HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Horizon's Deadline 6 Responses to Actions set in Issue Specific Hearing on 7 - 11 January 2019

PINS Reference Number: EN010007

19 February 2019

Revision 1.0
Examination Deadline 6

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

Horizon Internal DCRM Number: WN0902-HZDCO-PAC-REP-00277

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Contents

Appendices

List of Tables

[This page is intentionally blank]

1 Horizon Deadline 6 responses to actions set in Issue Specific Hearings 7-11th January 2019 inclusive

1.1 Introduction

1.1.1 This document contains Horizon Nuclear Power Wylfa Limited's ("Horizon") responses to actions outlined by the Hearing Action Points issued by the Examining Authority [OD-005 to OD-009 inclusive] on 25th January 2019.

1.1.2 It also contains Horizon's responses to actions it recorded during the Issue Specific Hearings (ISH) and committed to responding to in its Deadline 4 submissions [REP4-007 to REP4-010 inclusive].

1.2 Hearing Action responses – ISH 7th January 2019

1.2.1 The below table outlines the status of responses to actions recorded by the Examining Authority in document reference OD-005.

Table 1-1 Status of actions assigned to 'Applicant' on 7th January

Ref	Action	Deadline	Status
2	Provide a copy of the broadband and telecoms study.	Deadline 6	Please refer to our proposals set out in Appendix 1-1 of this document.

1.3 Hearing Action responses – ISH 8th January 2019

1.3.1 The below table outlines the status of responses to actions recorded by the Examining Authority in document reference OD-006.

Table 1-2 Status of actions assigned to 'Applicant' on 8th January

Ref	Action	Deadline	Status
7	Information to be provided with regards to the provision of broadband and telecoms services to the WNDA and in particular whether there would be the potential for Applicant and the Emergency Services to share information regarding traffic accidents and incidents to manage traffic flows during these events.	Deadline 6	Please refer to our proposed communication strategies set out in Appendix 1-2 of this document.

1.4 Hearing Action responses – ISH 9th January 2019

1.4.1 There are no further action responses planned from the 9th January 2019 Issue Specific hearing.

1.5 Hearing Action responses – ISH 10th January 2019

1.5.1 The below table outlines the status of responses to actions recorded by the Examining Authority in document reference OD-007.

Table 1-3 Status of actions assigned to 'Applicant' on 10th January

Ref	Action	Deadline	Status
14	Further information on saline intrusion to Ynys Môn minor ground water body in relation to dewatering.	Deadline 6	Horizon's response is contained in Appendix 1-3 of this document.
16	Further report on ground water impacts and mitigation at Tre'r Gof Site of Special Scientific Interest (SSSI).	Deadline 6	Horizon's response is contained in Appendix 1-4 of this document.
19	Report on baseline hydrological data at Cors Gwawr and Cae Canol-dydd.	Deadline 6	Please refer to "Tre'r Gof SSSI Compensation Proposal Volume II" submitted as part of Horizon's ES addendum at Deadline 6.
20	Further report on the implications of hydrological and soil monitoring information and how the sites might be taken forward.	Deadline 6	Please refer to "Tre'r Gof SSSI Compensation Proposal Volume II" submitted as part of Horizon's ES addendum at Deadline 6.

1.6 Hearing Action responses – ISH 11th January 2019

1.6.1 The below table outlines the status of responses to actions recorded by the Examining Authority in document reference OD-009.

Table 1-4 Status of actions assigned to 'Applicant' on 11th January

Ref	Action	Deadline	Status
11	Discussion on monitoring and active management plan at Esgair Gemlyn.	Deadline 5	Please find Horizon's response in Appendix 1-5

Ref	Action	Deadline	Status
13	Submission of further work on robust monitoring and adaptive management regime in relation to possible sediment build up on Esgair Gemlyn during construction and operation.	Deadline 5	Please find Horizon's response in Appendix 1-5
22	Submission on Wylfa Newydd Development Area (WNDA) Site flood risk in relation to Afon Cafnan.	Deadline 6	Please find Horizon's response in Appendix 1-6
25	Working drafts of drainage strategies and flood mitigation plans for Dalar Hir and the two proposed ecological compensation sites to be provided to NRW, IACC and the eNGOs.	Deadline 4	Please find Horizon's response in Appendix 1-6
32	Submission of revised Mitigation Route Map.	Deadline 6	This has been provided as part of Horizon's Deadline 6 submission.
33	Submission of internal document on contractual obligations.	Deadline 5	Horizon is awaiting further detail on exactly what this request is asking for before it can respond.

1.7 Summary of Deadline 6 responses to actions recorded by Horizon

Recorded in 10th January 2019 ISH: A note on the establishment process/times and mechanisms for management of the ecological compensation sites.

1.7.2 Please find Horizon's response to additional information request – SSSI compensation site establishment and management in Appendix 1-7 of this document.

1.8 Action responses planned for subsequent Examination Deadlines

1.8.1 No further responses are planned by Horizon to January ISH actions.

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HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Appendix 1-1 Horizon's Broadband Proposals

PINS Reference Number: EN010007

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Examination Deadline 6

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

Horizon Internal DCRM Number: WN0902-HZDCO-PAC-REP-00267

[This page is intentionally blank]

Contents

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1 Broadband Upgrade Proposals

1.1 Overview

1.1.1 Following discussions with Welsh Government, Horizon has committed to ensuring that the digital communication infrastructure network of north Anglesey will not be compromised as a result of the Wylfa Newydd DCO Project. It is also aware of its obligations in terms of community safety and emergency planning.

1.1.2 As part of this commitment, Horizon has proposed a new requirement within the Deadline 5 version of the draft DCO (Revision 4.0) which provides that, prior to the commencement of the authorised development (except Work No 12) Horizon will instruct experienced consultants to undertake a phased programme of works in order to assess the capacity of the existing network and the works required to ensure that there is adequate capacity across the WNDA during construction.

1.1.3 Following this assessment, this new requirement requires Horizon to prepare a Digital Infrastructure Plan which sets out the measure that Horizon will commit to in order to ensure continued capacity and availability of the network across the WNDA during construction and operation of the Wylfa Newydd DCO Project.

1.1.4 The phased programme of works for the technical assessment would likely include the following tasks to be undertaken:

- to meet with Welsh Government representatives to establish effective communication and consider the role of the WG;
- an audit of the current digital infrastructure, broadband, mobile capacity and Airwaves / Emergency Services Network at and in the vicinity of the proposed Power Station (with particular emphasis on the proposed Site Campus), all Off-Site facilities and Associated Developments;
- an assessment of current capacity for neighbouring settlements; and
- liaison with service providers and other stakeholders.

1.1.5 Future work will be determined by the outcome of the above tasks, but is likely to focus on:

- a review of the construction activities requirements and the potential impact these could have on the digital communication infrastructure network;
- a proposed strategy for establishing future requirements for the digital communication infrastructure network including the need for any additional mobile network mast/s;
- an agreed approach to how any solutions might be secured; and
- the proposed steps and timescales required to implement each solution proposed.

1.1.6 Following the technical assessment, Horizon would consider the measures that could be implemented across the WNDA to ensure the Wylfa Newydd DCO Project does not impact the capacity and availability of broadband in North Anglesey and include these within the resulting Digital Infrastructure Plan where appropriate.

HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Appendix 1-2 Horizon's Proposed Communication Strategies

PINS Reference Number: EN010007

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Examination Deadline 6

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

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Contents

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1 Proposed Communication Strategies

1.1 Overview

1.1.1 Horizon has committed to ensuring that the digital communication infrastructure network of north Anglesey will not be compromised and where possible will be enhanced as a result of the Project. It is also aware of its obligations in terms of community safety and emergency planning.

1.1.2 As part of this commitment, Horizon has proposed a new requirement within the Deadline 5 version of the draft DCO (Revision 4.0) which provides that, prior to the commencement of the authorised development (except Work No 12), Horizon will carry out a technical assessment of availability and capacity of mobile and broadband networks across the WNDA and provide the results of this assessment to the Welsh Government.

1.1.3 Following this assessment, this new requirement requires Horizon to prepare a Digital Infrastructure Plan which sets out the measure that Horizon will commit to in order to ensure continued capacity and availability of the network across the WNDA during construction and operation of the Wylfa Newydd DCO Project.

1.1.4 In preparing the technical assessment, Horizon would complete the following tasks:

- to meet with Welsh Government representatives to establish effective communication and consider the role of the WG;
- an audit of the current digital infrastructure, broadband, mobile capacity and Airwaves / Emergency Services Network at and in the vicinity of the proposed Power Station (with particular emphasis on the proposed Site Campus), all Off-Site facilities and Associated Developments; and
- liaison with emergency services and associated stakeholders.

1.1.5 Following the technical assessment, Horizon would consider the measures that could be implemented to improve communications with emergency services and include these within the resulting Digital Infrastructure Plan where appropriate. These measures are likely to include:

- a review of the construction vehicle movement requirements and the potential impact these could have on the digital communication infrastructure network;
- liaise with the emergency services to understand how the construction vehicle movements might have the potential to have a detrimental effect on emergency vehicle movements;
- an agreed approach to how any solutions might be secured; and
- the proposed steps and timescales required to implement required solutions.

1.1.6 This Digital Infrastructure Plan will be implemented in addition to the Community Safety Management Scheme that will also establish ways of working and incident responses between emergency services and Horizon.

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HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Appendix 1-3 Further Information on saline intrusion to Ynys Mon Secondary groundwater body in relation to dewatering

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

Horizon Internal DCRM Number: WN0902-HZDCO-PAC-REP-00269

[This page is intentionally blank]

Contents

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1 Action 14

1.1 Further information on saline intrusion to Ynys Môn Secondary groundwater body in relation to dewatering

1.1.1 Saline intrusion has the potential to affect both quantitative and chemical components of the Ynys Môn Secondary groundwater body. The potential effects of saline intrusion are described in paragraphs 7.3.258 – 7.3.282, Table 6.5 and Appendix D of the Water Framework Directive Compliance Assessment [APP-444]. Saline intrusion is predicted as a result of construction activities in regard to excavation and dewatering of the Cooling Water System (CWS) and deep excavations for Units 1 and 2.

1.1.2 There is the potential for minor saline intrusion in the 2 to 3-year period during excavation, until the maximum excavation depth has been reached. The predicted extent of saline intrusion is limited in both space and time.

1.1.3 The quantities of saline water drawn into the excavation are estimated at 6.5m^3 per day, compared to the estimated total groundwater abstraction from the seaward and inland excavations of around 175m^3/day. The effect of saline intrusion therefore is not considered a significant effect. Aside from the small area of the aquifer that will be affected, which is in the immediate environs of the power station, there are no sensitive receptors in the area of predicted saline intrusion.

1.1.4 Advice provided by Natural Resources Wales (NRW) stated that any saline intrusion would be considered as a deterioration. This advice is consistent with 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.

1.1.5 If the condition of the affected water body is adversely affected for only a short period of time and recovers without the need for any restoration measures, fluctuations in quality will not constitute deterioration of status. The dewatering during construction does not have a defined end date and the duration of the effect is uncertain. It is likely 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. As such, although the extent of the effect would be small, it may take longer than one River Basin Management Plan cycle to fully recover.

1.1.6 In conclusion, 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. As such a derogation to allow deterioration of the Ynys Môn Secondary groundwater body is required to allow dewatering of deep excavations and the CWS system.

1.1.7 The WFD makes provision for a situation where the environmental objectives required within the Directive (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. This process is described fully in section 1.4 of Water Framework Directive Information to Support Article 4(7) Derogation [APP-445].

1.1.8 Six mitigation measures were identified to mitigate the adverse effect of saline intrusion on the Ynys Môn Secondary groundwater (test a of Article 4(7)). Three measures were accepted: placement of a dry cofferdam in Porth-y-pistyll during deep water excavations, monitoring of groundwater sites to determine the extent of saline intrusion and the potential for additional mitigation (grouting major inflow fractures and altering of the dewatering regime) to be enacted should monitoring identify saline intrusion. Three measures were rejected from consideration, on the grounds of technical infeasibility (artificial ground freezing, vertical grout curtains and low permeability cut off wall using sheet piling). Whilst all three rejected methods are well established methods, it was predicted that they were unlikely to be scalable to the project need. Additionally, the hard bedrock substrates identified for excavation would result in a high certainty of failure over the feasibility of these methods (see the Water Framework Directive Information to Support Article 4(7) Derogation Revision 2 submitted at Deadline 6 (19 February 2019)). In conclusion, all practicable mitigation is in place.

1.1.9 A clear case for overriding public interest relevant to the Wylfa Newydd Project is presented in section (see the Water Framework Directive Information to Support Article 4(7) Derogation Revision 2 submitted at Deadline 6 (19 February 2019)). This assessment is made at a project level and not specific to saline intrusion.

1.1.10 Test D of Article 4(7) requires an assessment to be made of strategic and design alternatives that may present a significantly better environmental option. Site specific design elements linked to the activities predicted to result in saline intrusion, namely the deep excavations for reactor units and the siting of CWS infrastructure, were assessed. Whilst most alternatives are presented as technically feasible, none meet the criteria for being significantly better environmental options. Aside from the aquifer in the immediate environs of the Power Station, there are no sensitive receptors in the area of predicted saline intrusion.

1.1.11 It is Horizon's assertion that the provided evidence sufficiently meets the conditions of Article 4(7) (see the Water Framework Directive Information to Support Article 4(7) Derogation Revision 2 submitted at Deadline 6 (19 February 2019)). 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 Ynys Môn Secondary Groundwater body.

HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Appendix 1-4 Further report on ground water impacts and mitigation at Tre'r Gof Site of Special Scientific Interest (SSSI)

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

Horizon Internal DCRM Number: WN0902-HZDCO-PAC-REP-00271

[This page is intentionally blank]

Contents

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1 Action 16

1.1 Further report on ground water impacts and mitigation at Tre'r Gof Site of Special Scientific Interest (SSSI)

1.1.1 Moderate adverse residual groundwater impacts at Tre'r Gof SSSI are identified in D8 - Surface water and groundwater [APP-127] as:

- a change in natural catchment area through landscape mounding and managed drainage, which could alter the rainfall/runoff rates and base flow from groundwater leading to changes to water availability; and
- changes to surface water/shallow groundwater inflows at seeps and flushes affecting water availability and quality due to managed drainage system.

1.1.2 The following mitigation, was secured in the Main Power Station Site sub-CoCP [APP-415] and the Landscape and Habitat Management strategy [APP424] but did not, however, change the significance of the residual effect due to high level of uncertainty in the likelihood of success in this complex environment.

- Grouting major inflow fractures in context of the deep excavation;
- Drainage blanket and drainage design to mitigate reduction in groundwater quality and/ or flows to Tre'r Gof SSSI from mounding; and
- Post-construction monitoring of surface and groundwater quality and quantity at and around Tre'r Gof SSSI.

1.1.3 The groundwater conceptual model for Tre'r Gof SSSI has been broadened to align NRW's and Horizon's interpretations and to consider uncertainty in interpretation. The revised conceptual model is included in the ES Addendum, 5.7 Groundwater, to be submitted at Deadline 6 (19 February 2019). Accordingly, the assessment of impacts of construction dewatering of the main excavation and the cooling water tunnels on groundwater levels and flows near Tre'r Gof SSSI changed from minor adverse to moderate adverse.

1.1.4 Because of this change, further embedded mitigation [Construction Method Statement to be submitted at Deadline 5 (12 February 2019) and additional mitigation [Main Power Station Site sub-Code of Construction Practice also to be submitted at Deadline 5 (12 February 2019)], summarised below, have been secured. The revised residual assessment for dewatering is minor adverse.

- Additional construction monitoring of groundwater quantity, levels and quality in Tre'r Gof catchment and SSSI.
- Additional mitigation options if groundwater monitoring identifies an effect on the qualifying groundwater dependent terrestrial ecosystems (GWDTE) at Tre'r Gof, to include:
  - controlling water loss from the site via the underground culvert;

  - construction methodologies to reduce/eliminate groundwater ingress to the cooling water tunnels, e.g. by grouting major inflow fractures; and
  - recharging groundwater in areas potentially affected by dewatering during the construction period.
- the groundwater monitoring and mitigation is to form part of an adaptive monitoring and mitigation process which will be integrated with the wider water management mitigation in the Tre'r Gof catchment and overseen by the Hydrological and Ecological Clerks of Works.
- The cooling water tunnels will be lined post-construction within the Tre'r Gof catchment such that there will be no ingress or loss of water from the tunnel.

HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Appendix 1-5 Coastal Processes Monitoring and Mitigation Strategy

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

Horizon Internal DCRM Number: WN0902-HZDCO-PAC-REP-00276

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Contents

List of Tables

List of Figures

[This page is intentionally blank]

1 Coastal Processes Monitoring and Mitigation Strategy

1.1 Background

1.1.1 This technical note contains Horizon Nuclear Power Wylfa Limited's ("Horizon's") proposed coastal processes monitoring and mitigation strategy (CPMMS).

1.1.2 Horizon has agreed through the examination of the Wylfa Newydd DCO Project to undertake a monitoring programme of Esgair Gemlyn commencing in year 1 of construction and to adopt an adaptive management approach to mitigation. This approach is secured in the DCO application with the commitment set out in the Marine Works sub Code of Construction Practice (CoCP) submitted at Deadline 5 (12 February 2019).

1.1.3 The CPMMS provides a mechanism by which monitoring will be implemented and mitigation will be available to ensure that impacts are no greater than the residual effects predicted in the DCO application and removes the uncertainty of conclusions.

1.1.4 A distinction should be made between surveys (which are used to gather information) and monitoring (which is undertaken in order to validate an assumption or review an effect against a target).

1.1.5 Horizon's approach to the CPMMS is:

- to demonstrate a feasible monitoring and mitigation approach;
- to provide sufficient information to conclude, with the CPMMS implemented, there would be no likely significant effect on Esgair Gemlyn and no effects on site integrity;
- to provide sufficient information for DCO and Marine Licence consent;
- to allow development of the CPMMS post DCO consent; and,
- to allow development and review of the CPMMS measures at defined points as part of an adaptive management approach.

1.1.6 The CPMMS will be updated during the construction phase of the Wylfa Newydd DCO Project and it is for this reason that this is an adaptive strategy.

1.1.7 At a meeting with Natural Resources Wales (NRW) on 4 February 2019, the principles of a CPMMS were discussed and the strategy below represents the approach to be taken forward by Horizon.

1.2 Step 1: coastal processes monitoring

1.2.1 The key objectives for the monitoring programme are:

- to generate a suitable baseline (without and with the Wylfa Newydd DCO Project);
- to understand the effect of natural variability (e.g. storm events) on Esgair Gemlyn; and,
- to generate a baseline dataset to determine a set of trigger levels for adaptive management mitigation.

1.2.2 Between 2010 and 2018, four morphological surveys have been undertaken on Esgair Gemlyn which provide a valuable baseline dataset to build upon. Surveys consisted of:

- two ground topographic surveys which examined thirteen cross-shore ridge profiles using RTK laser equipment (see Pye 2018, [RD1]); and,
- two LIDAR surveys examining profiles and sediment volumes.

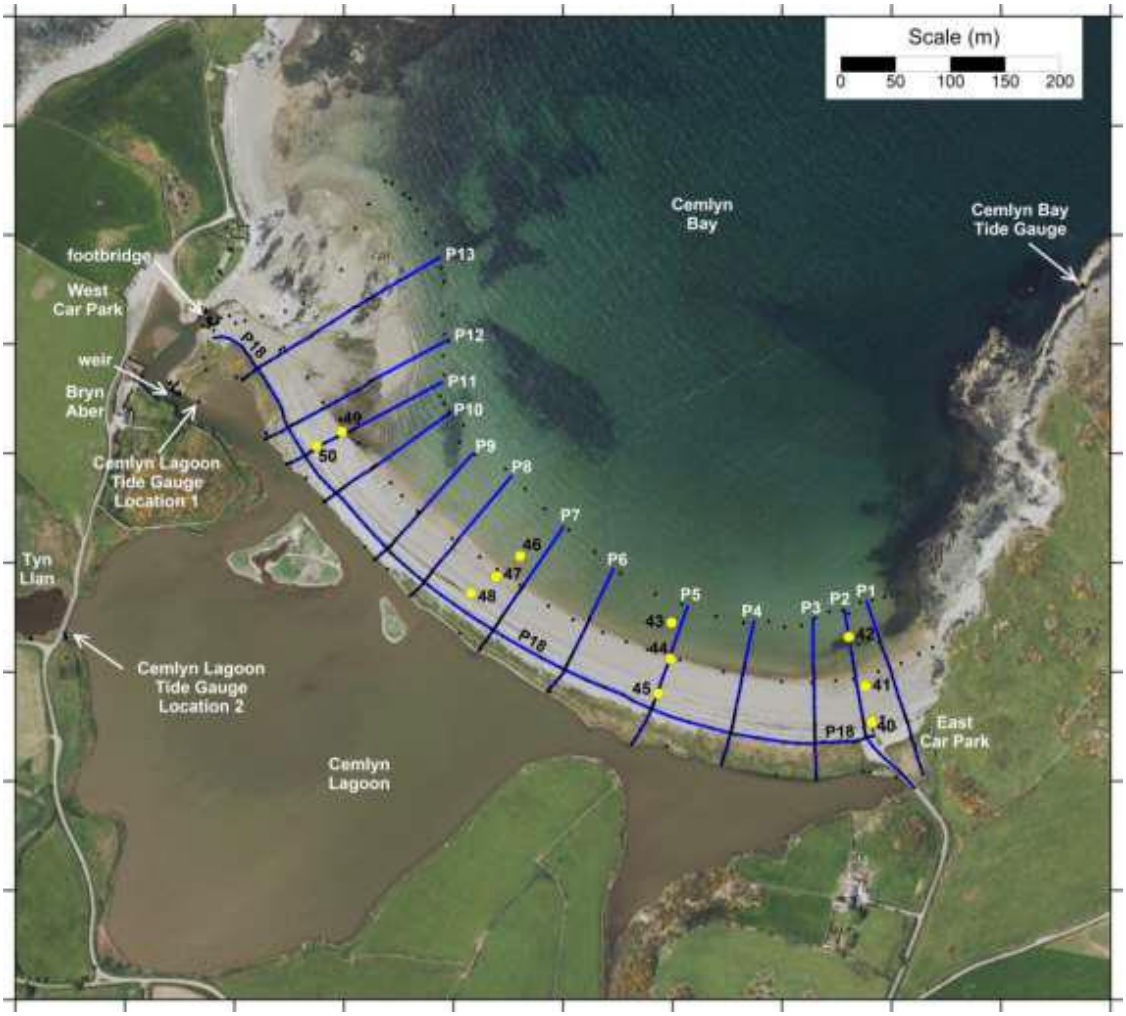
1.2.3 These surveys and other historic work, for example aerial photography, provide a good understanding of temporal trends, storm response and broader scale sediment changes/trends.

1.2.4 The present morphology and volume of Esgair Gemlyn is quantified in terms of the maximum crest elevation, barrier width, gradient (along cross-sectional profiles at 13 locations) and sediment volumes in cells 30m wide along the ridge.

1.2.5 To meet the monitoring objectives, the following coastal processes monitoring measures will be undertaken.

- Annual ground topographic surveys undertaken during the construction phase of the Wylfa Newydd DCO Project. Surveys would replicate the thirteen cross-shore profiles undertaken in 2016 and 2018 (see figure 1.1 and [RD1]) to examine the ridge profile (i.e. crest elevation, width and gradient). Each survey would be standardised to the same seasonal period dictated by the first survey which would commence in year 1 of construction (subsequent surveys would be within a four-week period of the first survey). A total of nine surveys would be undertaken; at least one survey would provide additional data pre-construction of the breakwater; the remaining surveys would be during and post breakwater construction. The need for and frequency of monitoring post construction phase (from year 9) will be reviewed as part of the adaptive management approach.
- Three LIDAR surveys would also be undertaken at years 1, 4, and 8 of the construction phase to examine sediment volume (in additional to profile). The need for and frequency of additional LIDAR surveys post construction (from year 9) will be reviewed as part of the adaptive management approach.

Figure 1-1 Thirteen beach profiles to survey annually during the construction phase (taken from Pye 2018 [RD1])



1.2.6 Monitoring data will be reported in an annual report building on successive datasets to examine temporal trends in ridge profile, storm response and broader scale sediment changes/trends against a set of objectives and principles. The annual report will make recommendations on the CPMMS as part of the ongoing adaptive management approach.

1.3 Step 2: adaptive management mitigation

1.3.1 The key objective for adaptive management mitigation is:

- to demonstrate commitment to remedial action, in good time, through adaptive management mitigation if trigger levels (i.e. changes outside of natural variation or storm events) are breached.

1.3.2 Data from surveys and monitoring will be used to devise a set of trigger levels (either a traffic light system or maximum / minimum approach) where adaptive management mitigation will be implemented. Development of the trigger levels will be undertaken with NRW and may include independent technical advice. Consideration would need to be given to the influence of natural factors (e.g.

storm events and climate changes) and any on-going management practices which may influence the results. Information will be recorded in an updated CPMMS.

1.3.3 It is envisaged that trigger levels will be set for each segment or cross-sectional profile shown in figure 1-1. Different levels may be set against different transects and at different positions on the ridge. These segments will be subsequently monitored and reviewed against the trigger levels during construction (as described in step 1) and reported through the annual monitoring reports.

1.3.4 In the event of a trigger level being reached, at one or more segments / cross-sectional profiles, mitigation will be agreed with NRW and National Trust (as landowners) and implemented.

1.3.5 The nature of change will dictate the adaptive management mitigation adopted. This could include:

- review monitoring programme and defer intervention;
- shingle recharge / re-profiling of the ridge with material from offsite; or,
- mechanical recycling of existing shingle i.e. re-distribution of material from elsewhere on the ridge (i.e. onsite).

1.3.6 Mitigation measures will be undertaken within segments or cross-sectional profiles where trigger levels are breached only and in accordance with a set of mitigation principles, such as establishment of a pre-defined / optimal ridge profile, crest height and sediment size / volume. This set of mitigation principles will be recorded in an updated CPMMS and agreed with NRW post DCO consent and prior to construction to minimise the amount of time for mitigation implementation should it be required.

1.3.7 Furthermore, during the implementation of the CPMMS Horizon will review annually the availability of suitably sized shingle from external sources to ensure shingle recharge to the optimal segment / cross-sectional profile remains a viable mitigation option.

1.3.8 Should shingle recharge be required it is envisaged material of between 20 - 35mm would be required for the main ridge segment replenishment, based on work by National Trust [RD2], which is generally in plentiful supply [see RD3]. Material could be derived from quarried (river gravel) material or ‘Marine Won’ aggregates. Currently three quarries could supply the required grade of material from within Gwynedd [RD3] and multiple more across Wales.

1.3.9 All mitigation measures will require co-operation with regulators and landowners and planning and licencing consents. Where practicable, agreements with landowners and outline consents should be put in place early in the construction programme to minimise the time lag between a breach (should it occur) and mitigation implementation. However, if this was not possible it is envisaged that planning and licencing would be achieved quickly due to the objectives of protecting a key designated site.

1.3.10 The implementation of mitigation would need to consider the timing of works in relation to tern presence and a phased approach might need to be implemented to reduce potential adverse impacts on the tern colony in Cemlyn

Lagoon. In addition, consideration would need to be given in the setting of optimum ridge conditions and nature of mitigation in relation to other conservation features and objectives (e.g. of the SAC), for example perennial vegetation on stony banks.

1.3.11 An annual review of all monitoring data during construction will be used to identify vulnerable segments of Esgair Gemlyn with biennial or triennial review of trigger levels and mitigation measures. The CPMMS will be updated accordingly through its implementation and cease upon agreement with NRW that it is demonstrated that the impacts from the Wylfa Newydd DCO Project are no greater than the residual not significant effects predicted in the DCO application.

2 References

Table 2-1 Schedule of references

ID	Reference
RD1	Pye, K. and Blott, S. (2018). Cemlyn Bay, Anglesey: Topographic survey and tidal level investigation summary report. EX181118. KPAL External Investigation Report.
RD2	Pye, K. and Blott, S. (2016). Cemlyn, Anglesey: Further geomorphological Assessment. EX20671. KPAL External Investigation Report.
RD3	Directory of Mines and Quarries, (2014), British Geological Survey.

HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Appendix 1-6 WNDA Site Drainage and Flood Risk in the Afon Cafnan, Cemaes Stream and Nant Cemlyn

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

Horizon Internal DCRM Number: WN0902-HZDCO-PAC-REP-00272

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Contents

List of Tables

1 Introduction

1.1 Purpose of this report

1.1.1 This report provides a response to a request for further information by the Examining Authority at the Issue Specific Hearing on Biodiversity (Coastal Change, Climate Change, Transboundary Impacts) on 11th January 2019.

1.1.2 The request for further information by the Examining Authority followed an indication by Natural Resources Wales (NRW) that further information was required on the impact that the development of the Wylfa Newydd Development Area (WNDA) appears to have on flood risk at key receptors, namely those adjacent to Cemaes Stream, the Afon Cafnan and Nant Cemlyn.

1.2 Scope of this report

1.2.1 This report collates information drawn from existing DCO application documents, as well as presenting new information on elements of the drainage design and flood risk to modelling in order to clarify the issues raised by NRW and the Examining Authority on the conclusions presented within the WNDA Flood Consequences Assessment (FCA) [APP-150 to APP-157] and supporting documents [APP-160 to APP-167].

1.2.2 This report firstly summarises the key conclusions of the WNDA FCA, highlighting why NRW has residual concerns with respect to flood risk.

1.2.3 This report will present information on the approach taken in order to represent the drainage scheme for the WNDA within the hydraulic modelling to support the WNDA FCA.

1.2.4 This report will then focus on the preliminary drainage design for the WNDA, drawing on and supplementing information presented in Appendix D8-8 Summary of preliminary design for construction surface water drainage [APP-167] and draw out the key conclusions with respect to impacts on flows in receiving watercourses and therefore flood risk.

1.2.5 Concluding remarks will draw this information together and the implications for flood risks at key receptors will be clearly identified.

1.2.6 Additional comment will also be provided on the positioning of Siltbuster® type units, particularly in relation to Mound E discharge points.

2 WNDA Flood Consequences Assessment

2.1 Summary of the WNDA FCA

2.1.1 The WNDA FCA [APP-150] and its supporting documents [APP-151 to APP-157 and APP-160 to APP-167], concludes that the WNDA development would result in residual impacts on flood risk at a number of locations, including to:

- properties upstream of Cemaes (Brookside Garage and adjacent residential properties) on Nant Cemaes;
- Cemlyn Road and land from the Afon Cafnan; and
- Cemlyn Road and land (including land within Cestyll Gardens) from Nant Cemlyn.

2.1.2 These conclusions were drawn primarily from both pluvial and fluvial flood risk modelling of the natural and drainage catchments draining to these watercourses and they were assessed as occurring in both construction phases and the operational phase, though the effect on the operational phase was to a lesser degree.

2.1.3 Horizon acknowledges that these conclusions are non-compliant with TAN15, however, Horizon maintains that any residual impact on flood risk would be dealt with through the development of a detailed drainage design that builds on and enhances, where necessary, the preliminary drainage design presented in Appendix D8-8 [APP-167].

2.1.4 Chapter D8 of the Environmental Statement [APP-127] concluded that with the development of a detailed drainage design these impacts were negligible.

2.1.5 It is understood that the position of NRW, Isle of Anglesey County Council (IACC), and the Welsh Government (WG) is that without further detail being provided by Horizon, including further modelling and mitigation design detail, they cannot be satisfied that following mitigation flood risk will be negligible. The information presented within this report will provide further clarification on the anticipated impacts on flood risk and will provide support to Horizon's current position that the FCA is robust and any residual issues can be dealt with at the detailed design stage.

3 Basis of Assessment

3.1 Introduction

3.1.1 The conclusions of the FCA with respect to flood risk on Cemaes Stream, the Afon Cafnan and Nant Cemlyn are drawn from flood risk modelling of the natural and drainage catchments draining to these watercourses.

WNDA Hydraulic Modelling

3.1.2 The conceptualisation of the hydraulic model is described in Appendix D8-7 (Part 1 of 7) [APP-160] of the Environmental Statement. Appendix D8-7 identifies the model nodes at which inflows are applied to the baseline, construction and operational versions of the hydraulic models and the proportion of each flow applied at specific nodes under those different scenarios. The flows applied at each of these locations is described in Appendix D8-7 (Part 7 of 7) [APP-166] of the Environmental Statement.

3.1.3 The hydraulic modelling undertaken to support the WNDA FCA includes a formal representation of the site's surface water drainage system. This is achieved, as described in Appendix D8-7 (Part 1 of 7), through the assumption that the drainage system will manage runoff for all events up to and including a 30-year event. As a result, runoff for areas that are formally drained within the WNDA (except the Nuclear Platform, which drains directly to the coast) are represented by greenfield flows to mimic the effect of the drainage system. Above this threshold, runoff from these areas is unrestricted.

3.1.4 These effects are incorporated into the hydraulic model through the inflows that were developed for the study, which are described in more detail in Appendix D8-7 (Part 7 of 7) [APP-166].

Preliminary Drainage Design

3.1.5 Having described the approach to representing the site's surface water drainage system taken within the hydraulic modelling, it is important to understand the principles of the preliminary surface water drainage system described in Appendix D8-8 [APP-167].

3.1.6 The preliminary drainage design was based on several simple premises:

- Swales and channels within the sites are designed to convey a 30-year event plus a 20% allowance for climate change without flooding;
- Attenuation ponds are sized to provide storage for a 100-year event plus an allowance for climate change without overtopping; and
- Maximum discharge rates from the attenuation ponds are limited to the existing greenfield 30-year event with an allowance for climate change.

3.1.7 The effectiveness of the proposed drainage system was modelled within MicroDrainage v2015.1 for the 1, 2, 5, 30 plus climate change, 100 and 100 plus climate change scenarios. The predicted discharge rates at each discharge point for the Baseline and Construction scenarios was calculated

and an indication of the performance of each element of the proposed drainage system was produced.

3.1.8 Despite the simplicity of the principles of the design, it was not possible to explicitly represent the drainage system as described above within the hydraulic model, hence the approach described in Sections 3.1.3 and 3.1.4. This has had the effect of overestimating the discharge from mound drainage, as is indicated in the following sections.

Summary

3.1.9 The following sections present the hydraulic modelling inflows for each catchment separately, splitting out upstream and downstream catchments as required. Where the hydraulic modelling simulated an increase or decrease in flows this is indicated, including the scale of change simulated.

3.1.10 Similar information for each drainage catchment from the preliminary drainage design is also presented.

3.1.11 The intention of this section of the report is to highlight where the outputs of the preliminary drainage design differ to the flows adopted within the hydraulic modelling. Comment is made on which is more valid and the implications for the conclusions of the flood risk assessment.

3.1.12 It should be noted that, all flows presented in the sections below represent reasonably foreseeable climate change projections and do not include credible maximum climate change scenarios. This is because comparisons can reasonably be made between the flood risk modelling flows and preliminary drainage design discharge rates for the reasonably foreseeable scenarios whilst no credible maximum climate change scenario results are currently available for the preliminary drainage design. Further details on reasonable. Foreseeable, and credible maximum climate change scenarios can be found in Section 3.1 (p.12) of Appendix D8-7 (Part 7 of 7) [APP-166].

3.2 Afon Cafnan

WNDA Hydraulic Modelling

3.2.2 The following table summarises the flows applied within the hydraulic models under each of the scenarios. Increases relative to the baseline are highlighted in red text, reductions are in green.

Table 3-1 Modelled Peak Flows, Afon Cafnan

Scenario/ Return Period	Baseline (m^3/s)		Construction (Point 4) (m^3/s)		Operation (Point 5) (m^3/s)	
2020	U/S	D/S	U/S	D/S	U/S	D/S
2	4.5	0.4	4.5	0.6		
30	10.0	1.0	10.0	1.4		
100	14.5	1.4	14.5	1.9		

1000	25.2	2.5	25.2	3.1		
2080	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	5.1	0.5			5.1	0.4
30	11.3	1.1			11.3	0.9
100	16.4	1.6			16.4	1.3
1000	28.5	2.9			28.5	2.2
2180	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	8.2	0.8			8.2	0.6
30	18.3	1.8			18.3	1.4
100	26.5	2.6			26.5	2.1
1000	46.0	4.6			46.0	3.6

3.2.3 As can be seen from the above, no changes are predicted in the upstream catchment of the Afon Cafnan. Changes in flows are, however, simulated in the downstream catchment.

3.2.4 For reference, catchments are identified within Figure 4.1 of Appendix E to the Hydraulic Modelling Report for the WNDA [p44, APP-167]. The upstream catchment (U/S) within APP-167 is referenced as Catchment 3, whilst the downstream catchment (D/S) is referenced as Catchment 2.

3.2.5 Table 5.5 (p.50) of the Hydraulic Modelling Report [APP-160] indicates that between the Baseline and Construction (Point 4) scenarios additional inflows representing discharges from Mound D (D1 and D2) and Mound E (E2) supplement the flows to the Afon Cafnan. The overall effect of these changes is an increase in peak flows to the watercourse, equivalent to between 0.2m^3/s in the 2-year event and 0.6m^3/s in the 1000-year event, as indicated in Table 3-1 above. At Point 5, flows to the Afon Cafnan revert to those of the Baseline (See Table 6.5 (p.68) of the Hydraulic Modelling Report).

Preliminary Drainage Design

3.2.6 The preliminary drainage design of the surface water drainage system to the Afon Cafnan includes discharges from Mound D and the eastern side of Mound E. During construction, runoff from the western side of Mound E (E1) will also be pumped to the Afon Cafnan, to avoid any potential impacts on the Cemlyn Lagoon SAC.

3.2.7 The landform changes introduced within the WNDA have resulted in changes in catchment area, runoff rates and the need for management of runoff rates and provision of attenuation. The following table summarises the key changes within the catchments drainage to the Afon Cafnan.

Table 3-2 Key aspects of the Afon Cafnan drainage catchments

Discharge Point	Existing catchment area (ha)	Proposed catchment area (ha)	Catchment area increase (ha)	Maximum greenfield discharge rate (l/s)	Attenuation Volume (m^3)
D1	3.46	4.39	+0.93	178.4	1,235
D2	8.77	8.77	0.00	419.2	2,420
E1 (construction only)	13.42	14.58	+1.16	960.6	4,198
E2	14.68	14.68	0.00	769.5	4,003

3.2.8 The following table summarises the discharges calculated within the preliminary drainage design at each of these discharge points for the Baseline and Construction scenarios. Increases relative to the baseline are highlighted in red text, reductions are in green.

Table 3-3 Modelled Peak Discharges, Afon Cafnan

Discharge Point	Return Period				
Baseline Flows (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
D1	89.9	150.5	258.6	274.5	329.4
D2	259.2	262.6	624.8	664.4	797.3
E1 (construction only)	352.0	589.4	1012.3	1074.2	1289.0
E2	323.3	545.2	944.9	1008.4	1210.1
Construction (Point 4) Flows (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
D1	71.7	109.5	178.4	189.7	227.6
D2	163.3	267.3	419.2	458.8	550.6
E1 (construction only)	331.3	552.3	968.1	1047.0	1256.4
E2	267.3	442.4	769.5	828.7	994.4
Difference (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
D1	-18.2	-41.0	-80.2	-84.8	-101.8

D2	-95.9	4.7	-205.6	-205.6	-246.7
E1 (construction only)	-20.7	-37.1	-44.2	-27.2	-32.6
E2	-56.0	-102.8	-175.4	-179.7	-215.6

3.2.9 As can be seen from the above, discharge rates are shown to reduce across each of the drainage catchments and for all return periods (bar an anomaly in the 5-year event in catchment D2). These reductions are despite the increases in catchment area identified in Table 3-2, and the benefits for events above the 30-year event are principally a result of the 100-year plus climate change storage being provided.

3.2.10 The MicroDrainage modelling indicates that there would be no flooding, i.e. exceedance of the proposed channel capacities, in any of the above return periods.

Discussion

3.2.11 The reductions in runoff identified in Table 3-3 are the outcome of simulating the preliminary drainage design within industry standard hydraulic modelling software. However, as can be seen in Table 3-1, these reductions in runoff are not reflected within the inflows utilised within the hydraulic modelling, which increase by 0.2m^3/s to 0.6m^3/s. Further, the outcome of the flood risk modelling presented within the FCA and its supporting documents, which shows an increased flood risk to Cemlyn Road and to land downstream because of the Wylfa Newydd DCO Project, also does not reflect this important aspect of the drainage design.

3.2.12 Collectively, the discharges from catchments D1, D2 and E2 are shown in Table 3-3 to reduce peak flow rates into the Afon Cafnan by between 170l/s and 564l/s, depending upon return period. Were this to be simulated within the hydraulic modelling under an operational scenario, allowing for the lack of changes in upstream catchments and the minor changes in other lateral catchments, the outcome would be expected to show a beneficial impact on flood risk in the Afon Cafnan and at receptors downstream.

3.2.13 The collective benefits indicated for discharge points D1, D2 and E2, would not fully off-set the additional, albeit temporary, discharge of catchment E1 into the Afon Cafnan during construction, even when allowing for the benefits seen at discharge point C1 (see Table 3-6, below). The proposed pumping rate from E1 to the Afon Cafnan will be limited, however, Chapter D8 of the ES [APP-127] indicates that the likely method to avoid an impact to the Afon Cafnan would be to amend the storage volume provided at E1 at the detailed design stage, increasing it above the 4,198m^3 already proposed so that a lower discharge rate could be adopted that would avoid an increase in flood risk. There is space for expansion of the attenuation pond at E1 towards the north east and north west, however, this would need to be confirmed by further

analysis, as it may be possible to deepen the pond to provide the required attenuation.

3.3 Nant Caerdegog Isaf (draining to the Afon Cafnan)

WNDA Hydraulic Modelling

3.3.2 The following tables summarise the flows applied within the hydraulic models under each of the scenarios. Increases relative to the baseline are highlighted in red text, reductions are in green.

Table 3-4 Modelled Peak Flows, Nant Caerdegog Isaf

Scenario/ Return Period	Baseline (m^3/s)		Construction (Point 4) (m^3/s)		Operation (Point 5) (m^3/s)	
2020	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	0.6	0.4	0.6	0.4		
30	1.4	0.9	1.3	0.8		
100	2.0	1.3	1.8	1.1		
1000	3.6	2.3	3.0	1.9		
2080	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	0.7	0.4			0.7	0.4
30	1.6	1.0			1.6	0.8
100	2.2	1.5			2.3	1.2
1000	4.0	2.6			4.0	2.1
2180	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	1.1	0.7			1.1	0.6
30	2.5	1.6			2.6	1.3
100	3.7	2.4			3.7	1.9
1000	6.5	4.2			6.4	3.3

3.3.3 As can be from the above, both positive and negative changes in flows are simulated in both the upstream (east) and downstream (west) catchments.

3.3.4 For reference, catchments are identified within Figure 4.1 of Appendix E to the Hydraulic Modelling Report for the WNDA [p44, APP-167]. The upstream catchment (U/S) within APP-167 is referenced as Catchment 5, whilst the downstream catchment (D/S) is referenced as Catchment 4.

3.3.5 Table 5.6 (p.50) of the Hydraulic Modelling Report [APP-160] indicates that between the Baseline and Construction (Point 4) scenarios, additional inflows representing discharges from Mound C and an area referred to as the

Mochda. At Point 5, these flows are redistributed to those of the Baseline and Mochda (See Table 6.6 (p.68) of the Hydraulic Modelling Report).

3.3.6 The overall effect of these changes are minor increases in peak flows to the upper catchment of the watercourse, equivalent to 0.1m^3/s, as indicated in Table 3-1 above. Most significantly, there are larger reductions in peak flows to the downstream catchment, amounting to between -0.1m^3/s and -0.9m^3/s.

Preliminary Drainage Design

3.3.7 The preliminary drainage design of the surface water drainage system to the Nant Caerdegog Isaf, which ultimately drains to the Afon Cafnan, includes discharges from Mound C.

3.3.8 The landform changes introduced within the WNDA have resulted in changes in catchment area, runoff rates and the need for management of runoff rates and provision of attenuation. The following table summarises the key changes within the catchments drainage to the Nant Caerdegog Isaf.

Table 3-5 Key aspects of the Nant Caerdegog Isaf drainage catchment

Discharge Point	Existing catchment area (ha)	Proposed catchment area (ha)	Catchment area increase (ha)	Maximum greenfield discharge rate (l/s)	Attenuation Volume (m^3)
C1	10.80	14.54	+3.74	1,001.2	5,728

3.3.9 The following table summarises the discharges calculated within the preliminary drainage design at each of these discharge points for the Baseline and Construction scenarios. Increases relative to the baseline are highlighted in red text, reductions are in green.

Table 3-6 Modelled Peak Discharges, Nant Caerdegog Isaf

Discharge Point	Return Period				
Baseline Flows (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
C1	370.2	612.9	1037.5	1090.8	1309.0
Construction (Point 4) Flows (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
C1	284.5	395.2	1001.2	1085.9	1303.1
Difference (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
C1	-85.7	-217.7	-36.3	-4.9	-5.9

3.3.10 As can be seen from the above, discharge rates are shown to reduce for all return periods. These reductions are despite the increases in catchment area identified in Table 3-5.

3.3.11 The MicroDrainage modelling indicates that there would be no flooding, i.e. exceedance of the proposed channel capacities, in any of the above return periods.

Discussion

3.3.12 The reductions in runoff identified in Table 3-6 are the outcome of simulating the preliminary drainage design within industry standard hydraulic modelling software. It can be seen in Table 3-4, reductions in runoff are reflected within the inflows utilised within the hydraulic modelling, which generally reduce in the construction and operational stages, though to a larger degree than the preliminary drainage design would suggest.

3.3.13 The flows from this catchment are not shown to be an issue within the site, however, discharges here will contribute to the simulated flooding issues at Cemlyn Road and further downstream on the Afon Cafnan, therefore this potential overestimate of the benefits provided could off-set some of the benefits noted in Section 3.2.12 above on the Afon Cafnan itself.

3.3.14 As indicated above, the benefits indicated could contribute towards off-setting the adverse, albeit temporary, effect of pumping runoff from discharge point E1 into the Afon Cafnan and would go some way to minimising any increase in flood attenuation that needs to be provided at the detailed design stage.

3.4 Cemaes Stream

WNDA Hydraulic Modelling

3.4.2 The following tables summarise the flows applied within the hydraulic models under each of the scenarios. Increases relative to the baseline are highlighted in red text, reductions are in green.

Table 3-7 Modelled Peak Flows, Cemaes Stream

Scenario/ Return Period	Baseline (m^3/s)		Construction (Point 4) (m^3/s)		Operation (Point 5) (m^3/s)	
2020	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	1.8	0.3	1.8	0.5		
30	4.1	0.7	4.0	1.0		
100	6	1	5.9	1.4		
1000	10.3	1.7	10.2	2.4		
2080	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	2	0.3			2	0.4
30	4.6	0.8			4.6	0.8
100	6.7	1.1			6.7	1.2
1000	11.7	1.9			11.7	2.0

2180	U/S	D/S	U/S	D/S	U/S	D/S
2	3.3	0.5			3.3	0.6
30	7.5	1.2			7.5	1.3
100	10.9	1.8			10.9	1.9
1000	18.9	3.1			18.9	3.3

3.4.3 As can be seen from the above table, both positive and negative changes in flows are simulated in both the upstream and downstream catchments, the more significant of which are in the downstream catchment.

3.4.4 For reference, catchments are identified within Figure 4.1 of Appendix E to the Hydraulic Modelling Report for the WNDA [p44, APP-167]. The upstream catchment (U/S) within APP-167 is referenced as Catchment 7, whilst the downstream catchment (D/S) is referenced as Catchment 6.

3.4.5 The Table 5.7 (p.51) of the Hydraulic Modelling Report [APP-160] indicates that between the Baseline and Construction (Point 4) scenarios additional inflows representing discharges from Mound A (A3). At Point 5, these flows are redistributed to those of the Baseline (See Table 6.7 (p.69) of the Hydraulic Modelling Report).

3.4.6 The overall effect of these changes are minor increases in peak flows to the lower catchment of the watercourse of between 0.2m^3/s and 0.7m^3/s, most notably in the construction phase, as indicated in Table 3-1 above. Minor reductions in peak flows of -0.1m^3/s are predicted in the upper catchment in the construction phase.

Preliminary Drainage Design

3.4.7 The preliminary drainage design of the surface water drainage system to Cemaes Stream includes discharges from Mound A, though this is limited to discharge point A3.

3.4.8 The landform changes introduced within the WNDA have resulted in changes in catchment area, runoff rates and the need for management of runoff rates and provision of attenuation. The following table summarises the key changes within the catchments drainage to the Nant Caerdegog Isaf.

Table 3-8 Key aspects of the Cemaes Stream drainage catchment

Discharge Point	Existing catchment area (ha)	Proposed catchment area (ha)	Catchment area increase (ha)	Maximum greenfield discharge rate (l/s)	Attenuation Volume (m^3)
A3	6.22	9.40	3.18	273.5	2,564

3.4.9 The following table summarises the discharges calculated within the preliminary drainage design at each of these discharge points for the Baseline

and Construction scenarios. Increases relative to the baseline are highlighted in red text, reductions are in green.

Table 3-9 Modelled Peak Discharges, Cemaes Stream

Discharge Point	Return Period				
Baseline Flows (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
A3	139.4	235.0	406.9	434.0	520.8
Construction (Point 4) Flows (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
A3	120.8	179.7	273.5	289.6	347.5
Difference (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
A3	-18.6	-55.3	-133.4	-144.4	-173.3

3.4.10 As can be seen from the above, discharge rates are shown to reduce for all return periods. These reductions are despite the increases in catchment area identified in Table 3-8.

3.4.11 The MicroDrainage modelling indicates that there could be minor flooding, i.e. exceedance of the proposed channel capacities, at two locations in the 100-year plus climate change scenario. The flood volumes concerned were 12m^3 and 2.5m^3 respectively, which is expected to be localised.

Discussion

3.4.12 The reductions in runoff identified in Table 3-9 are the outcome of simulating the preliminary drainage design within industry standard hydraulic modelling software. It can be seen in Table 3-7, reductions in runoff indicated by the preliminary drainage design are not reflected within the downstream catchment inflows utilised within the hydraulic modelling. This is significant, as the only changes to the hydraulic modelling of Cemaes Stream are those indicated in Table 3-7, which indicates that these changes are the primary cause of the increased flood risk to properties upstream of Cemaes that are shown in the FCA.

3.4.13 If, as is indicated by Table 3-9, the flows from the site do not increase above existing flow rates, then a key target agreed between Horizon and NRW, that there should be no increase in flow to Cemaes Stream, is already met by the preliminary drainage design and no further mitigation would be required to reduce flood risk at this key receptor.

3.5 Nant Cemlyn

WNDA Hydraulic Modelling

3.5.2 The following tables summarise the flows applied within the hydraulic models under each of the scenarios. Increases relative to the baseline are highlighted in red text, reductions are in green.

Table 3-10 Modelled Peak Flows, Nant Cemlyn

Scenario/ Return Period	Baseline (m^3/s)		Construction (Point 4) (m^3/s)		Operation (Point 5) (m^3/s)	
2020	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	1.4	0.4	1.4	0.6		
30	3.4	1.0	3.4	1.3		
100	5.0	1.5	5.0	2		
1000	9.0	2.7	9.0	3.4		
2080	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	1.6	0.5			1.6	0.5
30	3.8	1.1			3.8	1.2
100	5.6	1.7			5.6	1.8
1000	10.1	3.1			10.1	3.2
2180	**U/S**	**D/S**	**U/S**	**D/S**	**U/S**	**D/S**
2	2.6	0.8			2.6	0.8
30	6.1	1.8			6.1	1.9
100	9.1	2.7			9.1	2.8
1000	16.3	5.0			16.3	5.1

3.5.3 As can be seen from the above there are negative changes in flows simulated in downstream catchments, the more significant of which are in the construction phase.

3.5.4 For reference, catchments are identified within Figure 4.1 of Appendix E to the Hydraulic Modelling Report for the WNDA [p44, APP-167]. The upstream catchment (U/S) within APP-167 is referenced as Catchment 9, whilst the downstream catchment (D/S) is referenced as Catchment 8.

3.5.5 The Table 5.8 (p.52) of the Hydraulic Modelling Report [APP-160] indicates that between the Baseline and Construction (Point 4) scenarios additional inflows representing discharges from Mound E (E1). At Point 5, these flows are redistributed to those of the Baseline (See Table 6.8 (p.70) of the Hydraulic Modelling Report).

3.5.6 The overall effect of these changes are minor increases in peak flows to the lower catchment of the watercourse of between 0.2m^3/s and 0.7m^3/s, most notably in the construction phase, as indicated in Table 3-1 above.

Preliminary Drainage Design

3.5.7 The preliminary drainage design of the surface water drainage system to Nant Cemlyn includes discharges from Mound E, though this is limited to discharge point E1 once the landform has revegetated and stabilised (for the purposes of the discussion here, it is assumed that this is post-construction).

3.5.8 The landform changes introduced within the WNDA have resulted in changes in catchment area, runoff rates and the need for management of runoff rates and provision of attenuation. The following table summarises the key changes within the catchments drainage to the Nant Cemlyn.

Table 3-11 Key aspects of the Nant Cemlyn drainage catchment

Discharge Point	Existing catchment area (ha)	Proposed catchment area (ha)	Catchment area increase (ha)	Maximum greenfield discharge rate (l/s)	Attenuation Volume (m^3)
E1	13.42	14.58	+1.16	960.6	4,198

3.5.9 The following table summarises the discharges calculated within the preliminary drainage design at each of these discharge points for the Baseline and Construction scenarios. Increases relative to the baseline are highlighted in red text, reductions are in green.

Table 3-12 Modelled Peak Discharges, Nant Cemlyn

Discharge Point	Return Period				
Baseline Flows (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
E1	352.0	589.4	1012.3	1074.2	1289.0
Construction (Point 4) Flows (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
E1	331.3	552.3	968.1	1047.0	1256.4
Difference (l/s)	**1-year**	**5-year**	**30-year + CC**	**100-year**	**100-year + CC**
E1	-20.7	-37.1	-44.2	-27.2	-32.6

3.5.10 As can be seen from the above, discharge rates are shown to marginally reduce for all return periods. These reductions are despite the increases in catchment area identified in Table 3-11.

3.5.11 The MicroDrainage modelling indicates that there would be no flooding, i.e. exceedance of the proposed channel capacities, in any scenario simulated.

Discussion

3.5.12 The reductions in runoff identified in Table 3-12 are the outcome of simulating the preliminary drainage design within industry standard hydraulic modelling software. It can be seen in Table 3-10 that reductions in runoff indicated by the preliminary drainage design are not reflected within the downstream catchment inflows utilised within the hydraulic modelling, which increase by $0.2m^3/s$ to $0.7m^3/s$. Further, the outcome of the flood risk modelling presented within the FCA and its supporting documents, which shows an increased flood risk to Cemlyn Road and to land downstream at Cestyll Gardens because of the Wylfa Newydd DCO Project, also does not reflect this important aspect of the drainage design.

3.5.13 If, as is indicated by Table 3-12, the flows from the site do not increase above existing flow rates and were this to be simulated within the hydraulic modelling, the outcome would be expected to show a negligible to beneficial impact on flood risk in Nant Cemlyn and at receptors downstream.

4 Siltbuster locations

4.1 Introduction

4.1.1 It is understood that there is some uncertainty over the proposed location of Siltbuster® type units, should they be required, associated with Mound E discharge locations and particularly in respect to discharge point E1, which lies on the western side of Mound E.

4.1.2 The following seeks to clarify the specific requirements and issues around the use of Siltbuster® type units and the location, though essentially it is concluded that that the precise location of the Siltbuster® type units will be determined at the detailed design stage.

4.2 General Requirements

4.2.1 In general, the treatment train for sediment management within the WNDA will consist of source control measures (soil management, silt fences, silt traps), conveyance control measures (swales), settlement within a settlement pond followed, if necessary, by treatment in a Siltbuster® type dosing facility prior to discharge.

4.2.2 As a result of this treatment train the general position of Siltbuster® type units will be downstream of the location of settlement ponds. The Siltbuster® type unit will consequently apply polyelectrolyte coagulants to the discharge from the settlement pond, the amount of which will be driven by the suspended sediment content of the discharge, that will then promote the further settlement of sediment in the water column prior to it reaching Cemlyn Lagoon.

4.2.3 With respect to discharge point E1, this would typically place the Siltbuster® type unit adjacent to the Afon Cafnan on the north eastern side of Mound E. With respect to discharge point E2, this would typically place the Siltbuster® type unit adjacent to the Nant Cemlyn on the western side of Mound E. These latter areas are understood to be more sensitive, hence the concern and uncertainty over location of these units.

4.3 Relevant Issues

4.3.1 The location downstream of the settlement pond and near the discharge point means that the pumps involved in moving water from the settlement pond, through the Siltbuster® type unit, and into the nearby watercourse need only be designed for relatively low-head situations; that is, they will not need to pump water vertically up a significant height.

4.3.2 As described above, it is proposed to pump water from discharge point E1 to the Afon Cafnan at discharge point E2 during construction periods and specifically during periods in which the vegetation of Mound E has not yet stabilised and where there is a risk of suspended sediment pollution to the downstream Cemlyn Lagoon.

4.3.3 In theory it should be possible to locate the pumps and Siltbuster® type units adjacent to either the Nant Cemlyn or adjacent to the Afon Cafnan during the construction phase when discharge at discharge point E1 is being pumped to

discharge point E2. Several issues exist when pumping sediment-laden water over horizontal and vertical distance, though most apply in both situations and will need to be considered at the detailed design. It is possible that a pump and associated pipework that 'sucks' sediment laden water from a settlement pond may need to be more robust than one that 'pushes' sediment laden water to the Afon Cafnan, which will also need to be considered at the detailed design.

Head and Losses

4.3.4 Pumping sediment laden water over a horizontal and vertical distance could pose operational issues associated with the pipeline route from discharge point E1 to discharge point E2. Topographical plans suggest that the pipeline would rise in the region of +6m to cross the northern flank of Mound E. The issue of head primarily relates to the vertical elevation that the pumped water would need to travel. Losses are driven by the friction created between the pipe material and the water, and it is affected by the length of the pipework and factors such as the number of joints and bends. It is understood that there are limits to the head that can be overcome with 'pull' arrangements, which rely on creation of a vacuum, as opposed to 'push' type arrangements, which create pressure to push water through the pipework. A 'push' arrangement would be preferred for robustness, placing the pump for discharge E1 to the west of Mound E.

Pump Failure

4.3.5 The need to pump over distance and with +6m of head would also pose operation and maintenance issues in the event of failure. Should there be a pump failure, all water currently contained in the pipeline would stop and the sediment within the water column would immediately start to settle out (particularly as it would have been dosed with coagulant), blocking the outlet of the Siltbuster® type unit. Blockage of the pipe work in situations like this could require significant effort to correct and avoidance would be recommended through the addition of a mechanism to drain the pipework back into the settlement pond. This is an issue that would affect both 'pull' and 'push' arrangements.

5 Conclusions

5.1 Drainage Strategy and Flood Risk

5.1.1 Section 3 of this report summarises the hydrological inputs used within the hydraulic modelling that supported the conclusions of the FCA for the Wylfa Newydd DCO Project.

5.1.2 Section 3 also presents additional information from the preliminary drainage strategy, including modelled discharge rates for a range of return periods associated with drainage of the WNDA, and it is demonstrated that, in virtually all scenarios, the drainage strategy will result in a reduction in discharge rates, despite catchments that experience a significant increase in catchment area.

5.1.3 As indicated in Section 3, it was not possible to fully represent the proposed drainage system within the hydraulic modelling and as such the hydraulic modelling does not fully represent the drainage design submitted with the DCO application. The outcome of this is that the FCA, and consequently Chapter D8 of the Environmental Statement, conclude that there is an increased flood risk on several watercourses associated with the Wylfa Newydd DCO Project, including Cemaes Stream, the Afon Cafnan and Nant Cemlyn. The former was shown to affect properties upstream of Cemaes, whilst the latter two were shown to affect Cemlyn Road and land adjacent to these watercourses.

5.1.4 The conclusions that can be drawn by the provision of additional information on the preliminary drainage strategy is that the impacts on flood risk predicted on Cemaes Stream, Afon Cafnan and Nant Cemlyn are expected to be largely beneficial, and at worst neutral. The exception is during construction, when the additional transfer of water from discharge point E1 on Nant Cemlyn to the Afon Cafnan could continue to result in an increase in peak discharge rates and some increase in flood levels. It is proposed that provision of additional attenuation storage, for which there is adequate space, be investigated at the detailed design stage.

5.1.5 The outcome of the provision of this additional information and clarification is that the impacts on flood risk at Cemaes, Cemlyn Road and to land at Cestyll Gardens and adjacent to the Afon Cafnan and Nant Cemlyn is avoided. Furthermore, the overall conclusion of the Environmental Statement, that the issues can be dealt with at the detailed design, is considered by Horizon to continue to be a robust position.

5.2 Location of Siltbuster® type units

5.2.1 A final conclusion of this report is that the location of Siltbuster® type units is largely driven by their location along the treatment pathway for sediment management. It may, as identified above, be possible to locate those associated with Mound E in less sensitive areas, however, this will depend upon the constraints identified, amongst others, and design decisions taken at the detailed design stage.

HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Horizon's Response to additional Information Request - SSSI Compensation site establishment and management

PINS Reference Number: EN010007

19 February 2019

Revision 1.0
Examination Deadline 6

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

Horizon Internal DCRM Number: WN0902-HZDCO-PAC-REP-00270

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Contents

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1 Issue Specific Hearing - Biodiversity

1.1 Request for additional information

1.1.1 During the Issue Specific Hearing on biodiversity, held on Friday 11 January, the Examining Authority requested a briefing note on progress towards resolution between Horizon and Natural Resources Wales (NRW) with respect to the provision and adequacy of two of the three sites identified as Ecological Compensation Sites to address adverse effects to Tre'r Gof SSSI from the Wylfa Newydd Development. The two relevant Ecological Compensation Sites are:

- Cors Gwawr; and,
- Cae Canol-dydd.

1.1.2 Ty Du, the third site included in the overall package of Ecological Compensation Sites, is excluded from this note as the note relates specifically to the creation of rich-fen habitat as compensation for that potentially lost at Tre'r Gof SSSI. The Ty Du site is distinct as rich-fen creation is not proposed there; instead the existing mire habitats present will be managed to increase their quality.

1.1.3 A meeting between Horizon and NRW was held on 16 February 2019, in the form of the Technical Advisory Group (TAG), which has been established to advise on the Ecological Compensation Sites selection and creation/management design. The meeting included the presentation of hydrological data collected between September 2018 and January 2019 which would help inform the design of the two compensation sites. The overall hydrological monitoring programme is scheduled to run for a minimum of 12 months, the data required to fully inform the scheme designs and help determine the extent of habitat creation possible at each site.

1.1.4 It was agreed that the hydrological data collected to date provided further positive evidence that both compensation sites could be managed to develop the target habitat (rich-fen). However, it was recognised that the creation of this habitat involved a degree of uncertainty which meant that adopting an approach of implementing small rather than large scale changes could be more effective in determining the most appropriate management prescriptions across the sites. Thus, the construction methods described within Volume II of the SSSI Compensation Strategy document [APP-191], such as top soil removal, land drain removal, ditch modification and vegetation establishment, could be employed in small stages and differentially across the sites. Outcomes would be reviewed in terms of their success and would inform subsequent stages of habitat creation work within each site.

1.1.5 It was recognised that this staged, experimental approach to site design would extend the period of habitat creation at both sites beyond the original two years proposed within Volume II of the SSSI Compensation Strategy document [APP-191]. However, it was felt that this revised approach would provide greater flexibility in terms of design and increase confidence that the

extent of high quality rich-fen habitat proposed to be created at each site would be maximised.

1.1.6 It was also discussed at the 16 February TAG meeting whether the monitoring data gathered so far would allow an assessment of the confidence of success of the compensation proposal set out in the SSSI Compensation Strategy – Vol II document [APP-191]. It was felt that, in some areas of the compensation site, the data were encouraging as to the possibility of creating rich-fen habitat there, while in other areas the data were less positive or inconclusive. As such, the SSSI Compensation Strategy – Vol II document [APP-191], will be refined and submitted into Examination at Deadline 6 (19 February 2019), to take account of the current confidence or uncertainties highlighted by monitoring data and discussions within the TAG.

1.1.7 The changes to the SSSI Compensation Strategy – Vol II document [APP-191] outlined above will require further refinement as more hydrological data are gathered and as staged management of the sites is implemented. In accordance with ECS4 in the Draft Development Consent Order (submitted at Deadline 5 (12 February 2019), hydrological monitoring must be undertaken prior to commencement of the compensation works at Cors Gwawr and Cae Canol-dydd. Detailed designs must also be approved by IACC prior to commencement of the compensation works (in accordance with ECS2) and management schemes must be approved by IACC prior to completion of the compensation works (in accordance with ECS3).