reasons for modifications or alterations are specifically set out and explained in the RBMP*

4.2.19 Test (b) requires that where modifications or alterations to a water body require derogation, that the reasons for those modifications and alterations are specifically set out and explained in the RBMP and that the objectives are reviewed every six years.

4.2.20 The requirement to report the derogation within the WFD RBMP has been addressed including consideration of the timing of reporting and the need for sufficient consultation as set out in the European Commission Common Implementation Strategy for the WFD [RD6].

### *(c) overriding public interest and/or weighing benefits*

4.2.21 There are two approaches that can be followed for test (c) of Article 4(7); these are:

- c1: overriding public interest;
- c2: that the benefits of the project to human health, human safety or sustainable development outweigh the benefits of achieving the WFD objectives.

4.2.22 For c1 "overriding" means overriding the WFD objectives as stated in Article 4(1). This is explained by NRW as *"the interest furthered by the new activity has to be more important than an EU level public interest in improving water bodies status"* [RD5].

4.2.23 A range of 'public interests' exist, both at an EU level and for individual member states, including energy security, job security and environmental protection. However, it is necessary to demonstrate that there is a 'public interest' and an 'overriding public interest'. The European Commission's guidance on exemptions [RD6] sets out the basis for distinguishing between the two, which in turn draws upon guidance produced for the Habitats Directive [RD14]. The guidance concludes that it is reasonable to consider that the reasons of overriding public interest refer to situations where plans or projects envisaged prove indispensable within the framework of:

- actions or policies aiming to protect fundamental value for citizens' lives (health, safety, environment);
- fundamental policies for the state and the society;
- carrying out activities of an economic or social nature, fulfilling specific obligations of public services [RD6].

4.2.24 It has been indicated that the application of the exemption under Article 4(7) should be seen in the context of the implementation of other EU or international policies and funding mechanisms [RD8]. New modifications or new sustainable human development activities, potentially causing deterioration, are frequently linked with the fulfilment of the objectives of other policies, including energy.

4.2.25 The first part of the test, c1, has been used to determine compliance with this derogation condition for the Wylfa Newydd DCO Project. Evidence has been provided which describes the role of new nuclear power to the UK's energy security, its contribution to meeting future demands and how it aids the transition to a low carbon economy.

4.2.26 For the Wylfa Newydd Project the key policies in relation to overriding public interest are the *Overarching National Policy Statement for Energy EN-1 (NPS-EN1)* [RD12], the *National Policy Statement for Nuclear Power Generation EN-6 (NPS EN-6)* [RD15] and UK Government's Strategic Siting Assessment (SSA) process [RD16]. The policies were explicitly developed for Nationally Significant Infrastructure Projects (NSIPs) in the UK and were subject to public consultation prior to their adoption. The approach taken draws on these NPSs and other relevant policies and legislation, including the *Well-being of Future Generations (Wales) Act 2015* [RD8].

4.2.27 Horizon has commissioned Oxera to examine the available evidence pertaining to the urgent need for new nuclear power, over and above that considered in NPS EN-1 and EN-6. This analysis ('the Oxera analysis') presents the needs case for new nuclear power and contains evidence relevant when considering overriding public interest. It is provided in full at appendix G of the Planning Statement.

### *(d) the benefits of the project cannot be achieved by other means, which are a significantly better environmental option*

4.2.28 The scope of "other means" has two possible dimensions; the alternative options to the Wylfa Newydd Project, and secondly, design-related alternative options.

4.2.29 A summary of the strategic case for the Wylfa Newydd Project and how all reasonable alternatives were considered, is provided in Volume 6 chapter A4 (strategic alternatives) (Application Reference Number: 6.1.4) of the Environmental Statement. This outlines the alternative solutions and alternative locations for the Power Station, and relevant Associated Developments.

4.2.30 To address test (d) fully, the design-related alternatives are also considered; this could involve the following:

- different scales;
- different designs;
- alternative operating schemes; and
- alternative locations [RD5]; RD6].

4.2.31 This includes consideration of how the design is achieved, for example using different construction methods or an alternative means of achieving the required results. The guidance states that alternatives should be "comparable, realistic and viable" [RD5].

4.2.32 An option may be a significantly better environmental option if:

- the benefit it delivers is at least equivalent to the benefit that would be delivered by the proposal;
- its environmental cost is significantly less than the environmental cost of the proposal; and
- it is economically viable and hence a realistic option.

4.2.33 Design alternatives are set out in relation to the quality elements at risk in section 5.5 (Ynys Môn Secondary) and section 6.5 (The Skerries). This identified whether any of the alternative options would have delivered a significantly better environmental option and included consideration of technical feasibility and disproportionate cost.

4.2.34 The definitions of 'technically feasible' and 'disproportionate cost' are outlined below. These are also relevant to test (a).

### *Key terms relevant to test (a) and test (d)*

4.2.35 The terms 'technically feasible' and 'disproportionate cost' are specifically mentioned in the wording of Article 4(7) test (d) but in line with guidance [RD5]; RD6] are also relevant to test (a) in relation to mitigation measures. Definitions of these terms, drawing from the relevant guidance, are provided below. The term 'uncertainty' is also defined and criteria for assigning different levels of uncertainty are provided.

#### Technically feasible

4.2.36 Both NRW [RD5] and European Commission guidance [RD6], state that technical infeasibility is justified if:

- no technical solution is available;
- it takes longer to fix the problem than there is time available; and
- there is no information on the cause of the problem; hence a solution cannot be identified.

4.2.37 It is noted that issues of costs and benefits will need to be considered alongside technical feasibility [RD5]. If there could be a substantial benefit from an improvement, then this may justify a higher degree of effort to find a technically feasible option [RD5].

#### Disproportionate cost

4.2.38 The European Commission refers to the use of 'disproportionality' in Articles 4(4) and 4(5) as being a "political judgement informed by economic information" [RD6]. When determining that an option or measure is disproportionately costly the guidance suggests that the following points are taken into account:

- the assessment of costs and benefits will have to include qualitative costs and benefits as well as quantitative;
- the margin by which costs exceed benefits should be appreciable and have a high level of confidence; and

- disproportionate cost should also take into consideration the ability of those incurring the cost of the measures, to pay.

4.2.39 NRW guidance explains that disproportionate cost means more than a negligible amount as assessed against either total cost or turnover to the project developer [RD5]. It is also stated that "From the logic of the WFD it becomes clear that an assessment of disproportionate cost only makes sense after a combination of the most cost-effective solutions has been identified." The guidance places emphasis on implementing all measures that can be taken without involving disproportionate costs to reach the best status possible.

4.2.40 In relation to mitigation measures consideration should be given to whether the costs of the mitigation clearly outweigh the benefits, including benefits that are related to meeting WFD objectives but also wider social, economic and landscape benefits.

### Uncertainty

4.2.41 In some cases, there is an element of uncertainty associated with some mitigation measures in test (a), which may play an important role in determining whether the mitigation measure is suitable for inclusion. Whilst it may be technically feasible to incorporate a particular measure, the likelihood of a benefit being realised may be uncertain if there is either a lack of evidence of successful implementation elsewhere or a lack of underpinning scientific understanding. This uncertainty may also have implications for the disproportionate cost aspect, as if there is little evidence that a measure will effectively mitigate an effect, then the cost versus benefit case is weakened.

4.2.42 Levels of uncertainty are assigned using professional judgement based on the following criteria:

- Low: there is some uncertainty related to either the measure's feasibility or the benefit it would result in; however, the measure is likely to be effective.
- Medium: there is a moderate level of uncertainty related to either the measure's feasibility or the benefit it would result in, possibly related to limited scientific evidence of its effectiveness.
- High: there is no evidence of the measure's feasibility or the benefit it would result in, and no scientific evidence of its effectiveness.

## 4.3 Article 4(8)

4.3.1 When considering Article 4(7), it is also necessary to consider Article 4(8), "*exemptions for one water body must not permanently exclude or compromise achievement of the environmental objectives in other water bodies.*" Information relating to Article 4(8) is provided in section 7.1.

## 4.4 Article 4(9)

4.4.1 When considering Article 4(7), it is also necessary to consider Article 4(9), "*at least the same level of protection must be achieved as provided for by existing Community law.*" Information relating to Article 4(9) has been provided within the WFD Compliance Assessment (Application Reference Number: 8.26) and a brief summary of the conclusions has been presented in section 7.2.

# 5 Information to support Article 4(7) derogation criteria assessment for the Ynys Môn Secondary groundwater body

## 5.1 Introduction

5.1.1 This section of the report provides the information in relation to derogation for the Ynys Môn Secondary groundwater body and is split into the information relevant to each test of Article 4(7) from (a) to (d).

## 5.2 Test (a)

5.2.1 A description of all mitigation that was considered in relation to saline intrusion for the Ynys Môn Secondary groundwater body is presented in table 5-1. A description of all mitigation that was considered in relation to GWDTE for the Ynys Môn Secondary groundwater body is presented in table 5-2.

**Table 5-1 Mitigation measures considered in relation to saline intrusion for the Ynys Môn Secondary groundwater body**

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| YM1.1 | ✓ | | | Placement of a semi-dry cofferdam in Porth-y-pistyll at the same time as deep excavations | Construction of the marine cofferdam and excavation in the dry behind the cofferdam means that the flow reversal occurs offshore at the start of the excavations. | Yes | Low | No | None | Included within Construction Method Statement |
| YM1.2 | | ✓ | | Appropriate monitoring will be undertaken to determine if there is significant saline intrusion into the aquifer. | The monitoring will include continuous water level monitoring at selected groundwater monitoring boreholes with monthly or quarterly water level dips at other locations and quarterly water quality sampling (for major ions) at selected locations. Monitoring of sump water quality (for major ions) would also be undertaken on a monthly or quarterly basis. Where practicable existing boreholes will be used, although it is recognised that many of these will be lost during the construction works and some replacements may be required. | Yes | Low | No. | None | Yes |
| YM1.3 | ✓ | ✓ | | Additional mitigation triggered by monitoring. | If a significant effect is identified additional mitigation may be required. Options would include: (1) grouting major inflow fractures, (2) alter pumping regime,-Aim is to prevent further saline inflow. | Yes | Low | No. Implementing will help maintain the excavation in a dry state and reduce the period of dewatering. | Potential for water within the excavation to become alkaline which may then require treatment prior to discharge. | Yes |
| YM1.4 | ✓ | | | Artificial ground freezing. | Pipes with refrigerant are run through the subsurface to freeze the ground to prevent any groundwater flow into the excavation. | The hardness of the rock requires blasting to be used initially to excavate, and it would be very difficult to insert the pipework. | High | This measure would be disproportionately costly as there are no meaningful benefits from emplacing technically challenging and expensive groundwater inflow prevention measures. The cost is disproportionately high compared to direct pumping. | None | No |
| YM1.5 | ✓ | | | Vertical grout curtains. | This technique involves a row of vertically drilled holes filled with grout under pressure. | The hardness of the rock requires drilling or blasting, and it would be | Moderate | This measure would be disproportionately costly. There are no meaningful benefits | Groundwater contamination by grout | No |

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | The holes are drilled at intervals in such a way that they create a curtain. | very difficult to insert physical barriers. | | from emplacing technically challenging and expensive groundwater inflow prevention measures. The cost is disproportionately high compared to direct pumping. | | |
| YM1.6 | ✓ | | | Low permeability cut-off walls using piling. | Installation of a vertical bored pile wall around the excavation to prevent ingress of water. | The hardness of the rock would require pile installation by boring. | | This measure would be disproportionately costly. There are no meaningful benefits from emplacing technically challenging and expensive groundwater inflow prevention measures. The cost is disproportionately high compared to direct pumping. | Installation would result in additional effects on receptors from increased noise. | No |

**Table 5-2 Mitigation measures considered in relation to Tre'r Gof SSSI for the Ynys Môn Secondary groundwater body**

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| YM 2.1 | ✓ | ✓ | | Establish buffer strips between the western and northern toe of Mound A and Tre'r Gof SSSI prior to the commencement of earthworks and maintain thereafter. | Some of the groundwater supplying Tre'r Gof SSSI emerges as springs and seeps on the edge of the basin. They are thought to be recharged by infiltration and flow within a zone 50m to 150m to the south and east of Tre'r Gof SSSI.<br>The buffer strip in conjunction with the other mitigation aims to maintain these key groundwater discharges by encouraging residence time and infiltration to the aquifer. The buffer zone would also allow overland flow to Tre'r Gof SSSI to continue as at present.<br>No construction works will take place within the boundary of the Tre'r Gof SSSI. Suitably demarcated buffer zones will be established.<br>• For the north and west of the Tre'r Gof SSSI adjacent to the site Campus, the buffer zone will be 20m;<br>• To the south of the Tre'r Gof SSSI, the buffer zone will be established at 50m;<br>• For the more sensitive eastern end of the Tre'r Gof SSSI, the buffer zone will be established at 100m. | Yes | Medium | As it currently stands this measure is incorporated into the scheme and the cost is not disproportionate. | None | Yes |
| YM2.2 | ✓ | ✓ | ✓ | Landscape mounding has been designed to avoid changes in catchment boundaries as far as practical. | Some catchment boundary changes do result from the mounding. The overall contributing catchment area remains close to the baseline situation with <10% change in catchment area. | Yes, but it is not possible to keep mounds wholly outside of Tre'r Gof SSSI Catchment as this would mean that there would not be any landscape mounds or noise barriers. | Low, with respect to area.<br>There will be medium to high uncertainty related to the new runoff recharge characteristics of the new landscape mounding. | The landscape mounds are a sustainable local reuse of excavation material. Any transport of materials further afield would be less sustainable and more expensive and could be disproportionately costly. | None | Yes |
| YM2.3 | ✓ | ✓ | ✓ | Use of a permeable inert crushed rock drainage blanket below Mound A to the south and east of Tre'r Gof SSSI, and use of overflow pipes in drainage system. | Permeable drainage blanket to allow the shallow groundwater and surface water runoff flowing from the south and east of Mound A to flow under the mound into the SSSI as it currently does. The use of inert rock will seek to ensure that the shallow groundwater | Technically the blanket is easy to place, but it needs to be constructed to avoid instability of | Medium to High<br>There is significant uncertainty as to its effectiveness in replicating the quality and quantity of water sources that feed | No | No | Yes |

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | chemistry does not change appreciably from the baseline conditions. | overlying materials.<br>The overflow pipes and weirs are technically feasible. | Tre'r Gof SSSI. It is not possible to accurately predict the changes in the quality of shallow groundwater chemistry or to have certainty in the resulting groundwater levels and discharges. | | | |
| YM2.4 | | ✓ | | Timing of mounding. | Complete all associated earthworks on north and west side of mounding A and B (facing Tre'r Gof SSSI) during dry weather conditions, preferably within the drier months (Apr - Sep), of the first earthworks season.<br>Objective is to slow down runoff to mimic natural runoff characteristics and avoid excess sedimentation via natural processes to remove sediment.<br>Would also manage rainwater close to where it falls. | Yes, but will require rigorous planning and is subject to weather patterns once commenced. | Low to medium – weather and climate dependent. | No | This may slightly increase the time that the face is exposed, with effects on visual receptors for a limited period of time. | Yes |
| YM2.5 | ✓ | ✓ | ✓ | Drainage - The drainage system has been designed to maintain surface water balance within existing drainage catchments as far as is practicable. | This will maintain surface water elements of flow into and out of Tre'r Gof SSSI and ensure no flooding as a result of the development. | Maintaining an overall balance is technically feasible but there is uncertainty as to replication of individual components of flow, which is where the deterioration potential lies. | Medium | Not disproportionately costly regarding overall surface water balance. | None | Yes |
| YM2.6 | ✓ | ✓ | ✓ | Drainage - Drainage of the landscaped areas has been designed to incorporate as much flexibility as possible so that changes can be made to drainage water treatment and to the volume of water being | In addition to the drainage blanket, the drainage design for the Tre'r Gof SSSI will include the use of overflow pipes at 50m intervals in the drainage ditch to the north and west of Mound A such that during times of higher rainfall, water will flow to the ground adjacent to the drain, allowing overland flow to the SSSI to be maintained. Monitoring and | Yes | High | No, although this would require regular long term attention during operation incurring monitoring and maintenance costs which could be expensive. | None | Yes |

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | released at various discharge points during the construction period. | control weirs in the overflow pipes will be used to control the flow to the SSSI. | | | | | |
| YM2.7 | ✓ | ✓ | ✓ | The drainage design strategy will seek to be implemented to reduce potential effects on receiving water bodies and ecological receptors, most notably the Tre'r Gof SSSI. | Where practicable, a treatment train of Sustainable Drainage System (SuDS) methods will be utilised for discharges including site drainage, surface water runoff from exposed topsoil during construction and later from the newly formed landscape mounds and from dewatering discharges. Sediment settlement ponds will be used in conjunction with other measures including silt traps, silt curtains, silt fences and vegetated channels to manage flows and meet water quality thresholds as per the findings of the Wylfa Newydd DCO Project Water Framework Directive Compliance Assessment. | Yes, but will require regular and detailed long-term attention, development and engineering modifications in the early years of operation. | Medium | No | none | Yes |
| YM2.8 | | ✓ | | Drainage - A SuDS treatment train will be placed for drainage operation of the Site Campus and will include attenuation of discharge to surface water and groundwater recharge. | After each phase of site campus construction, surface water drainage from the completed elements of the Site Campus will either run into the ground around the site, or into surface water channels to the east of the site. Drainage design for operation of the Site Campus, will include attenuation of discharge to surface water (e.g. geocellular attenuation tank), and recharge of storm water runoff (e.g. via infiltration trenches, reno mattress, swales), in order to reduce potential hydrological effects on the SSSI arising from surface water flows. | Yes | Low | No | Small temporary alteration to Tre'r Gof water availability, but small when compared to the potential permanent changes due to mounding in Tre'r Gof Catchment. | Yes |
| YM2.9 | | ✓ | ✓ | Monitoring and active management of the drainage system to mitigate the effects of construction activities on surface water flow and quality at the Tre'r Gof SSSI. | Monitoring will continue up to the start of construction in order to improve the robustness of the baseline data. These data will be used during detailed design to refine the drainage system to reduce potential effects.<br>Active management of the drainage system to include monitoring of every discharge point will determine if there is a significant departure from baseline conditions. Will include monitoring upstream and downstream of all outfall points to determine if the outfall is | Yes. Depending on the findings, additional mitigation may be required as agreed with the regulator. Options could include: (1) implementing dosing using polyelectrolytes, (2) installation of additional | Low, related to the monitoring.<br>Associated mitigations have medium uncertainty. | No | None | Yes |

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | having an effect on water quality and to allow treatment to be adjusted. Frequency will be a mix of continuous, daily, weekly or monthly. Will continue into operation. | treatment capacity, (3) greater manual intervention/ management of the system, (4) new drainage channels, (5) new pumping systems, (6) automated treatment and/or pumping systems. | | | | |
| YM2.10 | | ✓ | ✓ | Tre'r Gof SSSI compensation package. | Horizon is committed to delivering a compensation package, in order to offset a potential adverse effect on Tre'r Gof SSSI, which will create new areas of rich-fen habitat and enhance areas of existing rich-fen habitat at three sites on Anglesey. Habitat creation and management schemes for each site will be developed, in line with the principles set out in the LHMS. All three sites are in the Ynys Mon Secondary groundwater body, although one also overlaps with the contiguous Ynys mon Central Carboniferous Limestone groundwater body. | Yes<br>The availability of land for purchase is also a constraint which would determine the feasibility of habitat creation. | Low to medium | This would be dependent on the sites selected and the works required. | The objective of these works would be to provide a net positive outcome. | Yes |
| YM2.11 | | ✓ | | Pollution prevention measures. | Horizon will employ protective measures to control the risk of pollution to groundwater, which will, in particular, be consistent with the *Environmental Permitting (England and Wales) Regulations 2016*<br>In addition, Horizon will avoid using materials that could result in direct or indirect discharge of hazardous substances or non-hazardous pollutants to groundwater. | Yes | Low | No | None | Yes |
| | | ✓ | | Prevention of contaminated runoff. | Horizon will address the handling of material from excavations being a potential source of contamination and will ensure measures are put in place to prevent contaminated runoff reaching open ground. Materials that could result in direct or indirect discharge of hazardous substances or non-hazardous pollutants to groundwater will be avoided. | Yes | Low | No | None | Yes |

## 5.3 Test (b)

5.3.1 Test (b) is a reporting obligation and does not mean that Member States must wait until the publication of the RBMP before allowing a new physical modification or new sustainable development activity to proceed [RD6]. The guidance given is that "*If a modification or alteration goes ahead in the middle of a river basin planning cycle, the reason for that modification or alteration must be set out in the subsequent (update of the) RBMPs*" [RD6].

5.3.2 The river basin management process incorporates adaptive management principles and the need to deal with physical modifications in an environmentally sensitive manner is acknowledged in the Western Wales RBMP [RD17]. This provides a framework for the necessary reporting. Should the Wylfa Newydd Project be constructed, Horizon would work with NRW to include the water body modifications when the Western Wales RBMP is updated. The information provided in both the WFD Compliance Assessment (Application Reference Number: 8.26) and this report can be used to inform this process.

5.3.3 As part of the guidance on test (b) the European Commission states that "*for modifications and alterations within the scope of the Environmental Impact Assessment Directive, Member States must ensure that the public concerned is given the opportunity to express an opinion before the project is initiated*" [RD6].

5.3.4 It is noted that even if the timing of a project is such that consultation on the RBMP will not provide an opportunity for stakeholders to comment, Article 14 requires Member States to actively involve all interested parties in the implementation of the Directive [RD6]. The guidance goes on to state that the feedback provided in such consultations can help Member States to reach a judgement on whether the exemption conditions have been met and will reduce the likelihood of challenges from interested parties [RD6].

5.3.5 Horizon has undertaken an extensive public consultation process, the feedback from which has been important in developing and refining the Wylfa Newydd Project. There have been three main stages of public consultation, as set out below, in addition to further informal consultation including a project update consultation in January 2016 and on specific elements of the Wylfa Newydd Project in May 2016 and December 2017:

- Stage One Pre-Application Consultation: September - December 2014;
- Stage Two Pre-Application Consultation: August - October 2016; and
- Stage Three Pre-Application Consultation: May - June 2017.

5.3.6 Consultation on the WFD has taken place with the Planning Inspectorate, NRW and the IACC, including monthly 'working group' meetings since February 2017. A Preliminary WFD Compliance Assessment was sent to NRW for comment in November 2016 and meetings were held to discuss the feedback and future work. In July 2017 a draft WFD Compliance Assessment was sent to NRW and IACC for comment and feedback was received and discussed at the following working group meeting. Subsequently, further

feedback was sought from the Planning Inspectorate and NRW on a draft DCO application in August 2017 which included the WFD Compliance Assessment (Application Reference Number: 8.26) for the Wylfa Newydd Project.

## 5.4 Test (c)

5.4.1 As noted in Section 4.2, the European Commission's guidance on exemptions [RD7] sets out the basis for distinguishing between public interests and overriding public interests. The guidance concludes that it is reasonable to consider that the reasons of overriding public interest refer to situations where plans or projects envisaged prove indispensable within the framework of:

- actions or policies aiming to protect fundamental value for citizens' lives (health, safety, environment);
- fundamental policies for the state and the society; and
- carrying out activities of an economic or social nature, fulfilling specific obligations of public services [RD7].

5.4.2 This section sets out evidence to inform a case of overriding public interest for the Wylfa Newydd DCO Project. This evidence is structured to describe:

- the public need for energy;
- the public need for nuclear energy; and
- the suitability of the Wylfa Newydd DCO Project

### *The need for new energy generation capacity*

5.4.3 NPS EN-1 states that energy underpins almost every aspect of our way of life. It enables us to heat and light our homes; to produce and transport food; to travel to work, around the country and the world. Our businesses and jobs rely on the use of energy. Energy is essential for the critical services we rely on – from hospitals to traffic lights and cash machines. It is difficult to overestimate the extent to which our quality of life is dependent on adequate energy supplies (para 3.2.1) [RD12].

5.4.4 NPS EN-1 [RD12] makes clear that the Government's key objectives in energy policy are to ensure energy security for the UK and to decarbonise energy capacity in order to meet the UK's 2050 climate change targets. It explicitly identifies the urgent need for new (and particularly low carbon) electricity Nationally Significant Infrastructure Projects (NSIPs) in the UK within the next 10-15 years, i.e. 2011 – 2025 (paras 3.3.1 to 3.3.5). It outlines the challenges facing the UK's energy security in light of the Government's carbon reduction objectives and notes that the UK not only needs a secure, diverse and reliable supply of electricity, but needs it in the context of reducing greenhouse gas emissions by at least 80% by 2050 (under the Climate Change Act 2008) (paras 3.3.14, 3.3.15).

5.4.5 The following sub-sections consider the need for new energy generation capacity in the context of (i) a loss of existing generating capacity, (ii) predicted

increase in the demand for electricity, and, (iii) the combination of increasing demand but decreasing supply (termed the generation shortfall).

### Loss of existing generating capacity

5.4.6 A combination of aging power stations and environmental regulation means that by 2020, at least 22GW of existing generating capacity will need to be replaced. This expected decrease in generation capacity is particularly acute for coal and nuclear plants [RD12]. 8.4GW of coal capacity closed between 2010 and 2015 in response to the EU's Large Combustion Plants Directive. There are further plans to close all unabated coal fired power stations by 2025 [RD18].

5.4.7 Two nuclear power plants have been decommissioned since NPS EN-1 was published (Oldbury in 2012 and Wylfa in 2015). In addition, 88% of residual nuclear power capacity is planned to be decommissioned by 2030 [RD19], as illustrated in figure 5-1.

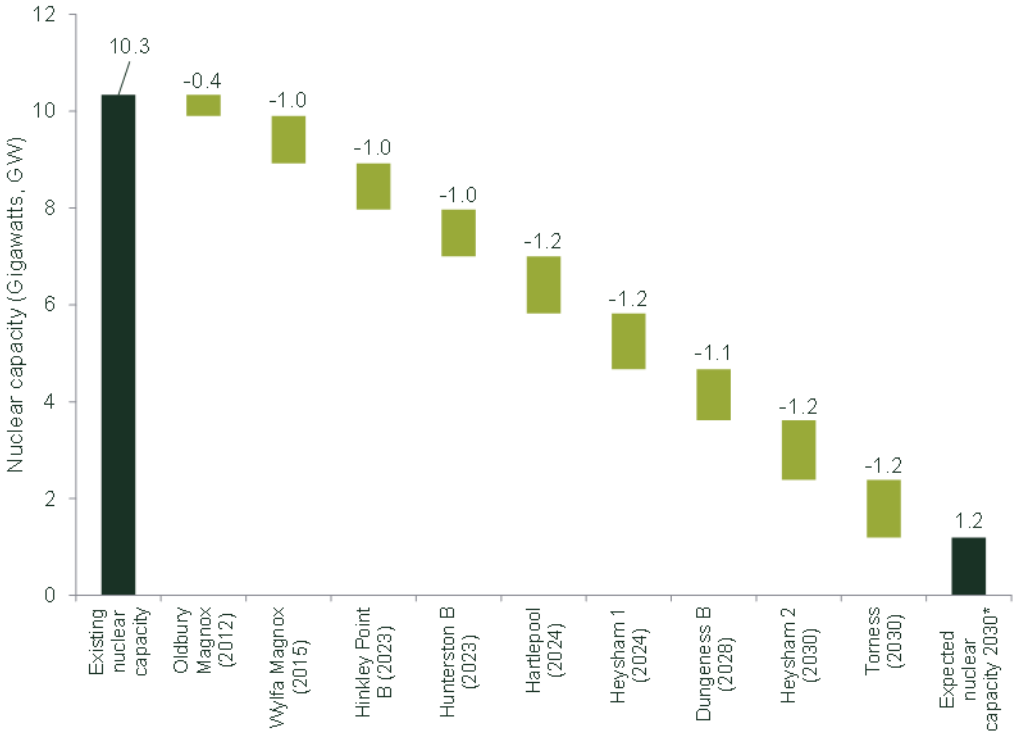


**Figure 5-1 The loss of existing nuclear generation capacity**

5.4.8 In essence, almost 90% of current coal and nuclear capacity, which together contribute almost 50% of the UKs current power needs, is expected to close by 2035.

5.4.9 Under the Climate Change Act 2008, the UK is committed to reducing its greenhouse gas emissions by at least 80% by 2050 relative to 1990 levels. It is therefore necessary that the UK reduces its use of fossil fuels, particularly in the four largest sectors for emissions: transport, industry, heating for buildings and electricity generation [RD20]. Switching away from fossil fuels in these sectors is anticipated to be achieved partly through electrification, such as increased use of electric vehicles.

5.4.10 To ensure that electrification does reduce overall emissions, new electricity has to be generated from low-carbon sources. The increase in the supply of low-carbon electricity is identified as an 'essential prerequisite' to meeting the UK's emissions targets (para 3.3.13) [RD12].

5.4.11 The government's consultation on the siting criteria and process for a new NPS for nuclear power between 2026 and 2035 [RD21] states 'the need for the UK to continue in transitioning to a low carbon electricity market is underlined by the 2015 United Nations Framework Convention on Climate Change Paris Agreement.

### Predicted increase in the demand for electricity

5.4.12 Even with major improvements in energy efficiency, the demand for electricity is expected to grow as a result of electrification. EN-1 states demand for electricity is likely to increase, as significant sectors of energy demand (such as industry, heating and transport) switch from being powered by fossil fuels to using electricity. As a result of this electrification of demand, total electricity consumption could double by 2050 (para 3.3.14) [RD12].

5.4.13 In December 2016, the Government published a consultation on the siting criteria and process for a new NPS for nuclear power between 2026 and 2035 [RD21]. The consultation document notes that since EN-1 [RD12], more recent Updated Energy and Emissions Projections 2016 have been produced which state that by 2035 overall demand for energy will have increased by approximately 20% relative to 2017 levels [RD22].

5.4.14 The National Audit Office (NAO) adopts these estimates in 'Nuclear Power in the UK', noting a predicted 20% increase in demand for electricity over the next two decades because of demographic changes, economic growth and the electrification of heat and transport (para 8) [RD23]. In particular, the NAO states that demand for generation capacity is expected to increase by a further 31GW by 2035 [RD23].

5.4.15 National Grid's projections demonstrate that a rapid uptake of electric vehicles alone could increase peak demand by approximately 15GW by 2035 [RD24]. In total National Grid estimates that by 2050, peak demand will have risen by up to 40% relative to 2016 [RD24].

### Increasing demand but decreasing supply: the generation shortfall

5.4.16 In combination, the expected loss of existing generation capacity and predicted increase in demand will result in a shortage of capacity in the coming decades unless substantial new low-carbon capacity is developed.

5.4.17 As outlined in EN-1, reflecting the requirement to maintain security of supply while also meeting greenhouse gas emission commitments, the UK will require an additional 59GW of new build electricity capacity by 2025 relative to the 2011 baseline, which translates to at least 113GW of total electricity generating capacity (para3.3.22) [RD12].

5.4.18 When looking to 2035, the NAO has specifically analysed the expected generation capacity shortfall arising from increased demand in the context of shrinking supply [RD23]. NAO estimates are illustrated in figure 5-2, showing that at least 31GW of additional capacity is required by 2035 relative to existing supply. As 64GW of existing capacity is expected to close, the overall requirement for new low-carbon energy is 95GW by 2035 (against an overall estimated requirement of 137GW).

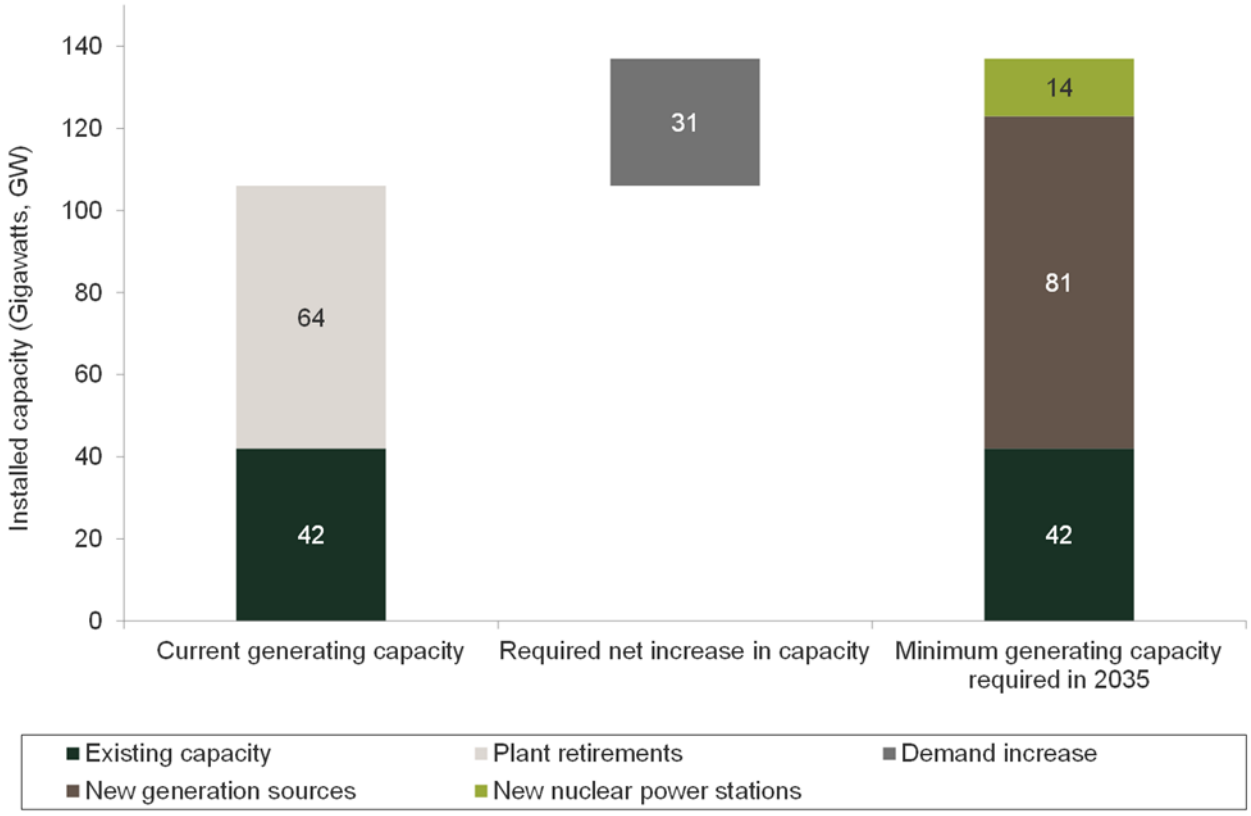


**Figure 5-2 National Audit Office on the UKs energy challenge until 2035**

5.4.19 The greater reliance on renewable, but intermittent generating technologies (e.g. wind and photovoltaics) in the future means that total generating capacity may need to be even greater to ensure that peak demand can always be met [RD23]. NPS EN-1 states that if there was a very strong electrification of energy demand and a high level of dependence on intermittent electricity generation, then the capacity of electricity generation could need to triple (para 3.3.14) [RD12].

### Summary

5.4.20 The significant reductions in existing capacity and predicted increases in demand relative to existing capacity will give rise to a shortage in generation capacity unless substantial new low-carbon generation is developed.

5.4.21 In addition to the need for capacity resulting from the expected shortfall in electricity generation capacity, a future increased reliance on renewable, but intermittent, generating technologies such as wind and photovoltaics means

that total generating capacity may need to be even greater, to ensure that peak demand can always be met.

5.4.22 In the context of the UK's requirement for energy, the Wylfa Newydd DCO Project will generate 2.7GW of low carbon energy for decades once operational. This is enough energy to power 5,000,000 homes.

### *The need for new nuclear generation capacity*

5.4.23 NPS EN-6 [RD15] is the NPS for nuclear power generation. It sits under the umbrella of NPS EN-1 [RD12] and, in combination, these existing NPSs establish the principle that there is a need for new nuclear power, and that this need is urgent. The urgency of bringing forward new nuclear power projects is driven by the drive to decarbonise the UK's electricity supply and to increase energy security.

5.4.24 The following sub-sections consider the need for new nuclear generation capacity in the context of (i) a need for low-carbon electricity generation, and, (ii) a lack of proven alternatives predicted increase in the demand for electricity.

#### Low-carbon electricity generation

5.4.25 The ministerial statement on Energy Infrastructure (Written Statement December 2017) [RD25] refers directly to the overarching NPS for Energy (EN-1) [RD12]. The statement notes that NPS EN-1 "made it clear that nuclear power is a low-carbon, proven technology which can play an important role increasing the resilience and diversity of the UK's energy system. With a number of the existing coal and nuclear fleet due to close by 2030, new nuclear power generation remains key to meeting our 2050 obligations". It states that the assessment of need for nuclear energy generation carried out to support NPS EN-1 [RD12] remains valuable and continues to be relevant.

5.4.26 The ministerial statement [RD25] acknowledges that EN-6 [RD15] only directly relates to development which forms part of a project able to demonstrate expected deployment by the end of 2025. However, it states that the Government continues to give its strong in principle support to project proposals at those sites listed.

5.4.27 The ministerial statement [RD25] states that "Government is confident that both NPS EN-1 [RD12] and NPS EN-6 [RD15] incorporate information, assessments and statements which will continue to be important and relevant for projects which will deploy after 2025 including statements concerning the need for nuclear power – as well as environmental and other assessments that continue to be relevant for those projects". In respect of matters where there is no material change in circumstances it is likely that significant weight would be given to the policy in NPS EN-1 [RD12] and NPS EN-6 [RD15].

5.4.28 In terms of the scale of need that the government believes necessary, NPS EN-1 states that of the 59GW of new electricity required by 2025, relative to the 2011 baseline, 18GW is to come from new non-renewable sources, and specifically nuclear (para 3.3.22) [RD12]. With respect to this balance, the

government has previously stated that it would like a significant proportion of this balance [capacity requirement] to be filled by new low carbon generation. The government believes that, in principle, new nuclear power should be free to contribute as much as possible towards meeting the need for around 18GW of new non-renewable capacity by 2025 (para 3.3.22) [RD12].

5.4.29 Beyond the NPSs, one of the key policies in the Clean Growth Strategy [RD18] is to deliver new nuclear power through Hinkley Point C and progress discussions with developers to secure competitive price for future projects in the nuclear pipeline.

5.4.30 In its 'Future Energy Scenarios' report, National Grid presents four very different scenarios for the future of the UKs energy system to meet emissions targets. It states that new nuclear build is required in all scenarios and a gap is predicted between old plants being decommissioned and new nuclear stations beginning to generate (p59) [RD24].

5.4.31 National Grid analysis implies that the need for new nuclear generation is especially acute if the 2050 emissions targets are to be met. Its 'Two Degrees' scenario is the only scenario where the 2050 emissions targets are met. This assumes 14.5GW of new nuclear power generation by 2035 [RD24]. Hinkley Point C will provide 3.2GW of capacity and all existing nuclear generation is expected to close by 2035 [RD26]. A significant amount of new nuclear is therefore urgently required to meet the 2050 emissions targets.

5.4.32 The carbon emissions of nuclear power compare favourably with other generating technologies. Data presented by the Intergovernmental Panel on Climate Change (IPCC) [RD27] are presented in Table 5-3. These figures show that nuclear and wind have comparable lifecycle emissions (11-12gCO2eq/kWh). Notably, the median emissions of nuclear are at least twice as low as those of hydropower or solar and nuclear generation has significantly lower emissions than, for example, biomass, gas or coal.

**Table 5-3 Lifecycle emissions of different generating technologies**

| Technologies | Lifecycle emissions (median gCO2eq |
|---|---|
| Wind onshore | 11 |
| Nuclear | 12 |
| Wind offshore | 12 |
| Hydropower | 24 |
| Concentrated solar power | 27 |
| Geothermal | 38 |
| Solar PV - rooftop | 41 |
| Solar PV – utility | 48 |
| Biomass - dedicated | 230 |
| Gas – combined cycle | 490 |
| Biomass – cofiring | 740 |

| | |
|---|---|
| Coal – pulverised coal | 820 |

Source: Working Group III Technical Support Unit (2014), 'Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change', p.1335. [RD27]

### Lack of proven alternatives

5.4.33 Even for technologies that have equivalently low-carbon emissions to nuclear, it is unclear how these alternatives could meet future energy needs. Industry research by Bloomberg concluded that weather conditions in the UK are such that solar could perhaps account for only 8% of the UKs generation by 2040 [RD28]. While Bloomberg [RD28] concludes that wind speeds in the UK appear 'favourable', the proportion of electricity demand that needs to be met by generation sources *other* than wind and solar by 2040 is still forecast to be as high as 50%.

5.4.34 Bloomberg predicts that even in 2040 there are entire weeks and months where non-wind/non-solar generation meets 80% and 72% of demand respectively (p4) [RD28]. The implication of this is that 70GW of dispatchable resources (generation, storage, flexible demand, interconnectors) are needed in 2040 to meet peak demand during periods of low wind and solar generation (p4) [RD28].

5.4.35 The NAO [RD23] also recognises this issue and states that with respect to nuclear power that it is a 'firm source of electricity that can be relied upon to deliver during periods of high demand, in contrast to wind and solar power which are intermittent' (para 2.7). NAO concludes that the intermittency and unreliability of renewables pose issues in terms of their adequacy and efficacy in bridging the capacity shortfall, even in the long-term.

5.4.36 In addition to industry and government concerns referred to above, academic research indicates that there is no significant evidence to support the notion of an electricity system that is 100% reliant on renewables. Heard et al [RD29] conducted a review of 24 studies, concluding that there is a near total lack of historical evidence for the technical feasibility of 100% renewable electricity systems operating at regional or larger scales. The only developed nation today with electricity from 100% renewable sources is Iceland, thanks to a unique endowment of shallow geothermal aquifers, abundant hydropower and a population of only 0.3 million people [RD29].

5.4.37 The review concluded that the assessments of studies proposing 100% renewable electricity systems reveals that in all cases and across the aggregated evidence, the case for feasibility is inadequate for the formation of responsible policy directed at responding to climate change [RD29].

5.4.38 One method of addressing the intermittency issue may be through storage. However, it is unclear whether electricity storage represents a viable option for overcoming these issues. Bloomberg notes that batteries and flexible demand technologies are not currently able to shift energy across weeks or months due to their economics and characteristics. Demand cannot be deferred for weeks, and the sheer scale (and cost) of batteries needed for seasonal storage would be prohibitive (p78) [RD28]

5.4.39 On this basis the government recognises that there are technical and commercial barriers to deploying other technologies that produce the same annual generation as that of nuclear power [RD25]. In order for large-scale solar and onshore wind to produce the same amount of electricity provided by [Hinkley Point C], there would be significant upgrades to the grid required as well as increased costs to keep the system in balance [RD30].

5.4.40 National Grid's 'Two Degree' scenario assumes that 74GW of low-carbon generation will be available from 2025, including carbon capture and storage, hydropower, wind, solar and other renewables [RD24] (but excluding nuclear and interconnectors to allow comparison with other quoted figures). However, HM Treasury [RD31] concludes that only 48GW of low-carbon generation will be available by these dates, implying a 26GW gap in the required low-carbon capacity. Currently planned interconnector projects may account for 12GW of this shortfall, but even if all of these operate on time, a 14GW capacity gap remains. This equates to approximately five Wylfa Newydd DCO Projects. BEIS's Energy and Emissions Projections assume that two to three new nuclear reactors will be commissioned between 2028 and 2032 in addition to the Hinkley Point C plant (which is currently expected to commence operation in 2025).

### Summary

5.4.41 The ministerial statement on Energy Infrastructure (Written Statement December 2017) [RD10] makes it clear that the assessment of need for nuclear power, and that this need is urgent, presented in NPS EN-1 and EN-6 remains valuable and relevant.

5.4.42 The urgency is driven by the need to shift to low-carbon electricity generation in the coming decades if the UK is to meet emissions targets and a lack of proven alternatives that can be deployed within these timescales.

## *The suitability of the Wylfa Newydd DCO Project*

5.4.43 The strategic case for the Wylfa Newydd DCO Project was assessed by the UK Government. The site at Wylfa was included within NPS EN-6 [RD15] as a potentially suitable location for new nuclear power, having satisfied the Strategic Siting Assessment process [RD16].

5.4.44 The ministerial statement on Energy Infrastructure (Written Statement December 2017) [RD25] acknowledges that EN-6 [RD15] only directly relates to development which forms part of a project able to demonstrate expected deployment by the end of 2025. However, it states that the Government continues to give its strong in principle support to project proposals at those sites listed, including Wylfa.

5.4.45 The government's consultation on the siting criteria and process for a new NPS for nuclear power between 2026 and 2035 [RD21] states that "sites listed in EN-6 on which a nuclear power station is anticipated to deploy after 2025 will continue to be considered appropriate sites and retain strong Government support during the designation of the new NPS". It states that subject to the outcome of the consultation and provided sites meet the final criteria,

Government proposes to carry forward the sites listed in EN-6 into the new NPS. The ministerial statement is consistent with the consultation, stating that "for projects yet to apply for development consent and due to deploy beyond 2025, the Government continues to give its strong in principle support to project proposals at those sites currently listed in EN-6".

5.4.46 The energy NPSs took the relevant national planning policy into account at the time of publication, including Planning Policy Wales [RD32], although newer Welsh policies may also be relevant.

5.4.47 The benefits of the project for energy policy are clear. However, when considering the project, it is important to set out the wider benefits arising from the Wylfa Newydd DCO Project. These include: economic benefits and job creation; infrastructure improvements: and, tourism.

5.4.48 Additionally, the Wylfa Newydd DCO Project will deliver a package of planning obligations to be secure through a legal agreement under Section 106 of the TCPA, which are required to mitigate the impacts of the Project, but many of which will provide a longer-term legacy to Anglesey and the wider North Wales region. These include: education; jobs and skills; health and well-being; housing fund; Welsh language and culture; biodiversity and environmental; and, recreation.

5.4.49 These direct and additional benefits are summarised in the following sub-sections.

### Economic benefits and job creation

5.4.50 The significant level of investment to be made by the Wylfa Newydd DCO Project would benefit the economies of both Anglesey and north Wales; this investment filters through the economy via payment to employees, contracts with local businesses and investment in infrastructure.

5.4.51 It is expected that at peak construction, up to 9,000 workers would be required for the Wylfa Newydd Project. Approximately 2,000 home-based workers would be employed during the peak period of construction from the Daily Construction Commuting Zone (DCCZ), which would deliver major beneficial changes to employment in the construction sector in the DCCZ. An estimated 1,260 of these home-based workers are expected from Anglesey, ensuring beneficial effects on the labour market on Anglesey itself are delivered during the construction period.

5.4.52 The construction stage would have a beneficial effect on the local economy in Wales. It is estimated that 60% of the £10+ billion Wylfa Newydd Project value during the construction phase would be spent in the UK. It is not yet clear precisely how much of the value would be spent locally within north Wales. Adopting a benchmark of between 2% and 4% (as explained at chapter 1 in volume C of the ES) this would equate to an investment of between £200 million and £400 million within north Wales over the construction period.

5.4.53 An investment of between £200 million and £400 million represents the provision or safeguarding of between 1,200 and 3,500 job years over the investment period, equivalent to 120 to 350 Full Time Equivalent jobs.

5.4.54 During operation of the Power Station Site it is estimated that a workforce of 850 will be required. This represents a significant contribution to local employment opportunities and to the long-term population stability on Anglesey. Given the magnitude of change in local employment, the long-term nature of the positions, and the potential to reduce outward migration trends, alongside the importance of the local labour market, this would represent a major beneficial effect on the labour market on Anglesey.

5.4.55 During planned periods of Power Station outage for maintenance, the additional outage workforce would comprise up to 1,000 additional staff.

5.4.56 The total value of the operating expenditure over the lifetime of the Power Station is equivalent to £1.8 billion in present value terms, equivalent to around £30 million per year. This estimate excludes staff costs, fuel, business rates, other financial contributions, National Grid fees or other trading costs.

5.4.57 The annual average direct, indirect and induced increase in income is estimated at around £20 million on Anglesey from staff costs at the Power Station. This is equivalent to an increase of 2.1% over baseline levels. This would represent a beneficial effect on the local economy on Anglesey.

### Infrastructure improvements

5.4.58 In addition to the delivery of the nuclear power station, which has significant benefits in providing long term, sustainable infrastructure for the benefit of the UK as a whole, the Project results in local infrastructure benefits through the delivery of the A5025 On-line and Off-line Highways Improvements.

5.4.59 Motorised and public transport users would experience significant decreases in traffic flow on the existing A5025 at various stages of the project.

5.4.60 The improvements will deliver benefits in specific locations. The A5025 Off-line Highways Improvements will, for example reduce existing traffic levels within Llanfachraeth by more than 60%. The highway improvements would also reduce traffic noise and air pollution in the communities of Valley, Llanfachraeth, Llanfaethlu and Llanrhuddlad (at Cefn Coch)

5.4.61 In addition, the development of the logistics centre at Parc Cybi is delivering an employment use which could be available in the long term, subject to achieving the necessary local consents. This also has the benefit of potentially kick-starting investment in this allocated employment area.

### Tourism

5.4.62 During peak construction it is estimated that the additional revenue to tourism providers will be just over £12 million per year (of which the majority - £10.5 million – would be realised on Anglesey). This additional expenditure represents the provision or safeguarding of up to 571 jobs in that year. Using the employment multiplier of 1.3 for the accommodation sector, it is estimated that a further 146 jobs could be created in the wider economy. This is set out in detail in the socio-economic analysis at chapter 1 in volume C of the ES (Application Reference Number: 6.3.1).

5.4.63 In recognition that the construction of Wylfa Newydd itself may become a visitor attraction in its own right, Horizon will operate a temporary construction viewing area. This is expected to be able to operate from an appropriate point in the construction programme (having regard to safety and security considerations).

5.4.64 In acknowledgement of the importance of the tourism sector to the economy of Anglesey, Horizon will establish a tourism fund, which would be available to support Brand Anglesey during the construction project and to address adverse effects if identified through monitoring.

### Education

5.4.65 The Wylfa Newydd Project will create real opportunities for young people in the communities local to the development sites.

5.4.66 The Jobs and Skills Strategy (Application Reference Number: 8.3) identifies Horizon's existing programme of engagement with schools, the Primary Outreach Programme, Work Insight Week and work with key partners to deliver Science, Technology, Engineering and Mathematics initiatives.

5.4.67 Horizon will establish and maintain an Education and Skill Service, secured through the s106 agreement, to maximise local opportunities for local people.

5.4.68 Horizon will fund early action related to existing skills shortages through modern apprenticeships and graduate apprenticeships.

5.4.69 Horizon will implement a monitoring scheme accompanied by a fund to provide new capacity if demonstrated that the Wylfa Newydd Project creates a shortage in certain primary schools as a result of workers who bring children with them.

5.4.70 Horizon will also provide a peripatetic teacher service to support current immersion education capacity across primary and secondary schools (in Anglesey and Gwynedd if required.

### Jobs and skills

5.4.71 The Jobs and Skills Strategy (Application Document Reference: 8.3) will seek to maximise the recruitment of locally-based workers and will seek to increase the number of home-based workers above the 2,000 estimate in order to minimise the effects caused by the arrival of construction workers. This will also seek to maximise the economic benefits for local residents that will result from the jobs created as a result of the Wylfa Newydd Project. The Jobs and Skills Strategy will be backed by a flexible Skills Fund that can be used to deliver any aspect of the strategy.

5.4.72 Horizon will, through an online Supply Chain Service Portal, also engage with the local supply chain and maximise opportunities for local people.

5.4.73 Horizon will work with local stakeholders and training providers to ensure training aligns better with likely demand for services. One of the key mechanisms for doing this will be the Wylfa Newydd Employment and Skills Service.

5.4.74 Horizon is also currently working with local colleges and the CITB to understand the nature of local training provision and where gaps are identified the partners will work with funders and other providers to ensure capacity is sufficient, drawing on the Skills Fund as required.

5.4.75 Around a third of the operational workforce will be required to be skilled to a technical level. Horizon's apprentice programme is therefore a key part of the Jobs and Skills Strategy, making the apprenticeship route an important entry point to a career at Wylfa Newydd Power Station. Twenty-two apprentices were started with local provider Grŵp Llandrillo Menai in 2017 and 2018, and the apprentice programme will expand in a number of areas. Horizon will work with Grŵp Llandrillo Menai and industry skills bodies to ensure that the apprentice provision is constantly adapted and improved to meet the requirements of the Wylfa project.

5.4.76 Horizon will also make provision for emergency services for the construction workforce, including a financial contribution to the emergency services. Horizon will also support IACC and Betsi Cadwaladr University Health Board to develop their own workforce strategy.

### Health and Well-being

5.4.77 When operational, the Power Station would help to bring a stable supply of low-carbon electricity to Wales and the UK. This has direct and indirect effects on health and well-being. For example, electricity enables people to heat and light their homes and to cook food. A stable power supply helps health and social care services to operate, jobs and economic activity to continue, and technology to function. Low-carbon energy generation can also help to reduce climate change and its many adverse effects on physical and mental health and well-being.

5.4.78 Horizon will provide appropriate occupational health and hygiene services for the construction and operational workforce, through on-site provision and financial contributions, to ensure that the local community health and welfare services and resources used by local residents are not adversely affected by the Wylfa Newydd Project.

5.4.79 The significant employment during both construction and operation will deliver health and well-being benefits, as working improves mental and physical health. The Project would benefit working people, their dependants and the wider economy. This investment is also an opportunity to improve the health and well-being of people living on Anglesey and in the wider north Wales area, for example by reducing levels of deprivation.

### Housing Fund

5.4.80 Horizon will provide a Housing Fund which could be used to:

- incentivise provision of new housing, especially affordable housing;
- augment IACC's existing empty homes programme and bring vacant properties back into use;

- encourage provision of more latent accommodation;
- fund measures to improve the function of the housing market – though helping people downsize or support rent deposits for example; and
- fund IACC officer time to deal with any increase in homelessness.

### Welsh language and culture

5.4.81 Horizon is already contributing to the vitality of the Welsh language and culture by supporting a series of local events and initiatives and also by means of incorporating the Welsh language as an important aspect of working life, education and community services.

5.4.82 The significant employment opportunities offered during the construction phase is expected to reduce out-migration of young people resulting in a beneficial effect on Welsh language and culture. Around half of the local construction workforce speaks Welsh. Significant numbers of Welsh speakers are therefore expected to gain employment through the Wylfa Newydd DCO Project during construction.

5.4.83 The permanent, high-quality job opportunities offered during operation would also have a beneficial effect on Welsh language and culture as 85% of the operational workforce would be local people.

5.4.84 Additional spend in the local economy, representing a beneficial effect for local businesses in north Wales, would have a beneficial effect on businesses owned by Welsh speakers or providing services through the medium of Welsh.

5.4.85 Safeguarding the provision of local services, through increased demand during construction and operation, contributes towards sustainable communities, where Welsh language and culture forms part of the social fabric of communities.

### Biodiversity and environmental

5.4.86 The overarching aim of the Landscape and Habitat Management Strategy (Application Reference Number: 8.16) is to deliver a net biodiversity benefit by restoring, creating, enhancing and providing for the ongoing management of habitats within the WNDA.

5.4.87 The proposals for the Off-site Power Station facilities will deliver a long term benefit through reducing flood risk on the site by the introduction of a swale.

5.4.88 A major beneficial effect would be the remediation of contaminated land across the WDNA, which would benefit those using or accessing the site in future.

### Recreation

5.4.89 There will be an increase in the recreational amenity of new footpaths compared to baseline conditions as a result of the provision of routes suitable for wheelchair users, picnic areas, interpretation boards and a nature trail.

### Summary

5.4.90 The strategic case for a new nuclear power station at Wylfa was assessed by the UK Government. The site at Wylfa was included within NPS EN-6 [RD6] as a potentially suitable location for new nuclear power, having satisfied the Strategic Siting Assessment process [RD16]. The ministerial statement on Energy Infrastructure (Written Statement December 2017) [RD25] states that the Government continues to give its strong in principle support to project proposals at those sites listed.

5.4.91 The Wylfa Newydd Project will deliver important benefits to the UK as a whole, including providing a vital role in the provision of safe and secure low-carbon electricity supplies for which there is a nationally recognised and urgent need.

## 5.5 Test (d)

### *Alternative options*

5.5.1 Within the Overarching National Policy Statement for Energy EN-1 (NPS EN-1) [RD12] the UK Government has considered the alternatives to the need for new large-scale electricity generation infrastructure (including nuclear power), including reducing overall demand, more intelligent use and additional interconnection of electricity systems. NPS EN-1 concludes that, although all of the above measures should and will be actively pursued, their effect on decreasing the need for new large-scale energy infrastructure will be limited, particularly given the likely increase in demand for electricity for domestic and industrial heating and transport.

5.5.2 NPS EN-1 states in paragraph 3.3.4 that: “There are benefits of having a diverse mix of all types of power generation. It means we are not dependent on any one type of generation or one source of fuel or power and so helps to ensure security of supply. In addition, as set out briefly below, the different types of electricity generation have different characteristics which can complement each other:

- fossil fuel generation can be brought on line quickly when there is high demand and shut down when demand is low, thus complementing generation from nuclear and the intermittent generation from renewables. However, until such time as fossil fuel generation can effectively operate with Carbon Capture and Storage, such power stations will not be low carbon;
- renewables offer a low carbon and proven (for example, onshore and offshore wind) fuel source, but many renewable technologies provide intermittent generation; and
- nuclear power is a proven technology that is able to provide continuous low carbon generation, which will help to reduce the UK’s dependence on imports of fossil fuels. Whilst capable of responding to peaks and troughs in demand or supply, it is not as cost efficient to use nuclear power stations in this way when compared to fossil fuel generation.” [RD12]

5.5.3 NPS EN-1 states in paragraphs 3.5.1 and 3.5.2 that: "For the UK to meet its energy and climate change objectives, the Government believes that there is an urgent need for new electricity generation plant, including new nuclear power. Nuclear power generation is a low carbon, proven technology, which is anticipated to play an increasingly important role as we move to diversify and decarbonise our sources of electricity" [RD12, paragraph 3.5.1].

5.5.4 "It is Government policy that new nuclear power should be able to contribute as much as possible to the UK's need for new capacity" [RD12, paragraph 3.5.2]

5.5.5 NPS EN-1 states in paragraph 3.1.3 that: "The IPC [now Planning Inspectorate and the Secretary of State] should… assess all applications for development consent for the types of infrastructure covered by the energy NPSs on the basis that the Government has demonstrated that there is a need for those types of infrastructure and that the scale and urgency of that need is as described for each of them in this Part". [RD12].

### *Strategic alternative to the Wylfa Newydd Development Area site location*

5.5.6 A summary of the strategic case for the Wylfa Newydd Project and how all reasonable alternatives were considered is given below. Further information is presented in Volume D2 (alternatives and design evolution) (Application Reference Number: 6.4.2). This presents the alternative solutions and locations considered for the relevant project elements of WNDA Development.

5.5.7 NPS EN-6 [RD15] (specifically covering nuclear power generation) states the view of the UK Government that the Wylfa NPS Site is potentially suitable for the deployment of a new nuclear power station. A Government site selection assessment [RD16] recommended the Wylfa NPS site on Anglesey as it has adequate space for the development of a new nuclear power station, an existing National Grid connection and hard rock foundations. It is sufficiently high above sea level to avoid serious flood risk and has good access to seawater for cooling purposes. The nuclear heritage of the Existing Power Station on Anglesey and Trawsfynydd in nearby Snowdonia has given rise to a strong skills and knowledge base necessary for the construction and operation of a new nuclear power station on Anglesey.

5.5.8 As the SSA considered alternative sites for new nuclear power stations and led to NPS EN-6 identifying the Wylfa NPS site, this fulfils the requirement in relation to consideration of strategic alternatives as part of test (d).

5.5.9 It was determined that its proximity to Tre'r Gof SSSI, a site of national importance should not prevent the site from being considered potentially suitable but identified Tre'r Gof SSSI as an area which would require further consideration.

### *Design-related alternative options*

5.5.10 The design-related alternatives relevant to effects on saline intrusion and the Tre'r Gof SSSI in the Ynys Môn Secondary groundwater body are outlined in

table 5-4. Figure 5-3 to figure 5-6 provide information on key locations and the landform and landscape setting to support the description of options outlined in table 5-4.

5.5.11 The series of design based alternatives were considered in tandem with the design process, the EIA and consultation processes, construction method evolution and, temporary infrastructure requirements. These are documented in:

- Site Selection Reports - Volume 2 – Wylfa Newydd Development Area. (Application Reference Number: 8.24.2).
- Design and Access Statement – Volume 2 – Power Station Site. (Application Reference Number: 8.2.2).
- Phasing Strategy (Application Reference Number: 8.29).
- Volume D2 (Application Reference Number: 6.4.2).
- Environmental Statement chapters including surface water and groundwater (Application Reference Number: 6.4.8) and terrestrial and freshwater ecology (Application Reference Number 6.4.9).
- Environmental Statement appendix D8-7 (Application Reference Number: 6.4.32).

5.5.12 The alternatives identified and addressed in table 5-4 which relate to the potential deterioration of the Ynys Môn Secondary groundwater body with respect to saline intrusion from dewatering of deep excavations are:

- Location, depth and sequencing of excavations for Unit 1 and Unit 2. This is on the condition that all design related alternatives would be within the Wylfa Newydd Development Area in accordance with NPS EN-6 [RD15].
- Location and depth of the Cooling Water intake. A series of locations for the Cooling Water intake were subject to option appraisals and design assessments.

5.5.13 In relation to the dewatering method of excavations for Unit 1 and Unit 2 a number of options were considered to reduce the amount of groundwater entering the excavation. These options, including artificial ground freezing, vertical grout curtains and low permeability cut-off walls have been considered under test (a) as mitigation measures (see table 5-1). The options relating to the duration and method of achieving long-term dewatering of the deep excavation are considered within table 5-3.

5.5.14 Horizon also considered locating the main plant including Unit 1 and Unit 2 to the east of the Existing Power Station. This option was ruled out because it would be closer to, or encroach on, the Tre'r Gof SSSI. This is clearly a poorer environmental option and was therefore not considered further.

5.5.15 The alternatives identified and addressed in table 5-4 which relate to the potential deterioration of the Ynys Môn Secondary groundwater body with respect to significant damage to the GWDTE of Tre’r Gof SSSI are:

- Location of landscape mounds, in particular Mound A. The overall landform and landscape design has developed in consultation with drainage, geotechnical and earthworks designers and with the IACC and other relevant stakeholders. There will be five new mounds designed to replicate the local drumlin landscape in accordance with the landscape design philosophy and framework. In respect of the Article 4(7) the discussion focuses on Mound A as this is located within the Tre'r Gof Catchment, although not within the SSSI. Mound B is also considered as it would drain into Tre'r Gof SSSI. Mounds C, D and E are not considered in respect of exemptions.
- To determine the location of the mounds, potentially available land was considered where the existing landform could best be replicated, environmental assets protected as far as possible, and which provided effective screening.
- The construction of Mounds A and B in the Tre'r Gof Catchment and change to the catchment boundaries, dimensions and steepness resulting in changes to flows was also considered.
- Landscape mounding construction phasing and timing was developed in response to consultation.

5.5.16 Design of Mound A and B, adjacent to Tre'r Gof SSSI, has evolved in tandem with the design process, architectural approach, site levels, temporary infrastructure requirements, construction method evolution, and the Environmental Impact Assessment and consultation process.

5.5.17 Key changes to the landscape and landform design to account for change to site layout and to respond to stakeholders and the public include:

- development of landscape mounding to protect views from Tregele, Cemaes, Cemlyn, the Wales Coast Path, the Isle of Anglesey AONB and Cestyll Gardens, amongst others;
- modifications to the height and gradients of mounds during project optimisation to improve the design and take account of comments from consultees;
- the early completion of Mound A to reduce disruption to the local community;
- the design of the slopes of Mound A facing Cemaes have been modified such that they would be more reflective of the existing conditions; and
- mounding would be seeded, then landscaped at the earliest practical opportunity in order to mitigate ongoing views of construction, stabilise newly created slopes, control surface water runoff and integrate the mounding into the surrounding landscape.

5.5.18 In locating the Site Campus adjacent to mounding surrounding Tre'r Gof SSSI it was considered that there was no significantly better environmental option that could be constructed within the constraints of the Wylfa Newydd Project.

The temporary Site Campus development occupies a small proportion of the Tre'r Gof catchment, in comparison to the permanent mounding, which occupies a significant proportion of the catchment. The presence of mounds A and B are therefore considered to drive non compliance of the GWDTE and as such specific design alternatives to Site Campus are not considered further.

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**Table 5-4 Consideration of design alternatives relevant to the Ynys Môn Secondary groundwater body**

| Element of the design | Options considered | Technically feasible | Disproportionate cost | Environmental impacts | Decision and justification |
|---|---|---|---|---|---|
| Location, depth and sequencing of excavations for Unit 1 and Unit 2 | Location<br>Within the constraints of NPS-EN6, Horizon considered locating the deep excavation areas to the south-east or east of the Existing Power Station. These locations would still fall within the Wylfa NPS Site boundary. | A direct and efficient connection between the grid connection and circulating water connections between the intake, condenser and outfall elements, particularly the turbine buildings, reactor buildings and heat exchanger building is an essential safety and functional consideration of the design.<br>The Power Station development platform also needed to be optimised relative to sea level and flood levels as the areas considered (as well as that chosen) comprise the lowest lying land within the Wylfa NPS Site.<br>The alternative sites do not optimise these factors. | The alternative locations for the deep excavation areas could give rise to additional costs which could undermine the economic case for development as a result of:<br>• additional long term Cooling Water pumping costs due to being further away from the source of Cooling Water and from pre-existing Cooling Water infrastructure; and<br>• costs associated with re-routing of the existing 400 kilovolt overhead transmission lines as locations are further from the existing National-Grid substation. | There would be significant environmental impacts compared to the selected site as the alternative sites are closer to or encroach on Tre'r Gof SSSI, and are closer to the villages of Cemaes and Tregele. | The deep excavation is located within the Wylfa Newydd Development Area on the south side of the Existing Power Station. The excavation is partially screened from Cemaes by the existing topography and avoids utilising land within the Tre'r Gof SSSI and Wylfa Head (figure 5-5).<br>The selected location for the Power Station also provides access to Cooling Water directly from the Irish Sea, for intake and discharge. The excavation reduces interference with the access route to the Existing Power Station, which assists Horizon's proposals to coordinate with the planned decommissioning of the Existing Power Station and maintain potential for National Grid to continue using the existing 400kV overhead transmission lines and substation.<br>An excavation base of -18mAOD was selected so that final platform levels remain outside of the extreme flood events.<br>The locations and depths deliver significantly better environmental and cost and safety benefits over locations south east and south west |
| | Depth<br>(The depth of excavation and therefore extent of dewatering is a function of the platform levels for the Unit 1 and Unit 2 to allow sufficient basement and pads etc.) | The alternative proposed building platform levels were optimised in terms of health and safety. construction methodologies, and environmental implications. They underwent a series of revisions following consultations and technical and design reviews.<br>The critical factor was that minimum site levels (ground elevation) for the buildings / facilities be selected above the height of extreme flood event levels. | The increase in platform and consequent excavation depth from -14m to – 18mAOD increased the overall quantity of material to be excavated during site levelling and grading. However, there were no disproportionate costs in relation to benefit in this respect. | In addition to flood considerations, the design requirement looked to maximise platform levels to reduce the extent of excavation and the need to move significant amounts of excavated material during construction to reduce the environmental effects associated with movement and management of materials. | |
| | Sequencing<br>The preferred option is for both units to be constructed together within a single excavation. The semi-dry cofferdam in Porth-y-pistyll would be in place for part of the excavation works.<br>The alternative was to undertake excavation in a staged approach with the main part of Unit 2 excavations (involving blasting) being completed before construction of Unit 1 can commence. | Although the alternative is technically feasible it was not technically preferred. Given the scale of the engineering and construction operations it is preferable to carry out construction of the units together within a single excavation. | The alternative construction option where excavation is phased would significantly extend the build timescale of the project and the date when the commissioning of reactors can commence and would therefore be more expensive. | There are environmental benefits to reducing the length of time that excavation would be open. | |

| Element of the design | Options considered | Technically feasible | Disproportionate cost | Environmental impacts | Decision and justification |
|---|---|---|---|---|---|
| Duration of dewatering of the deep excavation. | Duration and method of achieving long-term dewatering of the deep excavation throughout operation.<br>Options considered were continuation of pumping during Power Station operation or sealing of basements and cessation of pumping once construction has been completed. | It was determined that it is technically feasible to only dewater during construction and that long term dewatering during operation could be avoided with the use of passive drainage at 6mAOD. | No | Reduced energy requirements of only dewatering during the construction phase compared to during both construction and operation. | Dewatering would be restricted to the construction period after it was identified that a design was possible which allowed operational passive drainage and no dewatering. This solution reduced the environmental impacts and costs. |
| Location and depth of the Cooling Water intake.<br>Note the location of the Cooling Water System is also considered in The Skerries water body in relation to the effects on morphological conditions (see table 6-2).<br>The key aspects of this design element for the Ynys Môn Secondary water body are the general location (onshore/offshore) and depth. | Location<br>Onshore Cooling Water intake (preferred) and offshore Cooling Water intake options. | Technically feasible although offshore locations would involve:<br>• design and construction of long marine tunnels;<br>• technically more involved requirement to install and maintain the intake structures; and<br>• increased health and safety risks. | Selection of an offshore option would involve significantly increased construction cost and programme due to excavation of Cooling Water tunnels offshore and the increased distance from the Cooling Water intake. | Selection of an offshore option would widen the impacts of the Cooling Water intake compared to an onshore intake including:<br>• increased seabed footprint;<br>• increased volume of material excavated underwater;<br>• potential requirement for underwater blasting;<br>• increased habitat loss from seaward infrastructure;<br>• requirement to biocide extensive offshore sections of the system, resulting in decreased survival of entrapped fish and other marine species; and<br>• less opportunity to control intake velocities to limit the entrapment of fish and other marine species.<br>Modelling identified that the chosen location and associated local dewatering would not contribute to saline intrusion. | An onshore Cooling Water intake was selected, located on the Porth-y-pistyll foreshore as the preferred location.<br>It was deemed that the chosen onshore location would provide a number of advantages over offshore options, including:<br>• no or limited marine tunnels;<br>• no requirement to install and maintain offshore intake structures;<br>• reduced seabed footprint;<br>• limited seaward construction activities;<br>• reduced construction cost and programme,<br>• reduced requirement to biocide extensive offshore sections of the system;<br>• reduced health and safety risks; and<br>• no contribution to saline intrusion.<br>Therefore, an offshore Cooling Water intake is not considered to be a better environmental option. |
| Landscape mounds<br>In respect of the Article 4(7) derogation the entry focuses on Mound A and to a lesser degree Mound B as these are located | Location<br>Extend mounding into adjacent catchments and change catchment boundaries (see figure 5-4, figure 5-5 and figure 5-6). | Mounding drumlins are part of the core design concept based on restoring the surrounding landscape to agricultural use, reflecting the existing open, rolling, drumlin landscape (elongated oval-shaped hills) of the surrounding area to embed the permanent site into its context and create a framework | Given the core design principles, and the need to maintain the mound locations within the Wylfa Newydd Development Area, there were no major disproportionate costs associated with the alternative locations although if insufficient locations were found such that there would be a negative earthworks | Extending the mound into adjacent catchments to Tre'r Gof SSSI would not follow the guiding landscape design concept.<br>The alternative sites did not maximise the opportunity for mounding within the Wylfa Newydd Development Area to deliver coordinated environmental mitigation | The chosen location of Mound A is the result of a combination of many influencing factors and represents a balanced solution.<br>It maximises utilisation of available land taking into account the required buffer zones around Tre'r Gof SSSI, to provide a landscape setting which reflects the special landscape |

| Element of the design | Options considered | Technically feasible | Disproportionate cost | Environmental impacts | Decision and justification |
|---|---|---|---|---|---|
| within the Tre'r Gof Catchment.<br>Other mounds are not considered. | | within the main site islands. They also allow sustainable local reuse of excavated materials within the Wylfa Newydd Development Area.<br>Mound A is part of a series of five main drumlins, ranging in height from 25m to 42mAOD, with gradients of approximately 1:8 to 1:10. The drumlin landforms are predominantly orientated to the northeast. A sixth drumlin landform up to 40mAOD, Dame Sylvia Crowe's mound, was a feature created for the Existing Power Station (figure 5-3).<br>The heights and gradients follow the dimensions of regional drumlins with a north/northeast alignment within 2km of the Wylfa Newydd Development Area.<br>As such most available locations in the area were technically feasible for mounding. | balance, there would be extensive landfill disposal costs.<br>The selected location for Mound A may incur costs due to the requirement for very detailed drainage mitigations to support Tre'r Gof SSSI, but is not considered to be disproportionately costly given that this is a better environmental option (see explanation in adjacent column). | and enhancement measures to the Power Station Site in relation to:<br>• avoiding sensitive environmental features;<br>• maximising visual screening;<br>• delivering effective noise screening; and<br>• replicating the existing landscape.<br>The chosen location of Mound A was largely determined, controlled and affirmed through consultation to:<br>• avoid encroaching on Tre'r Gof SSSI with buffer zones to allow surface water flow into the SSSI to be managed appropriately;<br>• achieve visual and noise screening of the Power Station from Tregele and Cemaes;<br>• screen low-level buildings and soften views of the Power Station from the east; and<br>• reflect the existing contours/slope profiles as far as possible on the SSSI-facing slopes. | context. A natural gradient would be applied to the outward-facing slopes of the landscape mound to reflect the existing drumlins and to soften views of the development. It provides a high quality setting for operation of the Power Station.<br>Once complete it provides effective screening of construction noise sources located around the Power Station Site for properties at the western edge of Cemaes.<br>The proposed mound location would use natural resources efficiently by retaining excavated material on-site.<br>The design proposal avoids the creation of overbearing mound forms adjacent to Cemaes, with heights and profiles more reflective of the existing conditions.<br>Measures incorporated into the Mound A landform design include:<br>• the creation of buffer zones from the edge of Tre'r Gof SSSI boundary to allow surface water flow in to the SSSI to be managed appropriately; and<br>• reflecting the existing contours/slope profiles as far as possible on the SSSI-facing slopes and the existing characteristics of land cover, soil quality and vegetation as far as possible. |
| | Construction phasing and timing<br>A number of construction mound phasing alternatives were considered with regard to the landscape. | There were few significant technical feasibility barriers to the phasing alternatives other than the need to protect Tre'r Gof SSSI in terms of water management. | There are no disproportionate costs associated with the various mound options. | Early completion of the slopes facing the Cemaes are considered essential in order to reduce disruption to the local community. The slopes facing Tre'r Gof SSSI would also be prioritised. | The preferred option is for early completion of Mound A particularly the slopes facing Cemaes and Tre'r Gof SSSI. |

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**Figure 5-3 Location of Dame Sylvia Crowe's mound**

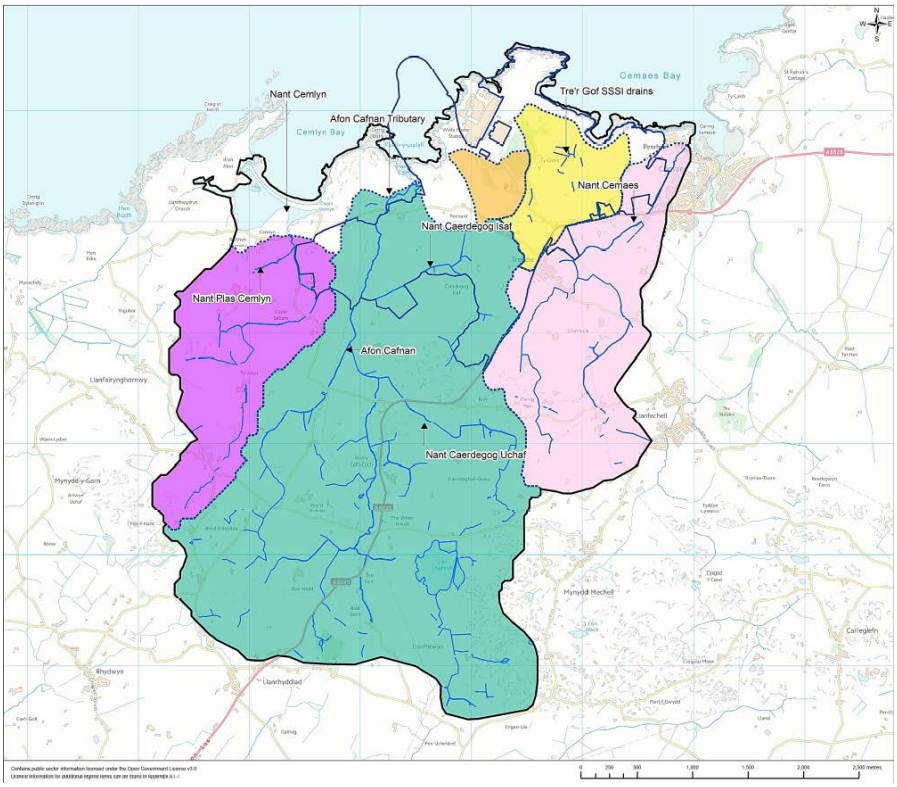


**Figure 5-4 Surface water catchment areas and watercourses**

**Figure 5-5 Illustrative view of landform looking north towards Wylfa Head**

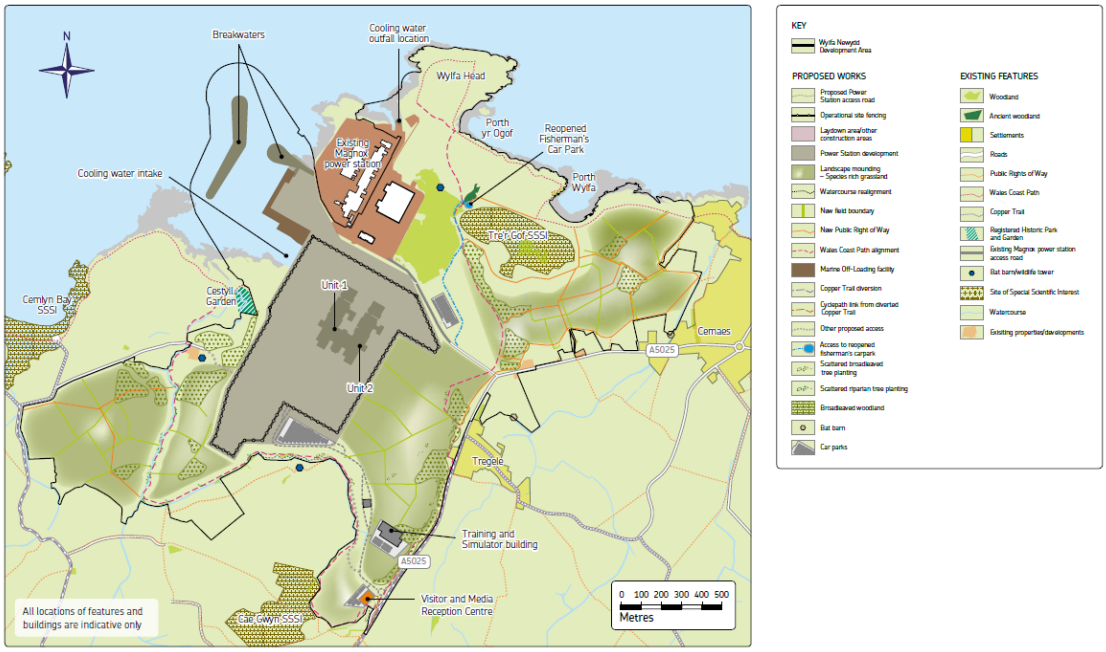


**Figure 5-6 Landscape setting - Pre-Application Consultation Stage Three**

# 6 Information to support Article 4(7) derogation criteria assessment for The Skerries water body

## 6.1 Introduction

6.1.1 This section of the report provides the information in relation to derogation for The Skerries water body and is split into the information relevant to each test of Article 4(7) from (a) to (d).

## 6.2 Test (a)

6.2.1 A description of all of the mitigation measures that were considered in relation to the effects on hydromorphology for The Skerries water body, is presented in table 6-1.

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**Table 6-1 Mitigation measures considered in relation to hydromorphology for The Skerries water body**

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| S1 | ✓ | | | The footprint of the breakwaters, Cooling Water Intake and Outfall structures, temporary causeway, including associated dredging activities will be designed to be as small as practicable (whilst meeting operational requirements). | The aim is to ensure that the structures are sufficiently large to perform the required role, but no larger than necessary. | Yes | Low | No | None. The measure would avoid impacts to marine habitats. | Yes |
| S2 | ✓ | | | Dredging of soft sediments in Porth-y-pistyll will be restricted to the area identified in the dredging plan and the duration will be shortened as far as practicable, in order to minimise the release of suspended solids and sediment bound contaminants. | This mitigation would ensure only the targeted areas of intertidal habitat that would be lost. | Yes | Low | No | None. The measure would avoid impacts to marine habitats. | Yes |
| S3 | | ✓ | | Provision of marine ecological enhancement measures in suitable locations unconstrained by engineering design and functionality, to include pre-cast ecological units (e.g. rock pools or features similar to bio-blocks) and modification of the permanent artificial structures (e.g. construction material, surface roughness or the addition of surface features). The purpose of marine ecological enhancement measures would be to increase surface and structural heterogeneity, encouraging the colonisation of native marine species and the establishment of diverse and productive intertidal and subtidal habitats within the footprint of the Marine Works. | To enhance the development of biodiversity and biomass on artificial structures and to create new additional intertidal habitat on the permanent marine structures. | Yes, although it is noted that there are only certain locations where this measure can be implemented due to technical (engineering) constraints related to the integrity of structures. | Low. There is some uncertainty about the degree to which ecological enhancements will result in an increase in colonisation and productivity of marine flora and fauna. | No. This would be determined by the extent of ecological enhancements required but some enhancements can be incorporated at relatively low cost. | Non-native species could potentially colonise ecological enhancement units. However, with consideration of the design and placement of units this would not lead to an increase in either the likelihood of establishment of non-native species that are not currently present in the area, or an increase in the abundance and/or distribution of non-native species that are currently present. | Yes |
| S4 | | ✓ | | Implementation of a monitoring programme for the marine ecological enhancement measures and permanent structures. The aim will be to determine the success of habitat enhancement by monitoring. the colonisation of new structures, | To monitor the success of the marine ecological enhancement measures against a set of ecological objectives agreed with the IACC in | Yes | Low | No | None | Yes |

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | this will allow adaptive management. | consultation with NRW. This information will be used to inform the decision to implement further ecological enhancement if necessary, with the dual purpose of facilitating academic research and the development of an evidence base demonstrating the commercial application of ecological enhancement as mitigation for effects to benthic habitats and species. | | | | | |
| S5 | | ✓ | | Removal of hard engineering structures or modification of existing structures. | Removal of other structures in The Skerries water body could reduce the net loss of the intertidal zone. | No. There are no known existing structures within The Skerries water body. | N/A | N/A as no structures identified. | N/A | No |
| S6 | | ✓ | | Indirect/offsite mitigation (offsetting measures). | Creation of new intertidal habitat to replace the habitat lost in a different location but still within The Skerries water body. | Yes. It is technically feasible to create new rocky intertidal habitat.<br>However, it is not considered feasible to create new sedimentary habitats within The Skerries water body. The habitats that would be lost are predominantly muddy/sandy sediment which would be very difficult to create in a sustainable manner along the existing | Low. Experience in the UK of rocky habitat creation has demonstrated its feasibility. | This would depend on the extent and location of habitat creation. | Creation of littoral rock habitat (e.g. an artificial rocky reef) would result in further losses of natural intertidal or subtidal habitat. This could result in additional pressure on hydromorphological quality elements within the water body which could lead to deterioration in status. | No, due to the potential impacts of the measure which could lead to further deterioration. |

| Ref | Design | Construction | Operation | Mitigation measure | Description | Is the mitigation measure technically feasible? | Level of uncertainty associated with the mitigation measure | Would the mitigation measure be disproportionately costly? | Potential impacts of the mitigation measure | Mitigation measure included? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | naturally rocky coastline. | | | | |
| S7 | | ✓ | | Replace hard shoreline protection with soft engineering. | In the areas where hard shoreline protection is proposed, seek an alternative softer approach. | No. Soft engineering options (e.g. salt marsh or dunes) would not provide the required protection. | N/A | N/A | N/A | No |

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## 6.3 Test (b)

6.3.1 The steps that would be taken to meet test (b) are outlined in section 5.3 and are relevant to both The Skerries and the Ynys Môn Secondary groundwater bodies.

## 6.4 Test (c)

6.4.1 The case for Overriding Public Interest is presented in section 5.4.

## 6.5 Test (d)

### *Alternative options*

6.5.1 A summary of the strategic case for the Wylfa Newydd Project and how all reasonable alternatives were considered is provided in section 5.5 and Appendix A. This presents the alternative solutions and locations considered for the Wylfa Newydd Development Area.

### *Design-related alternative options*

6.5.2 The design-related alternatives relevant to effects on morphological conditions for The Skerries water body are outlined in table 6-2.

6.5.3 One of the key decisions which informed the development of alternative options involved consideration of alternative means for transporting materials. The Wylfa Newydd Project has significant requirements in terms of the transportation of Abnormal Indivisible Loads (AIL) and bulk materials. The *Site Development. Heavy Route and MOLF Strategic Study* report [RD33] summarises the design options review that was undertaken to identify the preferred method for transportation of AIL and bulk material covering various land (road, rail) and/or sea transport options.

6.5.4 Section 5.13 of NPS EN-1 sets out the traffic and transport policies that should be considered when developing a DCO application and states that *"Water-borne or rail transport is preferred over road transport at all stages of the project, where cost-effective"* [RD12]. The Department of Transport also operates a policy to encourage the transportation of AIL away from roads and rail and towards marine solutions. Considering this policy together with technical feasibility, costs and environmental impacts, it was determined that delivery of AIL and bulk material to the Wylfa Newydd Development Area via a MOLF was the preferred option. Of the transportation alternatives examined, none were considered to represent a significantly better environmental option.

6.5.5 Several option reviews were undertaken to identify the preferred locations for key structures including the Cooling Water intake and associated structures (e.g. breakwaters), Cooling Water outfall, MOLF, each capturing evolution of the Project design [RD34, RD35]. A total of fifteen locations for the Cooling Water intake were identified over the course of the reviews; all of which were

considered to be technically feasible and of proportionate cost (see figure 6-1 and table 6-2).

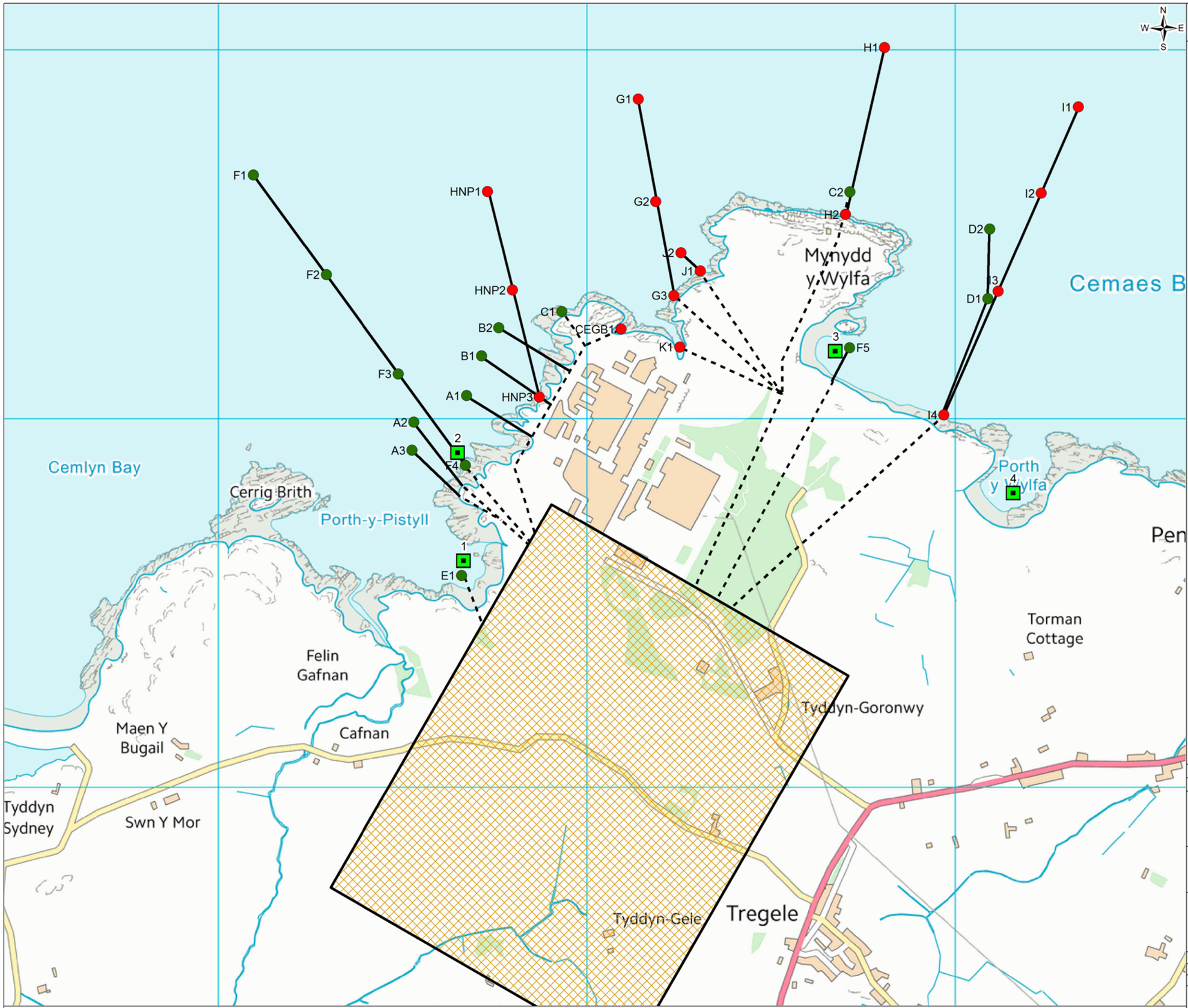
6.5.6 A separate study was carried out to consider suitable locations for a MOLF which identified four sites within the Wylfa Newydd Development Area [RD36] (figure 6-1). The sites to the east of Wylfa Head were discounted due to operational issues and the potential effects on terrestrial features, leaving the two options within Porth-y-pistyll (see figure 6-1 and table 6-2).

6.5.7 The preferred options for the Cooling Water intake and MOLF were considered in relation to a number of criteria including cost, safety, sustainability, constructability, operability and environmental impacts. Taking into account the outcomes of the separate studies for the Cooling Water intake and MOLF it was felt that there would be significant benefits of co-locating infrastructure to reduce the environmental impacts and footprint of the works [RD37].

6.5.8 There would be two breakwaters extending out into Porth-y-pistyll that would provide protection and create acceptable wave conditions for operation of the Cooling Water System; referred to as the western breakwater and the eastern breakwater (see figure 6-2). The breakwaters would also provide sheltered conditions for vessels accessing and berthing at the MOLF. Various design alternatives for the breakwaters have been considered including the optimum length and orientation of breakwaters and the need for breakwaters to attach to land. The design was informed by environmental assessment including the following considerations.

- The footprint on the seabed: a reduction in the size of the breakwater from 500m to 400m was investigated to ensure that the breakwater could still perform its primary function of protecting the Cooling Water intake whilst reducing its footprint.
- The form of the breakwater: wave climate studies have been carried out to assess the effects of wave refraction from the breakwater on the nearby Esgair Gemlyn.
- Effects on water quality: the western breakwater was designed with a gap between the southern tip and the land to maintain appropriate hydrodynamic flows and allow mixing within Porth-y-pistyll.
- Position of the western breakwater: this was carefully considered to ensure migratory fish species such as European eel and sea trout are not prevented from entering and leaving freshwater habitat in the Afon Cafnan.

# FIGURE 6-1




Legend

- Power Station (approximate location)
- Marine Off-Loading Facility options
- Cooling Water intake options
- Cooling Water outfall options


| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |
|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
ARTICLE 4(7) DEROGATION

Drawing Title

ALTERNATIVE OPTIONS FOR
THE COOLING WATER INTAKE AND OUTFALL
AND THE MARINE OFF-LOADING FACILITY

| | | |
|---|---|---|
| Scale @ A3 | 1:10,000 | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | | |

Drawing No.

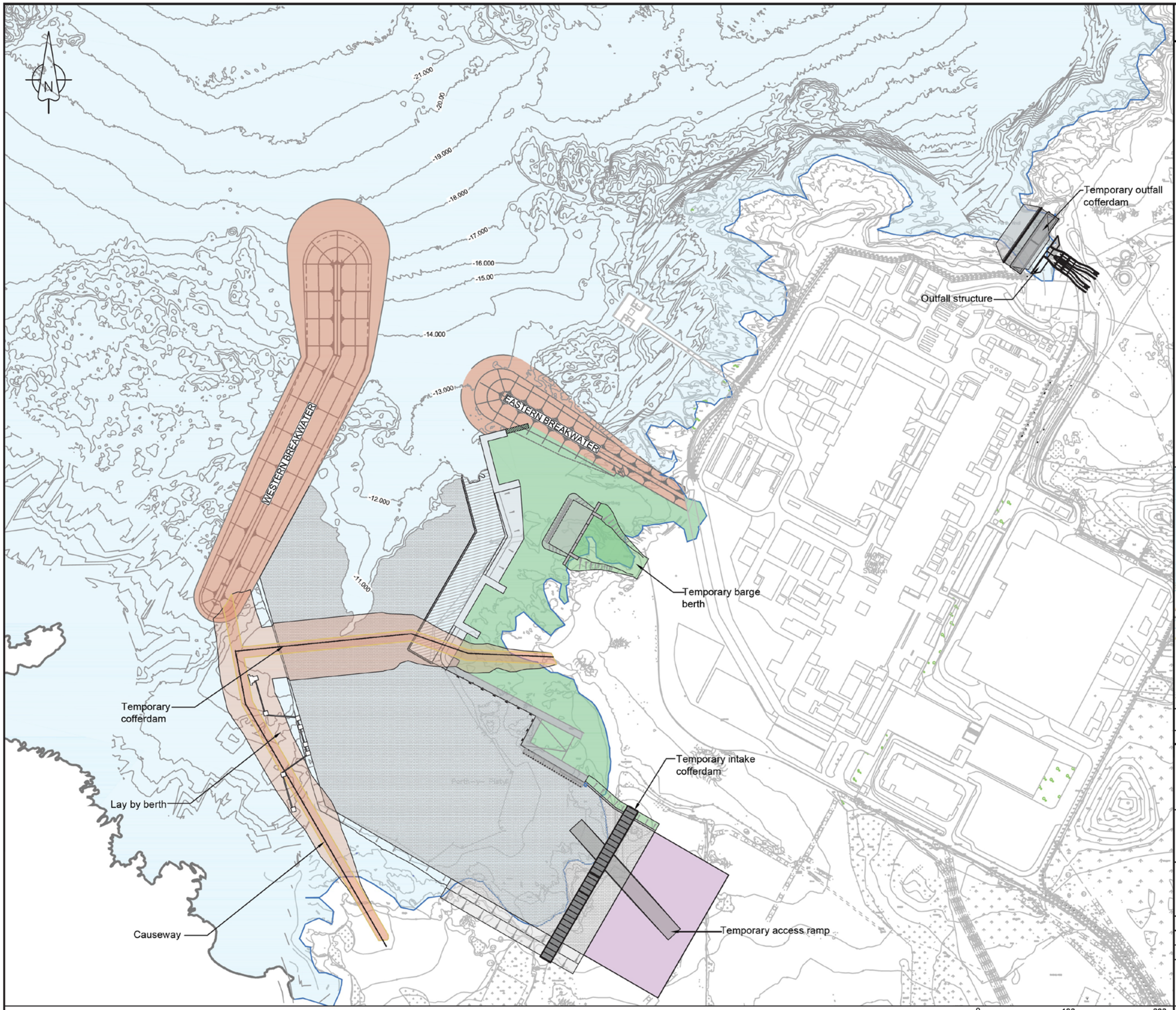
60PO8077_DCO_D_APP_08_07_06_01





0 50 100 200 300 400 500 metres

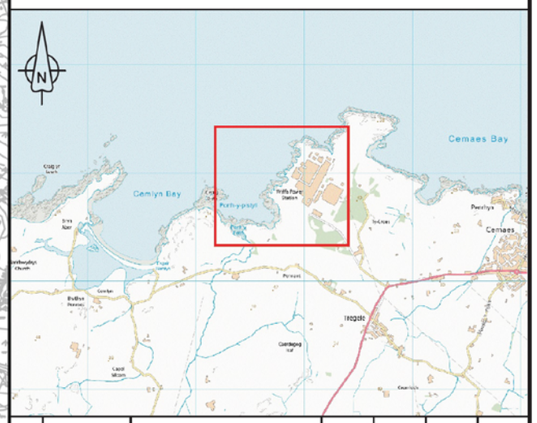
# FIGURE 6-2



LEGEND

- 🟦 Seawater
- 🟩 Reclaimed ground
- 🟧 Breakwater
- 🟪 Intake area
- ▩ Dredged area to -10m AOD
- ▨ MOLF dredged to -11.9m AOD
- ▥ Slope between the dredged area and the natural seabed
- — Mean high water

NOTE:
This figure is intended for illustrative purposes only; the locations, sizes and layouts of the facilities and construction areas shown are approximate. Design evolution is ongoing and certain elements shown, such as the temporary cofferdam, will be subject to change. For further details, refer to Chapter D1 of the Environmental Statement.



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|---|---|---|---|---|---|---|
| 1.0 | MAR 18 | DCO submission | HNPWL | HNPWL | HNPWL | HNPWL |
| Rev. | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd |

Client

HORIZON
NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
ARTICLE 4(7) DEGROGATION

Drawing title

INDICATIVE LAYOUT FOR THE
CONSTRUCTION OF MARINE FACILITIES

| | | |
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| Scale @ A3 | AS SHOWN | DO NOT SCALE |
| Jacobs No. | 60PO8077 | |
| Client No. | - | |

Drawing No.

60PO8077_AQE_REP_009_06_02

**Table 6-2 Consideration of design alternatives relevant to The Skerries water body (the preferred options are shown in highlighted cells)**

| Element of the design/construction | Options considered | Technical feasibility | Disproportionate cost | Environmental impacts | Decision and justification |
|---|---|---|---|---|---|
| Delivery of AILs<br><br>Several land (road) and/or sea transport options were examined in an options review [RD33] (see paragraphs 6.5.3 to 6.5.4 above) | Delivery by sea to the port of Holyhead and transhipment to the Wylfa Newydd Development Area by road (option 1). | Technically feasible although barge length would be limited and upgrades to the berths and load capacity may be required as well as remedial works to roads and culverts. There is also limited space nearby to locate a fabrication facility or for temporary land storage of AILs. | Costs would include shipment, port charges, possible upgrades to port and remedial road works but these are not considered disproportionate. | Delivery by sea could impact marine water quality, flora, fauna, birds and habitat integrity. Transport by road could potentially impact air quality and terrestrial flora, fauna and birds via deterioration in air quality and noise disturbance. | Direct delivery of AILs to the Wylfa Newydd Development Area via a MOLF (option 3) is a technically and financially feasible option which has considerable environmental and social benefits compared with option 1, requiring transhipment by road.<br>There was some uncertainty regarding option 2 and the feasibility of direct transhipment of AIL using the Anglesey Aluminium Jetty to berth delivery vessels. Overall, option 2 was not considered to be a significantly better environmental option than option 3.<br>Given the Government's preference for delivery by sea and the wider environmental impacts caused by road transport (e.g. congestion, deterioration in air quality, noise disturbance and increased carbon footprint), 'delivery by sea to the Wylfa Newydd Development Area using a MOLF' (option 3) is the preferred option. |
| | Delivery by sea to the port of Holyhead and transhipment to the Wylfa Newydd Development Area by sea using a MOLF (option 2). | Technically feasible although barge length at Holyhead would be limited and upgrades to the berths and load capacity may be required. There is also limited space nearby to locate a fabrication facility or for temporary land storage of AILs. Direct vessel to vessel transhipment at the port of Holyhead using the Anglesey Aluminium Jetty to berth delivery vessels would be practical providing the jetty is not required for increased cruise ship traffic in the future. | Costs would include shipment, port charges, possible upgrades to port and provision of the MOLF structure and new haul road at the Wylfa Newydd Development Area. The cost is not considered disproportionate. | Delivery by sea could impact marine water quality, flora, fauna, birds and habitat integrity.<br>Transport by sea is the Government's preferred method of transport with direct delivery of AILs to the site offering the widest environmental, social, and landscape benefits. | |
| | Delivery by sea to the Wylfa Newydd Development Area using a MOLF (option 3). | Technically feasible taking into consideration operational availability and layout, construction and protection requirements of the MOLF and associated structures. | Costs would include provision of the MOLF (and associated structures) and new haul road at the Wylfa Newydd Development Area. The cost is not considered disproportionate. | Delivery by sea could impact marine water quality, flora, fauna, birds and habitat integrity.<br>Transport by sea is the Government's preferred method of transport with direct delivery of AILs to the site offering the widest environmental, social, and landscape benefits. | |
| Delivery of bulk materials<br><br>Several land (road and rail) and/or sea transport options were examined in an options review [RD33] (see paragraphs 6.5.3 to 6.5.4 above). | Delivery by rail and transhipment to the Wylfa Newydd Development Area by road (option 1). | Technically feasible although new railhead and transhipment facilities would be required depending on the chosen station (e.g. Rhosgoch, Gaerwen and Valley). In the case of Rhosgoch, the Amlwch branch line would need to be reinstated. At Rhosgoch and Gaerwen, there is the option to transport bulk materials from the railway station to the Wylfa Newydd Development Area via a conveyor belt as well as via road. | Costs vary depending on the chosen railway station and the extent of necessary upgrades. Rhosgoch was considered the most expensive with a capital cost of £37 million whilst Anglesey Aluminium was considered the least expensive with a predicted capital cost of around £430,000. The costs of all railway stations examined were not considered to be disproportionate. | Rail delivery to Holyhead and Anglesey Aluminium could impact air quality.<br>Rail delivery to Rhosgoch, Gaerwen and Valley could impact geology and soils, land quality, surface water quality, ground water quality, sediment quality, Areas of Outstanding Natural Beauty (AONB) and terrestrial flora, fauna, birds and habitat integrity.<br>RSPB nature reserves could also be impacted if bulk materials were transported from Rhosgoch and Gaerwen railway stations to the | Delivery of bulk materials to the Wylfa Newydd Development Area via provision of a MOLF (option 4) is a technically feasible option which has lower and more localised environmental impacts than those options which require the transport of bulk materials by road and/or rail (options 1, 2 and 5).<br>Option 3 was not considered to be technically feasible.<br>Given the Government's preference for delivery by sea and the wider environmental, social and landscape impacts caused by road and rail |

| Element of the design/construction | Options considered | Technical feasibility | Disproportionate cost | Environmental impacts | Decision and justification |
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| | | | | Wylfa Newydd Development Area by road. | transport, 'delivery by sea to the Wylfa Newydd Development Area using a MOLF' (option 4) is the preferred option. |
| | Delivery by sea to the port of Holyhead and transhipment to the Wylfa Newydd Development Area by road (option 2). | Technically feasible with the Anglesey Aluminium jetty used as an import berth; materials transferred by existing conveyors to the Anglesey Aluminium Plant for storage and loading onto trucks going to the Wylfa Newydd Development Area. The jetty is only suitable for the delivery of bulk sand, aggregate and cement. Steel imports would need to be delivered by either road or rail. | Costs would include reconfiguration of the handling equipment and conveyors at Anglesey Aluminium and additional costs associated with the road transport of steel products from Holyhead to the Wylfa Newydd Development Area. These costs are not considered to be disproportionate. | Delivery by sea could potentially impact marine water quality, flora, fauna, birds and habitat integrity. Transport by road could potentially impact air quality and terrestrial flora, fauna and birds via deterioration in air quality and noise disturbance. | |
| | Delivery by sea to the port of Holyhead and transhipment to the Wylfa Newydd Development Area via sea using an on-site MOLF (option 3). | Not considered to be technically feasible option owing to the lack of space available for stockpiling materials at the port of Holyhead. | Not considered further. | Not considered further. | |
| | Delivery by sea to the Wylfa Newydd Development Area using a MOLF (option 4). | Technically feasible although consideration would need to be given to the deeper draft of bulk vessels. | When considered for bulk materials alone the costs of providing a MOLF were deemed to be disproportionate to the cargo volumes required. However, when considered in combination with the large number of deliveries of AILs the cost was proportionate. | Delivery by sea and construction of the MOLF could impact marine water quality, marine sediment quality, flora, fauna, birds and habitat integrity. Construction of the MOLF could impact air quality and noise disturbance. Terrestrial receptors could also be impacted including the North Anglesey Heritage Coast, RSPB reserves, terrestrial flora, fauna and birds. | |
| | Delivery by road from mainland UK (option 5). | Technically feasible however practically difficult to source sufficient truck capacity and schedule deliveries. | Costs would include trucks, fuel and tolls but these are not considered disproportionate. | Delivery by road would impact air quality and would result in noise disturbance. | |
| Location of the MOLF for delivery of AILs and bulk materials<br><br>Four sites were identified and examined within a series of option reviews [RD33]; [RD34]; [RD35]; [RD36] | Site 1 (Porth-y-pistyll). | Technically feasible to construct a MOLF. Offers the best direct access to the Power Station Site but would require significant protection works and dredging owing to the exposed nature of the site and the shallow depths offshore hindering navigation. | When considered for bulk materials alone the costs of providing a MOLF were deemed to be disproportionate to the cargo volumes required. However, when considered in combination with the large number of deliveries of AILs the cost was proportionate. | Construction of the MOLF in Porth-y-pistyll could potentially impact marine water quality, marine sediment quality, flora, fauna, birds and habitat integrity. Terrestrial receptors could also be impacted including flora, fauna, birds and habitat integrity. | Locating the MOLF at site 2 (north of Porth-y-pistyll) is a technically and financially feasible option which has considerably lower environmental impacts with respect to terrestrial receptors, compared with site 3 (Porth-y-Ogof) and site 4 (Porth Wylfa). In the options appraisal in 2012 [RD34] site 2 was considered to be too exposed, however with the decision to co-locate the intake and MOLF site 2 became a viable option. |
| | Site 2 (north of Porth-y-pistyll). | Technically feasible to construct a MOLF. Located close to the site so haul road requirements would be minimal but developing an access | When considered for bulk materials alone the costs of providing a MOLF were deemed to be disproportionate to the cargo volumes required. | Construction of the MOLF just north of Porth-y-pistyll could potentially impact marine water quality, marine sediment quality, flora, fauna, birds | |

| Element of the design/construction | Options considered | Technical feasibility | Disproportionate cost | Environmental impacts | Decision and justification |
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| | | route to the water's edge would be difficult due to high cliffs. Significant protection works would also be required owing to the exposure of this location. | However, when considered in combination with the large number of deliveries of AILs the cost was proportionate. | and habitat integrity. Terrestrial receptors could also be impacted including flora, fauna, birds, habitat integrity. | Locating the MOLF at site 1 (Porth-y-pistyll) does not represent a significantly better environmental option as the environmental impacts would be approximately the same.<br>Environmental impacts to marine receptors would be reduced by the co-location of the MOLF and Cooling Water intake within a single bay (Porth-y-pistyll), with protection works (e.g. breakwaters) affording both structures protection from wave surges. Site 2 is the preferred option. |
| | Site 3 (Porth-y-Ogof). | Technically feasible to construct a MOLF. Represents the most sheltered location. No protection works would be required and owing to the seabed profile, dredging requirements would be minimal. This location is some distance from the Power Station Site so significant amounts of earthworks would be required to construct a haul road. | Costs are not considered to be disproportionate to the cargo volumes required. | Construction of the MOLF in Porth-y-Ogof would significantly impact terrestrial flora, fauna (e.g. reptiles and bats), birds, habitat integrity (e.g. chough nests and SSSI qualifying grassland), an AONB, the Anglesey Coastal Path and ecologically designated sites (e.g. Tre'r Gof SSSI). Marine receptors could also be impacted including marine water quality, flora, fauna, birds and habitat integrity. | |
| | Site 4 (Porth Wylfa). | Not considered technically feasible to construct a MOLF which could accommodate delivery of both AIL and bulk material. Owing to the small size of the inlet, a combined facility could only be constructed offshore, requiring significant protection works and dredging. This location is furthest from the Power Station Site and significant earthworks would be required to construct a haul road. | To construct a MOLF for AIL and bulk material delivery, costs are considered disproportionate to the cargo volumes required. | Construction of the MOLF in Porth Wylfa would significantly impact terrestrial flora, fauna (e.g. reptiles and bats), birds, habitat integrity (e.g. chough nests and SSSI qualifying grassland) and designated sites (e.g. Tre'r Gof SSSI). Marine receptors could also be impacted including marine water quality, flora, fauna, birds and habitat integrity. | |
| Configuration of MOLF within Porth-y-pistyll<br><br>Four designs were identified and examined within a series of options reviews [RD33]; [RD34]; [RD35]; [RD36] | Ro-Ro MOLF (for delivery of AIL) and bulk materials MOLF located some 150m apart on either side of intake structure (option 1). Both breakwaters would be connected to the land. | Technically feasible option representing a compact harbour area and footprint although substantial dredging volumes would be required. | Not disproportionately costly. | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity. | Option 3 represents a technically and financially feasible option which has considerably lower environmental impacts compared with the other options examined.<br>Option 5 is not considered to be technically feasible.<br>Options 1, 2 and 4 do not represent a significantly better environmental option given the key and additional environmental impacts identified.<br>Whilst it is recognised that option 3 would have several impacts on marine ecological receptors, these impacts are not considered to be greater than options 1, 2 or 4 and |
| | Ro-Ro MOLF (for delivery of AIL) and bulk materials MOLF located some 200m apart on either side of intake structure (option 2). Both breakwaters isolated from land. | Technically feasible option representing a medium-sized open harbour arrangement. | Not disproportionately costly. | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity.<br>This option has the largest dredging and blasting extent resulting in loss of intertidal and subtidal habitats. Also being larger in extent, this could impact landscape and visual receptors. | |

| Element of the design/construction | Options considered | Technical feasibility | Disproportionate cost | Environmental impacts | Decision and justification |
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| | Ro-Ro MOLF and bulk materials MOLF located next to each other to the north of the intake structure. (option 3). Gap between the land and the western breakwater only. | Technically feasible option representing a medium-sized open harbour arrangement with both breakwaters isolated from land. | Not disproportionately costly. | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity. | mitigation measures have been proposed to reduce effects. Option 3 is the preferred option. |
| | Ro-Ro MOLF and bulk materials MOLF (two berths) located next to each other to the north of the intake structure (option 4). | Technically feasible option representing a large closed harbour arrangement with smaller dredging volumes, larger harbour entrance, larger MOLF footprint (with land reclamation) and longer intake structure to accommodate an additional Cooling Water unit. Both breakwaters would be connected to land. | Not disproportionately costly. | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity.<br>This option has the largest construction footprint resulting in loss of intertidal, subtidal and terrestrial habitats. | |
| | Floating bulk MOLF structure (two berths) (option 5). | Not considered technically feasible to construct two inline berths. It was also not feasible to build and operate the two berths at separate locations within the harbour given the position of the breakwaters (same as option 3). | n/a | n/a | |
| Location and design of the Cooling Water intake<br><br>Fifteen locations were identified and examined within a series of option reviews [RD34]; [RD35]; [RD38]. | Offshore (300m-1,200m) in Porth-y-pistyll (locations A1-A3, B1-B2 and F1-F3) (option 1). | Technically feasible option which would include a horizontal conduit; a vertical shaft for installation of pre-constructed intake structure; and an additional tunnel to connect to onshore pumphouse. | Not disproportionately costly although costs were anticipated to be greater for an offshore intake depending on the construction methodology (i.e. cut-and-cover versus tunnelling). | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity.<br>Vertical shafts would result in a pressure differential which could impact the survivability of organisms impinged in the Cooling Water intake.<br>Locations F1 and F2: longer conduits could impact the survivability of organisms entrained in the Cooling Water intake. | Offshore intake options at D1, D2 and F5 (option 5) were ruled out due to extent of habitat loss as a result of the cut and cover technique required for these options. F1 and F2 were also ruled out on an environmental basis as the longer tunnels would have a considerable effect on entrained organisms due to longer residence times.<br>An onshore intake located at E1 in Porth-y-Pistyll (option 2) is a technically and financially feasible option which has lower impacts on terrestrial receptors compared to other locations (e.g. option 4).<br>A nearshore intake (option 3 (at location C1)) or an offshore intake (options 1, 3, 4 and 5) are not considered to represent a significantly better environmental |
| | Onshore in Porth-y-pistyll, requiring breakwaters for protection (E1) (option 2). | Technically feasible option which would include an onshore intake structure; an open channel or culvert to the Cooling Water pumphouse; and two breakwater structures. | Not disproportionately costly although the requirement for breakwater structures adds cost. | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity.<br>European eel could be vulnerable to impingement in the Cooling Water intake.<br>Presence of breakwaters could impact landscape and visual receptors (Wales Coast Path). | |

| Element of the design/construction | Options considered | Technical feasibility | Disproportionate cost | Environmental impacts | Decision and justification |
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| | Nearshore and offshore in Porth-y-pistyll, requiring breakwaters for protection (C1 and F4, respectively) (option 3). | Technically feasible option which would require a horizontal conduit constructed; a vertical shaft for installation of pre-constructed intake structure; an additional tunnel to connect to onshore pumphouse; and two breakwater structures. | Not disproportionately costly although the requirement for breakwater structures and tunnels or cut-and-cover adds cost. | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity.<br>C1 could potentially impact a Regional Important Geological Site (RIGS).<br>Presence of breakwaters could impact landscape and visual receptors (Wales Coast Path).<br>Vertical shafts would result in a pressure differential which could impact the survivability of organisms impinged in the Cooling Water intake. | option given the key and additional environmental impacts identified.<br>Whilst it is recognised that an onshore intake located at E1 would have several impacts on marine ecological receptors (e.g. habitat loss on the foreshore), these impacts are not considered to be greater than option 2 and mitigation measures have been proposed to reduce effects. An onshore intake at E1 in Porth-y-pistyll is the preferred option. |
| | Offshore (100m) of Wylfa Head (C2) (option 4). | Technically feasible option which would also include a horizontal conduit; a vertical shaft for installation of pre-constructed intake structure; and an additional tunnel to connect to onshore pumphouse. | Not disproportionately costly although costs were anticipated to be greater for an offshore intake depending on the construction methodology (i.e. cut-and-cover versus tunnelling). | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity.<br>C2 could potentially impact a RIGS. | |
| | Offshore (100m-500m) in Cemaes Bay (D1-D2, F5) (option 5). | Technically feasible option which would include a horizontal conduit; a Cooling Water intake structure; and an additional tunnel to connect to onshore pumphouse. | Not disproportionately costly although costs were anticipated to be greater for an offshore intake depending on the construction methodology (i.e. cut-and-cover versus tunnelling). | Potential impacts on marine and terrestrial flora, fauna, birds and habitat integrity. Large area of marine habitat loss.<br>Locations D1 and D2: could impact surface water receptors (cut through Tre'r Gof catchment). Habitat in Tre'r Gof SSSI as well as areas of reptile habitat and chough foraging habitat would be impacted. Potential for impingement of flatfish and sea trout found in Cemaes Bay. | |
| Location of the Cooling Water outfall<br><br>Sixteen locations were identified and examined in a series of option reviews [RD34]; [RD35]; [RD38]. | Offshore north of Porth-y-pistyll (HNP1, HNP2), Porth Wnal (J2, G1 and G2), Wylfa Head (H1), Cemaes Bay (I1, I2 and I3) (option 1). | Technically feasible. This option would include a capped radial flow or direct port outfall constructed in precast concrete, and a horizontal conduit. | Not disproportionately costly although costs were anticipated to be greater for offshore outfall options. | All locations could potentially impact marine and terrestrial flora, fauna, birds and habitat integrity.<br>Locations HNP1, HNP2, J2, G1, G2, H1, I1, I2 and I3: entrained organisms would be subject to a pressure differential and exposed to biocides for a longer period depending on length of conduit.<br>Locations I3 and I4: heat and biocide retention within Cemaes Bay from Cooling Water discharge with possible impacts on benthic habitats and fish (notably sea trout). | An onshore outfall at K1 at Porth Wnal is a technically and financially feasible option which has fewer impacts on marine receptors compared to several other locations examined (e.g. I3 and I4).<br>An offshore Cooling Water outfall at locations J2 or G2, or an onshore Cooling Water outfall at locations HNP3, CEGB1, G3, J1, H2, I3 or I4 are not considered to represent significantly better environmental option given the environmental impacts identified. |

| Element of the design/construction | Options considered | Technical feasibility | Disproportionate cost | Environmental impacts | Decision and justification |
|---|---|---|---|---|---|
| | | | | Locations I1-2 and J2: Potentially impact archaeology and cultural heritage receptors (RIGS). | Whilst it is recognised that an onshore outfall located at K1 would have several impacts on marine ecological receptors, the quality of benthic habitats in Porth Wnal is low (silted habitats) and these impacts are not considered to be greater than other options. An onshore outfall at K1 in Porth Wnal is the preferred option. |
| | Onshore north of Porth-y-pistyll (HNP3), Porth Wnal (CEGB1 and K1, G3 and J1), Wylfa Head (H2), Cemaes Bay (I4) (option 2). | Technically feasible. This option would include an open channel or closed conduit that carries Cooling Water across the foreshore to the point of discharge. | Not disproportionately costly. | All locations could potentially impact marine and terrestrial flora, fauna, birds and habitat integrity.<br>Locations HNP3, K1, G3, J1, H2 and I4: could impact public access and recreation in Cemaes Bay (I4 only). | |

# 7 Articles 4(8) and 4(9)

## 7.1 Article 4(8)

7.1.1 Article 4(8) states that *"a Member State shall ensure that the application does not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district and is consistent with the implementation of other Community environmental legislation*."

7.1.2 The WFD Compliance Assessment (Application Reference Number: 8.26) considered the achievement of environmental objectives in water bodies beyond the Zone of Influence. The exemptions identified in relation to Article 4(7) are for the Ynys Môn Secondary groundwater body and The Skerries water body. It is considered that with the exception of these two water bodies the Wylfa Newydd Project would not compromise the achievement of the environmental objectives in any other water body within or beyond the Western Wales River Basin District. The conclusion of this assessment is presented in the WFD Compliance Assessment (Application Reference Number: 8.26). It is therefore concluded that the requirements of Article 4(8) have been met.

## 7.2 Article 4(9)

7.2.1 Article 4(9) states that *"Steps must be taken to ensure that the application of the new provisions, including the application of paragraphs 3, 4, 5, 6 and 7, guarantees at least the same level of protection as the existing Community legislation."*

7.2.2 The Community law relevant to the Wylfa Newydd Project includes the following:

- Bathing Water Directive (2006/7/EC);
- Habitats Directive (92/43/EEC);
- Birds Directive (2009/147/EC); and
- Drinking Water Directive (98/83/EC).

7.2.3 The Nitrates Directive (91/676/EEC) and Urban Waste Water Directive (91/271/EEC) are not relevant to the Wylfa Newydd Project as there are no protected areas within or near the Zone of Influence.

7.2.4 Compliance with other Community law was considered as part of the WFD Compliance Assessment (Application Reference Number: 8.26) and it was concluded that the Wylfa Newydd Project would meet the conditions of Article 4(9).

# 8 Summary

8.1.1 This report provides the information required to inform the application of a derogation under Article 4(7) of the WFD. This has been provided as the Wylfa Newydd Project may cause deterioration in quality elements in the Ynys Môn Secondary and The Skerries water bodies.

8.1.2 The information provided in this report provides evidence that for the current design of the Wylfa Newydd Project the conditions of Article 4(7) can be met sufficiently. It is recognised that the competent authority (Natural Resources Wales and the Planning Inspectorate on behalf of the Secretary of State) is responsible for case making with regards to the derogations for the two water bodies.

# 9 References

**Table 9-1 Schedule of references**

| ID | Reference |
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| RD34 | Jacobs. 2012. Ecological Options Appraisal for the Location of the Cooling Water Intake and Outfall and Marine Offloading Facility. Client report to Horizon Nuclear Power. |
| RD35 | Jacobs. 2016. Marine Elements Options Review: Cooling Water Intake and Outfall, MOLF and associated structures. Document number: 60PO8007/AQE/REP/019. |
| RD36 | Jacobs. 2014. Options Review for the Marine Off Loading Facility and Breakwaters. |
| RD37 | Royal Haskoning DHV. 2017. *Wylfa Bulk MOLF Floating Berth Feasibility Study Report*. Document number: M&APB6454R001D0.1. March 2017. |
| RD38 | Central Electricity Generating Board (CEGB). (1988). *Wylfa 'B' power station preapplication studies*. Volume 3 Section 11 General Civil Engineering, Cooling water structures. CF2365, 69 pp. |

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HORIZON
NUCLEAR POWER

WYLFA NEWYDD

# Wylfa Newydd Project

Operational Water Discharge Activity –
Environmental Permit Application: Appendices M to O

O

## Appendix O –
## Company Certificates

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WYLFA NEWYDD

# Wylfa Newydd Project

Operational Water Discharge Activity – Environmental Permit Application: Appendices M to O

# Appendix O – Company Certificates

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# CERTIFICATE OF INCORPORATION
# OF A
# PRIVATE LIMITED COMPANY

Company No. 6811987

The Registrar of Companies for England and Wales hereby certifies that

**INTERCEDE 2313 LIMITED**

is this day incorporated under the Companies Act 1985 as a private company and that the company is limited.

Given at Companies House on **6th February 2009**

Companies House
— for the record —

REGISTRAR OF COMPANIES FOR ENGLAND AND WALES

THE OFFICIAL SEAL OF THE REGISTRAR OF COMPANIES

# CERTIFICATE OF INCORPORATION ON CHANGE OF NAME

Company No. 6811987

The Registrar of Companies for England and Wales hereby certifies that

**INTERCEDE 2313 LIMITED**

having by special resolution changed its name, is now incorporated under the name of

**BOW BIDCO WYLFA LIMITED**

Given at Companies House on **19th February 2009**

Companies House
for the record

REGISTRAR OF COMPANIES FOR ENGLAND AND WALES

THE OFFICIAL SEAL OF THE REGISTRAR OF COMPANIES

# CERTIFICATE OF INCORPORATION ON CHANGE OF NAME

Company No. **6811987**

The Registrar of Companies for England and Wales hereby certifies that under the Companies Act 2006:

## BOW BIDCO WYLFA LIMITED

a company incorporated as private limited by shares; having its registered office situated in England/Wales; has changed its name to:

## HORIZON NUCLEAR POWER WYLFA LIMITED

Given at Companies House on **11th November 2009**

Companies House
— for the record —

REGISTRAR OF COMPANIES FOR ENGLAND AND WALES

THE OFFICIAL SEAL OF THE REGISTRAR OF COMPANIES

# CERTIFICATE OF INCORPORATION ON CHANGE OF NAME

Company No. 6811987

The Registrar of Companies for England and Wales hereby certifies that

**INTERCEDE 2313 LIMITED**

having by special resolution changed its name, is now incorporated under the name of

**BOW BIDCO WYLFA LIMITED**

Given at Companies House on **19th February 2009**

Companies House
— for the record —

REGISTRAR OF COMPANIES FOR ENGLAND AND WALES

THE OFFICIAL SEAL OF THE REGISTRAR OF COMPANIES

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PŴER NIWCLEAR
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NUCLEAR POWER

CONTACT US:

If you have any questions or feedback regarding the Wylfa Newydd Project you can contact us on our dedicated Wylfa Newydd freephone hotline and email address, by calling on **0800 954 9516** or emailing **wylfaenquiries@horizonnuclearpower.com**

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