HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

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16 Combined topic effects

16.1 Introduction

16.1.1 Combined topic effects, also known as intra-development effects, occur when a single receptor is affected in more than one way by the same development.

16.1.2 This combined topic effects chapter considers those receptors that would experience more than one of the minor, moderate or major residual effects identified in the preceding topic assessment chapters, and describes the predicted combined effects that would result. Effects from construction, operation and decommissioning are all considered.

16.1.3 Human receptors are considered first, followed by other receptors. Within those two main sections, receptors are grouped according to different types of receptors and the scale at which the effects have been assessed.

16.1.4 Within the section of this chapter relating to human receptors, in cases where effects would be different for residential and non-residential receptors, sub-headings are used to make this clear.

16.1.5 Embedded, good practice and additional mitigation measures are identified in the individual topic chapters and not in this chapter, which is based on the residual effects. It has not been possible to identify any additional mitigation to address combined effects that has not already been identified and committed to through the earlier steps in the Environmental Impact Assessment process.

16.1.6 Combined topic effects may be contributed to by multiple effects reported in one topic chapter (e.g. both a noise and a vibration effect) and/or in more than one topic chapter (e.g. both a noise and an air quality effect). Where combined topic effects result from individual effects reported in different topic areas, there is no published methodology for assessing such effects and assigning a level of significance to them, and so the assessment is limited to descriptions of the effects that would combine, based on professional judgement as to which individual effects would combine. The potential is recognised for some people affected to perceive the combined effect to be significant. Where combined topic effects result from individual effects reported within one topic, the significance criteria are as described in the relevant topic chapter in volume B (introduction to the environmental assessments) (Application Reference Numbers: 6.2.1 to 6.2.16).

16.2 Scope

16.2.1 The scope of this chapter is limited to the scope of this volume of the Environmental Statement, i.e. effects of the Power Station, other on-site development, the Site Campus and Marine Works.

16.2.2 All topics within this volume are scoped into the assessment of combined topic effects. However, the assessment has found that not all topics would contribute to combined topic effects. Appendix D16-1 (matrix of receptors and which topics affect them) (Application Reference Number: 6.4.100) indicates which receptors are shared by more than one topic.

16.2.3 In some cases, the effects reported in one topic chapter already have combined topic effects embodied within them (for example, amenity effects in the public access and recreation topic are based in part on visual and noise effects), and so they are not considered again in this chapter.

16.2.4 Traffic-related effects are assessed on a project-wide basis; hence, they are excluded from the assessment of combined effects for this development in isolation. Cumulative effects, both intra-project (resulting from the various developments that comprise the Wylfa Newydd Project) and inter-project (resulting from the Wylfa Newydd Project together with external projects) are not considered here, but are reported in volume I (cumulative effects) (Application Reference Numbers: 6.9.1 to 6.9.5).

16.2.5 This chapter identifies where there is the potential for combined topic effects on equality or health. However, for details of the resulting equality and health, reference should be made to the separate Equality Impact Assessment (Application Reference Number: 8.22) and the Health Impact Assessment Report (Application Reference Number: 8.19).

16.3 Combined effects

16.3.1 It should be noted that the various topics have grouped receptors at different scales as is appropriate for the particular assessments, and individuals that identify within some of these subgroups may overlap. For example, residents of residential areas considered in the air and noise assessments may also be active travellers considered in the public access and recreation assessment. Because the individual effects were assessed at these different scales, it is not practical to tease out the combined effects down to this individual level.

Human receptors

16.3.2 The socio-economic effects on local communities, as reported in chapter D3 (socio-economics) (Application Reference Number: 6.4.3), include effects on community amenity which are contributed to in part by noise, vibration, dust and visual effects. Socio-economic effects on these communities are therefore not repeated in this combined topic chapter, although amenity-related effects at a more localised level (rather than community-wide) are discussed below.

16.3.3 The construction dust assessment considered all relevant human receptors within 350m of the Wylfa Newydd Development Area as shown in figure 3 of appendix D5-1 (Construction Dust Assessment – Main Construction) (Application Reference Number: 6.4.20). This encompasses the majority of Tregele, the western half of Cemaes (i.e. those properties or locations to the west of the High Street) and several other properties located around the Wylfa Newydd Development Area. The proposed mitigation measures set out in chapter D5 (air quality) (Application Reference Number: 6.4.5) are anticipated to reduce any effects from dust emissions from the construction of the Power Station to a 'not significant' effect at all of these human receptors, including all receptors located further than 350m from the Wylfa Newydd Development Area. However, a human receptor's response to any particular level of dust deposition related to the construction of the Power Station may potentially be

influenced by whether they experience any other 'amenity-related' effects such as noise and vibration and changes to landscape and visual amenity. The assessed receptors within 350m of the Wylfa Newydd Development Area would have the greatest potential to experience the amenity-related combined topic effects described above, although the further from the Wylfa Newydd Development Area the receptor is, the lower the risk that dust effects would potentially contribute to the combined topic effect. It is possible that the combined effect on amenity at receptors within 350m of the Wylfa Newydd Development Area during construction may be perceived, by some of the people affected, to be significant.

16.3.4 The air quality assessment of construction plant, machinery and marine vessel emissions considered all relevant human receptors within 2km of the Wylfa Newydd Development Area, as shown on figure D5-1 (Application Reference Number: 6.4.101). This assessment identified effects described as medium and large (based on the criteria set out in chapter B5 (air quality) (Application Reference Number: 6.2.5) in relation to increases in nitrogen dioxide concentrations at receptors close to the Wylfa Newydd Development Area. Changes in nitrogen dioxide concentrations could lead to health effects or exacerbate existing health related conditions and could potentially contribute to a combined health effect.

16.3.5 At all of the assessed human receptors considered for the assessment of the Power Station, other on-site development, the Site Campus and Marine Works, there could potentially be combined health effects and equality effects. Depending on the geographic scale and vulnerable groups present there may be a range of different combinations of factors that affect health and equality. These include environmental effects (such as noise, increase in air pollutant concentrations, route diversions or visual disturbance); social effects (such as changes in community identity, social networks or culture); economic effects (such as new investment, employment or training opportunities); and infrastructure effects (such as the public benefits of an uninterrupted and affordable electricity supply). The potential for significant effects on population and human health, including the combined effects, are considered in the Health Impact Assessment Report (Application Reference Number: 8.19), and effects on equality are considered in the Equality Impact Assessment (Application Reference Number: 8.22). They are not considered again in this chapter as they are beyond the scope of the Environmental Impact Assessment.

Residential receptors

Cemaes

16.3.6 During the construction and decommissioning phases, there are likely to be combined effects on residents of Cemaes due to adverse effects resulting from an increase in noise and vibration, in addition to changes to visual amenity and perceived changes in dust deposition. Noise, dust deposition and visual effects would be most pronounced for the properties at the western edge of Cemaes, as these are closest to the Wylfa Newydd Development Area.

16.3.7 During construction and decommissioning, combined effects could arise as a result of moderate adverse noise effects at approximately 190 residential properties on the western edge of Cemaes, in combination with moderate adverse vibration effects.

16.3.8 The noise and vibration effects would also combine with the moderate to major adverse effects on visual amenity for residential receptors at a similar location (see viewpoint 12, figure D10-16, Application Reference Number: 6.4.101) resulting from views of construction activities and structures such as tower cranes. While there would be a not significant effect resulting from dust deposition on air quality, people who experience noise, vibration and/or visual effects may be more likely to feel that dust deposition at a particular level contributes to a combined topic effect.

16.3.9 The Flood Consequence Assessment in appendix D8-4 (Application Reference Number: 6.4.29) has identified moderate risk of fluvial flooding (i.e. flooding from watercourses) to properties in Cemaes and a high risk of pluvial flooding (i.e. surface water flooding) to properties upstream of Cemaes during construction. This increased flood risk would add to the combined topic effects already identified in this area.

16.3.10 The Flood Consequence Assessment (Application Reference Number: 6.4.29) has identified moderate risk of fluvial and pluvial flooding to properties in Cemaes during operation. For the operation of the Power Station, the landscape and visual topic area has identified a minor to moderate effect for the community of Cemaes; hence these effects would combine in this location.

16.3.11 It is possible that the combined effects during construction and decommissioning may be perceived, by some people affected, to be significant at receptors on the western edge of Cemaes.

Cemlyn Bay

16.3.12 There are likely to be combined effects on residents in the vicinity of Cemlyn Bay during the construction and decommissioning phases due to adverse effects resulting from an increase in noise levels and vibration, in addition to changes in visual amenity and perceived changes in dust deposition. Noise, dust deposition and visual effects would be most pronounced for the properties in Cemlyn Bay closest to the Wylfa Newydd Development Area.

16.3.13 Combined effects could arise as a result of major adverse noise effects at approximately fourteen properties east of Cemlyn Bay in close proximity to the Wylfa Newydd Development Area, in combination with a moderate adverse vibration effect.

16.3.14 These effects would also be in combination with a major adverse effect on visual amenity (see viewpoint 25, figure D10-16, Application Reference Number: 6.4.101) at properties in close proximity to the Wylfa Newydd Development Area. While there would be a not significant effect resulting from dust deposition on air quality, receptors that experience noise, vibration and/or visual effects may be more likely to be annoyed by dust deposition at a particular level that would otherwise be perceived as being not significant, than

receptors that experience a similar level of dust deposition but do not experience any other development-related effects.

16.3.15 It is likely, because of the combination of major as well as moderate and less significant effects, that the combined effects on receptors in the vicinity of Cemlyn Bay would be perceived to be significant, by some people affected, during construction and decommissioning.

Tregele

16.3.16 There are likely to be combined effects on residents of Tregele during the construction and decommissioning phases due to adverse effects resulting from an increase in noise levels and vibration, in addition to changes in visual amenity and perceived changes in dust deposition. Noise, dust deposition and visual effects would be most pronounced for the properties at the western edge of Tregele, as these are closest to the Wylfa Newydd Development Area.

16.3.17 Combined effects could arise as a result of major adverse noise effects at approximately 64 properties on the western edge of Tregele, in combination with major adverse effects on visual amenity (see viewpoint 18, figure D10-16, Application Reference Number: 6.4.101). While there would be a not significant effect resulting from dust deposition on air quality, people who experience noise, vibration and/or visual effects may be more likely to feel that dust deposition at a particular level contributes to a combined topic effect.

16.3.18 It is likely that the combined effects on receptors on the western edge of Tregele would be perceived, by some people affected, to be significant during construction and decommissioning.

Properties situated between Porth-y-pistyll and Cemlyn Bay, and to the west of Tregele

16.3.19 The bedrock groundwater modelling results show the predicted maximum change in groundwater levels to be small during both construction and operational phases, at one property to the west of the Wylfa Newydd Development Area (Felin Cafnan situated between Porth-y-pistyll and Cemlyn Bay) and up to approximately 30 properties to the west of the village of Tregele. As such, the effect of subsidence on these properties during construction and operation due to reduction in the groundwater level is considered to be minor adverse.

16.3.20 Effects to property receptors and/or their human occupiers in these areas have also been identified for the following topic areas:

- there would be a not significant effect resulting from dust deposition during construction;
- noise and vibration (construction phase only for Felin Cafnan, where a moderate adverse effect is identified and properties in Tregele with a major to moderate effect); and
- landscape and visual (visual effects during construction and operation at Tregele (major adverse during construction and decommissioning, and

moderate adverse during operation) and Felin Cafnan (minor adverse during construction).

16.3.21 The vibration effect could have an in-combination effect with potential subsidence due to groundwater dewatering resulting in a greater in-combination effect to the identified buildings. If realised, subsidence and vibration effects to the buildings are likely to cause concern to the properties' occupiers. As such, the potential subsidence and vibration effects, coupled with noise and visual effects, would lead to an in-combination effect for residents, and this may be perceived, by some people affected, to be significant.

Site Campus

16.3.22 Residents of the Site Campus, considered to be less sensitive than members of the public because they would be involved in the construction of the Power Station, would experience odour and dust deposition due to the construction of the Power Station although at not at levels considered to be significant.

16.3.23 Noise effects from the construction of the Power Station at the Site Campus would be of minor adverse significance following the implementation of mitigation.

16.3.24 Receptors that experience noise, vibration and/or visual effects may be more likely to feel more affected by odour and dust deposition at a particular level that would otherwise be perceived not to be significant.

16.3.25 Based on the above, it is not likely that the combined effect on the residents of the Site Campus would be perceived, by the people affected, to be significant.

Non-residential receptors

16.3.26 Potential effects on onshore public access and recreation receptors have included the combined effects of air (in terms of dust deposition), noise and vibration, and landscape and visual considerations. This combined effect is reported in chapter D4 (public access and recreation) (Application Reference Number: 6.4.4) as the 'recreational amenity' of the recreational receptors. No further combined topic effects are predicted for onshore public access and recreation. However, this chapter does consider how combined effects, including some amenity effects, may affect the special qualities of the Anglesey Area of Outstanding Natural Beauty (AONB).

16.3.27 The potential effects on offshore receptors for public access and recreation included the combined effects of noise landscape and visual considerations. In addition, the assessment included the effects associated with increased shipping movements and the construction of physical structures in the inshore waters. On this basis, no further combined topic effects are predicted for offshore public access and recreation.

Ancillary buildings at Existing Power Station

16.3.28 Lowering of groundwater levels for construction of the deep basement and the cut-and-cover sections of tunnel construction (if undertaken – please refer to

chapter D1 (proposed development) (Application Reference Number: 6.4.1) where a number of tunnels are described) has the potential to cause settlement of the ground as water is removed from pore spaces in sands, gravels and clays or from bedrock fractures. This ground settlement then has the potential to cause subsidence of existing ancillary buildings at the Existing Power Station. Based on groundwater modelling results and likely properties of the buildings, the effect of subsidence during construction is considered to be moderate adverse.

A moderate adverse effect to the Existing Power Station has also been identified for the noise and vibration topic due to the potential for vibration effects during construction. This vibration effect could have an in-combination effect with subsidence due to groundwater, and this potential for a combined effect is therefore reported here as a result of taking a conservative approach, although there is a very high level of uncertainty associated with this combined effect.

Other receptors

Tre'r Gof Catchment, water within the Site of Special Scientific Interest (SSSI) and Tre'r Gof SSSI drains

16.3.29 Works around the Tre'r Gof SSSI and within the Tre'r Gof Catchment have the potential to affect the water quality and flow into the SSSI. During construction, the following potential effects have been identified in relation to the SSSI and its catchment.

- Landscape mounding and drainage would alter the area of the Tre'r Gof Catchment, resulting in changes to surface water flows therein. Changes in flows are such that a moderate adverse effect would occur.
- Landscape mounding and drainage would lead to a reduction in water availability from diffuse seeps from shallow groundwater into the Tre'r Gof SSSI. This would result in a moderate adverse effect on the water quality in the SSSI.
- Rainfall onto the exposed bare earth surfaces could result in a high sediment loading in surface water runoff, affecting the water quality within the Tre'r Gof drains which discharge into the SSSI. This would result in a moderate adverse effect.
- Topsoil strip, movement and replacement could result in mobilisation of nutrients and metals that are currently not exposed to leaching. An increase of nutrients and potentially metals to the Tre'r Gof drains and into the SSSI is considered a potential minor adverse effect.
- There is the potential for fine sediment input into the Tre'r Gof drains from in-channel construction, removal of riparian vegetation and sediment input from bare earth surfaces. The effect of the drain discharges and sediment input on the fluvial geomorphology within the Tre'r Gof drains, when considering embedded and good practice mitigation, is minor adverse.

- Changes to groundwater recharge rates and groundwater dewatering for deep basements have the potential to reduce bedrock groundwater flows into the SSSI or SSSI drains. This has been assessed using modelling results and the effect of reduction of groundwater input to the SSSI is considered to be minor adverse.
- The soils and geology topic has identified that the disturbance of unexpected areas of contamination could result in the mobilisation of contaminants resulting in the creation of new pollutant pathways and effects to water receptors. The effect to the water receptors from the disturbance of unexpected areas of contamination within the Tre'r Gof Catchment would be minor adverse.

16.3.30 During construction, the overall potential effect to surface water quality and flow in Tre'r Gof drains and the SSSI itself is considered to be moderate adverse.

16.3.31 For the operation of the Power Station, the potential effects on water quality and flow within the Tre'r Gof Catchment and SSSI have been identified as follows.

- The presence of landscape mounding and drainage would reduce the catchment area, resulting in lower flows within the catchment. The landscape mounding and associated drainage could also alter the rainfall/runoff response. The effect of this change for the Tre'r Gof Catchment is considered to be major adverse.
- Landscape mounding could locally increase the steepness of land surfaces and the drainage would provide preferential flow pathways for surface water. This could increase overland flow rates, resulting in increased flooding. With the embedded mitigation in the drainage design, the effect of operation on flooding at Tre'r Gof is considered minor adverse.

16.3.32 During operation, these potential effects could combine to have a greater effect on surface waters within the Tre'r Gof drains and SSSI (in terms of both water quality and flow) than they would do individually. The combined effect to surface water quality and flow in Tre'r Gof drains and the SSSI itself is considered to be major adverse.

16.3.33 The potential effects to the Tre'r Gof drains and the SSSI (in terms of both water quality and flow) from the construction works would not combine with any effects from the operation or decommissioning works.

16.3.34 The ecological effects on the Tre'r Gof SSSI are considered in chapter D9, and that assessment takes into account the combined surface water and groundwater effects described above.

Afon Cafnan and Afon Cafnan Catchment (including Nant Caerdegog Isaf)

16.3.35 Works within the medium value Afon Cafnan and Afon Cafnan Catchment have the potential to affect the water quality and flow in the catchment. During

construction, the following effects have been identified in relation to the Afon Cafnan and its catchment.

- Water availability in the Afon Cafnan Catchment may be affected due to construction of laydown areas, creation of platform levels, creation of mounds and the associated construction phase drainage. The predicted reduction in flows for the Afon Cafnan would result in a minor adverse effect.
- For the Nant Caerdegog Isaf (which is within the Afon Cafnan Catchment), the mounding works and associated drainage have the potential to have localised effects on water availability for the watercourse with a resulting adverse minor effect.
- The construction of the laydown areas and drainage would result in the loss of the natural catchment of a tributary of the Nant Caerdegog Isaf. The effect on flows due to the loss of this watercourse has been assessed as a minor adverse effect.
- The provision of welfare facilities may carry the risk of leaks of sewage, which could cause degradation of water quality in any adjacent watercourses. The effect of such leaks on surface water quality is considered minor adverse.
- Rainfall onto the exposed bare earth surfaces (topsoil strip, bulk earthworks, storage and mounds) and in-channel works could result in high sediment loading in runoff, which could affect the water quality within the catchment. The change to water quality for the Afon Cafnan has been assessed as a minor adverse effect.
- Topsoil strip, movement and replacement could result in mobilisation of nutrients and metals that are currently not exposed to leaching. An increase of nutrients and potentially metals to the Afon Cafnan Catchment is considered a potential minor adverse effect.
- Four new outfall structures are proposed along the Afon Cafnan and Nant Caerdegog Isaf. These would require in-channel working for construction, as well as the removal of a short length of the vegetated riparian corridor and the adjoining channel banks. As the outfalls begin to discharge there would be a change in existing flow processes. The effect on the watercourse's fluvial geomorphology from these works is considered to be minor adverse.
- Works within the vicinity of the Afon Cafnan and Nant Caerdegog Isaf, such as topsoil storage, stockpiling, drainage construction and landscape mounding, would have the potential to lead to fine sediment input into the channel. The effect of sediment input on the watercourse's fluvial geomorphology is considered to be minor adverse.
- The complete removal of the tributary of the Nant Caerdegog Isaf would directly affect any flow and sediment delivery to the watercourse. Due to the very small size of the tributary and limited amount of water within the

channel for the majority of the year, the effects of the removal of the tributary on the fluvial geomorphology in the Nant Caerdegog Isaf would be minor adverse.

- Changes to groundwater recharge rates and groundwater dewatering for deep basements have the potential to reduce bedrock groundwater base flows into the Afon Cafnan and its tributaries. This has been assessed using modelling results and the effect of reduction of groundwater input to the watercourses is considered to be minor adverse.
- Changes to water quality in the Afon Cafnan and tributaries could result from the use of cementitious materials migrating to the watercourse in groundwater base flow from construction areas. This effect is considered to be minor adverse.
- The soils and geology topic has identified a potential effect to water quality within the Afon Cafnan Catchment during construction through the disturbance of unexpected areas of contamination. The effect from the disturbance of unexpected areas of contamination within the Afon Cafnan Catchment would be minor adverse.

16.3.36 The in-combination potential effect to water quality and flow to watercourses in the Afon Cafnan during construction is considered to result in a moderate adverse effect. This assumes that all activities would happen at the same time and that they would all have an adverse effect on the water quality and water availability. For fluvial geomorphology, the combined effect of the three separate effects is considered to be a minor adverse effect to the watercourse's fluvial geomorphology.

16.3.37 For the operation of the Power Station, the potential effects on water quality and flow within the Afon Cafnan Catchment have been identified as follows:

- The presence of landscape mounding and drainage would reduce the catchment area resulting in lower flows within the catchment. The landscape mounding and associated drainage could also alter the rainfall/runoff response. The effect of this change for the Afon Cafnan Catchment is considered to be moderate adverse.
- Changes to groundwater recharge rates and the removal of groundwater in the passive drainage system around deep basements have the potential to reduce bedrock groundwater base flows into the Afon Cafnan and its tributaries. The effect of reduction of groundwater input to the watercourses is considered to be minor adverse.

16.3.38 The combined potential effect to surface water quality and flow for the Afon Cafnan Catchment during operation is considered to be moderate adverse, based on the significance criteria used in the topic assessment for surface water and groundwater.

16.3.39 For the decommissioning of the Power Station, the potential effects on water quality and flow within the Afon Cafnan Catchment have been identified as follows.

- Release of sediment during works associated with removal of hardstanding and operational drainage infrastructure within the Power Station Site and Afon Cafnan Catchment, and exposure and movement of soil, could affect the water quality of the Afon Cafnan Catchment. The effect of decommissioning on the Afon Cafnan is considered to be minor adverse.
- Changes in runoff associated with the decrease in the impermeable areas due to removal of hardstanding could restore a rainfall/runoff response similar to the baseline, increase recharge to groundwater and reduce flood risk. This would result in an overall minor beneficial effect.

16.3.40 The combined potential effect to the Afon Cafnan Catchment surface waters (in terms of water flows and quality) during decommissioning is considered to be minor adverse.

16.3.41 The effects to the Afon Cafnan and Afon Cafnan Catchment (in terms of both water quality and flow) from the construction works would not combine with any effects from the operation or decommissioning works, as the effects from construction would be temporary.

Cae Gwyn SSSI

16.3.42 The Cae Gwyn SSSI lies within the Afon Cafnan Catchment. No works would take place within the boundary of the Cae Gwyn SSSI. However, the activities taking place nearby which could potentially affect the SSSI have been identified as follows.

- Clearance within a small part of the Wylfa Newydd Development Area and construction of landscape mounds and Simulator and Training Building to the east of the Cae Gwyn SSSI, could result in a small reduction of surface water flows into the SSSI's outflow basin with a resultant minor adverse effect.
- Changes to groundwater recharge rates and groundwater dewatering for deep basements have the potential to reduce bedrock groundwater flows into the SSSI. The effect of reduction of groundwater input to the SSSI is considered to be minor adverse.

16.3.43 The combined potential effect to the Cae Gwyn SSSI (in terms of water flows) during decommissioning is considered to be minor adverse.

16.3.44 The potential effects to the Cae Gwyn SSSI from the construction works would not combine with any effects from the operation or decommissioning works.

Nant Cemaes and Nant Cemaes Catchment

16.3.45 Works within the medium value Nant Cemaes and Nant Cemaes Catchment have the potential to affect the water quality and flow in the watercourse. During construction, the following effects have been identified in relation to the Nant Cemaes and its catchment.

- Water availability in the Nant Cemaes Catchment may be affected due to construction of landscape mounds and the associated construction

phase drainage. The predicted reduction in flows in the Nant Cemaes would result in a minor adverse effect.

- Rainfall onto the exposed bare earth surfaces (topsoil strip, bulk earthworks, storage and mounds) and in-channel works could result in high sediment loading in runoff, which could affect the water quality within the catchment. The change to water quality for the Nant Cemaes has been assessed as a minor adverse effect
- Topsoil strip, movement and replacement could result in mobilisation of nutrients and metals that are currently not exposed to leaching. An increase of nutrients and potentially metals to the Nant Cemaes Catchment is considered a potential minor adverse effect.
- One new outfall would be built to discharge to Nant Cemaes. The potential effect on the watercourse's fluvial geomorphology from these works is considered to be minor adverse.
- Changes to groundwater recharge rates and groundwater dewatering for deep basements have the potential to reduce bedrock groundwater base flows into the Nant Cemaes. The effect of reduction of groundwater input to the watercourses is considered to be minor adverse.
- The soils and geology topic has identified a potential effect to water quality within the Nant Cemaes Catchment during construction through the disturbance of unexpected areas of contamination. The effect from the disturbance of unexpected areas of contamination within the Afon Cafnan Catchment would be minor adverse.

16.3.46 The identified potential effects to surface waters within the Nant Cemaes Catchment are in a relatively small proportion of the total catchment and short-lived when compared to those in the Afon Cafnan Catchment. The in-combination effect to water quality and flow to watercourses in the Nant Cemaes Catchment during construction is therefore considered to result in a minor adverse effect.

16.3.47 For the operation of the Power Station, the potential effects on water quality and flow within the Nant Cemaes Catchment have been identified as follows.

- The presence of landscape mounding and drainage would increase the catchment area for the Nant Cemaes Catchment resulting in higher flows within the catchment. The landscape mounding and associated drainage could also alter the rainfall/runoff response. The effect of this change for the Nant Cemaes Catchment is considered to be moderate adverse.
- Changes to groundwater recharge rates and the removal of groundwater in the passive drainage system around deep basements have the potential to reduce bedrock groundwater base flows into the Nant Cemaes. The effect of reduction of groundwater input to the watercourses is considered to be minor adverse.

16.3.48 The combined potential effect to surface water quality and flow for the Nant Cemaes Catchment during operation is considered as moderate adverse,

based on the significance criteria used for the assessment of surface water and groundwater effects.

16.3.49 The potential effects to the Nant Cemaes and Nant Cemaes Catchment (in terms of both water quality and flow) from the construction works would not combine with any effects from the operation or decommissioning works.

Nant Cemlyn, Nant Cemlyn Catchment and the Cemlyn Bay SSSI

16.3.50 Works within the Nant Cemlyn and Nant Cemlyn Catchment have the potential to affect the water quality and flow in the watercourse. During construction, the following effects have been identified in relation to the Nant Cemlyn and its catchment.

- Water availability in the Nant Cemlyn Catchment may be affected due to construction of landscape mounds and the associated construction phase drainage. The predicted small increase in flows for the Nant Cemlyn would result in a minor adverse effect.
- The Nant Cemlyn flows into Cemlyn Lagoon (part of Cemlyn Bay SSSI) and the assessment shows that there could be a small increase in flows into the lagoon which could have a small impact on the salinity of the lagoon water. The effect of this change of flow on the lagoon's water availability and quality is minor adverse.
- Rainfall onto the exposed bare earth surfaces (topsoil strip, bulk earthworks, storage and mounds) and in-channel works could result in high sediment loading in runoff, which could affect the water quality within the catchment. The change to water quality for the Nant Cemlyn has been assessed as a minor adverse effect.
- Topsoil strip, movement and replacement could result in mobilisation of nutrients and metals that are currently not exposed to leaching. An increase of nutrients and potentially metals to the Nant Cemlyn and into the Cemlyn Bay SSSI is considered a potential minor adverse effect.
- One new outfall would be built to discharge to Nant Cemlyn during construction. The potential effect on the watercourse's fluvial geomorphology from these works is considered to be minor adverse.
- Works within the vicinity of the Nant Cemlyn such as changes to the existing vegetation and landscaping along the right bank, have the potential to lead to fine sediment input into the channel. The potential effect of sediment input on the watercourse's fluvial geomorphology is considered to be minor adverse.
- Changes to groundwater recharge rates and groundwater dewatering for deep basements have the potential to reduce bedrock groundwater flows into Nant Cemlyn and Cemlyn Bay SSSI. This has been assessed using modelling results and the effect of reduction of groundwater input to the Cemlyn Bay SSSI is considered to be minor adverse.

- The soils and geology topic has identified a potential effect to water quality within the Nant Cemlyn Catchment during construction through the disturbance of unexpected areas of contamination. The effect from the disturbance of unexpected areas of contamination within the Afon Cafnan Catchment would be minor adverse.
- In relation to the Cemlyn Lagoon, the coastal processes and geomorphology topic has identified that due to wave height during construction at times of extreme events, the potential effect upon Cemlyn Lagoon due to possible increases in overtopping of the shingle bank, would be a minor adverse effect on the lagoon.

16.3.51 The identified potential effects to surface waters within the Nant Cemlyn Catchment are in a relatively small proportion of the total catchment and short-lived when compared to those in the Afon Cafnan Catchment. The in-combination effect to water quality and flow to watercourses in the Nant Cemlyn, Cemlyn Lagoon and Cemlyn Bay SSSI is therefore considered to result in a minor adverse effect.

16.3.52 For the operation of the Power Station, the potential effects on water quality and flow within the Nant Cemlyn Catchment and Cemlyn Bay SSSI and Cemlyn Lagoon have been identified as follows.

- The presence of landscape mounding and drainage would increase the catchment area for the Nant Cemlyn Catchment resulting in higher flows within the catchment. The landscape mounding and associated drainage could also alter the rainfall/runoff response. The effect of this change for the Nant Cemlyn Catchment is considered to be moderate adverse.
- Assessment of flows from the Nant Cemlyn into Cemlyn Lagoon shows that there could be a small increase in flows into the lagoon which could have a small impact on the lagoon water quality. The effect of this change of flow on the lagoon's quality is minor adverse.
- The discharge from the proposed outfall on the Nant Cemlyn has the potential to alter flow and sediment processes locally within the channel. This could potentially cause a change in the flow processes and consequently the fluvial geomorphological features. This would result in a minor adverse effect for the watercourse's fluvial geomorphology.
- Changes to groundwater recharge rates and the removal of groundwater in the passive drainage system around deep basements have the potential to reduce bedrock groundwater base flows into the Nant Cemlyn. The effect of reduction of groundwater input to the watercourses is considered to be minor adverse.

16.3.53 The combined potential effect to surface water quality and flow in the Nant Cemlyn Catchment and associated receptors during operation is considered to be moderate adverse.

16.3.54 The potential effects to the receptors within the Nant Cemlyn Catchment (in terms of both water quality and flow) from the construction works would not combine with any effects from the operation or decommissioning works.

Groundwater in the Secondary aquifer

16.3.55 Works within the Wylfa Newydd Development Area have the potential to affect groundwater levels, groundwater flow direction and groundwater quality within the Secondary aquifer. During construction, the following effects have been identified in relation to groundwater in the low value Secondary aquifers.

- During construction, changes to groundwater recharge rates and groundwater dewatering for deep basements would reduce bedrock groundwater levels and change groundwater flow direction. The effects of these construction works on the water levels and flow direction in the Secondary aquifer are considered to be minor adverse.
- Dewatering for deep basements could result in seawater being drawn into the aquifer (a process known as 'saline intrusion'). Groundwater modelling shows that only a small quantity of saline water would be drawn into the aquifer and the effect of saline intrusion on the Secondary aquifer is considered to be minor adverse.
- Effects from construction of the cooling water outfall tunnel, principally due to dewatering in any 'cut and fill' sections of the tunnel, would cause changes to groundwater levels and flows. The effects of construction of the cooling water outfall tunnels on the groundwater levels and flow direction in the Secondary aquifer is considered to be minor adverse.
- Exposure of soils, potentially including made ground, could lead to an increase in contaminants (potentially nutrients and metals) leaching into groundwater. This effect would be temporary (as contaminated soils would be removed as exposed) and the effect on groundwater quality is considered to be minor adverse.
- The use of cement could affect the quality of groundwater in the Secondary aquifer with migration of any impacted groundwater affecting secondary receptors such as local watercourses. The effect from the storage and use of cementitious materials on groundwater in the Secondary aquifer and secondary effects on surface water receptors is considered to be minor adverse.
- There is potential for collection and treatment of foul water during the construction works to affect groundwater quality due to leaks or spills of sewage associated with the temporary sewage treatment plant and associated pipework. The effect of leaks of sewage on groundwater quality during construction is considered to be minor adverse.
- During construction, groundwater dewatering could draw contaminated groundwater from outside of the Wylfa Newydd Development Area into parts of the Secondary aquifer which are currently uncontaminated. Although such contaminated areas have not been identified, there is the potential that they do exist, and the effect from migration of contaminated groundwater is considered to be minor adverse.

16.3.56 The in-combination potential effect to groundwater quality and flows in the bedrock is considered to result in a minor adverse effect during construction.

16.3.57 For the operation of the Power Station, the potential effects on groundwater levels, groundwater flow direction and groundwater quality within the Secondary aquifer have been identified as follows.

- The presence of hardstanding would affect groundwater recharge rates and locations and the passive drainage system around the deep basement would lead to a lowering of bedrock groundwater levels (compared to baseline). In terms of the groundwater itself in the Secondary aquifer, effects from operation on the water levels and flow direction in the Secondary aquifer are considered to be minor adverse.
- The potential effects on groundwater quality from the construction of the Spent Fuel Storage Facility approximately 10 years after the construction of the remainder of the Power Station is complete, would be similar in type to those from the construction of the Power Station. Due to the relatively small scale of the works, the effect of the construction of the Spent Fuel Storage Facility on groundwater quality is considered to be minor adverse.

16.3.58 The in-combination effect to groundwater quality and flows in the bedrock is considered to result in a minor adverse effect during operation.

16.3.59 The effects to groundwater in the Secondary aquifer (in terms of groundwater quality, groundwater levels and groundwater flow) from the construction works would not combine with any effects from the operation or decommissioning works to increase the individual effects.

Terrestrial and freshwater habitats and species

16.3.60 The combined effects resulting from the assessments of air quality, noise and vibration, and surface and groundwater are identified and taken into account for each receptor relevant to terrestrial and freshwater ecology within chapter D9 (terrestrial and freshwater ecology) (Application Reference Number: 6.4.9). No further combined topic effects on these receptors are therefore reported in this chapter.

Local landscape character

16.3.61 There are likely to be combined effects on the local landscape character during construction due to minor adverse effects on landscape character, in combination with increases in noise levels and a reduction in air quality, which would increase the level of disturbance. Increases in noise levels have been predicted during construction within the character area. This would result in an increased perception of adverse changes to local landscape character, including the localised area of the Isle of Anglesey Special Landscape Area and AONB, when combined with the minor adverse effects resulting from the change to landscape character.

16.3.62 During operation, there would also be an increased perception of the minor adverse effects to local landscape character, when combining the loss of, or change to, existing landscape features.

16.3.63 During decommissioning, it is anticipated that the predicted increase in noise levels associated with the dismantling works would be similar to levels experienced during the construction phase. This would result in an increased perception of minor adverse changes to local landscape character, when combined with the loss of or change to existing landscape features.

Anglesey Area of Outstanding Natural Beauty special qualities

16.3.64 There are likely to be combined effects on the special qualities of the AONB during the construction, operation and decommissioning phases of the Power Station, other on-site development, the Site Campus and Marine Works. These effects on the special qualities result from a variety of topics as described below.

- Expansive views/seascapes: the following representative viewpoints within the AONB from chapter D10 (landscape and visual) (Application Reference Number: 6.4.10) have been considered: 2, 7, 8, 9, 11, 12, 15, 19, 24, 25, 26, 27, 28, 29 and 31. Viewpoints 2, 8, 19, 24 and 31 are not considered to be expansive, as they are not panoramic in nature either due to topography or intervening buildings and vegetation. Visitors to the William Thomas Monument, users of open access land (viewpoint 7), and users of the Wales Coast Path (WCP) approaching from the west at Carmel Head (viewpoint 9) would experience a moderate adverse effect on visual amenity during construction and operation. Users of the WCP approaching the Wylfa Newydd Development Area from the east at Llanbadrig Point (viewpoint 11) would experience a major adverse effect on visual amenity during construction and operation. Users of the WCP approaching the Wylfa Newydd Development Area from the east, and community view from the layby and seating on Bridge Street Cemaes (viewpoint 12), would experience a moderate adverse effect on visual amenity during construction and a minor adverse effect on visual amenity during operation. Visitors to Cestyll Garden, the ‘significant view’ across Porth-y-pistyll bay in north-north westerly direction (viewpoint 15) would experience a major adverse effect on visual amenity during construction and operation. Users of the WCP approaching the Wylfa Newydd Development Area from the west at the lifeboat monument at Cemlyn Bay (viewpoint 25), at Trwyn Pencarreg (viewpoint 26) and near Cerrig Brith (viewpoint 27) would experience a major adverse effect on visual amenity during construction and operation. Users of the National Cycle Network Route 566/Copper Trail approaching the Wylfa Newydd Development Area from the west at Taldrwst (viewpoint 28) would experience a moderate adverse effect on visual amenity during construction and operation. Users of the WCP (viewpoint 29) approaching the Wylfa

Newydd Development Area from the east would experience a major adverse effect on visual amenity during construction and operation.

- Broad-leaved woodland: during construction, there would be loss of a small area of broad-leaved woodland on the Wylfa Newydd Development Area (assessed as major adverse). There would be no further losses during operation and decommissioning.
- Built environment including Conservation Areas and Listed Buildings: there would be a moderate adverse effect on the setting of Felin Gafnan Corn Mill (Asset 137) and the associated corn-drying house and mill house (Assets 141 and 144; medium value) during construction, operation and decommissioning of the Power Station Site.
- Archaeology and Ancient Monuments/Historic Landscapes, Parks and Gardens: construction work would result in the removal of two archaeological remains assessed to be medium value; these are Neuadd Rectilinear Enclosure (Asset 281) and Possible Burnt Mound, Neuadd (Asset 311). During construction and operation there would be a major adverse effect on the setting of the Cestyll Garden Grade II Registered Historic Park and Garden (reference HLT 2). During decommissioning, there would be a moderate adverse effect on the setting of the Cestyll Garden Grade II Registered Historic Park and Garden.
- Soil, air and water quality: there would be localised significant effects on water quality (refer to chapter D8 (surface water and groundwater) (Application Reference Number: 6.4.8)) during construction, operation and decommissioning. During construction, there would be a minor adverse effect across the range of soil receptors due to soil stripping and storage. During operation and decommissioning there would be no combined effects on soil receptors. There would be no combined effects on air quality.
- Public Rights of Way network: as indicated above, there would be no further combined effects on the recreational amenity of users of Public Rights of Way especially when considered in the context of the size of the AONB around Anglesey's coast during construction, operation and decommissioning of the Power Station, other on-site development, the Site Campus, and Marine Works. Local access to the area of AONB from Public Rights of Way 30/034/1, 38/034/2, 38/035/1 and 38/035/2 and 38/035A/1 would be severed during construction. The loss of access would be permanent, and would result in a major adverse effect for the recreational use of this section of coastline.
- Accessible land and water: during construction, there would be a moderate adverse effect on the recreational amenity of Cemlyn Bay beach as a result of the closure of Fisherman’s Car Park and people being displaced from Porth yr Ogof and Porth Wylfa as a result of noise, the construction of the breakwater and Marine Off-Loading Facility and general construction activities at Cemlyn Bay. During construction, there

would be a minor adverse effect for kayakers and jet-skiers due to the physical loss of access to Porth-y-pistyll from the sea. During operation there would be a minor adverse effect on users of Cemlyn Bay as a result of the physical presence of the breakwater which would reduce the recreational amenity and may result in some people no longer using the beach for recreational purposes. During operation, there would be a minor adverse effect for kayakers and jet skiers due to the restricted access to Porth-y-pistyll from the sea. This effect is set out in more detail in chapter D15 (shipping and navigation) (Application Reference Number: 6.4.15). During decommissioning, there would be no combined effects.

16.3.65 Due to the effects listed above, there would be combined effects on the special qualities of the AONB during construction, operation and decommissioning.

Heritage assets

16.3.66 Both the cultural heritage and noise and vibration topics have assessed effects on Felin Gafnan Corn Mill, Porth y Felin (Asset 137). These effects would result from noise and visual intrusion into the setting of the mill from the construction of the Power Station buildings, Marine Off-Loading Facility, temporary causeway and breakwaters and potential damage to the historic fabric of the historic building. The heritage effect would be moderate adverse whilst the noise and vibration effects would be of moderate adverse significance. A combined topic effect is therefore predicted for this receptor during construction and is likely to be perceived to be significant.

16.3.67 Both the cultural heritage and landscape and visual topics have assessed effects on the Llanfechell Standing Stones (Asset 342) and Cestyll Garden (HLT 2), however given the similarity of these effects (on visual amenity and setting, respectively) no combined topic effects have been identified.

Marine receptors

16.3.68 Chapter D12 (coastal processes and coastal geomorphology) (Application Reference Number: 6.4.12) already takes into account the potential combined effects arising from surface water; for example, the discharge of fine sediment into the sea from watercourses has been shown to be negligible by the hydrodynamic modelling results.

16.3.69 Chapter D7 (soils and geology) (Application Reference Number: 6.4.7) covers the Regionally Important Geological Site. The majority of this site is hard rock and would not be affected by changes to waves and tidal currents. Potential effects on Hen Borth (an important geological/geomorphological feature) are covered within chapter D12 (Application Reference Number: 6.4.12).

16.3.70 There are no further combined effects on these receptors to assess in this chapter.

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