

Glyn Rhonwy Pumped Storage Development Consent Order

Deadline 1 – Applicants updated No Significant Effects Report and Draft Screening Matrices (Clean copy)



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EXECUTIVE SUMMARY

Snowdonia Pumped Hydro has submitted an application for a Development Consent Order (DCO) for a 99.9MW pumped storage facility at the Glyn Rhonwy site (the “Development”). Under the European Directive 92/43/EEC (Conservation of Habitats and Species Regulations 2010 (as amended)), the Secretary of State (SoS) is required, to ascertain whether the Development has the potential for Likely Significant Effects (LSEs) on sites with European Designations including Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites (all hereafter referred to as Natura 2000 sites). Where LSEs are identified, the SoS is required to make an Appropriate Assessment (AA) of the potential effects of the Development on Natura 2000 site conservation objectives.

To assist the Competent Authority, as part of the preparation of the DCO application Snowdonia Pumped Hydro has completed a Habitat Regulations Assessment (HRA) Screening to ascertain whether the Development has the potential for LSEs on Natura 2000 sites within the potential impact area (in this case 30km).

Further to consultation with Gwynedd Council and Natural Resources Wales (NRW), it was agreed that the following Natura 2000 sites were assessed:

- Afon Gwyrfai a Llyn Cwellyn SAC;
- Eryri / Snowdonia SAC;
- Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC;
- Glynllifon SAC;
- Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC;
- Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC;

- Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC;
- Liverpool Bay / Bae Lerpwl (Wales) SPA;
- Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar and SAC;
- Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC; and,
- Ynys Seiriol / Puffin Island SPA.

In relation to the assessment of in-combination effects on the Natura 2000 sites, in agreement with NRW and Gwynedd Council there were no projects or plans in the vicinity of the Development.

This HRA Screening concludes that with the implementation of mitigation measures the Development will not have any Likely Significant Effects (LSE's) on the integrity of Natura 2000 Sites. Therefore, an Appropriate Assessment – Stage Two of the HRA process - is not required.

It is the Applicant's intention to agree a Statement of Common Ground with NRW covering the matters included in this report and it is proposed that further meetings and dialogue will take place as necessary between the Applicant and NRW with that objective.

Limited information is available on the electrical connection and therefore this has not been assessed as the consenting of this connection will be outside this DCO.

1 INTRODUCTION

1.1 Introduction

- 1.1.1 Snowdonia Pumped Hydro has submitted an application for a Development Consent Order (DCO) for a 99.9MW pumped storage facility at the Glyn Rhonwy site (the “Development”). Under the European Directive 92/43/EEC (The Habitats Directive), the Secretary of State (SoS) is required, to ascertain whether the Development has the potential for Likely Significant Effects (LSEs) on sites with European Designations including Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites (all hereafter referred to as Natura 2000 sites). Where LSEs are identified, the SoS is required to make an Appropriate Assessment (AA) of the potential effects of the Development on each Natura 2000 sites conservation objectives.
- 1.1.2 The Planning Inspectorate (PINS) Advice Note Ten *Habitats Regulations Assessment relevant to nationally significant infrastructure projects* (PINS, 2013) states that if as a result of Habitats Regulation Assessment (HRA) Screening the developer concludes that there is a LSE on a Natura 2000 site, sufficient information must be provided with the DCO application to allow the Competent Authority to assess and review the information and make its own determination on LSEs and residual effects. A developer should provide reasons why an AA will, or will not be required and provide confirmation from the relevant nature conservation body (in this case Natural Resources Wales (NRW)) that this conclusion is supported. The HRA conclusion should be explained in a ‘No Significant Effects Report’ or ‘HRA Screening Report’.
- 1.1.3 If it cannot be ruled out that there will be significant effects on a Natura 2000 site, a Statement to Inform an Appropriate Assessment (STIAA) should be prepared and submitted with the DCO application to enable the

Competent Authority to undertake an AA. The AA considers if potential effects will adversely affect the integrity of the Natura 2000 site in view of its conservation objectives.

- 1.1.4 This document is a HRA Screening Report. It identifies potential LSEs on Natura 2000 sites and draws conclusions on the need for an Appropriate Assessment.
- 1.1.5 All references to the ES in this report refers to *The Glyn Rhonwy Pumped Storage Development Consent Order Environmental Statement Volume 2* (AECOM, 2015a):
- 1.1.6 The Development
- 1.1.7 Pumped storage is a way of storing electricity by turning electrical energy into stored (or potential) energy and back again. The system uses electricity to pump water from a lower reservoir to a higher reservoir. Pumping would normally happen during the night. During the day, the water is allowed back through a hydro-turbine to generate electricity again to meet sudden spikes in consumer demand. This cycle of pumping and generating repeats on a daily basis. Pumped Storage uses electricity generated at night when consumer demand is low and can generate electricity at very short notice during the day, providing a flexible service to the electricity System Operator, National Grid.
- 1.1.8 The Development comprises of:
- one headpond (Q1), its dam, access shaft and relief overflow to the Nant Y Betws;
 - one tailpond (Q6), its dam, access shaft and overflow to Llyn Padarn;
 - a pumping station at Llyn Padarn;
 - a power house at Glyn Rhonwy Industrial Estate Platform 5 (south of Q6);
 - a penstock connecting (Q1 to the power house); and
 - a tailrace (connecting the power house to Q6).

1.2 Summary of Development Characteristics

Description of the Headpond – Q1

- 1.2.1 The headpond will be formed at Q1 by the construction of a dam across the south western side of the quarry following excavation, stabilisation and access works to create the operationally safe and functional reservoir containing a working volume of up to 1,300,000m³ of water.
- 1.2.2 The dam will have a maximum elevation of 395m AOD and have an impermeable upstream face and a concrete wave wall along the inside crest. The crest will be approximately 4m wide. Additional wave protection will be provided by selected rock armour placed against the upstream slope. The normal maximum operational water level is 392m AOD. The overflow level is 393m AOD which provides up to 1m of freeboard for operating water level fluctuations before any overflow (spilling) would occur. A further 2m of freeboard above the overflow is provided, primarily for wave action.
- 1.2.3 The outward facing slope of the dam will be faced in slate for landscaping purposes and is likely to have a slope of between 1:1 and 1:2 although this is subject to detailed design and agreement from the Construction Engineer appointed under the Reservoirs Act.
- 1.2.4 A freestanding combined overflow and relief valve outlet structure (or draw-off tower) will be constructed adjacent to the Q1 dam and within the reservoir. The overflow is provided in case of failure of the pump system or cessation of generation which would result in natural filling of the reservoir. The relief valve outlet (also commonly known as the ‘scour’ and shown on drawings as such) provides a means of draining the reservoir to the level of the base of the dam if required in an emergency situation. Appendix C provides greater detail on this point.
- 1.2.5 The overflow is via an approximately 800mm diameter pipe. The scour pipe is approximately 400mm diameter. These discharge to the watercourse known as Nant y Betws to the south west of the Q1 dam.

- 1.2.6 Suitable erosion and energy dissipation measures will be employed at the outlet. It has been agreed with NRW that this will be a matter for detailed design and therefore is to be agreed through a DCO Requirement.

Description of the Tailpond – Q6

- 1.2.7 The tailpond at Q6 will be formed by the construction of a dam across the north eastern end of the existing quarry following excavation, stabilisation and access works to create the operationally safe and functional reservoir. The dam will have a maximum elevation of 156m AOD and a crest width of approximately 4m. Q6 will also hold a working volume of up to 1,300,000m³ of water.
- 1.2.8 Additional wave protection will be provided by selected rock armour placed against the upstream slope. The maximum normal operational water level is 154m AOD. The overflow level is 154.5m which provides up to 0.5m of freeboard for operating water level fluctuations before any overflow (spilling) would occur. A further 1.5m of freeboard (above the overflow) is provided, primarily for wave action.
- 1.2.9 A freestanding combined overflow and relief valve outlet structure (or draw-off tower) will be provided within Q6 reservoir. This would generally operate as per the overflow and relief valve (or 'scour') tower in Q1. The proposed overflow intake is also a vertical bellmouth intake structure. The relief valve outlet or scour pipe also acts as a rising main for water abstraction from Llyn Padarn to Q6. The relief valve outlet or scour provides a means of draining the reservoir to the level of the base of the dam if required in an emergency.
- 1.2.10 The overflow is via an approximately 800mm diameter pipe. The combined scour pipe or rising main is approximately 450mm diameter. These are routed under the dam, around the bombstore (Q8), across the A4086 and discharge to Llyn Padarn.

Removal of Water within the Quarries

- 1.2.11 Both Q1 and Q6 hold water within the existing quarry voids. Bathymetry surveys estimate a depth of 7m in Q1 and 17m in Q6 (at the time of the surveys in 2015).
- 1.2.12 Water in Q1 will be pumped out and discharged to Nant Y Betws. Baseline water sampling has not identified any exceedances of the Environmental Quality Standards (EQS) with the exception of dissolved copper, and therefore it is not expected that water treatment will be required. If required, the water will be passed through settlement lagoons and a 'Siltbuster' (or similar) to minimise the discharge of suspended solids. The rate and volume of any discharges will be undertaken in line with the required discharge consent.
- 1.2.13 Water in Q6 will be pumped out to the adjacent Llyn Padarn via a temporary pumping main. If required, the water will be passed through settlement lagoons and if necessary a 'Siltbuster' (or similar) to minimise the discharge of suspended solids. The rate and volume of any discharges will be undertaken in line with the required discharge consent.

Excavation of the Quarries

- 1.2.14 To make the quarries Q1 and Q6 safe and operable as reservoirs, excavation and stabilisation will be required. In addition, lining or sealing around the sides and base of the quarry may be required.
- 1.2.15 Approximately 550,000m³ will be excavated from Q1, which will mostly be required for the construction of the dam. Unsuitable material will be deposited in excess slate mounds to the south of Q1.
- 1.2.16 Approximately 360,000m³ will be excavated from Q6, of which approximately 90,000m³ will be used within the construction of the dam.
- 1.2.17 Excavation of both broken (previously disturbed) rock material and in situ bedrock will be required. Bedrock is likely to require excavation by blasting. Blasting is used to both excavate and fragment the rock to allow handling, processing and transport by mechanical plant (excavators, dump trucks, crushers, conveyors).

1.2.18 At Q1, excavated rock material will be treated (crushed and graded) and then transported out of the quarry to either the Q1 dam embankment construction or the excess slate mound area.

1.2.19 At Q6, excavated rock material will be treated (crushed and graded) and then transported out of the quarry to either the Q6 dam construction or transported to Q1 (via the penstock and Q1, utilising a conveyor system) for placement within the excess slate mounds adjacent to Q1.

Stabilisation Works

1.2.20 The sides of the existing quarries Q1 and Q6 are potentially unstable and require stabilisation to allow the safe construction and operation of the reservoirs. Where rock excavation is required then stable slopes will be formed using controlled blasting, with localised remedial works as required. In other areas stabilisation works will include the remodelling and reprofiling of the current quarry sides to form stable rock faces, either excavation by machinery or controlled blasting or a combination of these two methods.

1.2.21 Other methods of stabilisation potentially include the following:

- Removal – removal or scaling of individual features;
- Containment – localised containment using rock netting or rock traps (these can be permanent or temporary fences, ditches or stand-offs);
- Strengthening – localised reinforcement using rock anchors, bolts or dowels; and
- Support or protection – localised support using retaining walls, buttresses, sprayed concrete or anchored beams.

Unexploded Ordnance (UXO) & Sediment Remedial Works

1.2.22 There is documented evidence of the lower quarries being used for military bomb storage and disposal. The bombstore (Q8) was abandoned after the roof collapsed during World War II, but has been subsequently remediated by the former Welsh Development Agency. There are records of ordnance being disposed of in Q6 and also of a later remediation operation in the 1970s by the Ministry of Defence. However, there is the potential for unexploded ordnance (and also spent ordnance scrap) to be present in and

around Q6. As part of the development, a recorded remediation and discovery strategy will be undertaken in consultation with the appropriate authorities in relation to any potential unexploded ordnance (UXO).

- 1.2.23 Sediment collection from Q1 and Q6 was attempted in 2015, however, no discernible samples were collected due to the absence of any significant depths of sediment. Once drained, should there be any sediment at the base of the quarries this will be tested and investigated for UXO and contamination. Depending on the level of potential contamination present or ordnance found, this will be remediated as, and if required. It is not proposed to remove any contaminated sediments from the Development.

Quarry Lining Works

- 1.2.24 The amount of seepage or leakage of water from the sides and base of the quarries due to the natural and induced permeability of the rock mass may be unacceptably high without lining or treatment. In addition, a network of existing quarry drainage exists from the time of their excavation and this will require sealing.
- 1.2.25 For the base of the quarries, one of the following two methods is intended to be employed (to be confirmed at detailed design):
- 1.2.26 An impermeable High Density Poly-ethylene (HDPE) liner will be constructed in the base of the quarry. A sub-lining drainage system would be required to collect and discharge any leakage and groundwater. This will comprise of the following elements:
- Landforming of the base;
 - A sub-lining drainage system;
 - Underlying and overlying regulating layers;
 - Impermeable liner;
 - Overlying protection geotextile fleece; and
 - Cover or protection layers.

- This would prevent uplift pressures occurring during drawdown of the pond in generation and would allow the detection of leakage through the base; or
- Pressure grouting of the base will be undertaken through boreholes in the base of the quarry. The grout would fill in any fractures within the rock mass and therefore reduce permeability.

1.2.27 It is likely that pressure grouting using cementitious grout will be the most appropriate method for the quarry side slopes. The requirement for side slope grouting will be confirmed by permeability testing following detailed site investigation works as part of the enabling stage.

1.2.28 If required, grout treatment will be in a complete ring around the exterior of the quarry up to the elevation of the Top Water Level (TWL) of the reservoir. Grout will be injected at regular intervals in a controlled pattern as required.

Construction of the Dams

1.2.29 Approximately 500,000m³ is estimated to be excavated from Q1 and 360,000m³ from Q6.

1.2.30 The 'rockfill' embankment dams will be formed by rock material excavated from the quarries. Following processing (crushing and grading), rock material will be transported to the dam construction site (via a conveyor system or by vehicles using the internal access tracks). The treated rock material will be placed in the dam embankments in a controlled manner, with compaction in layers to build up the structures as required.

1.2.31 Excess rock material will be available for additional landscaping works in the areas surrounding the reservoirs.

Penstock and Tailrace

1.2.32 The penstock is a pipe which will convey the flow of water between the headpond and power house (and vice versa). The tailrace (or 'draft tube') is a pipe which will convey water from the power house to Q6 (and vice versa).

- 1.2.33 The penstock and tailrace will both be tunnelled. The penstock will be up to 4.5m finished internal diameter.
- 1.2.34 The length of the penstock will be approximately 1600m from its origin at Q1 to the power house. The outlet from Q1 is at an elevation of approximately 335m AOD (approximately 50m below current ground levels). Where the penstock enters the shaft for the turbine hall at the power house it is at an elevation of approximately 60m AOD (approximately 98m below current ground level) It should be noted that the elevation of the penstock may change underground during detailed design of the Development dependent on the ground conditions and particular technical requirements, including the pump-turbines selected.
- 1.2.35 The penstock design is subject to confirmation depending on geology and preferred turbine supplier to finalise the precise route, dimensions lining and other matters.

Excavation Method

- 1.2.36 The proposed tunnelling method is to use either a Tunnel Boring Machine (TBM) or drill and blast methods. Due to information gained from the adjacent Dinorwig pumped storage scheme and the confirmed presence of potentially extensive doleritic intrusions within the bedrock, it is likely to be drill and blast. This will be confirmed upon instruction of a Principal Contractor (PC). Other factors such as cost, tunnel length, ground conditions, ease of construction, lining requirements and required shape of the tunnel must be given consideration when eventually deciding upon a tunnelling method.
- 1.2.37 A TBM is a cylindrical machine with a circular rotating cutter head that uses discs to excavate a circular profile through rock as the machine advances.
- 1.2.38 Drill and blast methods involve drilling a carefully constructed pattern of holes into the rock which are then filled with explosives. The timing, depth and position of the holes together with the amount and type of explosives, is designed to form the tunnel with the minimum of overbreak (unwanted excavation). Once detonated, the fractured rock and rubble is removed and the newly formed sides of the tunnel surface are reinforced, potentially

involving rock bolts or anchors and sprayed concrete. This is repeated until the full length of the tunnel is finished. It is anticipated that progress using this technique could be up to 15m per day in good conditions. Given the potential for complex geology, a figure of 125m per month has been assumed for the preliminary construction programme.

- 1.2.39 It is proposed that the tunnelling operation would take up to 12 months and will not involve any above ground works along the route between Q1 and Q6.
- 1.2.40 Depending on the programme requirements for different elements of the construction, tunnelling could be advanced from either Q1 towards the power house or vice versa (or even both).
- 1.2.41 Once commenced, the tunneling activity is likely to be a 24 hour operation but wholly beneath ground level. However, blasting would only occur during the day during the normal working hours.
- 1.2.42 Any ventilation required will be via forced ventilation and would not involve any drilling of vent holes along the penstock route.

Lining

- 1.2.43 The penstock and tailrace will require lining to protect their integrity. The inner face of the penstock lining is required to be smooth to prevent friction losses. In addition a pressure lining is required where the pressure from the head of water exceeds the overburden pressure (the pressure due to rock cover above the penstock) and to protect the penstock against pressure surges (also known as water hammer effects).
- 1.2.44 A primary lining will be installed following tunnel excavation to provide support to the rock mass and to allow safe installation of the secondary lining. The primary lining is likely to comprise sprayed concrete with rock bolts, a system that can be readily adapted to varying geological conditions encountered in the tunnel. Where pressure lining is not required (see below), the secondary lining is likely to be a cast in situ reinforced concrete lining (with a smooth internal face).

1.2.45 It is currently anticipated that the lower half of the penstock will require pressure lining (a length of approximately 750m). Installation of pressure tunnel lining is expensive. It has currently been assumed that the pressure lining will be steel but it may be formed from heavily reinforced cast in situ concrete (with a smooth internal face). The selection of the pressure lining will be based on the technical requirements and economics.

1.2.46 The power house building is located above ground on Platform 5 of the Glyn Rhonwy Industrial Estate and consists of the following:

Power House Building

1.2.47 The power house is an above ground building with offices, plant hall, crane(s), workshop, welfare facilities and a control room. This building is approximately 15m high to its apex, 60m long and 26.4m wide. The power house straddles the shaft that contains the turbine hall which houses the turbine-pumps and generators.

1.2.48 The construction of the power house building (and the adjacent switchgear building) will follow once the shaft has been completed.

Electrical Substation Building and Transformers

1.2.49 The substation building is adjacent to the power house. The substation will contain 11kV and 400V electrical distribution equipment and will measure approximately 10m high, 18m wide and 30m long.

1.2.50 SPH are currently in discussions with SP Manweb regarding the exact location, insulation method and size of the substation. The current requirement and offer from SP Manweb is for gas-insulated equipment. This building will be approximately 12m high to apex, 12m wide and 30m long.

1.2.51 The external transformer compound will have provision for a single 11kV/400V transformer and two 11kV/132kV transformers for the 132kV electrical connection.

Underground Turbine Hall & Access Shaft

1.2.52 The above ground power house covers a shaft and underground turbine hall, which will be up to approximately 100m below the ground level.

1.2.53 Below the turbine is the draft tube arrangement plus drainage sumps which all require additional consideration when determining the depth. A drainage system will be provided in the deepest part of the below ground shaft. This will house a dewatering system to keep the underground areas dry at all times, and to provide the ability to drain water from the penstock or draught tubes if required for maintenance. The water would be pumped into Q6.

1.2.54 Below ground level, the turbine hall will contain the following:

- Fire lift shaft;
- Generator/pump hall;
- Turbine hall containing up to two turbines with a combined generating output of 99.9MW;
- Incoming and outgoing penstocks and draught tube; and
- Pumped drainage system

1.2.55 Turbine installation is likely to involve excavation (and possibly rock blasting) to obtain the correct level for the turbines, whilst using specialist heavy lifting equipment and cranes for the placement of equipment.

Overflow and Relief Valve or Scour Pipe from Q6 to Llyn Padarn

1.2.56 The purpose of the overflow is to discharge excess water collected within the reservoir(s) during operation. The purpose of the scour is to allow drawing-down of the water level in the reservoir to the base of the dam, including in an emergency situation. Any relief or overflow discharges will be gravity fed.

1.2.57 The overflow from Q6 will be connected to Llyn Padarn directly with an approximate 800mm diameter pipe. The combined scour and rising main is a separate pipe approximately 450mm in diameter. Valving will allow the relief or scour to discharge direct to Llyn Padarn (bypassing the pumping station).

1.2.58 The outtake pipe extends from the pumping station into Llyn Padarn, with the outtake structure itself at a minimum depth of 5m below the minimum recorded water surface level in Llyn Padarn. It was agreed with NRW that

the approved scheme would keep the depth of the outlet pipes above the thermocline so that effects on Arctic Char would be minimised but would be of sufficient depth that adverse effects to recreational users in Llyn Padarn would be avoided.

- 1.2.59 Surface buoys would mark the location of the spillway infrastructure. There will be a fine mesh screen on the pipes to avoid any wildlife, detritus or material from entering the pipe.
- 1.2.60 The rising main is required to provide a means of abstraction from Llyn Padarn (for initial filling and top-up during operation). It is connected to Llyn Padarn via a pumping station located to the south west of Llyn Padarn.

Pumping Station

- 1.2.61 The pumping station is required so that water may be abstracted from Llyn Padarn into Q6 in order to fill up the Development as part of the commissioning process and also to 'top up' levels if required. It will only be in operation when water is required to be pumped from Llyn Padarn.
- 1.2.62 The pumping station is connected to an intake in Llyn Padarn and valving allows pumping of water from Llyn Padarn through the combined scour or rising main into Q6.
- 1.2.63 The likely location of the proposed pumping station is in a vegetated area away from the shore of Llyn Padarn, adjacent to an existing car parking area. An alternative location is also being considered and is immediately adjacent to the toilet block in front of the access to the bombstore. SPH are currently in discussions with utility companies regarding easements. Therefore this alternative location is outlined in Works Package 4E).
- 1.2.64 The pumping station will comprise a below ground wet well, valve chamber and cable pit, and above ground kiosk. The majority of the structure is below ground and can be located in an area which avoids taking up space normally used by users of the car park and lagoon area.
- 1.2.65 The pumping station size will depend on the final location but will be completely underground and located at depth. A small above ground kiosk would be present and this is likely to be approximately 2m by 2m by 1m

high and would resemble a communications kiosk, most likely covered in British Standard 14-C-39 Green (subject to DCO Requirement). A manhole cover and grid plate is also required to gain access to the pumping station for maintenance purposes.

- 1.2.66 There would no operational lighting. The underground pumping station will still be equipped with sufficient acoustic attenuation to minimise any disturbance above ground.

Construction of the Overflow from Q6 Dam to the Pumping Station

- 1.2.67 The overflow and combined scour or rising main pipes will be culverted under the Q6 dam and will be buried in an open cut trench for the full route to the pumping station and then to Llyn Padarn. The route around the south side of the bombstore and across the A4086, to the pumping station (which is bypassed by the overflow and relief or scour outlet) and then to Llyn Padarn. The overflow extends from adjacent to the pumping station into Llyn Padarn, with the outlet structure itself at a minimum depth of 5m below the minimum recorded water surface level in Llyn Padarn.
- 1.2.68 From the Q6 dam a micro-sited route will be identified and the vegetation and trees cleared as appropriate, preferably outside the breeding bird season, otherwise a watching brief will be implemented.
- 1.2.69 A route corridor above and below the A4086 will then be fenced off with crossing points for public access where appropriate, for example at Llyn Padarn to enable access through the car parks and to the lagoons.
- 1.2.70 Topsoil (where present) will then be stripped and stored within the fenced off easement. The trench will be excavated to receive the pipe work.
- 1.2.71 Local dewatering may be required and is likely to be required for construction east of the A4086 to Llyn Padarn due to the highly permeable ground conditions (slate waste). The appointed contractor will develop detailed method statements for managing this process. If required, the water will be passed through settlement tanks and potentially a 'Siltbuster' (or similar) to minimise the discharge of suspended solids.

1.2.72 The pipes will then be “strung out” along the excavation and laid on appropriate bedding material. These will be connected and then back filled and compacted with the excavated material. Concrete anti-floating haunching may be required and this will be confirmed as part of the detailed design as it is dependent upon ground conditions and the level of the groundwater.

1.2.73 An area of the car park will be required for a small construction compound and material and plant storage. Any lighting required will be for security purposes and it is proposed to store as much material and plant in the construction compound for Q6 to minimise impacts to the lagoon area.

Construction of the Pumping Station

1.2.74 Once the location of the pumping station is confirmed and all required pre-commencement surveys have been completed, the topsoil will be stripped and sheet piling will be installed to form a safe environment for the installation of the pumping station, namely a ‘coffer dam’.

1.2.75 The material within the sheet piling will be excavated and removed to the Q6 site. This will be subject to appropriate geoenvironmental and geotechnical testing to confirm suitability for future uses.

1.2.76 A concrete base and superstructure will be cast and the pumps installed. The area within the sheet piling will then be backfilled and the sheet piles removed. The control cabinet, entry grid and manholes will then be installed.

Construction of the Overflow or Relief (Scour) Outlet and Intake to Llyn Padarn

1.2.77 The pipes, outlet and intake into Llyn Padarn will require a working area of approximately 5m by 20m into Llyn Padarn. This will be sheet piled to ensure a safe, water tight environment for the installation of the overflow as this will be at depth.

1.2.78 Where the overflow enters Llyn Padarn through the tree line, the working width will be minimised as much as possible to minimise any impacts to tree root systems. A tree survey will be undertaken prior to the construction

commencing to microsite the pipe through this area. Any trees that are removed will be subject to mitigation measures outlined in the Habitat Management Plan (HMP).

1.2.79 Where construction enters Llyn Padarn, access around this immediate area will be temporarily restricted to maintain a safe environment to the users of Llyn Padarn. This is expected to last up to 12 weeks.

1.2.80 There are potentially two options for the construction of the inlet and outlet structures into Llyn Padarn, as follows:

Option 1

1.2.81 Using the coffer dam area, as outlined above, the pipes will be “strung out” and sunk in place with pre-cast concrete weights.

1.2.82 Once the pipe is laid and the dry area reflooded, reinstated and coffer dam removed, access will be allowed. It is expected that this element of the construction of the pumping station will be short and temporary in nature. It is paramount that the health and safety of the construction of the pumping station is managed correctly due to the nature of the works.

Option 2

1.2.83 A smaller coffer dam would be used but a small boat or barge would then be used to string out the pipes and then connect to the onshore pipework once the pipe is sunk using pre-cast concrete weights. Access to this area would again be temporarily minimised whilst these works are ongoing to maintain the health and safety of users and construction workers.

Programme

1.2.84 It is proposed not to work within the main summer school holidays to minimise any significant adverse effects to users of Llyn Padarn and the lagoons. Outside school holidays, it is proposed to construct the overflow and pumping station sequentially to minimise any disturbance to users of Llyn Padarn and the lagoons. A small construction compound will be required and access for cycle and vehicle users on the shore will not be impeded. It is not proposed to block off or sever any existing routes for Llyn

Padarn users but some traffic management will be in place during critical activities.

- 1.2.85 There is no requirement for night time lighting during construction outside working hours other than for security purposes.

Electrical Connection

- 1.2.86 A distribution connection will be required to connect the pumped storage facility to the distribution network. This is likely to be 132kV, and will be consented under a separate planning regime as it is considered to be Associated Development (which cannot be included in a DCO in Wales). It may be possible to complete the works under SP Manweb's permitted development rights. If required consent will be sought under the Town and Country Planning Act 1990. The application for the appropriate consents will be prepared and submitted by SPH, an Independent Connection Provider (ICP) or SP Manweb as appropriate. A high level intra-project assessment has been undertaken on the indicative route in Chapter 17 Cumulative Effects and this is based on the current grid connection agreement which was applicable at the time of submission.

- 1.2.87 The route of the electrical connection will be designed by SP Manweb.

Drainage Works to Q5

- 1.2.88 The 2012 ES noted that Q2 to Q8 are in hydrological continuity. This was in response to anecdotal evidence provided by Gwynedd Council from their investigations of drainage to Llyn Padarn. It is unclear whether artificial drainage exists between Q1 (which is in a separate catchment) and Q2 and the other quarries. In the absence of any firm data, SPH are taking the precautionary approach that blocking-up of tunnels between Q5 and Q6 could potentially result in a disruption to the drainage from the upper quarries and ponding in Q5.

- 1.2.89 Previous attempts by Gwynedd Council, before QBC and SPH presented proposals for the quarries, to investigate the drainage scheme have failed to find the source and routes of the quarry drainage towards Llyn Padarn.

- 1.2.90 However it is recognised that drainage works may be needed between Q5 and Q6, and this can only be confirmed once the main construction works have commenced.
- 1.2.91 Further investigations are ongoing to source the true elevation of the base of Q5 and whether this is above the proposed maximum normal operating level in the Q6 reservoir. In Q5 the topography, trees and other vegetation have prevented survey using LiDAR or laser scanning. Therefore SPH are investigating other options.
- 1.2.92 As a worst case scenario for assessment in this ES, should drainage be required this is likely to involve excavating a tunnel from Q6 into Q5 at a level which will provide drainage from Q5 into Q6 but that does not allow Q5 to be back-flooded when Q6 is at its maximum normal operating level. This engineering solution would not impinge on the current bat mitigation and enhancement measures located in Q5. In addition the direction of the excavation will be from Q6 into Q5 and therefore the archaeological features of the quarry can be retained. The Order Limits have been drawn to allow for this possibility.

Permanent Excess Slate Mounds

- 1.2.93 Material will be generated from the excavation of the Q1 and Q6 quarries to form the headpond and tailpond reservoirs. This material will be crushed and graded with only suitable material utilised in the construction of the dam, with less suitable material used for landscaping purposes or incorporated into the new excess slate mounds south west of Q1.
- 1.2.94 There is approximately 100,000m³ of material within the existing slate mound to the south-west of Q1.
- 1.2.95 Up to two excess slate mounds will be created with a volume of up to 935,000m³, an extension to the existing slate mound and then another to the south.
- 1.2.96 The methods employed for the reinstatement and restoration of the excess slate mounds is discussed in greater detail in Chapter 6 Landscape and Visual Assessment and Chapter 16 Environmental Management.

Permanent and Temporary Access

- 1.2.97 Access to Q1 will be via the existing unclassified road (known as the Green Road) from the A4086 and through Waunfawr. Upgrades will be made from the A4086 to the Q1 site compound with temporary access tracks from the compound to the quarry.
- 1.2.98 Gwynedd Council required this road to be upgraded to adoptable standards as part of the approved Development. This upgrade will be undertaken in connection with the Development and as part of a planning application under the TCPA supported by Section 278 Highways Act agreements as required. However, the road will retain its single track status with several passing places constructed for vehicle movements. The improvements to the Green Road will be undertaken before construction and then fully reinstated to adoptable road standard after construction.
- 1.2.99 Access to Q6 will be through the existing road network off the A4085 to within the existing Glyn Rhonwy Industrial Estate. Minor amendments may be made to the A4085 and Industrial Estate junction for delivery of plant and materials during construction although these will be reinstated post-construction, unless their retention is agreed with the Highways Authority.
- 1.2.100 Ffordd Clegir (translated as Clegir Road), which bisects Q5 and Q6, will not be used for any construction or operational traffic although it may be subject to a temporary closure during critical works such as blasting. Advance notice will be given to the local residents, appropriate signage provided on the road and approval of Gwynedd Council as Highways Authority will be gained prior to any works commencing.

1.3 Construction Phase

- 1.3.1 Construction is expected to last up to 4 years with large scale plant and machinery used in construction of the dam, reprofiling the quarries and tunnelling of the penstock pipes. Ground investigation works started in March 2015 and were completed onsite in August 2015. At the time of writing results are still being collated although water quality and groundwater testing is available; the geotechnical results are not yet completed.

1.4 Operational Phase

Operational Lifetime

1.4.1 A pumped storage scheme can have an operational lifetime of up to 125 years subject to market forces, durability and maintenance. Regular maintenance will be undertaken on all machinery including scans and assessments made of underground pipework and above ground installations.

1.5 Decommissioning

1.5.1 At the end of the 125 year operational life, the Development will be decommissioned:

- Assessment of any buildings that are to be removed, including ecology;
- Removal of all above ground structures, notably the power house;
- Water will be drained from Q1 to Q6 and released at an agreed rate and timescale through the appropriate licensing regime into Llyn Padarn;
- Pumping station will be removed, although the overflow pipework at Q6 will remain in situ after being sealed;
- Dams to remain in situ;
- Access tracks will be left in situ;
- Security fences will remain although access through the dam structures will be secured;
- Penstock pipework between Q1 and Q6 will remain in situ and sealed; and
- Overflow pipework at Q1

1.5.2 It is proposed that due to the anticipated lifespan of the Development, a Decommissioning Plan will be required by the relevant authorities at the point of decommissioning this Development. This will therefore be a Requirement of the DCO.

1.6 Justification for Undertaking HRA Screening

- 1.6.1 The generating capacity of the Development exceeds 50 megawatts (MW), and it is therefore designated as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008.
- 1.6.2 The Conservation of Habitats and Species Regulations 2010 (as amended) require DCO applicants to consider the potential impacts of the NSIP on Natura 2000 sites.
- 1.6.3 Consultation with NRW has been undertaken and they have advised that Natura 2000 sites designated for bats within 10km and all other non-bat Natura 2000 sites within 2km be identified for the HRA Screening. In addition, to take account of Natura 2000 sites over 2km with possible hydrological links to the Development, the Applicant has identified all the Natura 2000 sites within 30km around the Order Limits.

1.7 HRA Methodology

- 1.7.1 The methodology for the HRA will pay due regard to the Planning Inspectorate guidance document: *Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects* (2013). It has become generally accepted that a stage-by-stage approach should be followed. These stages are:
- Stage One: Screening — the process which identifies whether there are likely to be any effects upon a Natura 2000 site as a result of the project or plan, either alone or in combination with other projects or plans, and considers whether these effects are likely to be significant;
 - Stage Two: Appropriate Assessment — the consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse effects on site integrity, an assessment of potential mitigation of those impacts;
 - Stage Three: Assessment of alternative solutions — the process which examines alternative ways of achieving the objectives of the project or

plan that avoid adverse effects on the integrity of the Natura 2000 site identified at Stage Two; and

- Stage Four: Assessment where no alternative solutions exist and where adverse impacts remain — an assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed.

1.7.2 This report provides a Stage One HRA Screening. The detailed methodology for this is given in Chapter 2.

2 SCREENING ASSESSMENT METHODOLOGY

2.1 Introduction

2.1.1 This chapter outlines the methodology followed during the Screening Assessment. A Screening assessment assesses the potential effects from the Development against Qualifying Features of Natura 2000 Sites and identifies LSEs.

2.1.2 The tables in section 3 detail the Qualifying Features present at each Natura 2000 site, the conservation objectives and potential vulnerabilities.

2.2 Methodology Overview

2.2.1 The Screening assessment comprises the following steps and concludes whether options should proceed to the next stage of the HRA:

- Identifying Natura 2000 sites that lie within 30km (or 10km if designated for bats) from the Order Limits that may be effected by the Development;
- Confirming the Qualifying Features and the conservation objectives for these Natura 2000 sites;
- Collating information on other plans and projects that may have “in combination effects”. In-combination effects refers to the cumulative effects as a result of the Development together with other existing or proposed projects or plans;
- Identifying the broad elements of the Development that may interact with Natura 2000 sites alone or in-combination with other projects or plans;
- Identifying the potential effects and ascertaining whether the Natura 2000 sites are at risk of LSEs from the Development; and
- Identifying avoidance, cancellation, and reduction measures which may be implemented to avoid LSEs.

- 2.2.2 A precautionary approach is taken when insufficient information is available to make a judgment, by assuming that a significant effect is possible.
- 2.2.3 If LSEs are identified, either alone or in-combination with other projects or plans, which cannot be mitigated against using best practice measures, it will be necessary to proceed to the Stage Two of the HRA process: Appropriate Assessment.

3 IDENTIFICATION OF POTENTIAL EFFECTS AND NATURA 2000 SITES

3.1 Introduction

3.1.1 This section sets out the potential ecological effects that the Development could have on identified Natura 2000 Sites in the construction, operation and decommissioning.

3.2 Identification of Natura 2000 Sites

3.2.1 Potential impacts on Natura 2000 sites are not constrained by the distance of the Development from a Natura 2000 site. Natura 2000 sites that are assessed are those which are likely to be significantly affected by the Development. Distance from a site is therefore less important than the existence of effect pathways which may link a Development with a Natura 2000 site. Examples include: watercourse SACs which are hydrologically linked to a proposed Development and that may therefore be effected for a considerable distance downstream by, for example, pollutants that are introduced into the headwaters of a catchment; and SPAs that support birds that may disperse over an extensive area of the wider countryside.

3.2.2 Natura 2000 sites within 30km of the Development and Natura 2000 sites within 10km designated for bats have been assessed. No Natura 2000 sites outside of 30km have been identified as having feasible pathways for LSEs from the Development.

3.2.3 The location, size and characteristics of the Development as well as the characteristics of the potential receptors (qualifying features and conservation objectives) must be taken into account when determining the potential for LSEs to occur.

3.3 List of Natura 2000 Sites

3.3.1 A total of thirty designations on twenty-eight Natura 2000 sites (dual designations are present on two sites) have been identified within 30km and 10km for bat sites (Table 3.1). The locations of the Natura 2000 sites within 30km are shown in Figures 1.1 to 1.4 of this report and in Table 3.1.

Table 3.1 Natura 2000 Sites within 30km of the Development

Site Name	Designation	Distance (km) from Order Limits	Direction from Order Limits
Afon Gwyrfai a Llyn Cwellyn	SAC	1.6	South-west
Eryri / Snowdonia	SAC	2.2	East
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay	SAC	7	North-west
Glynllifon (Bats site)	SAC	7.5	South-west
Llyn Idwal	Ramsar	7.6	East
Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh	SAC	9.8	West
Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes	SAC	11	West
Traeth Lafan / Lavan Sands, Conway Bay	SPA	11.8	North
Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat	SAC	12.3	North-west

Table 3.1 Natura 2000 Sites within 30km of the Development			
Site Name	Designation	Distance (km) from Order Limits	Direction from Order Limits
Sites			
Coedydd Aber	SAC	12.5	North-east
Corsydd Eifionydd / Eifionydd Fens	SAC	13.8	South-west
Glan-traeth	SAC	14	West
Liverpool Bay / Bae Lerpwl (Wales)	SPA	17.6	North
Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines	SAC	18.6	East
Corsydd Môn a Llyn / Anglesey and Llyn Fens (in 2 sections)	Ramsar	20 (Anglesey) 32 (Llyn)	North South-west
Corsydd Mon / Anglesey Fens	SAC	20	North
Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau	SAC	21.7	South
Ynys Seiriol / Puffin Island	SPA	22	North
Migneint-Arenig- Dduallt	SAC SPA	23.8	South-east
Clogwyni Pen Llyn / Seacliffs of Lleyn	SAC	25	South-west

Table 3.1 Natura 2000 Sites within 30km of the Development			
Site Name	Designation	Distance (km) from Order Limits	Direction from Order Limits
Morfa Harlech a Morfa Dyffryn	SAC SPA	25.4	South
Ynys Feurig, Cemlyn Bay and The Skerries	SPA	27.1	North-west
Rhinog	SAC	27.3	South-east
Llyn Dinam	SAC	28.7	North-west
Glannau Ynys Gybi / Holy Island Coast	SPA	29.3	North-west
Great Orme's Head / Pen y Gogarth	SAC	29.4	North-east
Coedwigoedd Penrhyn Creuddyn / Creuddyn Peninsula Woods	SAC	29.4	North-east
Afon Eden - Cors Goch Trawsfynydd	SAC	30	South

3.4 Potential Effects on Natura 2000 Sites within 30km

3.4.1 Table 3.2 lists the potential effects that could result from the Development at Glyn Rhonwy.

Table 3.2: Potential effects that could result from the Development

Potential Effect	Description
Runoff, and pollution from surface runoff	<p>There are potential hydrological links between the Development and 12 Natura 2000 sites within 30km.</p> <p>During construction there is potential for accidental spills of pollutants such as fuel, oil, chemicals or silt into or in proximity to watercourses within or adjacent to the Order Limits.</p> <p>During construction aluminium could be leached by surface water runoff and conveyed to Natura 2000 sites from activities such as crushing, storing, working or transporting slate spoil.</p> <p>The Development will produce negligible pollution during operation and decommissioning.</p>
Construction dust and vehicle movements	<p>As stated in ES Chapter 14 Air Quality (AECOM, 2015a), during construction, there will be specific dust generating activities including drilling, blasting, rock bolting, excavation, and potential partial removal of existing spoil heap at Q1 dam site. The Development will produce negligible emissions to air during operation and decommissioning. The Institute of Air Quality Management (IAQM) (IAQM, 2012) Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance states that <i>'an assessment will normally be required where there are sensitive receptors within 350m of the boundary of the site and / or within 100m of the route(s) used by construction vehicles on the public highway, or up to 500m from the site entrance'</i>;</p>
Change in aerial pollutant concentrations (NO ₂)	<p>Changes in NO₂ due to vehicle emissions will be limited to the immediate locality during construction. There will be no change to emission levels during operation or decommissioning. As stated in ES Chapter 14- Air Quality, the background concentrations of NO₂ in the locality are consistently well below the NO₂ annual mean objective of 40g/m³.</p>
Noise	<p>As stated in ES Chapter 13: Noise and Vibration the loudest noise during construction of the Development will be generated during the construction of the head pond and tail pond (including blasting and use of hydraulic hammers and breakers within Q1 and Q6). Volume 3, Figures 13.2 and 13.4 show the extent of the noise dispersal. Noise has the potential to affect Natura 2000 sites within the immediate locality (within 5km) only.</p>
Vibration	<p>Vibration from construction of the Development will be detectable across a range of distances depending on the</p>

Table 3.2: Potential effects that could result from the Development

Potential Effect	Description
	<p>activity. The nearest human receptor from the vibration-generating works is at 200m.</p> <p>Surface plant vibration will be negligible at the closest human receptors. Accordingly, the significance of effects is a localised, temporary, minor adverse effect for all high sensitivity receptors.</p> <p>Hydraulic hammers and breakers that are mounted on excavators will cause groundborne vibration from their impulsive percussive action. For example the safe working distance for using a large hydraulic hammer (1,600kg – 18-34t excavator) is 73m, the nearest human receptor from the vibration-generating works is at 200m, and at this distance the vibration will not be perceptible.</p> <p>Blasting – With appropriate design by suitably qualified blasting contractors, the magnitude of effects due to blasting is predicted to be negligible and the significance of effects if predicted to be a localised, temporary, minor adverse for all high sensitivity human receptors.</p> <p>Tunnelling – Vibration from tunnelling is limited to the distance range of 10m to 100m.</p> <p>Vibration during operation and decommissioning of the Development will be less than during construction. (Noise and Vibration Chapter; AECOM, 2015a).</p> <p>Given that the above activities will not have a significant effect at 200m and the nearest Natura 2000 site is 1.6km from the vibration generating activities, there will be no LSE on any Natura 2000 site for any phase of the Development.</p>
Direct habitat loss or fragmentation	There will be no construction or requirement to remove any habitat within any Natura 2000 sites.
Direct disturbance to species	There will be no construction or requirement to remove any habitat within any Natura 2000 sites. Habitat and roost loss within the Order Limits could affect Natura 2000 Bat sites within 10km.

Table 3.2: Potential effects that could result from the Development

Potential Effect	Description
Alteration of management	The Development will not cause the alteration of site management actions at any Natura 2000 sites;
Increase in lighting	The Development will require additional external lighting. As stated in ES Chapter 4: Project Description and Chapter 16 Environmental Management, night time lighting associated with the construction, operation and decommissioning phases includes permanent and security lighting. In addition, lighting will conform to Obtrusive Light Limitations for Exterior Lighting Installations for each respective Environmental Zone in the area, and appropriate lighting will be used to minimise the impact of lighting on ecological resources, including nocturnal species, and neighbours. Lighting will be designed to minimise spillage into surrounding habitats to avoid disturbance to wildlife.
Spread of invasive species	<p>To prevent the transfer of any invasive species from Q1, Q6 or Llyn Padarn during construction, operational routine discharges and decommissioning a pre-construction/decommissioning survey for invasive and non-native species (including plants, invertebrates and fish) was undertaken in late April / early May 2015 and June 2015.</p> <p>No invasive species were identified during the surveys of Q1 and Q6 (Goldsmith et al., 2015).</p> <p>Nuttall’s pondweed (<i>Elodea nuttallii</i>) was identified during the survey of Llyn Padarn within the lagoons on the south-western shore, either side of where the spillway pipe is proposed to be located, the nearest specimen is approximately 75m away from the proposed intake / spillway pipe (Goldsmith et al., 2015). Although it is unlikely that construction works will cause the disturbance and/or spread of the species due to the distance from the construction zone to the plants, measures will be taken to help prevent the spread as the plant reproduces vegetatively.</p> <p>The Phase 1 habitat survey identified Himalyan balsam within the Order Limits near Llyn Padarn car park (AECOM, 2015b). Construction near Llyn Padarn has the potential to spread Himalayan balsam, although this will have no LSE on any Natura 2000 sites due to the distance between the sites and the location of the species, and the lack of means to transfer the plants and/or soil containing the plants to Natura 2000 sites.</p> <p>There will be no construction within, or requirement to access, any Natura 2000 sites.</p>

Table 3.2: Potential effects that could result from the Development

Potential Effect	Description
Nutrient enrichment / eutrophication	<p>The surrounding catchment is predominantly comprised of old quarries and slate mines. Nutrient inputs will therefore be low, and the chemistry of the water from the initial abstraction and infill of Q6 from Llyn Padarn is unlikely to be changed significantly.</p> <p>Waters held within Llyn Padarn is naturally oligotrophic to mesotrophic (i.e. low to moderate in nutrients), with slightly acidic to neutral pH and low conductivity, although there is evidence of increasing mesotrophic conditions since the mid-1800 and this enrichment has contributed to a vulnerability to episodic eutrophic problems and algal blooms that can be triggered by a sudden increase in nutrient availability together with conducive hydrological and weather conditions.</p> <p>During the infill of Q1 and Q6, nutrient rich waters could enter the closed system and onto Natura 2000 sites via the Q1 and/or Q6 spillways.</p> <p>Prior to decommissioning testing of the water to be released into Llyn Padarn will be tested for nutrient levels and actions undertaken to remediate if required.</p> <p>Construction will not affect nutrient enrichment/eutrophication of Natura 2000 sites.</p>
Water quality	<p>Water quality testing of Q1 and Q6 (Goldsmith et al., 2015) did not reveal evidence of high levels of contamination, other than elevated levels of dissolved copper which exceeded the 1 ug/l annual average bioavailable standard for oligotrophic water bodies. Dissolved copper ranged between 2.1 ug/l and 3.6 ug/l with an average of 2.8 ug/l in Q1, and ranged between 5.7 and 9.0 with an average of 7.01 ug/l in Q6 (i.e. more than twice the concentration of Q1).</p>
Temperature changes	<p>It is not expected that there will be a significant increase in water temperature within the system or discharged from spillways during operation, or when the system is drained during decommissioning. No temperature change effects are predicted during construction.</p> <p>A low-friction system will be used to limit the effect of warming on water within the Development. It is a closed system with water discharged and abstracted only to maintain water level as and when required. It is expected that water temperature within the Development will vary diurnally and seasonally and will be moderated by the</p>

Table 3.2: Potential effects that could result from the Development

Potential Effect	Description
	<p>bathymetry of the reservoirs, the operation of the plant resulting in mixing, and the altitude of the quarries. Without a significant source of additional heat, it is anticipated that the water held within the Development will be controlled predominantly by natural factors such as climate and bathymetry. Water that will be discharged from the spillways will be siphoned off near to the surface where it is likely to be acclimatised to the surrounding air temperature.</p> <p>Under normal operations the main pathway for releasing stormwater runoff into the Development is via the Q6 spillway to Llyn Padarn. The Q1 spillway overflow is unlikely to be used unless there is a failure of the pumping system, restriction on the discharge from Q6 to Llyn Padarn, or a large storm event could cause the level in Q1 to increase by natural inflow. Under these circumstances flows in the Afon Gwyrfai are also likely to be higher offering increased dilution and dispersion of the Q1 spillway overflow waters.</p>
Alteration of flow regime	<p>Discharges from the Q1 spillway during operation have the potential to affect the flow of the Afon Gwyrfai SAC via the Nant-y-Betws. No other Natura 2000 sites are likely to be affected by alteration of flow regime. No changes to flow regime are predicted during construction. During decommissioning water will be discharged to Llyn Padarn and due to the capacity of this lake and measures use to limit the flow into the lake it is unlikely to affect flow regimes of any connected Natura 2000 sites.</p>

3.5 Natura 2000 Sites Assessed

Potential Effects Scoped In and Out

A check list of effects scoped in for further assessments is provided in Table 3.4. Some potential effects have been scoped out, for example due to lack of feasible pathways or negligible predicted magnitude of the effect, as discussed below in Table 3.3.

Table 3.3: Potential effects scoped in or out for further assessment		
Potential Effect	Justification	Scoped In or Out
Runoff, and pollution from surface runoff	There are hydrological links between the Development and 12 Natura 2000 sites within 30km. Pollution incidents during construction are likely to be sporadic accidental events which will be avoided and controlled through best practice site management. Runoff will be limited by the implementation of control measures to intercept contamination before it exits the Order Limits. However, there is some potential for LSEs on Natura 2000 sites that are hydrologically linked to the Development during construction. The Development will produce negligible pollution during operation and decommissioning, as such there are not LSE associated with water pollution during operation and/or decommissioning.	Scoped In
Construction dust and vehicle movements	IAQM Guidance states that <i>'an assessment will normally be required where there are sensitive receptors within 350m of the boundary of the site and / or within 100m of the route(s) used by construction vehicles on the public highway, or up to 500m from the site entrance'</i> ; The nearest Natura 2000 site is approximately 1.6 km away from the construction site and, as such, there will be no LSEs on Natura 2000 sites within 30km during all stages of the Development.	Scoped Out
Change in aerial pollutant concentrations (NO ₂)	Changes in NO ₂ due to vehicle emissions will be limited to within 100m during construction. There will be no change to emission levels during operation and/or decommissioning. The nearest Natura 2000 site is approximately 1.6 km away from the construction site, well over the 100m distance for predicted effects. There will be no LSEs on Natura 2000 sites within 30km during all phases of the Development.	Scoped Out
Noise	Noise during construction of the head pond and tail pond as a result of blasting and stabilisation works has the potential to affect Natura 2000 sites within the immediate locality only (within 5km). There are two Natura 2000 sites within 5km (Afon Gwyrfai a Llyn Cwellyn SAC and Eryri / Snowdonia SAC) and hence there is potential for LSEs on those sites with qualifying features that are known to be susceptible to noise. There are no qualifying features within either of the sites that are susceptible to noise.	Scoped Out

Table 3.3: Potential effects scoped in or out for further assessment

Potential Effect	Justification	Scoped In or Out
	<p>As such, there will be no LSE on Natura 2000 sites within or over 5km associated with noise during construction. The operation and decommissioning phases will not generate noise that will be detected over 400m (Noise and Vibration Chapter; AECOM, 2015a)</p> <p>There will be no LSE on Natura 2000 sites associated with noise during operation and decommissioning.</p>	
Vibration	<p>Vibration from construction of the Development will be detectable across a range of distances depending on the activity. The nearest human receptor is at 200m.</p> <p>Surface plant vibration will be negligible at the closest human receptors. Accordingly, the significance of effects is a localised, temporary, minor adverse effect for all high sensitivity receptors.</p> <p>Hydraulic hammers and breakers that are mounted on excavators will cause groundborne vibration from their impulsive percussive action. For example the safe working distance for using a large hydraulic hammer (1,600kg – 18-34t excavator) is 73m, the nearest human receptor is at 200m, and at this distance the vibration will not be perceptible.</p> <p>Blasting – With appropriate design by suitably qualified blasting contractors, the magnitude of effects due to blasting is predicted to be negligible and the significance of effects if predicted to be a localised, temporary, minor adverse for all high sensitivity human receptors.</p> <p>Tunnelling – Vibration from tunnelling is limited to the distance range of 10m to 100m.</p> <p>Vibration during operation and decommissioning of the Development will be less than during construction.</p> <p>(Noise and Vibration Chapter; AECOM, 2015a).</p> <p>Given that the above activities will not have a significant effect at 200m and the nearest</p>	Scoped Out

Table 3.3: Potential effects scoped in or out for further assessment		
Potential Effect	Justification	Scoped In or Out
	Natura 2000 site is 1.6km from the vibration generating activities, there will be no LSE on any Natura 2000 site for any phase of the Development.	
Direct habitat loss or fragmentation	There will be no construction or requirement to remove any habitat within any Natura 2000 sites, as such there will be no LSEs on Natura 2000 sites associated with direct habitat loss or fragmentation during all phases of the Development.	Scoped Out
Direct disturbance to species	There will be no construction or requirement to remove any habitat within any Natura 2000 sites. There is one bat site within 10km. There is some potential that the population of lesser horseshoe bats at Glynllifon (7.5km away) could be affected by the loss of habitat and loss of tunnel hibernation and summer roosts within the Order Limits. Therefore, there may be a potential low level effect on bats at Glynllifon. There will be no LSEs on any other Natura 2000 sites associated with direct disturbance to species during all phases of the Development.	Scoped In – Only for bat sites within 10km
Alteration of management	The Development will not cause the alteration of site management actions at any Natura 2000 sites There will be no LSEs on Natura 2000 sites associated with alteration of management during all phases of the Development;	Scoped Out
Increase in lighting	The nearest Natura 2000 site is 1.6km from the proposed Development and as such light spill will not measurably increase onto Natura 2000 sites within 30km. There will be no LSEs on Natura 2000 sites within 30km associated with lighting during all phases of the Development;	Scoped Out
Spread of invasive species	The Development will not allow the spread of invasive species into Natura 2000 sites. There are no invasive species within Q1 or Q6. Due to the growing requirements for Nuttall’s pondweed (in shallow, slow-flowing or still water), there will be no opportunity for the species to survive within Q1 or Q6 should any be drawn into the intake during the filling of Q1 and Q6; this, coupled with the infrequency and	Scoped Out

Table 3.3: Potential effects scoped in or out for further assessment		
Potential Effect	Justification	Scoped In or Out
	low likelihood of discharges via the Q1 spillway, and the lack of suitable habitat with the the Afon Gwyrfai SAC downstream from where the Nant-y-Betws joins the watercourse means there will be no LSE on any Natura 2000 sites associated with invasive species during construction and operation. Prior to decommissioning the water held within Q1 and Q6 will be surveyed for the precense of invasive species and if reuquired apporiate action taken to prevent their spread to Natura 2000 sites.	
Nutrient enrichment / eutrophication	<p>The surrounding catchment is predominantly comprised of old quarries and slate mines. Nutrient inputs will therefore be low, and the chemistry of the water from the initial abstraction and infill of Q6 from Llyn Padarn is unlikely to be changed significantly.</p> <p>However, Llyn Padarn has historically suffered from toxic blue-green algal blooms caused high concentrations of phosphorus linked to other factors that create the conditions for the potentially toxic blue-green algae blooms. During the initial infill of Q1 and Q6 there is the potential for nutrient rich water to enter the system. During operation there is the potential for nutrient rich water to enter Afon Gwyrfai SAC via the Q1 spillway and the Nant-y-Betws, and Llyn Padarn via the Q6 spillway during routine discharges.</p> <p>Due to dilution and dispersal, Natura 2000 sites beyond Llyn Padarn and the Afon Gwyrfai are unlikely to be affected by any nutrient enriched water discharged from Q1 or Q6 during operation.</p> <p>Construction will not affect nutrient enrichment/eutrophication of Natura 2000 sites.</p> <p>Prior to decommissioning the water within Q1 and Q6 will be tested for nutrient enrichment/eutrophication and if reuquired measures taken to prevent a LSE on a Natura 2000 site.</p>	Scoped In – only for Afon Gwyrfai SAC during operation
Water quality	The Development will not significantly alter the quality of water discharged from Q6 or Q1 during operation. Therefore, it is not expected that overflow will change the natural	Scoped Out

Table 3.3: Potential effects scoped in or out for further assessment		
Potential Effect	Justification	Scoped In or Out
	<p>concentration and variability of the Water Framework Directive physio-chemical parameters (i.e. ammonia, dissolved oxygen, and acid neutralising capacity).</p> <p>During construction, water with high concentrations of copper will be discharged to Llyn Padarn. High concentrations of copper can be toxic to aquatic organisms especially in soft water as occurs in this catchment, although higher concentrations can be tolerated for shorter period without having a significant impact on biological quality elements (BQEs) in the long term.</p> <p>After the draining of Q6 and Q1 the water will become fully mixed with that in Llyn Padarn and will have a negligible effect on the overall copper concentration of the water within Llyn Padarn under stratified or un-stratified conditions due to the available dilution. Around the location of the discharge there may be a temporary increase in dissolved copper concentrations, but this would be short lived occurring while the discharge is occurring and for a short period afterwards until the runoff has been dispersed. Due to the mobility of copper it would typically flush through the lake system quickly becoming increasingly diluted and dispersed and would not persist in the long term; the standard is an annual average and higher concentrations in the short term can be tolerated by BQE).</p> <p>The source of the copper within the water in Q1 and Q6 is likely to be leached from the surrounding rock in light of no other anthropogenic sources. In the longer term, there is the potential for the the water held in the Development to reflect the copper concentrations observed in the current quarry water, although the operation of the Development should not introduce any new sources. Occasional discharges from Q6 are unlikely to have a LSE on Natura 2000 sites beyond Llyn Padarn due to the diluting capacity of Llyn Padarn. Occasional discharges from Q1 are unlikely to have a LSE on the Afon Gwryfai SAC (or Natura 2000 site beyond) due to the extremely-low frequency of discharges and the capacity for dilution within the watercourse.</p>	

Table 3.3: Potential effects scoped in or out for further assessment

Potential Effect	Justification	Scoped In or Out
	<p>The volume of discharge would be greater in an emergency situation but this would be an unlikely and 'one-off' event.</p> <p>Testing prior to decommissioning will be undertaken and if required remedial action taken to help ensure the draining of the water into Llyn Padarn will not adversely affect the quality of the water within the lake or the Natura 2000 sites into which it flows. There will be no LSEs on Natura 2000 sites associated with water quality during construction, operation or decommissioning.</p>	
Temperature changes	<p>The Development is unlikely to discharge water that would significantly differ in temperature from the water into which it was discharged into via the Q1 and Q6 spillways. In addition, due to dilution and dispersal qualities of the water bodies into which Q1 and Q6 discharge, any effect is unlikely to have an affect on a Natura 2000 site beyond Llyn Padarn and the Afon Gwyrfa.</p> <p>Under normal operations the main pathway for releasing stormwater runoff into the Development is via the Q6 spillway to Llyn Padarn. The Q1 spillway overflow is unlikely to be used unless there is a failure of the pumping system, restriction on the discharge from Q6 to Llyn Padarn, or a large storm event could cause the level in Q1 to increase by natural inflow. Under these circumstances flows in the Afon Gwyrfa are also likely to be higher offering increased dilution and dispersion of the Q1 spillway overflow waters.</p> <p>Due to the design of the system (low-friction), and the distance, dilution and dispersal between the Q1 spillway and Afon Gwyrfa SAC (the distance from where the Q1 spillway enters the Nant-y-Betws to where the Nant-y-Betws enters the Afon Gwyrfa is approximately 2.7km) the effects from temperature changes on the Afon Gwyrfa section of the SAC are will be negligible and are unlikely to result in the degradation of habitats degradation of habitat or effects on species.</p>	Scoped Out
Alteration of flow	This is only likely to affect the Afon Gwyrfa SAC during operation. There will be no LSEs	Scoped In – only

Table 3.3: Potential effects scoped in or out for further assessment

Potential Effect	Justification	Scoped In or Out
regime	on any other Natura 2000 sites associated with flow regimes during all phases of the Development. There is no abstraction required from the Afon Gwyrfai SAC during construction or operation and therefore water flows will not be depleted as a result of the Development. There are no LSE associated with the construction or decommissioning phases of the Development on any Natura 2000 sites within 30km.	for Afon Gwyrfai SAC during operation

Natura 2000 Sites Scoped In and Out

- 3.5.1 A check list of the Natura 2000 sites scoped in for further assessments are provided in Table 3.4. Thirteen Natura 2000 site designations will be assessed to ascertain if the Development will have any LSEs on their Qualifying Features and conservation objectives, during construction, operation and decommissioning. The details of these Natura 2000 sites are contained within Appendix A, Tables 8.1 – 8.13.
- 3.5.2 Fifteen Natura 2000 sites were scoped out as they are at a significant distance from the Development and lack the effect-pathways and as such will result in no LSE.
- 3.5.3 Following Hundt, 2012 Bat Survey Guidelines, sites designated for bats within 10km of the Development will be assessed.
- 3.5.4 The thirteen Natura 2000 site designations listed below will be assessed.
- Afon Gwyrfai a Llyn Cwellyn, SAC;
 - Eryri / Snowdonia, SAC;
 - Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, SAC;
 - Traeth Lafan / Lavan Sands, Conway Bay, SPA
 - Glynllifon, SAC;
 - Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh, SAC;
 - Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes, SAC;
 - Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, SAC;
 - Liverpool Bay / Bae Lerpwl (Wales), SPA;
 - Corsydd Môn a Llyn / Anglesey and Llyn Fens, Ramsar
 - Corsydd Mon / Anglesey Fens, SAC;
 - Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau, SAC; and,
 - Ynys Seiriol / Puffin Island, SPA.

Table 3.4 Check list of Natura 2000 Assessed														
Site Name	Potential Effects													
	Water pollution and Runoff	Dust	NO ²	Noise	Vibration	Habitat Loss & Fragmentation	Species	Management	Lighting	Spread of Invasive's	Nutrient Enrichment	Water Quality	Water Temperature	Flow Regime
Afon Gwyrfai a Llyn Cwellyn SAC	✓	x	x	x	x	x	x	x	x	x	✓	x	x	✓
Eryri / Snowdonia SAC	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Glynllifon SAC	x	x	x	x	x	x	✓	x	x	x	x	x	x	x
Llyn Idwal Ramsar	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Traeth Lafan / Lavan Sands, Conway Bay SPA	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Coedydd Derw a Safleoedd Ystumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC	✓	x	x	x	x	x	✓	x	x	x	x	x	x	x
Coedydd Aber SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Corsydd Eifionydd / Eifionydd Fens SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													

Table 3.4 Check list of Natura 2000 Assessed														
Site Name	Potential Effects													
	Water pollution and Runoff	Dust	NO ²	Noise	Vibration	Habitat Loss & Fragmentation	Species	Management	Lighting	Spread of Invasive's	Nutrient Enrichment	Water Quality	Water Temperature	Flow Regime
Glan-traeth SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Liverpool Bay / Bae Lerpwl (Wales) SPA	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines SAC	Site scoped out – significant distance and no feasible pathways													
Corsydd Môn a Llyn / Anglesey and Llyn Fens (in 2 sections) Ramsar	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Corsydd Mon / Anglesey Fens SAC	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Ynys Seiriol / Puffin Island SPA	✓	x	x	x	x	x	x	x	x	x	x	x	x	x
Migneint-Arenig-Dduallt SAC and SPA	Site scoped out – significant distance and no feasible pathways													
Clogwyni Pen Llyn / Seacliffs of Llyn SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Morfa Harlech a Morfa Dyffryn SAC and SPA	Site scoped out – significant distance and no feasible pathways													
Ynys Feurig, Cemlyn Bay and The	Site scoped out – significant distance, no hydrological links and no other feasible pathways													

Table 3.4 Check list of Natura 2000 Assessed														
Site Name	Potential Effects													
	Water pollution and Runoff	Dust	NO ²	Noise	Vibration	Habitat Loss & Fragmentation	Species	Management	Lighting	Spread of Invasive's	Nutrient Enrichment	Water Quality	Water Temperature	Flow Regime
Skerries SPA														
Rhinog SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Llyn Dinam SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Glannau Ynys Gybi / Holy Island Coast SPA	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Great Orme's Head / Pen y Gogarth SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Coedwigoedd Penrhyn Creuddyn / Creuddyn Peninsula Woods SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													
Afon Eden - Cors Goch Trawsfynydd SAC	Site scoped out – significant distance, no hydrological links and no other feasible pathways													

4 SCREENING ASSESSMENT

4.1 Overview

4.1.1 Thirteen Natura 2000 sites were identified within 30km of the Development that have the potential to be effected during construction, operation or decommissioning. Potential effects that will be assessed are listed below. A checklist is provided in Table 3.4 which shows which Natura 2000 site these have potential to effect:

- Water pollution and runoff;
- Noise during construction;
- Disturbance to species;
- Nutrient enrichment;
- Temperature changes; and
- Flow regime.

4.1.2 The following sections describe the potential effects that could result in a LSE to the Natura 2000 sites identified in Table 3.4

4.2 Afon Gwyrfai a Llyn Cwellyn SAC

Effect Pathways

Water Pollution and Runoff

4.2.1 The Development is connected to the Afon Gwyrfai river SAC via the Nant-y-Betws watercourse and Q1 spillway. The standing water Llyn Cwellyn (SAC feature *Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea*) is upstream from where the Nant-y-Betws discharges to the Afon Gwyrfai and as such there will be no discharge of water to the Llyn Cwellyn part of the SAC.

Nutrient Enrichment

4.2.2 The water used to fill the pumped hydro system will be taken from Llyn Padarn, which is known to suffer from sporadic nutrient enrichment and algal blooms. The SAC is connected to the Development via the Q1 spillway and Nant-y-Betws watercourse; the distance from where the Q1 spillway enters the Nant-y-Betws to where the Nant-y-Betws enters the Afon Gwyrfai is approximately 2.7km.

Alteration of Flow Regime

4.2.3 During operation, discharge from the Q1 spillway has potential to intermittently increase the flow regime of the Afon Gwyrfai via the Nant-y-Betws.

Potential Effects

Water Pollution and Runoff

4.2.4 During construction and operation of the spillway from Q1 to the Nant-y-Betws, pollutant inputs arising from spoil waste-generated aluminium runoff, accidental fuel and chemical spills and runoff (sediment, concrete etc.) have the potential to affect the following SAC features through degradation of habitat: Water courses of plain to montane levels with *the Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, Atlantic salmon (*Salmo salar*); Floating water-plantain (*Luronium natans*); and Otter (*Lutra lutra*).

4.2.5 Through integrating pollution controls into the Development design and processes, as described below in 'mitigation by design' there will be no LSEs on the features of this Natura 2000 site as result of water pollution from the construction and operation of the Development.

4.2.6 In addition, dilution between the Development and the SAC will reduce the significance of any accidental fuel and chemical spills and runoff. It is unlikely, due to dilution, that any pollution reaching the SAC would be significant enough to cause direct injury or death.

4.2.7 There is no likelihood of water pollution associated with the decommissioning of the Development as there will be no demolition of the Development only draining of the water in the Development into Llyn

Padarn. There will be no LSEs on the features of this Natura 2000 site as a result of water pollution from the decommissioning of the Development.

Mitigation by Design for Water Pollution and Runoff

4.2.8 The following elements have been designed into the Development and into the construction process to avoid and manage pollution incidents in-line with best practice. These will be implemented and detailed within a Code of Construction Practice (CoCP) document which contains a Pollution Prevention Plan (PPP) and Water Management Plan (WTMP). An outline of the environmental measures to be incorporated is given in the WTMP, ES Chapter 7 Ecology, Section 7.8 and Chapter 16 Environmental Management (AECOM, 2015a) and summarised below:

- Runoff from the site would not be allowed to drain directly into any watercourse and would be filtered and attenuated using silt traps and settlement ponds. The arrangements of such drainage infrastructure would be set out in the detailed design and as appropriate agreed with NRW prior to construction. The measures would ensure that any sediment or metals (such as aluminium from crushed slate) carried in suspension in the surface water runoff from the site would have settled out to an acceptable level before being discharged into watercourses close to the site. The appropriate discharge license will be sought by the PC from NRW should dewatering activities require treatment prior to discharge.
- During the initial site preparation works prior to the start of construction, there would be a requirement for the formation of temporary measures to ensure controlled management of runoff draining from the construction site.
- Any areas required for the crushing of slate (for placement into the dam or excess spoil mounds) will be located at least 20m away from any watercourses. These areas will be bunded and any drainage linked to settlement lagoons. It is acknowledged that crushed slate may contain aluminium and therefore appropriate water treatment will be implemented when the construction programme and works areas are

allocated. Any mitigation measures required will be implemented with the express agreement of NRW for the protection of controlled waters and Gwynedd Council for the protection of water supplied for private water supplies in the area.

- To avoid potential pollution effects to soils, vegetation and watercourses from machinery during construction and operation, all refuelling and servicing of vehicles will be carried out within a designated area with an impermeable base, away from any natural habitats.
- To prevent spillages, refuelling will be carried out by pumping through a trigger delivery nozzle. Fuel, oil and other potential contaminants will be stored within bunded tanks to 110% of the volume stored, drip trays installed and only the minimum quantity required will be stored on site. The designated area will be maintained in a secure and clean manner. An adequate quantity of oil absorbent material will be stored on site and spillages cleared up immediately. All construction and operational equipment will be maintained in good working order and checked regularly for spillages and leaks.
- The Environment Agency's (now NRW) Pollution Prevention Guidelines 5 (PPG5), *Works in, Near or Liable to Affect Watercourses* and PPG6 *Working at Construction and Demolition Sites* will be implemented to avoid and minimise adverse effects. Detailed descriptions of mitigation regarding aquatic habitats can be found within the ES Chapter 9 Water Resources (AECOM, 2015a).
- Concrete will either be imported from a local batching plant or a concrete batching plant will be established on site depending on the chosen contractor, the availability of local supply and the time of year. If concrete is batched on site, appropriate containment, clean-up measures and procedures will be put in place following specific method statements to minimise risk of spillage, contamination of soils, water and vegetation.

Nutrient Enrichment

4.2.9 The surrounding catchment is predominantly comprised of old quarries and slate mines. Nutrient inputs will therefore be low, and the chemistry of the

water from the initial in-fill from Llyn Padarn is unlikely to be changed significantly.

- 4.2.10 However, the water used to fill the pumped hydro system will be taken from Llyn Padarn, which is known to suffer from from sporadic nutrient enrichment and algal blooms. The SAC is connected to the Development via the Q1 spillway and Nant-y-Betws watercourse; the distance from where the Q1 spillway enters the Nant-y-Betws to where the Nant-y-Betws enters the Afon Gwyrfai is approximately 2.7km.
- 4.2.11 Nutrient enrichment entering the Afon Gwyrfai watercourse has the potential to affect the following SAC features through degradation of habitat, limiting light levels, dissolved oxygen, smothering plants and reducing food availability: Water courses of plain to montane levels with *the Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation, Atlantic salmon (*Salmo salar*); Floating water-plantain (*Luronium natans*); and Otter (*Lutra lutra*).
- 4.2.12 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and /or of the *Isoteo-Nanojuncetea* occurs upstream of where the Nant-y-Betws enters the Afon Gwyrfai, as such will not be affected by nutrient enrichment caused by the Development.
- 4.2.13 One of the most significant sources of phosphorus are discharges from Llanberis Waste Water Treatment Works (WwTW). The last algal bloom in Llyn Padarn occurred between May and October 2009 and according to NRW “*was caused by a combination of weather conditions and nutrients (phosphorous) entering the lake, particularly from the nearby sewage treatment works and storm overflow.*”
- 4.2.14 Evidence from the investigations undertaken by NRW into Llyn Padarn and the more recent PROTECH modelling of the lake system, identified that the Llanberis WwTW was responsible for the environmental damage. However, the immediate risk of continuing damage has been eliminated by the following mitigation measures:
- NRW has installed a continuous water quality monitoring station on the lake in order to track daily changes in lake quality from the lake bottom to

its surface and has commissioned modelling work to understand the nutrient pressures on the lake both historically and in the future;

- In 2010 NRW required Dŵr Cymru Welsh Water (DCWW) to comply with a regulator-initiated permit variation to reduce permitted total phosphorous levels in the Llanberis WWTW final treated effluent from 1.6 mg/l to 1 mg/l (as an annual average). NRW also identified improvements required for Llanberis WwTW and the sewer network. These will include further reductions to both (i) the permitted Total Phosphorous limit (reduced to 0.5 mg/l as an annual average from the current 1 mg/l); and (ii) the frequency and timing of untreated storm discharges to the lake. These improvements will be delivered by DCWW in the AMP6 capital investment programme between April 2015 and March 2020; and,
- DCWW have undertaken sewer network modelling of the Llanberis network to understand its operation and identify potential impacts on the lake. The modelling was used to assess the apportionment of Total Phosphorus loadings into the lake. They required the removal of a phosphorous-enriched trade effluent to sewer emanating from Siemens Healthcare Diagnostics Ltd. and have implemented other practical short-term solutions to improve the quality of the effluent discharged from Llanberis WwTW to prevent the risk of future algal blooms. They have also identified and undertaken repairs on the sewerage network within Llanberis and made improvements to sewage pumping stations which has reduced the flow of sewage to the works, and have constructed an inlet works at Llanberis WwTW and have also improved treatment of final effluent by adding two additional DynaSand sand filters at the site in addition to the 2 No. sand filters already on site. Finally, specialist phosphorus removal technology Blue-PRO has been trialled at the site and flow meters installed to measure the volume of storm water discharges.

4.2.15 Such measures have contributed to the phytoplankton quality element in the Water Framework Directive (WFD) classification of ecological status returning to 'good' status in the 2013 and 2014 (draft) classifications.

- 4.2.16 Water quality monitoring of Llyn Padarn before abstraction commences and throughout the process will help to avoid abstracting during short term periods of very poor quality that may occur for a short periods following prolonged wet weather when there will be additional wash out of the catchment and a greater risk of stormwater spills from Llanberis WwTW and other intermittent discharges. However, since water will be abstracted at a relatively slow rate over a long period of time short term deterioration in water quality will tend to be offset by abstraction at times of better quality. The water abstracted from Llyn Padarn will also be diluted by natural runoff into Q1 and Q6.
- 4.2.17 Furthermore, nutrients would most likely be in a dissolved form (given the abstraction from Llyn Padarn and then overflow from Q1) that are less likely to accumulate in river sediments, and that over time and in the absence of any other nutrient sources the concentration of nutrients in Q1 would decrease with incidental rainfall.
- 4.2.18 In addition, under normal operations the main pathway for releasing stormwater runoff into the Development is via the Q6 spillway to Llyn Padarn. The Q1 spillway overflow is unlikely to be used unless there is a failure of the pumping system, restriction on the discharge from Q6 to Llyn Padarn, or a large storm event could cause the level in Q1 to increase by natural inflow. Under these circumstances flows in the Afon Gwyrfa are also likely to be higher offering increased dilution and dispersion of the Q1 spillway overflow waters.
- 4.2.19 There will be no LSE on the features of this Natura 2000 site as result of nutrient enrichment from any phase of the Development.

Alteration of Flow Regime

- 4.2.20 The conservation objectives state that the flow regime should be characteristic of the river, $\pm 10\%$ of the naturalised daily flow throughout the year. (CCW, 2008).
- 4.2.21 However, the Q1 spillway overflow is unlikely to be used unless there is a failure of the pumping system, restriction on the discharge from Q6 to Llyn Padarn, or a large storm event could cause the level in Q1 to increase by

natural inflow. Under normal operations the main pathway for releasing stormwater runoff into the Development is via the Q6 spillway to Llyn Padarn (for further details on when the Q1 spillway will be used see Technical Note in Appendix C). However, if the estimated annual rainfall to Q1 was discharged to the Afon Gwyrfai via the Nant-y-Betws and spread evenly throughout the year it would amount to approximately 442 m³ / day which is <2 % of the Q95 flow (Q95 is the flow exceeded 95% of the time) in the Afon Gwyrfai (as monitored approximately 5 km downstream at Bontnewydd). The rate and volume would vary, but this would be comparable with natural runoff from the catchment in response to the incident rainfall. In addition, emergency draw down discharge will be controlled through an Environmental Permit and mitigated in order not to cause excessive and unacceptable erosion of Nant-y-Betws, and as such the flow entering the Afon Gwyrfai will be subsequently controlled.

4.2.22 There will be no LSEs on the features of this Natura 2000 site as result of water pollution, the spread of invasive species, nutrient enrichment and alteration of flow regime from any phase of the Development.

4.3 Eryri / Snowdonia SAC

Effect Pathways

Water Pollution

4.3.1 There are a number of hydrological links between the SAC and the Development via Q6 spillway, Llyn Padarn and a number of small watercourses. However, the small watercourses run from the SAC into Llyn Padarn, therefore eliminating any potential effect pathways for water pollution.

4.3.2 Due to the direction of flow of the watercourses there will be no LSEs on the features of this Natura 2000 site as result of water from any phase of the Development.

4.4 Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC

Effect Pathways

Water Pollution

4.4.1 There are two hydrological links and feasible pathways between the SAC and the Development:

- Via the Q1 spillway, the Nant-y-Betws and Afon Gwyrfai which flows into the SAC; and,
- Via the Q6 spillway, Llyn Padarn, the Afon Rhythallt and Afon Seiont which flows into the SAC.

Potential Effects

Water Pollution

4.4.2 It is unlikely that any pollution and temperature changes generated during construction, operation or decommissioning will reach or significantly affect the features and integrity of the SAC due to:

- The distance between the Development and the SAC; and,
- The level of dilution and dispersal between the Q1 spillway and the Nant-y-Betws (2.6km) and Afon Gwyrfai (9.6km) watercourses; and/or,
- The level of dilution and dispersal between the Q6 spillway and Llyn Padarn (1.5km), and the Afon Rhythallt and Afon Seiont watercourses (12.6km).

4.4.3 There will be no LSEs on the features of this Natura 2000 site as result of water pollution from any phase of the Development.

4.5 Traeth Lafan / Lavan Sands, Conway Bay SPA

Effect Pathways

Water Pollution

4.5.1 There are two hydrological links and feasible pathways between the SPA and the Development:

- Via the Q1 spillway, the Nant-y-Betws and Afon Gwyrfai which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, and is linked to the SPA; and,
- Via the Q6 spillway, Llyn Padarn, the Afon Rhythallt and Afon Seiont which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, and is linked to the SPA.

Potential Effects

Water Pollution

4.5.2 It is unlikely that any pollution and temperature changes during construction, operation or decommissioning will reach or significantly affect the features and/or integrity of the SPA due to:

- The distance between the Development and the SPA; and,
- The level of dilution and dispersal between the Q1 spillway and the Nant-y-Betws and Afon Gwyrfai (2.6km) watercourses, and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay; and/or,
- The level of dilution and dispersal between the Q6 spillway and Llyn Padarn (1.5km), and the Afon Rhythallt and Afon Seiont watercourses (12.6km), and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay.

4.5.3 There will be no LSEs on the features of this Natura 2000 site as result of water pollution from any phase of the Development.

4.6 Glynllifon SAC

Effect Pathways

Disturbance to Species – Lesser horseshoes bats

4.6.1 Lesser horseshoe bats are known to forage up to 10km from their roost sites. There is some potential that the population of lesser horseshoe bats at Glynllifon (7.5km away) could commute through and forage within the Order Limits.

Potential Effects

Disturbance to Species – Lesser horseshoes bats

- 4.6.2 There will be no construction or requirement to remove any habitat within any Natura 2000 sites. There is some potential that the population of lesser horseshoe bats at Glynllifon (7.5km away) could be affected by the loss of habitat and loss of tunnel hibernation and summer roosts within the Order Limits. Based on Billington and Rawlinson, 2006, Lesser horseshoe bats have repeatedly been found ranging 1.5km and 6km from two separate roosts in Gwynedd and at times over 10km. The differences in foraging ranges will be affected by factors including the colonies' size, roost suitability, proximity of foraging habitat, and weather. Billington and Rawlinson, 2006 states that in a 7 to 10km radial zone around large lesser horseshoe roosts (such as Glynllifon) only a small part of the area is likely to be used for foraging but flight routes may lead further connecting to other roost sites. Billington and Rawlinson, 2006 states that in a 7 to 10km radial zone some of the most pronounced areas of extensive hedgerows (particularly higher overgrown ones), scrub and wet woodland, especially surrounding pasture and or wet ground will be important to the bats. Billington and Rawlinson, 2006 states that a scheme should aim to maintain habitat links through the 7 to 10km zone.
- 4.6.3 There is no wet woodland or hedgerows within the Order Limits. There are no pronounced areas of scrub within the Order Limits. However, there are areas of broadleaved woodland at the eastern section of the Development. Based on the summer walked transect bat survey results the eastern end of the Development is not frequently used by foraging or commuting lesser horseshoe bats. Woodland and woodland linkages across the Development will be retained.
- 4.6.4 There will be loss of some tunnel roosts within the Development. However, other tunnels at the Development will be retained and enhanced to maintain a summer and winter roosting resource within the Development.
- 4.6.5 Through pre-application email correspondence with NRW on the scope of the HRA, NRW have confirmed that they have limited information on the

flight lines of lesser horseshoe bats outside the Glynllifon SAC. Some radio tracking mapping of lesser horseshoe bats has been undertaken in the vicinity of Glynllifon but, in the wider landscape they have no information to confirm that the SAC is connected to the Glyn Rhonwy Development. Glyn Rhonwy is approx. 10km (direct distance) from the Glynllifon SAC, and there is the potential for lesser horseshoe bats from the Glynllifon SAC to be using the Development. However, NRW noted both the low numbers of bats at the Development and stated that the mitigation and compensation measures proposed should ensure that there will be no adverse effects on the Glynllifon SAC.

4.6.6 There will be no LSE on Glynllifon SAC. There will be no LSEs on any other Natura 2000 sites associated with direct disturbance to species during all phases of the Development

4.7 Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC

Effect Pathways

Water Pollution

4.7.1 There are two hydrological links and feasible pathways between the SAC and the Development:

- Via the Q1 spillway, the Nant-y-Betws, the Afon Gwryfai which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, which is linked to the SAC; and,
- Via the Q6 spillway, Llyn Padarn, the Afon Rhythallt and Afon Seiont which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, which is linked to the SAC.

Potential Effects

Water Pollution

4.7.2 It is unlikely that any water pollution from any phase of the Development will reach or significantly affect the features and integrity of the SAC due to:

- The distance between the Development and the SAC; and,

- The level of dilution and dispersal between the Q1 spillway, the Nant-y-Betws and Afon Gwyrfai (2.6km) watercourses, and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay; and/or,
- The level of dilution and dispersal between the Q6 spillway and Llyn Padarn (1.5km), the Afon Rhythallt and Afon Seiont watercourses (12.6km), and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay.

4.7.3 There will be no LSEs on the features of this Natura 2000 site as result of water pollution from any phase of the Development.

4.8 Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC

Effect Pathways

Water Pollution

4.8.1 There are two hydrological links and feasible pathways between the SAC and the Development:

- Via the Q1 spillway, the Nant-y-Betws, the Afon Gwyrfai which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, which is linked to the SAC; and,
- Via the Q6 spillway, Llyn Padarn, the Afon Rhythallt and Afon Seiont which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, which is linked to the SAC.

Potential Effects

Water Pollution

4.8.2 It is unlikely that any pollution generated during construction, operation and decommissioning will reach or significantly affect the features and integrity of the SAC due to:

- The distance between the Development and the SAC; and,
- The level of dilution and dispersal between the Q1 spillway, the Nant-y-Betws and Afon Gwyrfai (2.6km) watercourses, and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay; and/or,

- The level of dilution and dispersal between the Q6 spillway and Llyn Padarn (1.5km), the Afon Rhythallt and Afon Seiont watercourses (12.6km), and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay.

4.8.3 There will be no LSEs on the features of this Natura 2000 site as result of water pollution from any phase of the Development.

4.9 Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Effect Pathways

Water Pollution

4.9.1 Although the SAC and Development are hydrologically linked, the water source from the Development enters a watercourse and flows away from the SAC. There are no feasible effect pathways.

4.9.2 Due to the lack of effect pathways there will be no LSEs on the features of this Natura 2000 site from any phase of the Development.

Disturbance to Species

4.9.3 This SAC is over 10km from the Development. As such, there are considered to be no effect pathways between this SAC and the Development for disturbance to bats.

4.10 Liverpool Bay / Bae Lerpwl (Wales) SPA

Effect Pathways

Water Pollution

4.10.1 There are two hydrological links and feasible pathways between the SPA and the Development:

- Via the Q1 spillway, the Nant-y-Betws, the Afon Gwyrfa which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, which is linked to the SPA; and,
- Via the Q6 spillway, Llyn Padarn, the Afon Rhythallt and Afon Seiont which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, which is linked to the SPA.

Potential Effects

Water Pollution

4.10.2 It is unlikely that any pollution during construction, operation and decommissioning will reach or significantly affect the features and integrity of the SPA due to:

- The distance between the Development and the SPA; and,
- The level of dilution and dispersal between the Q1 spillway, the Nant-y-Betws and Afon Gwyrfai (2.6km) watercourses, and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay; and/or,
- The level of dilution and dispersal between the Q6 spillway and Llyn Padarn (1.5km), the Afon Rhythallt and Afon Seiont watercourses (12.6km), and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay.

4.10.3 There will be no LSEs on the features of this Natura 2000 site as result of water pollution from any phase of the Development.

4.11 Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar

Effect Pathways

Water Pollution

4.11.1 Although the Ramsar and Development are hydrologically connected, the watercourses within the Anglesey and Llyn Fens Ramsar flow out of the Ramsar sites and towards the Development. There are no feasible effect pathways.

4.11.2 There will be no LSEs on the features of this Natura 2000 site as result of water pollution from any phase of the Development.

4.12 Corsydd Mon / Anglesey Fens SAC

Effect Pathways

Water Pollution

4.12.1 Although the SAC and the Development are hydrologically connected, the watercourse within the Anglesey Fens SAC flows out of the SAC and towards the Development. There are no feasible effect pathways.

4.12.2 There will be no LSEs on the features of this Natura 2000 site as result of water pollution from any phase of the Development.

4.13 Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC

Effect Pathways

Water Pollution

4.13.1 Although the SAC and Development are hydrologically connected, the aquatic input source from the Development enters a watercourse and flows away from the SAC. There are no feasible effect pathways.

4.13.2 Due to the lack of effect pathways there will be no LSEs on the features of this Natura 2000 site as result of water pollution from any phase of the Development.

4.14 Ynys Seiriol / Puffin Island SPA

Effect Pathways

Water Pollution

4.14.1 There are two hydrological links and feasible pathways between the SPA and the Development:

- Via the Q1 spillway, the Nant-y-Betws, the Afon Gwyrfa which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, which surrounds the SPA; and,
- Via the Q6 spillway, Llyn Padarn, the Afon Rhythallt and Afon Seiont which flows into Y Fenai a Bae Conwy / Menai Strait and Conwy Bay, which surrounds the SPA.

Potential Effects

Water Pollution

4.14.2 It is unlikely that any pollution during construction, operation and decommissioning will reach or significantly affect the features and integrity of the SPA due to:

- The distance between the Development and the SPA; and,

- The level of dilution and dispersal between the Q1 spillway, the Nant-y-Betws and Afon Gwyrfai (2.6km) watercourses, and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay; and/or,
- The level of dilution and dispersal between the Q6 spillway and Llyn Padarn (1.5km), the Afon Rhythallt and Afon Seiont watercourses (12.6km), and Y Fenai a Bae Conwy / Menai Strait and Conwy Bay.

4.14.3 There will be no LSEs on the features of this Natura 2000 site as result of water pollution, invasive species, nutrient enrichment / eutrophication and changes in water quality from any phase of the Development.

4.15 Residual Effects

4.15.1 Sections 4.2 – 4.13 show that the Development alone (not in-combination with other projects and plans) will have no LSE on Natura 2000 sites and their Qualifying Features or conservation objectives within 30km.

4.15.2 However, as stated in the CCW *“Assessing Projects Under the Habitats Directive – Guidance for Competent Authorities”* (David Tyldesley and Associates, 2011) the Competent Authority should check whether significant effects would be likely if the project was combined with other plans or projects by taking any negative residual effects forward to the in-combination test for LSE.

4.15.3 Table 4.4 sets out the residual effects of the Development.

4.15.4 Section 5 sets out the other plans or projects that could act in-combination with the residual effects and then tests them for LSE.

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Table 4.4 Summary of Residual Effects of the Project

Effect	Summary of Residual Effects
Water pollution from surface runoff	No residual effects. The hydrological links between the Development and Natura 2000 sites within 30km are flowing in a direction that would take the pollution source away from the Natura 2000 site; or are at a distance where dispersal and dilution of a pollutant would prevent it reaching and/or significantly affecting the Natura 2000 site. In addition, appropriate site-based mitigation in-line with best practice (PPG 5, 6 and 7) is in place to help prevent and limit the occurrence and the effects of pollution and/or runoff incidents. These will be implemented through the CoCP, PPP and WTMP (found in Volume 3, Appendix 16.1)
Noise during construction	No residual effects. Noise levels travelling to the nearest two Natura 2000 sites will be near ambient levels. The noise generated from blasting will be intermittent and temporary. No qualifying features within the nearest Natura 2000 sites that are susceptible to noise.
Spread of invasive species	No residual effects. No opportunities to cause the spread of invasive species into Natura 2000 sites during construction, operation or decommissioning.
Nutrient enrichment/eutrophication	No residual effects. The hydrological links between the Development and all Natura 2000 sites within 30km, apart from the Afon Gwyrfa a Llyn Cwellyn SAC, are flowing in a direction that would take the input away from the Natura 2000 site; or are at a distance where dispersal and dilution of enrichment/eutrophication would prevent it reaching the Natura 2000 site. The surrounding catchment is predominantly comprised of old quarries and slate mines. Nutrient inputs will therefore be low, and the chemistry of the water from the initial abstraction and infill of Q6 from Llyn Padarn is unlikely to be changed significantly. Measures are being put in place by Llanberis WwTW to limit the occurrences of eutrophication-causing incidences within Llyn Padarn. Water drawn into the system during occasional occurrences of increased level of nutrients (such as during overturn or a stormwater event) will be diluted by the water taken from times when nutrient levels are low/normal. The water within the system will be monitored for nutrient enrichment and appropriate remedial action taken to prevent the addition of nutrient-rich water into the Afon Gwyrfa a Llyn Cwellyn SAC.
Changes to water quality	No residual effects. The hydrological links between the Development and Natura 2000 sites within 30km are flowing in a direction that would take the input away from the Natura 2000 site; or are at a

Table 4.4 Summary of Residual Effects of the Project

Effect	Summary of Residual Effects
	<p>distance where dispersal and dilution of the input would prevent it reaching the Natura 2000 site.</p> <p>The Development will not significantly alter the quality of water discharged from Q6 or Q1 during operation. Therefore, it is not expected that overflow will change the natural concentration and variability of the Water Framework Directive physio-chemical parameters (i.e. ammonia, dissolved oxygen, and acid neutralising capacity).</p> <p>During construction, water with high concentrations of copper will be discharged to Llyn Padarn. High concentrations of copper can be toxic to aquatic organisms especially in soft water as occurs in this catchment, although higher concentrations can be tolerated for shorter period without having a significant impact on biological quality elements (BQEs) in the long term.</p> <p>Occasional discharges from Q6 are unlikely to have a LSE on Natura 2000 sites beyond Llyn Padarn due to the diluting capacity of Llyn Padarn. Occasional discharges from Q1 are unlikely to have a LSE on the Afon Gwryfai SAC (or Natura 2000 site beyond) due to the extremely-low frequency of discharges and the capacity for dilution within the watercourse.</p> <p>The volume of discharge would be greater in an emergency situation but this would be an unlikely and ‘one-off’ event.</p> <p>Testing prior to decommissioning will be undertaken and if required remedial action taken to help ensure the draining of the water into Llyn Padarn will not adversely affect the quality of the water within the lake or the Natura 2000 sites into which it flows. There will be no LSEs on Natura 2000 sites associated with water quality during construction, operation or decommissioning.</p>
Temperature changes	<p>No residual effects. The hydrological links between the Development and Natura 2000 sites within 30km are flowing in a direction that would take the input away from the Natura 2000 site; or are at a distance where dispersal and dilution of the input would prevent it reaching the Natura 2000 site. A low-friction system will be used to minimise the effect of any warming. Water temperature will vary diurnally or seasonally and will be moderated by the bathymetry of the reservoirs, the operation of the plant resulting in mixing, and the altitude of the quarries. Without a significant source of additional</p>

Table 4.4 Summary of Residual Effects of the Project

Effect	Summary of Residual Effects
	<p>heat, it is anticipated that the water held within the pumped storage Development will be controlled predominantly by natural factors. Water that will be discharged will be siphoned off from near to the surface where it is most likely to be acclimatised to the surrounding air temperature. In addition, under normal operations the main pathway for releasing stormwater runoff into the Development is via the Q6 spillway to Llyn Padarn. The Q1 relief overflow is unlikely to be used unless there is a failure of the pumping system, restriction on the discharge from Q6 to Llyn Padarn, or a large storm event which may cause the level in Q1 to increase by natural inflow. Under these circumstances flows in the Afon Gwyrfai are also likely to be higher offering increased dilution and dispersion of the Q1 spillway overflow waters.</p>
<p>Alternation of the Afon Gwyrfai SAC flow regime</p>	<p>No residual effects. The operational discharge from the spillway will be intermittent and unlikely to permanently alter the flow regime of the Afon Gwyrfai. There is no abstraction required from the Afon Gwyrfai SAC during construction or operation and therefore water flows will not be depleted as a result of the Development. There will be no LSEs on any other Natura 2000 sites associated with flow regimes during all phases of the Development.</p>
<p>Construction dust and vehicle movements</p>	<p>No residual effect. Dust generated will travel less than the distance to the nearest Natura 2000 site.</p>
<p>Change in aerial pollutant concentrations (NO₂) due to vehicle emissions</p>	<p>No residual effect. Concentrations will travel less than the distance to the nearest Natura 2000 site.</p>
<p>Vibration</p>	<p>No residual effect. Vibration will travel less distance than the nearest Natura 2000 site.</p>
<p>Direct habitat loss or fragmentation</p>	<p>No residual effect. There will be no construction or requirement to remove any habitat within any Natura 2000 sites.</p>
<p>Disturbance to species</p>	<p>No residual effect. The Development will not affect foraging, commuting or roosting bats from Glynllfion SAC due to the distance from the SAC and the retention of foraging, commuting and roosting habitats within the Order Limits during construction, operation and decommissioning. There</p>

Table 4.4 Summary of Residual Effects of the Project

Effect	Summary of Residual Effects
	will be no disturbance to species at any other Natura 2000 site.
Alteration to management	No residual effect. The Development will not cause the alteration of site management actions at any Natura 2000 sites.
Increase in lighting	No residual effect. Lighting levels onto the nearest Natura 2000 site will not measurably increase.

5 IN-COMBINATION EFFECTS

5.1 Introduction

5.1.1 The Conservation of Habitats and Species Regulations 2010 (as amended) state that, when considering whether a specific plan or project is likely to have a significant effect on a Natura 2000 Site, consideration should be given to the effect of the proposal in isolation and in-combination with other projects. Part of the HRA process is to identify the plans, programmes and projects that could have in-combination effects.

5.1.2 The PINS Advice Note Ten: *Habitat Regulations Assessment relevant to nationally significant infrastructure projects* (PINS, 2013) states that, in assessing in-combination effects, the following projects should be considered:

- Projects which have been given consent but which have not yet been implemented or completed;
- Projects for which applications for consent have been made; and
- Ongoing projects that are subject to periodic regulatory reviews.

5.1.3 It has been proposed that the new Wylfa C Nuclear Power Station and Bontnewydd Bypass will be assessed cumulatively for the purposes of the EIA, and only where there are shared receptors. This was outlined in the Scoping letter submitted on the 12th November 2014 (to which no comments were received from NRW on this approach) and within the Scoping Report. Within the EIA, the cumulative assessment will be limited to socio-economics and traffic and transportation routes. Due to the lack of Natura 2000 shared receptors and therefore the negligible potential for LSE, there will be no further assessment of in-combination effects.

6 CONCLUSION

6.1 Introduction

6.1.1 This section summarises the potential effects of the Development and considers whether the requirement for a HRA Stage Two AA is triggered. An AA is necessary when the HRA Screening concludes that a project will give rise to a LSE on a Natura 2000 site.

6.2 Potential Effects

6.2.1 There are no LSEs on Natura 2000 sites within 30km of the Development associated with the following potential effects. Therefore the AA - Stage Two of the HRA process is not required:

- Water pollution from surface runoff;
- Noise during construction;
- Spread of invasive species;
- Nutrient enrichment/eutrophication;
- Changes to water quality;
- Temperature changes;
- Alternation of the Afon Gwyrfa SAC flow regime;
- Construction dust and vehicle movements;
- Change in aerial pollutant concentrations (NO₂) due to vehicle emissions;
- Vibration;
- Direct habitat loss or fragmentation, and disturbance to species;
- Alteration to management; and,
- Increase in lighting.

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APPENDIX A: TABLES SHOWING THE ASSESSED NATURA 2000 SITES QUALIFYING FEATURES, CONSERVATION OBJECTIVES, SITE CONDITION AND THREATS TO SITE INTEGRITY

Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity	
Site Distance and Direction from the Development	1.6km south-west
Qualifying Features	<p>This site comprises Llyn Cwellyn in Snowdonia, the Afon Gwyrfai and its tributary the Afon Treweunydd. Llyn Cwellyn has long been recognised for its conservation importance and is an excellent example of a deep, low-nutrient lake, formed during the last Ice Age. It supports a range of typical water plants, including one of the best populations of the rare floating water plantain in the UK (NRW, 2014a).</p> <p>Annex I habitats that are a primary reason for selection of this site:</p> <p><u>Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea</u></p> <p>Llyn Cwellyn, north Wales, is an oligotrophic glacial lake (Type 3) representative of oligotrophic lakes found in the mountains of Snowdonia. It is a relatively large, deep lake, in contrast to Llyn Idwal, also in Snowdonia. Because of its depth the lake stratifies during the summer, with a thermocline developing at 10-15 m depth that has a marked effect upon the ecology of the site. Although the site has acidified since the late 19th century, water quality remains high and Llyn Cwellyn supports one of the few native Welsh populations of Arctic charr <i>Salvelinus alpinus</i> ('Torgoch' in Welsh). The macrophyte flora of Llyn Cwellyn is characterised by abundant shoreweed</p>

Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

alternate water-milfoil *Myriophyllum alterniflorum*. The rare awlwort *Subularia aquatica* is abundant in places and 1831 Floating water-plantain *Luronium natans* occurs at this site. Six-stamened waterwort *Elatine hexandra* has been recorded in shallow water off the north shore and bog pondweed *Potamogeton polygonifolius* occurs in stream inflows in the south.

Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation

The Gwyrfai is a good example of the small, steep rivers that occur in north-west Wales. It is dominated by base-poor rock and contains extensive beds of the most oligotrophic end of sub-type 3 of this habitat, dominated by stream water-crowfoot *Ranunculus penicillatus* ssp. *penicillatus*, intermediate water-starwort *Callitriche hamulata*, aquatic mosses *Fontinalis* spp. and bulbous rush *Juncus bulbosus*. The conservation value of the site is enhanced by the presence of good adjacent river corridor habitat, and by the presence of Llyn Cwellyn, a good example of a Littorella – Lobelia – Isoetes oligotrophic lake.

Annex II species that are a primary reason for selection of this site

Atlantic salmon (*Salmo salar*)

The Afon Gwyrfai in north-west Wales is representative of the small montane rivers in this region. It contains a largely unexploited salmon population with a characteristically late run. Environment Agency electrofishing data indicates the presence of healthy juvenile populations downstream of Llyn Cwellyn.

Floating water-plantain (*Luronium natans*)

Llyn Cwellyn and its outflow, the Afon Gwyrfai, support one of the largest and most diverse populations of floating water-plantain *Luronium natans* anywhere in Britain. There are extensive submerged, vegetative beds of this species in the clear, oligotrophic waters of the lake and (generally) several small flowering colonies around its edge whilst, downstream from the lake, *L. natans* occupies a highly unusual – and vulnerable – habitat along several hundred metres of slow-moving river. The diversity of growth forms and their range across the Cwellyn-Gwyrfai makes this an internationally significant site for the species.

Annex II species present as a qualifying feature, but not a primary reason for site selection

Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • Otter (<i>Lutra lutra</i>) <p>(JNCC, 2014a)</p>
<p>Conservation Objectives</p>	<p>Conservation Objective for the water course:</p> <p>The ecological status of the water course is a major determinant of FCS for all features. The required conservation objective for the water course is defined below.</p> <ul style="list-style-type: none"> • The capacity of the habitats in the SAC to support each feature at near-natural population levels, as determined by predominantly unmodified ecological and hydromorphological processes and characteristics, should be maintained as far as possible, or restored where necessary. • The ecological status of the water environment should be sufficient to maintain a stable or increasing population of each feature. This will include elements of water quantity and quality, physical habitat and community composition and structure. It is anticipated that these limits will concur with the relevant standards agreed between CCW and the Environment Agency through the Review of Consents process. • Flow regime, water quality and physical habitat should be maintained in, or restored as far as possible to, a near-natural state, in order to support the coherence of ecosystem structure and function across the whole area of the SAC. • All known breeding, spawning and nursery sites of species features should be maintained as suitable habitat as far as possible, except where natural processes cause them to change.

Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Flows, water quality, substrate quality and quantity at fish spawning sites and nursery areas will not be depleted by abstraction, discharges, engineering or gravel extraction activities or other impacts to the extent that these sites are damaged or destroyed.
- The river plan-form and profile should be predominantly unmodified. Physical modifications having an adverse effect on the integrity of the SAC, including, but not limited to, revetments on active alluvial river banks using stone, concrete or waste materials, unsustainable extraction of gravel, addition or release of excessive quantities of fine sediment, will be avoided.
- River habitat SSSI features should be in favourable condition.
- Artificial factors impacting on the capability of each species feature to occupy the full extent of its natural range should be modified where necessary to allow passage, e.g. weirs, bridge sills, acoustic barriers.
- Natural factors such as waterfalls, which may limit the natural range of a species feature or dispersal between naturally isolated populations, should not be modified.
- Flows during the normal migration periods of each migratory fish species feature will not be depleted by abstraction to the extent that passage upstream to spawning sites is hindered.
- Levels of nutrients, in particular phosphate, will be agreed between the EA and CCW in the Water Framework Directive water body in the Afon Gwyrfai a Llyn Cwellyn SAC, and measures

Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>taken to maintain nutrients below these levels. It is anticipated that these limits will concur with the standards to be agreed between CCW and Environment Agency Wales used by the Review of Consents process.</p> <ul style="list-style-type: none"> • Levels of water quality parameters that are known to affect the distribution and abundance of SAC features will be agreed between NRW for the Water Framework Directive water bodies in the Afon Gwyrfai a Llyn Cwellyn SAC and measures taken to maintain pollution below these levels. It is anticipated that these limits will concur with the standards to be agreed between CCW and Environment Agency Wales used by the Review of Consents process. • Potential sources of pollution not addressed in the Review of Consents, such as contaminated land, forestry operations and improvement of riparian habitat, will be considered in assessing plans and projects. • Levels of suspended solids will be agreed between EA and CCW for the Water Framework Directive water body in the Afon Gwyrfai a Llyn Cwellyn SAC. Measures including, but not limited to, the control of suspended sediment generated by agriculture, forestry and engineering works, will be taken to maintain suspended solids below these levels. <p>Conservation Objective for Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and /or of the <i>Isoteo-Nanojuncetea</i></p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the
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Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>following conditions are satisfied:</p> <ul style="list-style-type: none"> • Water quality of the lake is within parameters which are suitable to support the characteristic flora and fauna. • The lake shows a characteristic vegetation zonation from the shore to the deeper water. • The lake has a macrophyte flora which includes many of the characteristic species including <i>Littorella uniflora</i>, <i>Lobelia dortmanna</i>, <i>Isoetes lacustris</i>, <i>Luronium natans</i> and <i>Subularia aquatica</i>, together with a diverse range of associates including <i>Myriophyllum alterniflorum</i>, <i>Callitriche hamulata</i>, <i>Nitella flexilis</i> and <i>Potamogeton berchtoldii</i>. <i>Nitella gracilis</i> and <i>Luronium natans</i> to be present as characteristic plants. <p>Conservation Objectives for Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation</p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • The conservation objective for the water course as defined above must be met. • The extent of this feature within its potential range in this SAC should be stable or increasing. • The extent of the sub-communities that are represented within this feature should be stable or increasing.
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Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The conservation status of the feature’s typical species should be favourable.
- All known, controllable factors, affecting the achievement of these conditions are under control (many factors may be unknown or beyond human control).

Conservation Objective for Atlantic salmon *Salmo salar*

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
- The conservation objective for the water course as defined above must be met.
- The population of the feature in the SAC is stable or increasing over the long term.
- The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches where predominantly suitable habitat for each life stage exists over the long term. Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms e.g. suitable flows to allow upstream migration, depth of water and substrate type at spawning sites, and ecosystem structure and functions. Suitable habitat need not be present throughout the SAC but where present must be secured for the foreseeable future. Natural factors such as waterfalls may limit the natural range of individual species. Existing artificial influences on natural range that cause an adverse effect on site integrity, such as physical barriers to migration, will be

Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>assessed.</p> <ul style="list-style-type: none"> • The Gwyrfai will continue to be a sufficiently large habitat to maintain the feature’s population in the SAC on a long-term basis. <p>Conservation Objective for Floating water-plantain <i>Luronium natans</i></p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in favourable conservation status, where all of the following conditions are satisfied: • The conservation objective for the water course as defined above must be met. • Llyn Cwellyn will continue to support a peripheral floating water-plantain assemblage, as well as a deeper water assemblage, with a characteristic zonation of vegetation from the shore at two areas of the lake. • Floating water-plantain will continue to flourish in the Afon Gwyrfai and will continue to occur in every selected section • All factors affecting the achievement of these conditions are under control. <p>Conservation Objective for European otter <i>Lutra lutra</i></p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The population of otters in the SAC is stable or increasing over the long term and reflects the
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Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>natural carrying capacity of the habitat within the SAC, as determined by natural levels of prey abundance and associated territorial behaviour.</p> <ul style="list-style-type: none"> • The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches that are potentially suitable to form part of a breeding territory and/or provide routes between breeding territories. The size of breeding territories may vary depending on prey abundance. • The population size should not be limited by the availability of suitable undisturbed breeding sites. Where these are insufficient they should be created through habitat enhancement and where necessary the provision of artificial holts. No otter breeding site is subject to a level of disturbance that could have an adverse effect on breeding success. Where necessary, potentially harmful levels of disturbance are managed. • The safe movement and dispersal of individuals around the SAC is facilitated by the provision, where necessary, of suitable riparian habitat, and underpasses, ledges, fencing etc. at road bridges and other artificial barriers. • All factors affecting the achievement of these conditions are under control. <p>(NRW, 2014a).</p>	
<p>Current Condition</p>	<p>Site and</p>	<p>The Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and /or of the <i>Isoteo-Nanojuncetea</i> feature is considered to be in Unfavourable Recovering condition. This is due to an historic</p>

Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Threats to Site Integrity	<p>moderate acidification of Llyn Cwellyn since the 1860's. This trend in acidification may be reverting, but patterns need to be monitored. Some concerns over localised nutrient enrichment, sedimentation and from continued water abstraction, Burgess et al. (2006).</p> <p>The Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation feature is considered to be in Favourable condition.</p> <p>The Atlantic salmon <i>Salmo salar</i> feature is considered to be in Unfavourable condition. The current unfavourable status results from a precautionary assessment of feature distribution and abundance, in particular the results of salmon catches and juvenile surveys, and from the presence of adverse factors, in particular flow depletion.</p> <p>The Floating water-plantain <i>Luronium natans</i> feature is considered to be in Favourable condition.</p> <p>The European otter <i>Lutra lutra</i> feature is considered to be Unfavourable. The number and distribution of actual and/or potential breeding sites are too few and they are insufficiently spread throughout the SAC.</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Acidification; • Sedimentation; • Nutrient enrichment; • Abstraction; • Discharges; • Pollution; • Runoff;
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Table 8.1: Afon Gwyrfai a Llyn Cwellyn SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none">• Invasive non-native species;• Artificial barriers;• Entrainment in water abstractions; and,• Stocking. <p>(NRW, 2014a).</p>
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

<p>Site Distance and Direction from the Development</p>	<p>2.2km east</p>
<p>Qualifying Features</p>	<p>The varied geology of the highest mountains in Wales, running from Beddgelert to Llanfairfechan support montane habitats and species of international importance. It is especially important for arctic alpine plants, though often restricted to crags and ledges away from grazing animals. Other important features include tundra-like montane heaths, cliff ledges with tall herbaceous communities and rocky crevice vegetation with their rare plants. Also notable at this site are wetlands such as blanket bogs, mires, lakes, springs and wet heaths. These habitats support numerous rare plants, upland bird populations such as raven and ring ouzel and mountain invertebrates, with many northern species at the southern limit of their range.</p> <p>Annex I habitats that are a primary reason for selection of this site:</p> <p><u>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i></u></p> <p>Llyn Idwal, in the mountains of Snowdonia, represents oligotrophic waters (Type 3) in north Wales. It is a relatively small, shallow, upland corrie, in contrast to Llyn Cwellyn, also in Snowdonia, and complete ice cover has been recorded in winter. No overall change in the lake’s water chemistry has been found since the mid-19th century, and the water quality is considered to be high. The site has a good representation of typical plant species, including quillwort <i>Isoetes lacustris</i>, water lobelia <i>Lobelia dortmanna</i>, shoreweed <i>Littorella uniflora</i>, bulbous rush <i>Juncus bulbosus</i>, alternate water-milfoil <i>Myriophyllum alterniflorum</i> and intermediate water-starwort <i>Callitriche hamulata</i>. Bog pondweed <i>Potamogeton polygonifolius</i> has been recorded from stream inlets, and pillwort <i>Pilularia globulifera</i> is reported from this site. Emergent and floating vegetation is mainly confined to the shallow sub-basin at the south end of the site, where floating bur-reed <i>Sparganium angustifolium</i> forms extensive mats, alongside stands of common reed <i>Phragmites australis</i>, water horsetail <i>Equisetum fluviatile</i> and bottle sedge <i>Carex rostrata</i>.</p> <p><u>Siliceous alpine and boreal grasslands</u></p> <p>Snowdonia has the best-developed and most extensive areas of Siliceous alpine and boreal grasslands in Wales</p>

Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

and is the largest example of the habitat type south of Scotland. The principal sub-type present is U10 *Carex bigelowii* – *Racomitrium lanuginosum* moss-heath, but there are also fragments of U7 *Nardus stricta* – *Carex bigelowii* grass-heath. This site is representative of the more impoverished southern variants of the habitat type.

Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

Snowdonia is the most southerly site selected and contains the most extensive and diverse examples of hydrophilous tall herb fringe communities in Wales. Fragmentary stands of the habitat type occur on pumice tuff and other base-enriched igneous rocks at a range of altitudes throughout the site. The vegetation is floristically somewhat impoverished compared with Scottish examples but includes many of the species found further north, such as globe-flower *Trollius europaeus*, wild angelica *Angelica sylvestris* and holly-fern *Polystichum lonchitis*. It is important as a southern outlier for arctic-alpines such as alpine saw-wort *Saussurea alpina* and black alpine-sedge *Carex atrata*. There are also some southern species, which are absent further north, for example Welsh poppy *Meconopsis cambrica*.

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)

Snowdonia is the largest site in Wales representative of siliceous scree. The site has extensive screes of igneous rocks with large stands of U21 *Cryptogramma crispa* – *Deschampsia flexuosa* vegetation; associated species include fir clubmoss *Huperzia selago*. Bryophyte and lichen-dominated screes are also well-represented and include important populations of rare and local montane and oceanic species, such as *Marsupella adusta*, *Marsupella stableri* and *Cornicularia narmoerica*.

Calcareous rocky slopes with chasmophytic vegetation

Snowdonia is representative of Calcareous rocky slopes with chasmophytic vegetation at one of its most southerly outposts in the UK, and contains the most extensive and diverse examples of these communities in Wales. Crevices in base-rich igneous rocks support a characteristic assemblage of plants, with a large number of arctic-alpine species. These include a number of nationally rare species, such as alpine saxifrage *Saxifraga nivalis*, tufted saxifrage *S. cespitosa*, alpine meadow-grass *Poa alpina* and alpine woodsia *Woodsia alpina*. A species of particular interest is the Snowdon lily *Lloydia serotina*, which in the UK occurs only in Snowdonia, in rock cracks and crevices on calcareous and more siliceous substrates, and is here at its northern limit in western

Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>Europe.</p> <p><u>Siliceous rocky slopes with chasmophytic vegetation</u></p> <p>Snowdonia, north Wales, is representative of Siliceous rocky slopes with chasmophytic vegetation at the southern edge of the range of the habitat type. Acidic crevice communities occur throughout the site on igneous outcrops and include populations of stiff sedge <i>Carex bigelowii</i>, fir clubmoss <i>Huperzia selago</i> and forked spleenwort <i>Asplenium septentrionale</i>. Atlantic species, including Wilson’s filmy-fern <i>Hymenophyllum wilsonii</i> and a wide range of bryophytes, are also well-represented.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site</p> <ul style="list-style-type: none"> • Northern Atlantic wet heaths with <i>Erica tetralix</i> • European dry heaths • Alpine and Boreal heaths • Alpine and subalpine calcareous grasslands • Species-rich <i>Nardus</i> grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) * Priority feature • Blanket bogs (* if active bog) * Priority feature • Depressions on peat substrates of the <i>Rhynchosporion</i> • Petrifying springs with tufa formation (<i>Cratoneurion</i>) * Priority feature
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • Alkaline fens • Alpine pioneer formations of the <i>Caricion bicoloris-atrofuscae</i> * Priority feature • Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles <p>Annex II species that are a primary reason for selection of this site</p> <p><u>Slender green feather-moss <i>Drepanocladus (Hamatocaulis) vernicosus</i></u></p> <p>This is an upland site in north Wales for Slender green feather-moss <i>Drepanocladus vernicosus</i>, which has been recorded in flushes up to an altitude of 450 m.</p> <p><u>Floating water-plantain <i>Luronium natans</i></u></p> <p>Snowdonia in north Wales is an example of a montane lake habitat supporting floating water-plantain <i>Luronium natans</i>. Records date back to the 18th century, indicating that habitat conditions are particularly favourable for this species.</p> <p>(JNCC, 2014b)</p>
<p>Conservation Objectives</p>	<p>Conservation Objectives for Siliceous alpine and boreal grasslands</p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • The high summits of the Carneddau (Carnedd Dafydd, Pen yr Ole Wen, Carnedd Llewelyn, Garnedd Uchaf, Yr Aryg, Foel Grach, Llwytmor, Drosogl, Foel Fras, Pen Llythrig y Wrach and Pen yr Helgi Ddu) the Glyderau (Y Garn, Glyder Fach, Glyder Fawr, Elidir Fach, Carnedd y Ffiliast and Mynydd Perfedd), should each support summit heath vegetation which does not show signs

Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>of heavy modification by grazing and/or heavy trampling.</p> <ul style="list-style-type: none"> • There should be no further loss of summit heath on Yr Wyddfa. The extent of the habitat at Crib y Ddysgl and Garnedd Uchaf should be retained as an absolute minimum and there should be no loss of quality. • The vegetation should be dominated by species typical of species of summit heath such as <i>Racomitrium lanuginosum</i> (woolly hair moss), <i>Carex bigelowii</i> (stiff sedge), shrubs dwarfed by the high altitude conditions such as <i>Vaccinium myrtillus</i> (bilberry) and <i>Salix herbacea</i>, lichens and montane bryophytes. • Grasses should not comprise a significant proportion of the vegetation. • The habitat should grade into montane heath at its lower level. • All factors affecting the achievement of these conditions are under control. <p>Conservation Objectives for Alpine and Boreal Heaths</p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • Alpine and Boreal heath habitat should cover considerable areas of the Eryri SAC at high altitudes i.e. from about 600m upwards, though it may extend below this in particularly exposed
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>areas.</p> <ul style="list-style-type: none"> • It should grade into summit heath on the high summits and ridges, and into dry heath at its lower end. • This vegetation should be dominated by dwarf shrubs, typically stunted by the high altitude conditions, such as cowberry (<i>Vaccinium vitis idea</i>), bilberry (<i>Vaccinium myrtillus</i>) and mountain crowberry (<i>Empetrum hermaphroditum</i>), prostrate ling (<i>Calluna vulgaris</i>) and in some stands dwarf juniper (<i>Juniperus communis ssp. nana</i>). Other montane species such as wooley hair moss (<i>Racomitrium lanuginosum</i>) and other montane bryophytes and lichens should be present. • Although some grasses, particularly sheep's fescue, will be present, they should not be at high cover. • In the long term we expect existing habitat to be retained and to improve in quality in its current locations, and also to expand into other suitable localities where the habitat now exists in a degraded state. • All factors affecting the achievement of these conditions are under control. • <p>Conservation Objective for Hydrophilous tall herb communities of plains and of the montane to alpine levels</p>
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
- The area of tall herb ledge must be stable, or increasing in the long term. There will be no loss of tall herb ledge vegetation and the feature will occur in all management units in which it currently occurs.
- Tall herb ledge vegetation will develop on ledges and on damp calcareous grassland below cliffs where the potential exists but expansion is currently prevented by grazing.
- Tall herb vegetation will consist of a number of flowering plant species such as Lady's mantle *Alchemilla* spp., Meadowsweet *Filipendula vulgaris*, Globeflower *Trollius europaeus*, Welsh poppy *Meconopsis cambrica*, Devilsbit scabious *Succisa pratensis*, Ox-eye daisy *Leucanthemum vulgare*, Wild Angelica *Angelica sylvestris*, Roseroot *Sedum rosea*, Lesser meadow rue *Thalictrum minus* and Common valerian *Valeriana officinalis*.
- The flowering plants will be ungrazed and able to mature and set seed freely.

Conservation Objectives for Calcareous rocky slopes with chasmophytic vegetation

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The feature must be stable or increasing in the long term. There will be no loss of calcareous

Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>chasmophytic vegetation and it will continue to occur in all of management units in which it currently occurs.</p> <ul style="list-style-type: none"> • The feature must continue to support a range of arctic alpine plant populations. • The plants will be ungrazed and able to mature and set seed freely, or non-flowering plants reproduce by propagules or vegetative means. • The feature will not be inhibited by invasive non-native plant species. <p>Conservation Objectives for Alpine and subalpine calcareous grasslands</p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • This habitat should remain in its current locations although there may be some shifts in its extent. • The feature should continue to support the characteristic plants including arctic alpine plant species. • The only acceptable losses of this habitat should be due to succession to other valuable montane communities such as tall herb ledge vegetation. <p>Conservation Objectives for Siliceous rocky slopes with chasmophytic vegetation</p>
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
- This habitat should support a range of bryophytes and ferns in suitable crevices on acid rocks.
- The feature should not be damaged by grazing.
- It should be widespread on suitable moist acidic rock crevices on each massif.

Conservation Objectives for Siliceous scree of the montane to snow levels

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The naturally mobile scree on each massif will have open vegetation on or among the boulders, with *Cryptogramma crispa*, *Deschampsia flexuosa*, *Festuca ovina*, *Galium saxatile*, *Huperzia selago* and an extensive and varied bryophyte flora.
- There will not be excessive disturbance to the as a result of human or animal activity.

Conservation Objectives for Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Each of the lakes has a macrophyte flora which includes some of the characteristic species such as *Littorella uniflora*, *Lobelia dortmanna*, *Isoetes lacustris*, *Myriophorum alterniflorum*, *Juncus bulbosus*, *Potamogeton* species and *Subularia aquatica*
- The lakes which have not been dammed for use as reservoirs retain a natural profile.
- All of the lakes show a characteristic vegetation zonation from the shore to the deeper water.
- Water quality of each lake is within parameters which are suitable to support the characteristic flora and fauna.

Conservation Objectives for North Atlantic wet heaths with *Erica tetralix*

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
- The feature must be stable or increasing in the long term.
- The habitat will typically comprise *Erica tetralix* and *Calluna vulgaris* and mosses on a wet peaty substrate with a range of small flowering plants such as bog asphodel *Narthecium ossifragum*, milkwort *Polygala serpyllifolia*, Common butterwort *Pinguicula vulgaris*, small sedges and round leaved sundew *Drosera rotundifolia*.

Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>Conservation Objectives for European dry heath</p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The feature must be stable or increasing in the long term. • The habitat will be dominated by at least two dwarf shrub species, usually heather <i>Calluna vulgaris</i> and bilberry <i>Vaccinium myrtillus</i>, but sometimes western gorse <i>Ulex gallii</i> or crowberry <i>Empetrum nigrum</i> may be prominent. • There will be a mixed age range of heath at an appropriate scale which includes stands of young vigorous dwarf shrubs, mature stands where the heather is becoming senescent, and all age ranges in between. • The heath shrubs will not exhibit forms characteristic of overgrazing. • There will be no signs of frequent burning nor reversion to grassland. • All factors affecting the achievement of these conditions are under control. <p>Conservation Objectives for Blanket bog</p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The extent of this habitat should be of the order of 1342 ha (as notified on the N2K data form). This figure however includes a considerable amount of degraded blanket bog. At present it is unknown how much of this is capable of restoration to good quality blanket bog habitat.
- The good quality blanket bog will support typical species e.g. oligotrophic Sphagnum spp., cotton grass Eriophorum spp, ling Calluna vulgaris, bell heather Erica cinerea, crowberry Empetrum nigrum, cow berry Vaccinium vitis-idaea, and cranberry Vaccinium oxycoccus.
- The intact habitat will not show any signs of degradation as a result of overgrazing, drainage, or burning, such as depletion of dwarf shrubs and sphagna with increased grass cover.
- The degraded habitat will not show any recent signs of further degradation as a result of overgrazing, drainage or burning.
- All factors affecting the achievement of these conditions are under control.

Conservation Objectives for Depressions on peat substrates of the Rhynchosporion

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
- The extent has not been fully measured because the nature of the habitat is small scale and patchy within mosaics of blanket bog and wet heath. However the extent should be at least that

Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>which has been mapped.</p> <ul style="list-style-type: none"> • The habitat, characterised by white beak sedge <i>Rhynchospora alba</i> will support a range of plant species such as bog pimpernel <i>Anagallis tenella</i>, ling <i>Calluna vulgaris</i>, round leaved sundew <i>Drosera rotundifolia</i>, cross-leaved heath <i>Erica tetralix</i>, cottongrass <i>Eriophorum angustifolium</i>, marsh St John’s wort <i>Hypericum elodes</i>, purple moor grass <i>Molinia caerulea</i>, bog asphodel <i>Narthecium ossifragum</i>, bog pondweed <i>Potamogeton polygonifolius</i>, <i>Sphagnum</i> spp., and short sedges. • There will be no signs of excessive grazing which would result in large areas of bare peat and possibly significant cover of rushes <i>Juncus</i> spp. • Drainage or burning would damage this habitat and neither activity should be consented where this habitat could potentially be affected. • At Cwmffynnon and other small areas in the Glyderau, the habitat supports the uncommon species, marsh clubmoss <i>Lycopodiella inundata</i>. Here we would expect to see frequent small patches of bare peat which support the species. Many of these areas may be caused by vigorous flushing of water rather than by grazing animals. <p>Conservation Objectives for Species-rich <i>Nardus</i> grassland on siliceous substrates in mountain areas</p>
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The extent will be at least 10 hectares of the habitat to include 5 ha on the slopes above Llyn Llydaw. • The grassland will support a range of plant species such as Harebell <i>Campanula rotundifolia</i>, Eyebright <i>Euphrasia</i> spp. Devilsbit scabious <i>Succisa pratensis</i>, Wild thyme <i>Thymus polytrichus</i>, Heath speedwell <i>Veronica officinalis</i>, Spring sedge <i>Carex caryophyllea</i>, Flea sedge <i>Carex pulicaris</i>, Carnation sedge <i>Carex panicea</i>, Lady’s mantle <i>Alchemilla glabr.</i> • There will not be any significant cover of invasive species. New Zealand willowherb, <i>Epilobium brunnescens</i> is a long established alien plant on the site and is accepted at present as it doesn’t appear to adversely affect the feature. (At present CCW has no knowledge of any means of reducing or eliminating it). <p>Conservation Objectives for Old sessile oakwoods with <i>Ilex</i> and <i>Blechnum</i></p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The extent is increasing.
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • The woodland comprises locally native canopy forming trees including: <i>Quercus petraea</i>, <i>Betula pubescens</i>, <i>B. pendula</i>, <i>Fraxinus excelsior</i> and <i>Sorbus aucuparia</i>. • There is a mixed age structure within the woodland. • Regeneration is occurring and sufficient seedlings can grow on to saplings and ultimately canopy trees. • There are no significant alien species. <p>Conservation Objectives for Petrifying springs with tufa formation (<i>Cratoneuron</i>)</p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • This feature on Eryri does not form tufa but should display a dominant cover of mosses such as <i>Cratoneuron communitum</i>, <i>Philonotis fontana</i> and <i>Bryum pseudotriquetrum</i> with frequent characteristic forbs such as <i>Montia fontana</i>, <i>Chrysosplenium oppositifolium</i> and <i>Saxifraga stellaris</i>. • There are no significant increases in grass or rush cover • The extent of the spring vegetation is largely dictated by natural factors, chiefly hydrology. Reductions in extent could occur in response to trampling, and encroachment by rush and grass
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>species due to nutrient enrichment.</p> <p>Conservation Objectives for Alkaline fens</p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The habitat consists of flushes, influenced by some base-enrichment, where brown mosses (such as <i>Scorpidium scorpioides</i>, <i>Cratoneuron commutatum</i> and <i>Drepanocladus revolvens</i>) are present. Small sedge species such as <i>Carex viridula</i>, <i>C. panicea</i>, <i>C. dioica</i>, <i>C. pulicaris</i> and <i>Eriophorum</i> spp will be present and usually also <i>Pinguicula vulgaris</i>. <p>Conservation Objectives for Alpine pioneer formations of the <i>Caricion bicolorisatrofuscae</i></p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The feature consists of base rich flushes at high altitude which are flushed continuously with cold water. • This habitat should have a high bryophyte cover and support arctic alpines such as <i>Saxifraga oppositifolia</i>, <i>S. stellaris</i> and <i>Thalictrum alpinum</i>. <i>Juncus triglumis</i> should be present and sedges
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>such as <i>Carex viridula</i>.</p> <ul style="list-style-type: none"> • There should be no non-native species. • The flowering plants should be able to flower and set seed unhindered by grazing. <p>Conservation Objectives for Floating water plantain <i>Luronium natans</i></p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • <i>Luronium natans</i> occurs in Llyn Cwmffynnon as a minimum <p>Conservation Objectives for Slender green feather-moss <i>Drepanocladus (Hamatocaulis) vernicosus</i></p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The moss is present at Cwm Afon Llafar Flush A and Flush B. • The associated vegetation should be dominated by rushes and sedges, with <20% rush cover. • There should be less than 10% disturbed bare ground within the flushes.
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	(CCW, 2008a)
<p>Current Condition Threats to Site Integrity</p>	<p>The Siliceous alpine and boreal grasslands feature is considered to be in Unfavourable Declining condition. Dwarf shrubs are very low in cover, <i>Racomitrium</i> has declined and grass cover is too high. Restoration of this habitat is a very long term objective.</p> <p>The Alpine and Boreal Heaths feature is considered to be in Unfavourable condition. It is possibly declining in some areas and recovering in others.</p> <p>The Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels feature is considered to be in Unfavourable condition because many of the ledges are being grazed by sheep and feral goats.</p> <p>The Calcareous rocky slopes with chasmophytic vegetation feature is considered to be in Unfavourable condition because some of it is grazed and also because a non-native species is present.</p> <p>The Alpine and subalpine calcareous grasslands feature is considered to be in Unfavourable condition because of the cover of <i>Epilobium brunnescens</i> and flowering plants which were insufficient to pass the threshold.</p> <p>The Siliceous rocky slopes with chasmophytic vegetation feature is considered to be in Unfavourable/Unclassified condition due to the poor definition of this habitat type in the NVC or Annex 1 habitats.</p> <p>The Siliceous scree of the montane to snow levels feature is considered to be in Unfavourable condition because of excessive disturbance by sheep, goats and humans.</p> <p>The Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i> feature is considered to be in Unfavourable/Recovering condition.</p> <p>The North Atlantic wet heaths with <i>Erica tetralix</i> feature is considered to be in Unfavourable condition.</p> <p>The European Dry Heath feature is considered to be in Unfavourable condition due to overgrazing causing change in structure and composition.</p> <p>The Blanket Bog feature is considered to be in Unfavourable condition since much of the habitat has been subjected to past drainage, overgrazing and burning.</p>

Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>The Depressions on peat substrates of the Rhynchosporion feature is considered to be in Favourable/Maintained condition.</p> <p>The Species-rich Nardus grassland on siliceous substrates in mountain areas feature is considered to be in Unfavourable condition due to overgrazing.</p> <p>The Old sessile oakwoods with Ilex and Blechnum feature is considered to be in Unfavourable Recovering condition.</p> <p>The Petrifying springs with tufa formation feature is considered to be in Unfavourable/Declining condition.</p> <p>The Alkaline fens feature is considered to be in Favourable/ Maintained condition.</p> <p>The Alpine pioneer formations of the Caricion bicolorisatrofuscae feature is considered to be in Unfavourable/ Declining condition.</p> <p>The Floating water plantain <i>Luronium natans</i> feature has not been fully assessed due to it being difficult to located in deep water.</p> <p>The Slender green feathermoss <i>Drepanocladus (Hamatocaulis) vernicosus</i> feature is considered to be in Favourable/ Maintained condition.</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Overgrazing; • Manuring by livestock; • Atmospheric nitrogen deposition; • Human trampling; • Burning;
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Table 8.2 Eryri / Snowdonia SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • Non-native species; and, • Drainage. <p>(CCW, 2008a).</p>
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Table 8.3: Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	7km north-west
Qualifying Features	<p>The Menai Strait separates Anglesey from mainland Wales. The powerful tidal currents and low wave energy in the Strait creates a very unusual marine environment. The intertidal mudflats and sandflats include Traeth Lafan, the shores of the Menai Strait, and the Foryd estuary. Traeth Lafan (which is also a Special Protection Area in its own right for its birds) comprises extensive mud and sandflats that experience a broad range of wave exposure. Elsewhere there are subtidal sandbanks which are exposed to varying degrees of tidal currents. The reefs include the tidal rapids of the Menai Strait, and limestone reefs along the south-east Anglesey coast, around Puffin Island and the Great and Little Ormes. The reef communities vary greatly depending on the rock type, topography and exposure to waves and tidal streams.</p> <p>Annex I habitats that are a primary reason for selection of this site:</p> <p><u>Sandbanks which are slightly covered by sea water all the time</u></p> <p>Menai Strait and Conwy Bay between mainland Wales and Anglesey includes the Four Fathom Banks complex, which is a relatively rare type of subtidal sandbank in Wales, in that it is comparatively large, and is fairly sheltered from wave action but situated in an area of open coast. The sandbanks vary from stable muddy sands in areas that experience weak tidal streams to relatively clean well-sorted and rippled sand in the outer area of the bank</p>

Table 8.3: Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

where tidal streams are stronger. In very shallow waters, particularly in the inner shore areas, relatively species-rich sandy communities are dominated by polychaetes such as *Spio filicornis*. In some years when numbers of bivalves are high, internationally important flocks of common scoter *Melanitta nigra* have been observed to congregate in the area of the Four Fathom Banks complex to feed.

Mudflats and sandflats not covered by seawater at low tide

The intertidal mudflats and sandflats of the Menai Strait and Conwy Bay on the north Wales coast include Traeth Lafan, the shores of the Menai Strait, and the Foryd estuary. Traeth Lafan is an example of an almost fully marine extensive mud and sandflat that experiences a broad range of wave exposure, providing a range of sediment types with typical associated communities. For example, the shrimps *Haustorius arenarius* and *Bathyporeia sarsi* are found in mobile clean sand, whilst bivalves such as the cockle *Cerastoderma edule*, the gaper *Mya arenaria* and Baltic tellin *Macoma balthica* are common in more sheltered fine and muddy sand. The sand-mason worm *Lanice conchilega* is found in more tide-swept areas. The mixed sediment shores between Beaumaris and Lleiniog are highly productive shores that are rich in animal and plant species. These shores include a nationally important biotope that is rare in the UK. The nationally scarce dwarf eelgrass *Zostera noltei* is also found at this site.

Reefs

The reefs of the Menai Strait and Conwy Bay between mainland Wales and Anglesey include the tidal rapids of the Menai Strait, and limestone reefs along the south-east Anglesey coast and around Puffin Island and the Great and Little Ormes. The environmental conditions of the Menai Strait are unusual. The water is relatively turbid, containing a relatively high level of suspended material, and although the area is largely sheltered from wave action tidal streams are strong, reaching up to 8 knots (4 m s⁻¹) in places during spring tides. As a result, the rocky reefs of the Strait are dominated by a diverse and unusual mixture of animals that feed mainly by filtering their food from the seawater. For example, colonies of sponges, such as the breadcrumb sponge *Halichondria panicea*, grow to unusually large sizes, with single colonies covering areas of over 1 m². The limestone reefs are home to several species that bore into rock, and some limestone specialists are restricted to this relatively rare habitat. Species include the rock-boring sponge *Cliona celata*, piddocks *Hiatella arctica*, polychaete worms

Table 8.3: Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p><i>Polydora</i> sp., and acorn worms <i>Phoronis hippocrepia</i>.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <ul style="list-style-type: none"> • Large shallow inlets and bays; and, • Submerged or partially submerged sea caves. • (JNCC, 2014c)
<p>Conservation Objectives</p>	<p>Conservation objective for Sandbanks which are slightly covered by sea water all the time</p> <p>The large shallow bay feature should continue to comprise a variety of sediment and hard substrate habitats and their associated biological communities, subject to a wide range of physical conditions, from the wave-sheltered, tide-swept conditions at the eastern end of the Menai Strait through to the more open coast, wave-exposed conditions in Conwy Bay. The subtidal sediments within the embayment should comprise a dynamic mosaic of sediment types, with associated communities which may display considerable temporal and spatial variation, influenced by prevailing physical conditions.</p> <p>Areas of enriched muddy sand in Red Wharf Bay and Conwy Bay are expected to persist, whilst the large shallow bay is expected to continue to be an important feeding and breeding area for a variety of fish species. Certain habitats and communities within the large shallow bay (many of which are part of other habitat features) are expected to improve in quality and become more diverse under appropriate management. Other areas will be expected to either maintain their condition or improve.</p> <p>Conservation objective for Mudflats and sandflats not covered by seawater at low tide</p> <p>The intertidal mudflats and sandflats feature should continue to comprise an array of sediment habitats and their associated biological communities, ranging from wave-exposed sands, through to sheltered muds and tide-swept muddy gravels. In many areas, such as at Traeth Lafan and around the mouth of the Conwy Estuary, the feature will comprise a dynamic mosaic of sediment types, with associated communities, whilst other intertidal sediments, such as sheltered areas in the Menai Strait are expected to have more temporal and spatial stability. On the</p>

Table 8.3: Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>extreme lower shore in the western Menai Strait and Conwy Bay, dynamism is expected between the intertidal mudflat and sandflat and the subtidal sandbank features, depending on the prevailing physical conditions.</p> <p>Conservation objectives for Reefs</p> <p>The reef feature should continue to comprise a variety of habitats and their associated biological communities, occurring on hard substrate of different types throughout the site. Substrate types range from limestone and clay habitats, through to areas of tide-swept sublittoral hard substrata, including boulders and bedrock. Some areas of reef feature, such as intertidal boulder habitats are expected to improve in quality and become more diverse under appropriate management. Other areas will be expected to either maintain their condition or improve.</p> <p>Conservation objectives for Large shallow inlets and bays</p> <p>The large shallow bay feature should continue to comprise a variety of sediment and hard substrate habitats and their associated biological communities, subject to a wide range of physical conditions, from the wave-sheltered, tide-swept conditions at the eastern end of the Menai Strait through to the more open coast, wave-exposed conditions in Conwy Bay. The subtidal sediments within the embayment should comprise a dynamic mosaic of sediment types, with associated communities which may display considerable temporal and spatial variation, influenced by prevailing physical conditions. Areas of enriched muddy sand in Red Wharf Bay and Conwy Bay are expected to persist, whilst the large shallow bay is expected to continue to be an important feeding and breeding area for a variety of fish species. Certain habitats and communities within the large shallow bay (many of which are part of other habitat features) are expected to improve in quality and become more diverse under appropriate management. Other areas will be expected to either maintain their condition or improve.</p> <p>Conservation objective for Submerged or partially submerged sea caves</p> <p>The sea caves feature should continue to comprise intertidal and subtidal caves, clefts, crevices and tunnels in the limestone substrate around the Great and Little Ormes and the north-east coast of Anglesey.</p> <p>(CCW, 2009)</p>	
Current Condition	Site and	No Information on current condition of site.

Table 8.3: Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Threats to Site Integrity	<p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Dock, marina and harbour activities; • Civil engineering including coastal defences; • Waste disposal (domestic and industrial); • Exploitation of natural resources; • Exploitation of non living resources; • Aquaculture; • Pollution; • Recreation; and, • Military activity. • (CCW, 2009)
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Table 8.4: Glynllifon SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	7.5km south-west
Qualifying	Glynllifon SAC, southwest of Caernarfon in north-west Wales is of European importance for the large colony of

Table 8.4: Glynllifon SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

<p>Features</p>	<p>lesser horseshoe bats which are found at this site. There are three maternity roosts within the main site along with two hibernation roosts including old mine workings in the Nantlle Valley east of the main site. Areas of habitat essential for the foraging bats around these roosts include a tree lined stream, a large amount of woodland and a small area of hillside.</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p><u>Lesser horseshoe bat <i>Rhinolophus hipposideros</i></u></p> <p>This single site in north Wales is both a maternity and hibernation site for a large population of lesser horseshoe bat <i>Rhinolophus hipposideros</i>, comprising about 6% of the UK population.</p> <p>(JNCC 2014d)</p>
<p>Conservation Objectives</p>	<p>Conservation objectives for Lesser horseshoe bat <i>Rhinolophus hipposideros</i></p> <p>The natural range of lesser horseshoe bats will not be reduced, nor be likely to be reduced for the foreseeable future.</p> <p>There is, and will continue to be, sufficient habitat to maintain the lesser horseshoe bat population on a long-term basis.</p> <p>The three maternity roosts will continue to be occupied annually by lesser horseshoe bats and their babies</p> <ul style="list-style-type: none"> • Glynllifon Mansion (Unit 16). • Melin y Cim (Unit 32). • Pen y Bont (Unit 36). <p>There will be a sufficiently large area of suitable habitat surrounding these roosts to support the bat population, including continuous networks of sheltered, broadleaved and coniferous woodland, tree lines and hedgerows connecting the various types of roosts with areas of insect-rich grassland and open water.</p> <p>All factors affecting the achievement of these conditions are under control.</p>

Table 8.4: Glynllifon SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	(CCW,2008)
Current Condition Threats to Site Integrity	<p>The Lesser horseshoe bat <i>Rhinolophus hipposideros</i> feature is considered to be in Unfavourable condition.</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Site security; • Lighting; • Future development of surrounding areas; and • Absence of management agreement with land owners. • (CCW,2008)

Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	9.8km west
Qualifying Features	<p>This site in the southwest corner of Anglesey, includes the estuaries of the Afon Cefni, Afon Braint and the Afon Ffraw and lies adjacent to the sand dunes of Newborough and Aberffraw. It has extensive areas of ungrazed saltmarsh, with a good range of typical saltmarsh plants including sea aster and sea lavender. Large areas of glasswort occur on Malltraeth Sands in the Cefni estuary, which also has one of the largest stands of sea rush in Britain. In the Braint estuary the vegetation is characterised by unusually large amounts of greater sea-spurrey. Below the saltmarsh there are extensive mud and sand flats which are important feeding areas for migratory waders and wildfowl.</p>

Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>Annex I habitats that are a primary reason for selection of this site:</p> <p><u>Salicornia and other annuals colonizing mud and sand</u></p> <p>This is part of a complex of saltmarsh and dune habitats lying either side of the dune systems at Newborough Warren, north Wales. It is therefore important in terms of the structural integrity of the site, which has been selected primarily for a range of sand dune Annex I types. The most significant stands of Salicornia spp. saltmarsh occur on Malltraeth Sands in the Cefni estuary.</p> <p><u>Atlantic salt meadows (Glauco-Puccinellietalia maritimae)</u></p> <p>This site, which includes both the Braint and Cefni estuaries, forms a complex of saltmarsh and dune habitats lying either side of the dune systems at Newborough Warren. Atlantic salt meadows form the bulk of the saltmarsh vegetation, but much of it is far from typical. In the Braint estuary the vegetation is characterised by unusually large amounts of greater sea-spurrey Sparganium media, whilst in the Cefni estuary the more typical Atlantic salt meadow is subordinate to saltmarsh dominated by sea rush Juncus maritimus. In fact, this is one of the largest stands of Juncus maritimus saltmarsh in Britain, and has affinities with 1410 Mediterranean salt meadows (Juncetalia maritimi), an Annex I vegetation type that is not now considered to occur in the UK.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <ul style="list-style-type: none"> • Estuaries; and, • Mudflats and sandflats not covered by seawater at low tide. <p>(JNCC, 2014e)</p>
<p>Conservation Objectives</p>	<p>Conservation objectives for <i>Salicornia</i> and other annuals colonizing mud and sand</p> <p>The vision for this feature is for it to be in a favourable conservation status, where, subject to natural processes all of the following conditions are satisfied:</p>

Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The distribution and extent of Salicornia and other annuals is determined predominantly by natural structure and environmental processes;
- The natural habitat structures necessary for the long-term maintenance of Salicornia and other annuals and their typical species are maintained;
- The granulometry and structure of Salicornia and other annuals' sediments, and their natural variation, distribution and extent, are determined predominantly by natural sediment supply and transport processes;
- The geomorphology of the Salicornia and other annuals feature, and its natural variation, distribution and extent, are determined predominantly by the underlying geology and natural environmental processes;
- The natural environmental processes necessary for the long-term maintenance of the Salicornia and other annuals feature and its typical species, are maintained;
- The hydrographic and meteorological processes necessary for the long-term maintenance of the Salicornia and other annuals feature and its typical species are determined predominantly by natural environmental processes;
- The salinity regime and gradients of the Salicornia and other annuals feature are determined predominantly by natural hydrodynamic, hydrological and meteorological processes;

Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Nutrients in the water column and sediments remain within ranges that are not potentially detrimental to the long-term maintenance of the Salicornia and other annuals' communities, their distribution and range;
- Contaminants in the water column and sediments derived from human activity remain below levels potentially detrimental to the long-term maintenance of the Salicornia and other annuals' communities, their distribution and range;
- Dissolved oxygen levels in the water column and sediments are determined predominantly by natural environmental processes
- Communities of typical species are maintaining their conservation status on a long-term basis as viable components of the Salicornia and other annuals' habitats;
- The management of activities or operations likely to degrade the distribution, extent, structure, function or typical species communities of the feature, is appropriate for maintaining favourable conservation status and is secure in the long-term.

Conservation objectives for Atlantic salt meadow

The vision for this feature is for it to be in a favourable conservation status, where, subject to natural processes all of the following conditions are satisfied:

- The distribution and extent of the saltmeadows is determined predominantly by natural structure

Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>and environmental processes;</p> <ul style="list-style-type: none"> • The natural habitat structures necessary for the long-term maintenance of the saltmeadows and typical species are maintained; • The granulometry and structure of the saltmeadows’ sediments, and their natural variation, distribution and extent, are determined predominantly by natural sediment supply and transport processes; • The geomorphology of the saltmeadows, and their natural variation, distribution and extent, are determined predominantly by the underlying geology and natural environmental processes; • The hydrographic and meteorological processes necessary for the long-term maintenance of the saltmeadows and their typical species are determined predominantly by natural environmental processes; • The salinity regime and gradients within the saltmeadows are determined predominantly by natural hydrodynamic, hydrological and meteorological processes; • Nutrients in the water column and sediments are within ranges that are not potentially detrimental to the long-term maintenance of the saltmeadows’ communities, their distribution and range; • Contaminants in the water column and sediments derived from human activity remain below
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Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>levels potentially detrimental to the long-term maintenance of the saltmeadows' communities, their distribution and range;</p> <ul style="list-style-type: none"> • Dissolved oxygen levels in the water column and sediments are determined predominantly by natural environmental processes; • The zonation of saltmarsh from pioneer, lower mid marsh and upper mid marsh and their transitions to fresh water and terrestrial vegetation are maintained; • Communities of typical species are maintaining their conservation status on a long-term basis as viable components of the saltmeadows habitats, • The species richness, community dynamics, abundance, biomass, community structures, physiological health, reproductive capacity, recruitment and range are maintained: • The management of activities or operations likely to degrade the distribution, extent, structure, function or typical species communities of the feature, is appropriate for maintaining favourable conservation status and is secure in the long-term. <p>Conservation objectives for Estuaries</p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The distribution and extent of the estuaries, and their encompassed habitats, are determined
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Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>predominantly by natural structure and environmental processes</p> <ul style="list-style-type: none"> • The natural habitat structures necessary for the long-term maintenance of the estuaries and their encompassed habitats and typical species are maintained; • The granulometry and structure of the estuaries' sediments, and their natural variation, distribution and extent, are determined predominantly by natural sediment supply and transport processes • The quality of habitat structure is no more degraded as a consequence of human action or by materials of anthropogenic origin • The natural environmental processes necessary for the long-term maintenance of the estuaries, their encompassed habitats and their typical species are maintained • Water & sediment chemistry are determined predominantly by natural hydrodynamic, hydrological and meteorological processes • The salinity regime and gradients within the estuaries are determined predominantly by natural hydrodynamic, hydrological and meteorological processes • Typical species are determined predominantly by inherent population dynamics and ecological processes
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Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The species richness, population dynamics, abundance, biomass, population structures, physiological health, reproductive capacity, recruitment, range and mobility are maintained
- The management of activities or operations likely to degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long-term;
- The management of existing commercial fisheries for typical species ensures that species exploitation is at or below maximum sustainable yield and is secure in the long-term.

Conservation objectives for Mudflats and sandflats not covered by seawater at low tide.

- The vision for this feature is for it to be in a favourable conservation status, whereall of the following conditions are satisfied:
- The distribution and extent of the mudflats and sandflats, and their encompassed habitat, are determined predominantly by natural structure and environmental processes
- The natural habitat structures necessary for the long-term maintenance of the mudflats and sandflats, and their encompassed habitat and typical species are maintained
- The granulometry and structure of the mudflats and sandflats' sediments, and their natural variation, distribution and extent, are determined predominantly by natural sediment supply and transport processes

Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The quality of habitat structure is no more degraded as a consequence of human action or by materials of anthropogenic origin
- The natural environmental processes necessary for the long-term maintenance of the mudflats and sandflats, their encompassed habitats and their typical species are maintained
- Water & sediment chemistry are determined predominantly by natural hydrodynamic, hydrological and meteorological processes
- The salinity regime and gradients within the mudflats and sandflats are determined predominantly by natural hydrodynamic, hydrological and meteorological processes
- Typical species are determined predominantly by inherent population dynamics and ecological processes
- The species richness, population dynamics, abundance, biomass, population structures, physiological health, reproductive capacity, recruitment, range and mobility are maintained
- The management of activities or operations likely to degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long-term;
- The management of existing commercial fisheries for typical species ensures that species

Table 8.5: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>exploitation is at or below maximum sustainable yield and is secure in the long-term. (CCW, 2008b)</p>
<p>Current Condition Threats to Site Integrity</p>	<p>The Salicornia and other annuals colonizing mud and sand feature is considered to be in Favourable condition. The Atlantic salt meadows feature is considered to be in Unavourable condition due to the incomplete zonation present in some transects and to the presence of coastal defence or modified habitat at the terrestrial transition. The Estuaries feature condition is unknown. The Mudflats and sandflats not covered by seawater at low tide feature is considered to be in Favourable condition. Threats to site integrity include:</p> <ul style="list-style-type: none"> • Change in land use in surrounding areas. • (CCW,2008b)

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

<p>Site Distance and Direction from the Development</p>	<p>11km west</p>
<p>Qualifying Features</p>	<p>Abermenai to Aberffraw Dunes in north Wales comprises 3 distinct areas of dunes at Aberffraw, Newborough and Morfa Dinlle with a range of dune vegetation. This dynamic landscape of dunes has blown inland providing a challenging environment of dry dune and wet slacks. The ever changing strandline and shifting 'white dunes' contrast with the more stable 'grey dunes' inland. One of the more unusual dune plants is early sandgrass, said to</p>

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

be the smallest grass in the world and often less than 2cm tall. On the south side of the Menai Strait, at Dinas Dinlle, there is an area of lichen-rich dune, lying over a sequence of shingle ridges, which is extremely rare in Wales.

Annex I habitats that are a primary reason for selection of this site:

Embryonic shifting dunes

Abermenai to Aberffraw Dunes is one of two sites selected to represent Embryonic shifting dunes in north Wales. Embryonic dunes form a zone across a broad part of the beach/dune interface, making this site one of the most extensive examples of this habitat type in the UK. It is a site where, in contrast to some others in north Wales, recreational damage is minimal.

"Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")"

Abermenai to Aberffraw Dunes is one of two sites selected in north Wales. It contains one of the largest areas of lyme-grass *Leymus arenarius* shifting dune community in Wales. The mobile dunes at the southern end of the site support an abundance of sea-holly *Eryngium maritimum*, and there is well-developed zonation of dune types, including both seaward transitions between mobile dune and foredune, and landward transitions to fixed dune and dune slack.

"Fixed coastal dunes with herbaceous vegetation ("grey dunes")" * Priority feature

Within this dune complex in north Wales are extensive areas of both fixed dune vegetation with red fescue *Festuca rubra* and lady's bedstraw *Galium verum* and semi-fixed dune grassland with *marram* *Ammophila arenaria* and red fescue. Despite the fact that a large proportion of the open vegetation has been afforested, the remaining communities retain considerable interest. Notable species of the site include early sand-grass *Mibora minima*. On the south side of Menai Strait, the dunes at Morfa Dinlle include a lichen-rich community with *Coelocaulon aculeatum* (SD11), a type of vegetation which is very rare in Wales.

Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)

Abermenai to Aberffraw Dunes in north Wales comprises an extensive area of dunes with a complete range of

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

dune vegetation, including substantial areas of slack vegetation dominated by creeping willow *Salix repens* ssp. *argentea*. Despite the extent of afforestation, the dune aquifer retains its overall integrity, although changes in water table, partly attributable to the growth of the forest, have influenced the development of the dune slacks. There is long-term potential for further improvement.

Humid dune slacks

Abermenai to Aberffraw Dunes represents Humid dune slacks in north Wales. There are large areas of open dune vegetation and many Humid dune slacks remain, although there have been changes in the water table that are partly attributable to the growth of the commercial forest. The changes have influenced the development of humid dune slacks, which nonetheless retain most the essential features of the habitat type.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation

Annex II species that are a primary reason for selection of this site:

Petalwort *Petalophyllum ralfsii*

Abermenai to Aberffraw Dunes is an extensive complex of sand dunes, dune slacks, marsh, shingle and cliffs in south-west Anglesey, north Wales. There is a large population of petalwort *Petalophyllum ralfsii* here that was first recorded in 1828. This historical continuity indicates that the site is especially favourable for the survival of this species. Although partly afforested, the open dunes have a very rich bryophyte flora, including the mosses *Amblyodon dealbatus*, *Catoscopium nigritum* and the liverwort *Southbya tophacea*, particularly in damp, calcareous slacks and flats.

Shore dock *Rumex rupestris*

Abermenai to Aberffraw Dunes in north Wales is important as it represents shore dock *Rumex rupestris* at the far

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>north-west of its geographical range. It is remote from other known sites for this species, and shore dock occurs in an unusual situation: along a small stream bed and on damp pond edges, formerly in duneland, now in a clearing in a conifer plantation. There are two small colonies, which held 21 flowering plants in 1994, 26 in 1995 and 53 in 1996.</p> <p>(JNCC, 2014f)</p>
<p>Conservation Objectives</p>	<p>Conservation objectives for Embryonic shifting dunes</p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The distribution and extent of embryonic shifting dunes in late summer is determined by the availability of naturally accreting sand and strand line organic material. However, we would not expect all this potential embryonic dune habitat area to be vegetated in any one year and embryonic dunes may be absent in some years. Continuous absence over the six-year reporting cycle would cause the condition to be considered unfavourable. • The potential for the embryonic shifting dunes element of the typical zonation, from beach to fixed dune, is intact along the soft coastal frontage. This includes an unrestricted supply of sediment, opportunity for aeolian transport and naturally occurring organic strandline material. • The typical species of the strandline vegetation include <i>Atriplex</i> spp., <i>Beta vulgaris</i>, <i>Cakile maritime</i>, <i>Honkenya peploides</i>, <i>Salsola kali</i>. • The typical species of the embryonic dune vegetation include <i>Elytrigia juncea</i> and /or <i>Leymus</i>

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>arenarius.</p> <ul style="list-style-type: none"> • All factors affecting the achievement of these conditions are under control. <p>Conservation objectives for "Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")"</p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • Shifting dunes with <i>Ammophila arenaria</i> are present along the dune front facing prevailing (southwest) winds where sediment supply is adequate. • There should be no decrease in the total (aggregate) area of qualifying dune habitats for which this site was designated (i.e., the sum total of qualifying dune habitat should not diminish). The extent and location of individual dune habitat features may be subject to periodic and seasonal variation. • The shifting dunes element of the typical zonation from beach to fixed dune is intact along the soft coastal frontage. • Bare ground is present. • The typical species of the shifting dune vegetation include <i>Ammophila arenaria</i>, <i>Leymus arenarius</i>, <i>Elymus farctus</i>, <i>Eryngium maritimum</i>, <i>Euphorbia portlandica</i>, <i>Euphorbia paralias</i>, and
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Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw DunesSAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>Calystegia soldanella.</p> <ul style="list-style-type: none"> • All factors affecting the achievement of these conditions are under control. <p>Conservation objectives for "Fixed coastal dunes with herbaceous vegetation ("grey dunes")" * Priority feature</p> <ul style="list-style-type: none"> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The distribution of fixed dunes within the site may vary in response to natural dynamic processes and changes to other qualifying dune habitats for the site. • There should be no decrease in the total area of fixed dunes with herbaceous vegetation. • The fixed dunes element of the typical zonation from beach to fixed dune is intact along the soft coastal frontage. • Bare ground is present • The typical species of the fixed dune vegetation include Cerastium fontanum, Crepis capillaris, Cladonia spp., Peltigera spp., Erodium cicutarium, Geranium molle, Luzula campestris, Odontites verna, Pilosella officinarum, Plantago lanceolata, Prunella vulgaris, Festuca rubra, Galium verum, Anacamptis pyramidalis, Thymus polytrichus, Sedum acre, Veronica chamaedrys, Carex arenaria, C. flacca, Euphrasia officinalis, Hypnum cupressiforme,
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Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Hypochaeris radicata, Linum catharticum, Lotus corniculatus, Ononis repens, Rhinanthus minor, Rhytidiadelphus squarrosus, R triquetrus, Tortula muralis Viola canina, V. riviniana and V. tricolor.

- All factors affecting the achievement of these conditions are under control.

Conservation objectives for Dunes with *Salix repens ssp. argentea* (*Salicion arenariae*)

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
- The distribution of dunes with *Salix repens ssp argentea* is consistent with the typical dune zonation and where topographic conditions are suitable. The location of dunes with *Salix repens ssp argentea* within the site may vary in response to natural dynamic processes and changes to other qualifying dune habitats for the site
- There should be no decrease in the total (aggregate) area of qualifying dune habitats for which this site was designated (i.e., the sum total of qualifying dune habitat should not diminish). The extent of individual dune habitat features may be subject to periodic and seasonal variation.
- *Salix repens* is at least frequent and generally 5 - 30cm tall.
- Opportunities for the initiation of embryonic dune slacks by wind erosion exist.

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Bare ground is present.
- The groundwater level is appropriate in winter and summer.
- Groundwater quality is unaffected by pollution.
- The typical species include *Salix repens*, *Carex arenaria*, *C. flacca*, *Euphrasia officinalis*, *Festuca rubra*, *Lotus corniculatus*, *Ononis repens*, *Equisetum variegatum*, *Epipactis palustris*, *Epipactis leptochila* spp *dunensis* and *Pilosella officinarum*.
- All factors affecting the achievement of these conditions are under control.

Conservation objectives for Humid dune slacks

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
- The distribution of humid dune slacks is consistent with the typical dune zonation and where topographical conditions are suitable. The location of humid dune slacks within the site may vary in response to natural dynamic processes and changes to other qualifying dune habitats for the site.
- There should be no decrease in the total (aggregate) area of qualifying dune habitats for which this site was designated (i.e., the sum total of qualifying dune habitat should not diminish). The

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>extent and location of individual dune habitat features may be subject to periodic and seasonal variation.</p> <ul style="list-style-type: none"> • All humid dune slack communities should be present, from embryonic dune slacks with a high % of bare ground to more closed vegetation with <i>Salix repens</i>. • Opportunities for the initiation of embryonic dune slacks (by wind erosion) exist. • Bare ground is present. • The ground water level is appropriate in winter and summer. • Ground water quality is unaffected by pollution. • The typical species include <i>Salix repens</i>, <i>Carex arenaria</i>, <i>C. flacca</i>, <i>Equisetum variegatum</i>, <i>Lotus corniculatus</i>, <i>Ononis repens</i>, <i>Potentilla anserina</i>, <i>Galium palustre</i>, <i>Mentha aquatica</i>, <i>Hydrocotyle vulgaris</i>, <i>Campyllium stellatum</i>, <i>Prunella vulgaris</i>, <i>Ranunculus flammula</i>, <i>Calliergon cuspidatum</i>, <i>Anagallis tenella</i>, <i>Parnassia palustris</i>, <i>Selaginella selaginoides</i>, <i>Dactylorhiza incarnata</i> and <i>Epipactis palustris</i>. • Petalwort occurs in humid dune slacks in which <i>Equisetum variegatum</i> is frequent at Aberffraw and Newborough compartments. • All factors affecting the achievement of these conditions are under control.
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Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw DunesSAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Conservation objectives for Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation
- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
- The distribution of the lakes reflects their physiographic status as dune-dammed lakes of shallow valleys.
- The extent (area) of the habitat is 30ha, except if reduced by natural succession to swamp or bog.
- The catchment of the lakes continues to provide adequate quality and quantity of water.
- Appropriate water level is maintained throughout the year, (seasonal fluctuation +/- 30cm).
- Water quality is characteristic of maritime, high alkalinity shallow lakes, such as to maintain pH 7-9, alkalinity 1500-2500µeq/l, dissolved oxygen and peak annual Total Phosphorus <50µg/l.
- Chlorophyll α values are low, and sufficient to allow both lakes to be passed as 'Good' or better for a 'high alkalinity shallow lake' using Water Framework Directive classification methods.
- The typical species are submerged aquatic plants including *Elatine* *hydropiper*, *Potamogeton* *trichoides*, *P. pectinatus* *P. perfoliatus* *P. lucens*, *Ranunculus* *circinatus*, *Eleocharis* *acicularis*,

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Myriophyllum spicatum, Callitriche hermaphroditica, and Chara spp..

- Emergent aquatic plants, typically Phragmites australis, Schoenoplectus lacustris, Sparganium erectum, Typha latifolia, Alisma plantago-aquatica and Litorella uniflora should be present on the shoreline.
- Invasive or disruptive species such as *Crassula helmsii* or coarse fish should be absent.
- All factors affecting the achievement of these conditions are under control.

Conservation objectives for Petalwort *Petalophyllum ralfsii*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The population of petalwort is stable or increasing.
- Petalwort occurs in humid dune slacks in which *Equisetum variegatum* is frequent, across all sectors of the site where habitat conditions are suitable, i.e. Aberffraw and Newborough compartments.
- Humid dune slack with bare sand or humus crust and short vegetation characterised by *Equisetum variegatum* is present at Aberffraw and Newborough compartments where sediment and hydrological conditions permit. (see Objective for humid dune slacks).

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw DunesSAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Competition (including shading) from other species is controlled.
- All factors affecting the achievement of these conditions are under control.

Conservation objectives for Shore dock *Rumex rupestris*

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
 - The population of shore dock is stable or increasing.
 - Shore dock occurs in at least 3 locations across the site.
 - Opportunities occur for marine dispersal of seed.
 - Open streamside, coastal soft cliff seepages or dune slack pool habitat is adequate for its survival.
 - Adequate freshwater supply is maintained.
 - Bare ground or disturbed areas are maintained (e.g. by grazing animals) to permit germination.
 - Competition (including shading) from other species is controlled.
 - All factors affecting the achievement of these conditions are under control.
- (CCW,2008b)

Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

<p>Current Condition Threats to Site Integrity</p>	<p>Site and Site</p> <p>The Embryonic shifting dunes feature is considered to be in Unfavourable condition largely due to failure to meet the target for the range of zones within the vegetation structure.</p> <p>The "Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")" feature is considered to be in Unfavourable condition largely due to failure to meet the target for the range of zones within the vegetation structure.</p> <p>The "Fixed coastal dunes with herbaceous vegetation ("grey dunes")" feature is considered to be in Unfavourable condition due in part to the truncation of the natural zonation by the conifer plantation at Newborough and to the preponderance of grassy conditions in the fixed dune – lichen heath vegetation on Morfa Dinlle.</p> <p>The Dunes with <i>Salix repens ssp. argentea (Salicion arenariae)</i> feature is considered to be in Unfavourable condition due to the dunes with <i>Salix repens</i> vegetation at Tywyn Aberffraw being in an unfavourable condition.</p> <p>The Humid dune slacks feature is considered to be in Unfavourable condition.</p> <p>The Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation feature is considered to be in Unfavourable/Maintained condition.</p> <p>The Petalwort <i>Petalophyllum ralfsii</i> feature is considered to be in Unfavourable declining condition.</p> <p>The Shore dock <i>Rumex rupestris</i> feature is considered to be in Unfavourable declining condition.</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Afforestation; • Lowering of the water table; • Changes in grazing regime; • Scrub encroachment; and,
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Table 8.6: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • Changes to ground chemistry. • (CCW,2008b)
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Table 8.7: Y Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	12.3km north-west
Qualifying Features	<p>As the name suggests the dominant woodland type is oak/birch woodland, but there are a variety of other woodland types within the SAC, including bog woodland, floodplain woodland (alder dominated) and ash woodland (occurring in ravines and gorges where less acidic soils have developed). In addition there are complex mosaics of wooded and open areas supporting scrub, heath-land, grassland and marshy grassland. Lesser horseshoe bats are a European priority species, with an important population centred within the Meirionnydd Oakwoods SAC. The bats use the woodlands and fields for foraging and roost throughout the area, usually in buildings or old mine shafts.</p> <p>Annex I habitats that are a primary reason for selection of this site:</p> <p><u>Old sessile oak woods with Ilex and Blechnum in the British Isles</u></p> <p>Meirionnydd Oakwoods are a very large example of old sessile oak woods in north Wales, with an outstanding Atlantic flora of bryophytes and lichens. Notable bryophyte species include the endangered <i>Sematophyllum demissum</i> and the nationally scarce <i>Campylopus setifolius</i> and <i>Leptoscyphus cuneifolius</i>. The woods – primarily of sessile oak <i>Quercus petraea</i> with an acidic ground flora – extend along a series of inter-connected valleys, with a wide variety of slopes and aspects, and include many narrow ravines and gorges. Management is diverse, including grazed and ungrazed areas, and stands managed silviculturally, or as minimum intervention. This wide range of environmental, topographic and management conditions contributes to the high biological diversity of this</p>

Table 8.7: Y Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

exceptional site. The woods extend into the adjacent Rhinog cSAC.

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) * Priority feature

Meirionnydd Oakwoods and Bat Sites includes probably the most extensive area of alder *Alnus glutinosa* alluvial forest in north Wales. The woodland occurs on a dynamic floodplain, allowing cyclical regeneration and decay of alder stands, and the development of a natural structure, rich in dead wood. There is a rich ground flora, with notable plant species including globe-flower *Trollius europaeus* and creeping-jenny *Lysimachia nummularia*. The woodland occurs in a mosaic with species-rich marsh and wet grassland, and is continuous with stands of 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles. The site is also important for wildfowl.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation;
- Northern Atlantic wet heaths with *Erica tetralix*;
- European dry heaths;
- Tilio-Acerion forests of slopes, screes and ravines * Priority feature; and,
- Bog woodland * Priority feature.

Annex II species that are a primary reason for selection of this site:

Lesser horseshoe bat *Rhinolophus hipposideros*

This large composite site includes most of the known maternity roosts in Meirionnydd and some hibernacula, and comprises the centre of distribution for lesser horseshoe bats *Rhinolophus hipposideros* in Wales. The sheltered

Table 8.7: Y Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>river valleys provide excellent tree cover and numerous suitable maternity roosts. (JNCC, 2014g)</p>
<p>Conservation Objectives</p>	<p>Conservation objectives for woodlands including Old sessile oakwoods with <i>Ilex</i> and <i>Blechnum</i>, Bog woodland, <i>Tilio-Acerion</i> forests of slopes, screes and ravines and Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i>.</p> <p>The vision for the Woodland SAC feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • The total extent of the woodland area, including woodland canopy and scrub, woodland glades • and associated dry heath, bracken and grassland shall be maintained as indicated on maps (see Annex 2, CCW 2008c) some 1826 ha in total. • The location of the different woodland SAC features, as listed in the title above, will be as shown in Annex 2. The distribution of these woodland communities is largely a reflection of the topography, soils, geology and aspect and is unlikely to change. • The tree canopy percentage cover within the woodland area for the whole SAC (see maps in Annex 2) shall be no less than 80%, 87% being the current canopy cover (excepting natural catastrophic events). Some units will have a lower canopy cover which is acceptable provided this is compatible with safeguard of the habitat, features and special interest. • The canopy and shrub layer comprises locally native species, see Table 2 for the relevant

Table 8.7: Y Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>species for each woodland SAC feature.</p> <ul style="list-style-type: none"> • There shall be sufficient natural regeneration of locally native trees and shrubs to maintain the woodland canopy and shrub layer, by filling gaps and allowing the recruitment of young trees, and encouraging a varied age structure. • The typical ground layer species of each woodland SAC feature will be common. It is important for most of the woodland SAC that the vegetation does not becomes rank and overgrown with a height above 40cm and/or dominated by species such as bramble, ivy and young holly. Limits may be set on a unit or compartment basis. • The abundance and distribution of common and typical (Atlantic, sub-Atlantic, western, oceanic) mosses and liverworts, lichens (and slime moulds), will be maintained or increased. • The abundance and distribution of uncommon mosses and liverworts, lichens and slime moulds, will be maintained or increased. • There will be a scattering of 5 mature trees per hectare within the existing tree canopy or parkland, that is trees of c60cm diameter plus for oak and ash and/or with signs of decay, holes etc. In the longer-term, by 2060 there should be 1 veteran trees per hectare that is trees of c100cm diameter plus for oak and ash and 75cms birch. • The volume of dead wood will exceed 30 cubic metres per hectare throughout and consist of a
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Table 8.7: Y Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>mixture of fallen trees (minimum 1 per hectare), broken branches, dead branches on live trees, and standing dead trees (minimum 1 per hectare). Volumes of deadwood are currently at relatively low levels because the woodlands, in general, have an even-age structure and lack mature trees and any quantity of deadwood because of past silvicultural management. Some lower plants are dead wood specialists but these woodlands tend to lack the rare dead wood invertebrate assemblage found in other parts of the UK.</p> <ul style="list-style-type: none"> • Invasive non-native species such as rhododendron, Japanese knotweed and Himalayan balsam will not be present. • All factors affecting the achievement of these conditions are under control. • Conservation objectives for Lesser horseshoe bats <i>Rhinolophus hipposideros</i> • The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: <ul style="list-style-type: none"> • The population of lesser horseshoe bats should be maintained at its current size and encouraged where possible to increase. • There are sufficient breeding roosts (buildings, structures and trees) and hibernation roosts (mines and buildings) of appropriate quality. The other types of roost such as night, transitional, leks and swarming sites, should also be maintained as our knowledge of these often significant
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Table 8.7: Y Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>roosts improves.</p> <ul style="list-style-type: none"> • Foraging or feeding habitat in the SAC and surrounding countryside, including grasslands and some gardens, is of appropriate quality, extent and connectivity across the range. • The range of the population within the SAC/Gwynedd is stable or increasing. • All factors affecting the achievement of these conditions are under control. • (CCW, 2008c)
<p>Current Condition Threats to Site Integrity</p>	<p>The Old sessile oakwoods with <i>Ilex</i> and <i>Blechnum</i> feature is considered to be in Unfavourable/ Recovering condition due to a lack of mature-veteran trees</p> <p>The Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> feature is considered to be in Unfavourable due to the shortage of deadwood and veteran trees.</p> <p>The Lesser horseshoe bats <i>Rhinolophus hipposideros</i> feature is considered to be in Favourable condition</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Water abstraction; • Tree felling due to natural on unnatural causes; • Artificial lighting; • Building work; • Obstruction of roost entrances;

Table 8.7: Y Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • Tree shading of roosts; • Human disturbance; • Loss or decline in quality of linear features; and, • Collision of bats with vehicles. • (CCW, 2008c)
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Table 8.8: Liverpool Bay / Bae Lerpwl (Wales)SPA Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	17.6km north
Qualifying Features	<p>Liverpool Bay is one of the most important sea areas around the UK for populations of wintering seabirds, particularly common scoter and red throated diver, which arrive in large numbers in the autumn from their breeding sites in Northern Europe and sub-Arctic areas.</p> <p>The site qualifies under Article 4.1 by regularly supporting over wintering populations of red throated divers <i>Gavia stellata</i>. The site supports 5.4% of the British wintering population.</p> <p>The site qualifies under Article 4.2 by regularly supporting wintering populations of common scoter <i>Melanitta nigra</i>. The site supports 3.4% of the British winter population.</p> <p>The site qualifies under Article 4.2 by supporting an internationally important assemblage of birds. The site regularly supports non breeding populations of 55597 waterfowl including red throated diver and common scoter.</p>

Table 8.8: Liverpool Bay / Bae Lerpwl (Wales)SPA Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity	
	(JNCC, 2010)
Conservation Objectives	<p>Conservation objectives for Internationally important non-breeding population of red-throated diver (<i>Gavia stellata</i>)</p> <p>The interest feature red-throated diver will be considered to be in favourable condition only when both of the following two conditions are met:</p> <ul style="list-style-type: none"> • The size of the red-throated diver population is at, or shows only non-significant fluctuation around the mean population at the time of designation of the SPA. to account for natural change; • The extent of the supporting habitat within the site is maintained. <p>Conservation objectives for Internationally important non-breeding population of common scoter (<i>Melanitta nigra</i>)</p> <ul style="list-style-type: none"> • The interest feature common scoter will be considered to be in favourable condition only when each of the following two conditions is met: • The size of the common scoter population is at, or shows only non-significant fluctuation around the mean population at the time of designation of the SPA to account for natural change; • The extent of the supporting habitat within the site is maintained <p>Conservation objectives for Non-breeding assemblage of over 20,000 waterbirds</p> <ul style="list-style-type: none"> • The interest feature waterbird assemblage will be considered to be in favourable condition only when each of the following two conditions is met:

Table 8.8: Liverpool Bay / Bae Lerpwl (Wales)SPA Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • (The size of the waterbird assemblage population shows only non-significant fluctuation around the mean at the time of designation to allow for natural change; • The extent of the waterbird assemblage supporting habitat within the site is maintained. • (NE/CCW/WG, 2010)
<p>Current Condition Threats to Site Integrity</p> <p>Site and Site</p>	<p>The site is a newly qualifying SPA, conditions have not yet been assessed.</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Physical Loss; • Physical Damage; • Non-physical disturbance; • Toxic contamination; • Non-toxic contamination; and, • Biological disturbance. • (NE/CCW/WG, 2010)

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	20km north
Qualifying Features	<p>Corsydd Môn / Anglesey Fens SAC is a wetland complex comprising a series of fens located in valleys in the limestone of eastern Anglesey. Several of the sites (Cors Goch, Cors y Farl, Cors Erddreiniog, Cors Bodeilio) occupy former lake basins which have gradually infilled with clay, marl and peat sediments. These sites and others (Waun Eurad, Caeau Talwrn, Gwenfro - Rhos y Gad) also contain areas of flush mire where calcareous springs irrigate the surface. The site includes some of the best examples of lime-rich fen in Wales along with nutrient-poor lakes, areas of purple moor grass meadow, and wet and dry heath. The sites support many scarce species including Geyer's whorl snail, southern damselfly, and marsh fritillary.</p> <p>Annex I habitats that are a primary reason for selection of this site:</p> <p><u>Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.</u></p> <p>Within Anglesey Fens, Llyn Yr Wyth Eidion is a small active marl-producing lake in north Wales and is an example of a lake on limestone. It is surrounded by the extensive calcareous valley mire of Cors Erddreiniog, which overlies limestone and protects the lake against nutrient enrichment, resulting in water of high quality. Hedgehog stonewort <i>Chara pedunculata</i> and the rare rugged stonewort <i>C. rudis</i> have been recorded at this site.</p> <p><u>Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> * Priority feature</u></p> <p>The Anglesey Fens complex supports the second-largest area of calcareous fens in the UK. In some parts the low vigour of <i>Cladium</i> accounts for the species-richness of the vegetation, but elsewhere management prevents the development of monodominant stands, enabling the persistence of communities referable to the <i>Caricion davallianae</i>. The juxtaposition between species-poor stands of <i>Cladium</i> and areas with a more diverse floristic composition and structure is widespread, with characteristically species-rich contact zones between the two. Anthropogenic disturbance is believed to have been instrumental in the develop of various facies of a <i>Cladium – Molinia</i> community, a particular feature of the rich fens of north-west Wales.</p> <p><u>Alkaline fens</u></p>

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

This composite site includes four component fen systems supporting a diverse range of short-sedge mires, including the best and most extensive Welsh examples of NVC type M13 *Schoenus nigricans* – *Juncus subnodulosus* mire and a range of communities referable to M9a *Carex rostrata* – *Calliergon cuspidatum/giganteum* mire. These are considered to be of pre-eminent importance in the UK, owing to their extent, biogeographical significance and exceptionally rich assemblage of rich-fen species. The fens are strongly influenced by the underlying Carboniferous limestone and are fed by calcareous groundwater arising from discrete springs and more diffuse zones of seepage. The alkaline fen communities often occur within complex vegetation zonations, and typical contact communities include great fen-sedge *Cladium mariscus* swamp, fen carr, fen meadow communities dominated by blunt-flowered rush *Juncus subnodulosus* (M22 *Juncus subnodulosus* – *Cirsium dissectum* fen-meadow) and purple moor-grass *Molinia caerulea* (M25 *Molinia caerulea* – *Potentilla erecta* mire) as well as a range of vegetation types broadly referable to the *Cladio* – *Moliniatum*. Gradations to unimproved calcicolous and neutral grasslands also occur. The characteristic mixture of southern and northern floristic elements includes a wide range of nationally or locally scarce species, including fly orchid *Ophrys insectifera*, narrow-leaved marsh orchid *Dactylorhiza traunsteineri*, marsh helleborine *Epipactis palustris*, lesser clubmoss, *Selaginella selaginoides* and slender sedge *Carex lasiocarpa*. Examples of M13 mire within Anglesey Fens which are strongly influenced by the discharge of calcareous groundwater provide the sole north Wales locus for the Annex II species 1044 Southern damselfly *Coenagrion mercuriale*.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Northern Atlantic wet heaths with *Erica tetralix*; and,
- Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinia caerulea*).

Annex II species that are a primary reason for selection of this site

Geyer's whorl snail *Vertigo geyeri*

Cors Erddreiniog and Waun Eurad represent Geyer's whorl snail *Vertigo geyeri* in north Wales. The site contains one of the largest known populations of *V. geyeri* in calcareous fen at low altitude.

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>Annex II species present as a qualifying feature, but not a primary reason for site selection:</p> <ul style="list-style-type: none"> • Southern damselfly <i>Coenagrion mercuriale</i>; and, • Marsh fritillary butterfly <i>Euphydryas (Eurodryas, Hypodryas) aurinia</i>. <p>(JNCC 2014h)</p>
<p>Conservation Objectives</p>	<p>Conservation objectives for Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.</p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • Calcareous fen exhibits a range of condition states (see below) in which great fen sedge <i>Cladium</i> is frequent to dominant, with no less than 10% referable to species-poor <i>Cladium</i> swamp and the remainder to either vegetation in which <i>Cladium</i> occurs with sweet gale <i>Myrica gale</i>, bluntflowered rush <i>Juncus subnodulosus</i>, purple moor-grass <i>Molinia caerulea</i> and cross-leaved heath <i>Erica tetralix</i>, or vegetation with many of the above elements as well as bog-bean <i>Menyanthes trifoliata</i> marsh cinquefoil <i>Potentilla palustris</i>, bladderwort <i>Utricularia vulgaris</i>, and slender sedge <i>Carex lasiocarpa</i> and other small sedges. . • Species indicative of drainage or agricultural modification, such as yorkshire fog <i>Holcus lanatus</i>, bramble <i>Rubus</i> spp., nettle <i>Urtica dioica</i> are largely absent from the calcareous fen. • Purple moor grass <i>Molinia caerulea</i> does not exceed 25% of ground cover. • Leaf Litter forms no more than 20% of the ground cover at any location.

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Scrub species such as willow *Salix* and birch *Betula* are largely absent from the calcareous fen .
- *Rhododendron* spp. is absent.
- Standing surface water is present or expressable on footfall over most of the winter period.
- Groundwater is within 15cm of surface in mid summer.
- All hydrological (diffuse, surface and sub-surface) pathways (inputs and outputs) are restored and/or intact (includes ditch infilling, blocking, diversion and re-engineering). Water quality reflects the base-rich but nutrient poor requirements of the habitat.

Conservation objectives for Alkaline fens

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The following plants are common in the alkaline fen: black bog rush *Schoenus nigricans*, moss *Campyllum stellatum*, great fen sedge *Cladium mariscus* (up to 1m tall), blunt flowered rush *Juncus subnodulosus*, sweet gale *Myrica gale*, moss *Drepanocladus revolvens*, bladderwort *Utricularia* sp., butterwort *Pinguicula vulgaris*.
- Species indicative of drainage or agricultural modification, such as yorkshire fog *Holcus lanatus*, bramble *Rubus* spp., nettle *Urtica dioica*, are largely absent from the alkaline fen.
- Purple moor grass *Molinia caerulea* does not exceed 25% of ground cover and is restricted to

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>drier areas</p> <ul style="list-style-type: none"> • Bare ground including tufa constitutes about 10% of the ground cover. • Alkaline Fen exhibits a diverse age and height structure across the site (tussocks are undamaged and 20% short grazed, 50% mature – 30% in between incl bare ground) • Scrub species such as willow <i>Salix</i> spp and birch <i>Betula pubescens</i> are largely absent from the alkaline fen. • <i>Rhododendron</i> spp. is absent • Water expressible on foot-fall or running surface water is present between tussocks throughout the year. • All Hydrological (diffuse, surface and sub-surface) pathways (inputs and outputs) should be restored and/or intact (includes ditch infilling, blocking, diversion and re-engineering) • Water quality is appropriate to the needs of the vegetation and species. <p>Conservation objectives for Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • The following plants are common in the wet heath: heather <i>Calluna vulgaris</i>; Cross-leaved heath <i>Erica tetralix</i> as well as bog moss <i>Sphagnum</i> spp. Devil’s bit scabious <i>Succisa pratensis</i> and
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Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>Nartheceium ossifragum.</p> <ul style="list-style-type: none"> • Competitive species indicative of under-grazing, particularly bracken <i>Pteridium aquilinum</i>, purple moor-grass <i>Molinia caerulea</i> and western gorse <i>Ulex gallii</i> will be kept in check. • 70% of wet heath will be “good condition” wet heath. • The wet heath supports viable populations of marsh gentian at Cors Erddreiniog • The wet heath contributes to the support of a viable meta-population of marsh fritillary • All factors affecting the achievement of these conditions are under control. <p>Conservation objectives for <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caerulea</i>).</p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • <i>Molinia</i> meadows occupy at least 2% of the total site area. • <i>Molinia</i> meadows are distributed over at all 7 component sites. • The following plants are common in the <i>Molinia</i> meadows: purple moor-grass <i>Molinia caerulea</i>; devil’s bit scabious <i>Succisa pratensis</i>; carnation sedge <i>Carex panicea</i>; saw wort <i>Serratula tinctoria</i>; lousewort <i>Pedicularis sylvestris</i>, <i>Carex pulicaris</i> and <i>C. hostiana</i> and Marsh orchids <i>Dactylorhiza</i> sp
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Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Soft rush *Juncus effusus* and species indicative of agricultural modification, such as perennial rye grass *Lolium perenne* and white clover *Trifolium repens* are largely absent from the Molinia Meadows.
- Purple moor grass *Molinia caerulea* does not exceed 50% of ground cover.
- Scrub species such as willow *Salix* and birch *Betula* are largely absent from the Molinia meadows
- *Rhododendron* spp. are absent
- Leaf litter should comprise <25% of ground cover
- Groundwater will be between –10cm and –25cm below ground level for most of the year
- The integrity of the hydrological system (inputs and outputs) will be intact.
- Swards structure should reflect the requirements of feature 9 (Marsh fritillary)
- All factors affecting the achievement of these conditions are under control.

Conservation objectives for Geyer’s whorl snail *Vertigo geyeri*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- There are abundant areas of flushed fen grassland (M13 / feature 2) with sedge/moss lawns 5-15cm tall, containing species such as *Carex viridula* subsp. *brachyrrhyncha*, *Pinguicula vulgaris*,

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Briza media, Equisetum palustre, Juncus articulatus and the mosses Drepanocladusrevolvens, Campylium stellatum, with scattered tussocks of Schoenus nigricans no greater than 80cm tall.

- Soils are saturated schoenus tussocks lower than 80cm

Conservation objectives for Southern damselfly *Coenagrion mercuriale*

The vision for this feature is for it to be in favourable conservation status, where all of the following conditions are satisfied:

- Population size is stable or increasing
- The population occupies at least 3 distinct management units
- The total area of good breeding habitat does not fall below 1000m²
- Seepages and shallow runnels at Nant Isaf will be clear, pollution free and will support good numbers of native aquatic plants.
- The population of southern damselflies on the site (allowing for normal annual fluctuations) is maintained or increases.
- Species indicative of drainage or agricultural modification, such as yorkshire fog Holcus lanatus, bramble Rubus spp., nettle Urtica dioica are largely absent
- Alkaline Fen habitat exhibits a diverse age and height structure across the site (tussocks are undamaged and 20% short grazed, 50% mature – 30% in between incl bare ground

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • Scrub species such as willow <i>Salix</i> spp and birch <i>Betula pubescens</i> are largely absent from the alkaline fen habitat • <i>Rhododendron</i> spp. is absent from the feature. • Appropriate grazing is managed across 100% of the site • Standing or running surface water is present between tussocks throughout the year, and visible over 30% of the tussock covered area. • All Hydrological (diffuse, surface and sub-surface) pathways (inputs and outputs) should be restored and/or intact (includes ditch infilling, blocking, diversion and re-engineering) • Water quality is appropriate to the needs of the vegetation and species. • All factors affecting the achievement of the foregoing conditions are under control. <p>Conservation objectives for Marsh fritillary butterfly <i>Euphydryas (Eurodryas, Hypodryas) aurinia</i></p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • The site supports a sustainable meta population of the marsh fritillary. • The population is viable in the long term, (acknowledging the extreme population fluctuations of the species).
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Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • Habitats on the site are in optimal condition to support the metapopulation. • At least 6% (approximately 30ha) of the total site area is marshy grassland or wet heath suitable for supporting marsh fritillary, with Devil's-bit scabious <i>Succisa pratensis</i> present and only a low cover of scrub. • At least 40% of this 30ha is good marsh fritillary breeding habitat, dominated by purple moorgrass <i>Molinia caerulea</i>, with <i>S. pratensis</i> abundant throughout and a vegetation height of 10-20cm over the winter period. • Areas of good marsh fritillary habitat are scattered over several management units. Off site habitats that function as stepping stone or corridors located between SAC compartments will be maintained for migration, dispersal, foraging and genetic exchange purposes • All factors affecting the achievement of the foregoing conditions are under control. <p>(CCW, 2008d)</p>
<p>Current Condition Threats to Site Integrity</p>	<p>The Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> feature is considered to be in Unfavourable Declining.</p> <p>The Alkaline Fens feature is considered to be in Unfavourable Declining condition.</p> <p>The Northern Atlantic wet heaths with <i>Erica tetralix</i> feature is considered to be in Unfavourable/ Unclassified condition.</p> <p>The <i>Molinia</i> meadows on calcareous, peaty clay or silt laden soils (<i>Molinion caeruleae</i>) feature is considered to be in Unfavourable/Declining condition.</p>

Table 8.9: Corsydd Môn/ Anglesey Fens SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>The European dry heaths feature is considered to be in Unfavourable condition.</p> <p>The Southern damselfly <i>Coenagrion mercurial</i> feature is considered to be in Unfavourable/Declining condition.</p> <p>The Marsh fritillary <i>Euphydryas (Eurodryas, Hypodryas) aurinia</i>. feature is considered to be in Unfavourable/Declining condition.</p> <p>The Geyer's whorl snail <i>Vertigo geyeri</i> feature is considered to be in Unfavourable Declining condition</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Drainage; • Lack of management (including lack of grazers); • Pollution; and, • Scrub encroachment. <p>(CCW, 2008d)</p>
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Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	<p>The Corsydd Môn/Anglesey Fens part of the Ramsar is located 20km north, this is discussed below.</p> <p>The Llyn Fens part of the Ramsar is located 32km south-west, this is not considered to be relevant to the assessment and is not discussed.</p>
Qualifying Features	<p>An internationally important suite of base-rich fens comprised of six component sites, supporting a range of associated floral and faunal rarities. The six wetlands occupy valley heads and former lake basins which have</p>

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

mostly infilled with marl and peat deposits, with open water persisting at two of the sites. Calcareous springs from limestone and calcareous drift aquifers irrigate the fens and result in a distinctive vegetation. of *Schoenus nigricans*-*Juncus subnodulosus* hummocks which is rich in plants such as *Dactylorhiza traunsteineri*, *Ophrys insectifera*, *Pinguicula vulgaris*, the longstalked yellow-sedge *Carex viridula* ssp. *brachyrrhyncha*, and the moss *Scorpidium scorpioides*. In lower-lying areas, swamp vegetation dominated by stands of *Cladium mariscus*, *Carex elata* and *Carex lasiocarpa* is characteristic. These fens are notable as the best Welsh sites for stoneworts such as *Nitella tenuissima*. These fens are notable as the best sites in Wales for stoneworts.

The Corsydd Môn /Anglesey Fen part of the Ramsar includes:

- Cors Erddreiniog SSSI
- Cors Goch SSSI
- Cors Bodeilio SSSI
- Cors y Farl SSSI
- Gwenfro Rhos y Gad SSSI
- Waun Eurad SSSI
- Caeau Talwrn SSSI

The site supports a suite of base-rich, calcareous fens which is a rare habitat type within the United Kingdom's biogeographical zone.

Habitats Directive Annex I features present include:

- Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Northern Atlantic wet heaths with *Erica tetralix*
- Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
- Alkaline fens
- European dry heaths
- Geyer’s whorl snail *Vertigo geyeri*
- Southern damselfly *Coenagrion mercuriale*
- Marsh fritillary *Euphydryas* (*Eurodryas*, *Hypodryas*) *aurinia*
- Great crested newt *Triturus cristatus*
- Otter *Lutra lutra*

Ramsar criterion 3

The site supports a diverse flora and fauna with associated rare species and is of special value for maintaining the genetic and ecological diversity of the region.

Nationally important species occurring on the site.

Higher Plants:

- *Dactylorhiza traunsteineri*

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none">• <i>Eriophorum gracile</i> <p>Lower Plants:</p> <ul style="list-style-type: none">• <i>Nitella tenuissima</i>. <p>Invertebrates:</p> <ul style="list-style-type: none">• <i>Vertigo geyeri</i>• <i>Vertigo moulinsiana</i>• <i>Coenagrion mercuriale</i>• <i>Euphydryas aurinia</i>• <i>Chlaenius tristis</i>• <i>Asilus crabroniformis</i>• <i>Stratiomys chamaeleon</i>• <i>Acrometopia wahlbergi</i>• <i>Hirudo medicinalis</i> <p>Mammals:</p> <ul style="list-style-type: none">• Otter <i>Lutra lutra</i>
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Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

<p>Conservation Objectives</p>	<p>Conservation objectives for Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.</p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • Calcareous fen occupies at least 20% (93ha) of the total site area. • Calcareous fen is distributed over at least 5 of the 7 sites including Cors Erddreiniog, Cors Bodeilio, Cors Goch, Gwenfro-Rhos Y Gad and Cors Y Farl. • Calcareous fen exhibits a range of condition states (see below) in which great fen sedge <i>Cladium</i> is frequent to dominant, with no less than 10% referable to species-poor <i>Cladium</i> swamp and the remainder to either vegetation in which <i>Cladium</i> occurs with sweet gale <i>Myrica gale</i>, bluntflowered rush <i>Juncus subnodulosus</i>, purple moor-grass <i>Molinia caerulea</i> and cross-leaved heath <i>Erica tetralix</i>, or vegetation with many of the above elements as well as bog-bean <i>Menyanthes trifoliata</i> marsh cinquefoil <i>Potentilla palustris</i>, bladderwort <i>Utricularia vulgaris</i>, and slender sedge <i>Carex lasiocarpa</i> and other small sedges. . • Species indicative of drainage or agricultural modification, such as yorkshire fog <i>Holcus lanatus</i>, bramble <i>Rubus</i> spp., nettle <i>Urtica dioica</i> are largely absent from the calcareous fen. • Purple moor grass <i>Molinia caerulea</i> does not exceed 25% of ground cover. • Leaf Litter forms no more than 20% of the ground cover at any location.
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Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Scrub species such as willow *Salix* and birch *Betula* are largely absent from the calcareous fen .
- *Rhododendron* spp. is absent.
- Standing surface water is present or expressible on footfall over most of the winter period.
- Groundwater is within 15cm of surface in mid summer.
- All hydrological (diffuse, surface and sub-surface) pathways (inputs and outputs) are restored and/or intact (includes ditch infilling, blocking, diversion and re-engineering). Water quality reflects the base-rich but nutrient poor requirements of the habitat.

Conservation objectives for Alkaline fens

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Alkaline fen occupies at least 17% of the total site area.
- Alkaline fen is found on all 7 component sites.
- The following plants are common in the alkaline fen: black bog rush *Schoenus nigricans*, moss *Campyllum stellatum*, great fen sedge *Cladium mariscus* (up to 1m tall), blunt flowered rush *Juncus subnodulosus*, sweet gale *Myrica gale*, moss *Drepanocladus revolvens*, bladderwort *Utricularia* sp., butterwort *Pinguicula vulgaris*.
- Species indicative of drainage or agricultural modification, such as yorkshire fog *Holcus lanatus*,

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- bramble *Rubus* spp., nettle *Urtica dioica*, are largely absent from the alkaline fen.
- Purple moor grass *Molinia caerulea* does not exceed 25% of ground cover and is restricted to drier areas
 - Bare ground including tufa constitutes about 10% of the ground cover.
 - Alkaline Fen exhibits a diverse age and height structure across the site (tussocks are undamaged and 20% short grazed, 50% mature – 30% in between incl bare ground)
 - Scrub species such as willow *Salix* spp and birch *Betula pubescens* are largely absent from the alkaline fen.
 - *Rhododendron* spp. is absent
 - Water expressible on foot-fall or running surface water is present between tussocks throughout the year.
 - All Hydrological (diffuse, surface and sub-surface) pathways (inputs and outputs) should be restored and/or intact (includes ditch infilling, blocking, diversion and re-engineering)
 - Water quality is appropriate to the needs of the vegetation and species.

Conservation objectives for Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Open water occupies not less than 1% of the total site area.
- Natural deep lakes persist at Cors Goch and Cors Erddreiniog component sites
- The macrophyte, phytoplankton, zooplankton and predator components of the ecosystem operate in balance in a clear-water environment, where:
- Characteristic macrophyte species are present in the water bodies, including dense beds of stoneworts (*Chara* spp), in areas <6m deep
- Invasive non-native species are absent, or occur at no more than rare or occasional frequency.
- Locally native (non-coarse) fish are present.
- All coarse fish are absent
- Water quality is such as to maintain pH 7-9 and mean annual Total Phosphorus <15µg/l.
- The water is clear throughout the year, with an absence of algal blooms.
- Marl deposition occurs within all the lakes.
- There is minimal extraneous sediment input
- The integrity of the natural hydrological system (inputs and outputs) is intact.
- Appropriate water level is maintained throughout the year, (seasonal fluctuation 30cm).

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- All factors affecting the achievement of these conditions are under control.

Conservation objectives for Molinia meadows on calcareous, peaty or clayey silt laden soils (*Molinia caerulea*)

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Molinia meadows occupy at least 2% of the total site area.
- Molinia meadows are distributed over at all 7 component sites.
- The following plants are common in the Molinia meadows: purple moor-grass *Molinia caerulea*; devil's bit scabious *Succisa pratensis*; carnation sedge *Carex panicea*; saw wort *Serratula tinctoria*; lousewort *Pedicularis sylvestris*, *Carex pulicaris* and *C. hostiana* and Marsh orchids *Dactylorhiza* sp
- Soft rush *Juncus effusus* and species indicative of agricultural modification, such as perennial rye grass *Lolium perenne* and white clover *Trifolium repens* are largely absent from the Molinia Meadows.
- Purple moor grass *Molinia caerulea* does not exceed 50% of ground cover.
- Scrub species such as willow *Salix* and birch *Betula* are largely absent from the Molinia meadows

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Rhododendron spp. are absent
- Leaf litter should comprise <25% of ground cover
- Groundwater will be between –10cm and –25cm below ground level for most of the year
- The integrity of the hydrological system (inputs and outputs) will be intact.
- Swards structure should reflect the requirements of feature 9 (Marsh fritillary)
- All factors affecting the achievement of these conditions are under control.

Conservation objectives for Northern Atlantic wet heaths with *Erica tetralix*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Wet heath covers at least 4%ha of the site
- The following plants are common in the wet heath: heather *Calluna vulgaris*; Cross-leaved heath *Erica tetralix* as well as bog moss *Sphagnum* spp. Devil’s bit scabious *Succisa pratensis* and *Narthecium ossifragum*.
- Competitive species indicative of under-grazing, particularly bracken *Pteridium aquilinum*, purple moor-grass *Molinia caerulea* and western gorse *Ulex gallii* will be kept in check.
- 70% of wet heath will be “good condition” wet heath.

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The wet heath supports viable populations of marsh gentian at Cors Erddreiniog
- The wet heath contributes to the support of a viable meta-population of marsh fritillary
- All factors affecting the achievement of these conditions are under control.

Conservation objectives for European dry heaths

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Dry heath covers at least 1.2% ha of the site
- The following plants are common in the dry heath: heather *Calluna vulgaris*; bell heather *Erica cinerea*, and western gorse *Ulex galii*.
- Competitive species indicative of under-grazing or over-frequent burning, particularly bracken *Pteridium aquilinum*, purple moor-grass *Molinia caerulea* and European gorse *Ulex europeaus* are not abundant.
- Competitive species indicative of agricultural improvement such as ryegrass *Lolium perenne*, Yorkshire fog *Holcus lanatus*, nettles, *Urtica dioica*, are no more than rare or occasional.
- 70% of dry heath will be “good quality” dry heath.
- Invasive exotic species, e.g. Rhododendron are absent

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- All factors affecting the achievement of these conditions are under control.

Conservation objectives for Geyer`s whorl snail *Vertigo geyeri*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- There are abundant areas of flushed fen grassland (M13 / feature 2) with sedge/moss lawns 5-15cm tall, containing species such as *Carex viridula* subsp. *brachyrrhyncha*, *Pinguicula vulgaris*, *Briza media*, *Equisetum palustre*, *Juncus articulatus* and the mosses *Drepanocladus revolvens*, *Campylium stellatum*, with scattered tussocks of *Schoenus nigricans* no greater than 80cm tall.
- Soils are saturated schoenus tussocks lower than 80cm

Conservation objectives for Southern damselfly *Coenagrion mercurial*

The vision for this feature is for it to be in favourable conservation status, where all of the following conditions are satisfied:

- Population size is stable or increasing
- The population occupies at least 3 distinct management units
- The total area of good breeding habitat does not fall below 1000m²
- Seepages and shallow runnels at Nant Isaf will be clear, pollution free and will support good numbers of native aquatic plants.
- The population of southern damselflies on the site (allowing for normal annual fluctuations) is

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>maintained or increases.</p> <ul style="list-style-type: none"> • Species indicative of drainage or agricultural modification, such as yorkshire fog <i>Holcus lanatus</i>, bramble <i>Rubus</i> spp., nettle <i>Urtica dioica</i> are largely absent • Alkaline Fen habitat exhibits a diverse age and height structure across the site (tussocks are undamaged and 20% short grazed, 50% mature – 30% in between incl bare ground • Scrub species such as willow <i>Salix</i> spp and birch <i>Betula pubescens</i> are largely absent from the alkaline fen habitat • Rhododendron spp. is absent from the feature. • Appropriate grazing is managed across 100% of the site • Standing or running surface water is present between tussocks throughout the year, and visible over 30% of the tussock covered area. • All Hydrological (diffuse, surface and sub-surface) pathways (inputs and outputs) should be restored and/or intact (includes ditch infilling, blocking, diversion and re-engineering) • Water quality is appropriate to the needs of the vegetation and species. • All factors affecting the achievement of the foregoing conditions are under control. <p>Conservation objectives for Marsh fritillary butterfly <i>Euphydryas (Eurodryas, Hypodryas) aurinia</i></p>
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Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The site supports a sustainable meta population of the marsh fritillary.
- The population is viable in the long term, (acknowledging the extreme population fluctuations of the species).
- Habitats on the site are in optimal condition to support the metapopulation.
- At least 6% (approximately 30ha) of the total site area is marshy grassland or wet heath suitable for supporting marsh fritillary, with Devil's-bit scabious *Succisa pratensis* present and only a low cover of scrub.
- At least 40% of this 30ha is good marsh fritillary breeding habitat, dominated by purple moorgrass *Molinia caerulea*, with *S. pratensis* abundant throughout and a vegetation height of 10-20cm over the winter period.
- Areas of good marsh fritillary habitat are scattered over several management units. Off site habitats that function as stepping stone or corridors located between SAC compartments will be maintained for migration, dispersal, foraging and genetic exchange purposes
- All factors affecting the achievement of the foregoing conditions are under control.

Conservation objectives for great crested newt *Triturus cristatus*

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Great crested newts will be present on the site
- At least 3 display/breeding ponds occur throughout the entire site
- Great crested newt larvae will be found in 2 or more of the breeding ponds
- All of display/breeding ponds on the site will have a water depth of 10cm or more during the normal summer months.
- Native macrophytes will cover at least half of the pond surface yet some of the water surface will still remain open.
- Aquatic marginal vegetation will be present around the ponds
- Breeding/display ponds will not be heavily shaded by surrounding vegetation
- Algal blooms and surface sheens will be absent from display/breeding ponds
- Fish will be absent from breeding/display ponds which support great crested newts
- Only small numbers of water and wildfowl will be seen on the ponds
- The terrestrial habitat surrounding breeding ponds will provide refuge, foraging and hibernacula areas and corridors which will aid the dispersal of great crested newts

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Off site habitats that function as stepping stone or corridors located between SAC compartments will be maintained for migration, dispersal, foraging and genetic exchange purposes
- Non-native aquatic species will be no more than rare or occasional at any location
- All factors affecting the achievement of the foregoing conditions are under control.

Conservation objectives for otter *Lutra lutra*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The population of otters using the SAC is stable or increasing over the long term and reflects the natural carrying capacity of the habitat within and adjacent to the SAC
- The SAC will have habitat, including riparian trees and vegetation and wetlands, to help support the otter population in the long term
- The site contributes food (including eels, other fish, amphibians etc.) to help support a resident otter population.
- All factors affecting the achievement of the foregoing conditions are under control.

Conservation objectives for vascular plant assemblage

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- All the components of the assemblage are present on the site
- All the component species comprise viable populations of at least 200 individuals or at least 100m² of stoloniferous or tufted species (e.g. *Potamogeton coloratus*)
- All the component species are found in at least 3 distinct loci.
- All the factors affecting the achievement of the conditions are under control.

Conservation objectives for Marsh gentian *Gentiana pneumonanthe*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Colonies comprise viable populations of at least 200 individuals
- Flowering and seed setting occur in most years
- Colonies are found in at least 3 distinct loci within the SAC.
- All factors affecting the achievement of the foregoing conditions are under control

Conservation objectives for *Antennaria dioica*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Colonies comprise viable populations of at least 200 individuals
- Flowering and seed setting occur in most years

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Colonies are found in at least 3 distinct loci within the SAC.
- All factors affecting the achievement of the foregoing conditions are under control

Conservation objectives for Fen pondweed *Potamogeton coloratus*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Colonies comprise viable populations covering at least 20m2 .
- Flowering and seed setting occur in most years
- Colonies are found in at least 3 distinct loci within the SAC.
- All factors affecting the achievement of the foregoing conditions are under control.

Conservation objectives for Marsh dandelion *Taraxacum palustre*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Colonies comprise viable populations of at least 200 individuals
- Flowering and seed setting occur in most years
- Colonies are found in at least 3 distinct loci within the SAC.
- All factors affecting the achievement of the foregoing conditions are under control

Conservation objectives for Olive Earthtongue *Microglossum olivaceum*

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Colonies comprise viable populations of at least 200 individuals
- Flowering and seed setting occur in most years
- Colonies are found in at least 3 distinct loci within the SAC.
- All factors affecting the achievement of the foregoing conditions are under control

Conservation objectives for *Ophrys insectifera* (fly orchid)

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Colonies comprise viable populations of at least 200 individuals
- Flowering and seed setting occur in most years
- Colonies are found in at least 3 distinct loci within the SAC.
- All factors affecting the achievement of the foregoing conditions are under control

Conservation objectives for Stonewort assemblage

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- All the components of the assemblage are present on the site

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- All the component species are found in at least 3 distinct loci.
- All factors affecting the achievement of the foregoing conditions are under control

Conservation objectives for *Nitella tenuissima*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Colonies comprise patches of at least 1m².
- Colonies are found in at least 3 distinct loci within the SAC.
- All factors affecting the achievement of the foregoing conditions are under control

Conservation objectives for *Stratiomys chamaeleon* (soldier fly)

To maintain the soldierfly *Stratiomys chamaeleon* in favourable condition where:

- At least 3 colonies of the species occur within the SAC
- Viable populations occur on each colony
- Adequate habitat exists to support the colonies
- All factors affecting the achievement of the foregoing conditions are under control

Conservation objectives for Medicinal leech *Hirudo medicinalis*

To maintain the medicinal leech *Hirudo medicinalis* in favourable condition where:

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • At least 3 colonies of the species occur within the SAC • Viable populations occur on each colony • Adequate habitat exists to support the colonies • All factors affecting the achievement of the foregoing conditions are under control <p>Conservation objectives for Neutral grassland, Calcareous grassland, Marshy grassland, Peatland invertebrate assemblage, <i>Limnephilus tauricus</i> (caddis fly). Variable damselfly <i>Coenagrion pulchellum</i>, scarce blue-tailed damselfly <i>Ischnura pumilio</i> and <i>Arvicola terrestris</i> Water vole</p> <p>Objectives for these SSSI features will be supplied later (CCW, 2008d)</p>
<p>Current Condition Threats to Site Integrity</p> <p>Site and Site</p>	<p>The Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> feature is considered to be in Unfavourable Declining.</p> <p>The Alkaline Fens feature is considered to be in Unfavourable Declining condition.</p> <p>The Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara spp</i> feature is considered to be in Unfavourable Declining condition.</p> <p>The Northern Atlantic wet heaths with <i>Erica tetralix</i> feature is considered to be in Unfavourable/ Unclassified condition.</p> <p>The <i>Molinia</i> meadows on calcareous, peaty clay or silt laden soils (<i>Molinion caeruleae</i>) feature is considered to be in Unfavourable/Declining condition.</p> <p>The European dry heaths feature is considered to be in Unfavourable condition.</p> <p>The Geyer’s whorl snail <i>Vertigo geyeri</i> feature is considered to be in Unfavourable Declining condition</p>

Table 8.10: Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>The Southern damselfly <i>Coenagrion mercurial</i> feature is considered to be in Unfavourable/Declining condition.</p> <p>The Marsh fritillary <i>Euphydryas (Eurodryas,Hypodryas) aurinia.</i> feature is considered to be in Unfavourable/Declining condition.</p> <p>The Great Crested Newt <i>Triturus cristatus</i> feature is considered to be in Favourable/Unclassified condition.</p> <p>The Otter <i>Lutra lutra</i> feature is considered to be in Unfavourable/Unclassified condition</p> <p>The conservation status of other SSSI species features has not yet been assessed.</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Drainage; • Lack of management (including grazing and burning regime); • Invasive species; • Pollution; and, • Scrub encroachment. <p>(CCW, 2008d)</p>
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Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	21.7km south
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Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Qualifying Features	<p>Pen Llŷn a'r Sarnau SAC is a multiple interest site that has been selected as a SAC for 9 different types of marine habitat and associated wildlife (habitats listed in Annex I of the Habitats Directive) and for the populations of 3 mammal species (listed in Annex II of the Habitats Directive) that it supports. The Pen Llŷn a'r Sarnau SAC encompasses a wide range of physiographic conditions around the Llŷn Peninsula, within Cardigan Bay and within the estuaries. The site supports a very diverse mixture of habitats and their associated plant and animal communities.</p> <p>Annex I habitats that are a primary reason for selection of this site</p> <p><u>Sandbanks which are slightly covered by sea water all the time</u></p> <p>Pen Llyn a'r Sarnau on the north-west coast of Wales includes the sandbanks of Devil's Ridge, Bastram Shoal, the Tripods, and areas within and to the south of Tremadog Bay. These include examples of fully marine salinity, tide-swept sandbanks and relatively sheltered sandbanks. On Devil's Ridge, Bastram Shoal and the Tripods strong tides mean that the sand, shell and gravel sediments are constantly shifting, and as a result the sandbanks support animals that can tolerate these high levels of disturbance.</p> <p><u>Estuaries</u></p> <p>Pen Llyn a'r Sarnau has representative examples of bar-built estuaries in north-west Wales, and includes the Glaslyn/Dwryd, Mawddach and Dyfi estuaries. There is a continuous gradient between the clean sands near the entrance to the sea and the mud or muddy sands in the sheltered extremes of the estuaries. The intertidal sandflats support communities of burrowing invertebrates, including dense populations of polychaete worms, crustaceans, bivalve molluscs and gastropod molluscs. Saltmarsh fringing the shores of the estuaries, and the saltmarsh creeks and pools, are important habitat features for juvenile fish.</p> <p><u>Coastal lagoons * Priority feature</u></p> <p>Morfa Gwyllt lagoon is a small percolation lagoon that consists of a depression in a shingle bar across the mouth of the Afon Dysynni in mid Wales. This is the only example of a percolation lagoon in Wales. The substrate is a mosaic of medium sand over/amongst shingle, with muddier patches within the deeper pockets, and scattered larger pebbles. Three lagoonal specialists have been found at this site: the amphipod <i>Sphaeroma hookeri</i>, the</p>
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Table 8.11: Pen Llyn a'r Sarnau / Lleyrn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

bryozoan *Conopeum seurati* and the alga *Chaetomorpha linum*.

Large shallow inlets and bays

The seabed of Tremadog Bay on the south side of the Lleyrn Peninsula, north-west Wales, consists of a mosaic of different sediment types, which support a diverse mixture of plant and animal communities. Areas of cobbles and pebbles in shallow water support algal species that can tolerate sand-scour, such as *Naccaria wiggii* and *Scinaia* spp. There are patchy areas of maerl around St Tudwal's Islands. Maerl has been found at only one other site in Wales, in Milford Haven. Burrowing animals, including bivalves, crabs, brittlestars, urchins and worms, dominate the muddier sediments in Tremadog Bay. There are also beds of eelgrass *Zostera angustifolia* and muddy gravel shores within Tremadog Bay, both uncommon habitats. The gravelly beach at Traeth Crugan supports the nationally rare amphipod *Pectenogammarus planicrurus*. Several unusual species that are more often seen in warmer Mediterranean waters have been found in Tremadog Bay, such as the bearded red seaweed *Anotrichium barbatum* and the mantis shrimp *Rissoides desmaresti*.

Reefs

This site on the coast of north-west Wales encompasses a varied range of reef habitats, including an unusual series of submerged and intertidal glacial moraines. The areas of bedrock, boulders, cobbles, sandy rock, surge gullies and the tide-swept area of Bardsey Sound support a diverse array of plant and animal communities. There are distinctive communities on bedrock and boulders, ranging from sites exposed to very strong wave action and/or tidal streams to sites sheltered from strong water movement. For example, reefs on the north coast of the Llyn are dominated, in different locations, by either the mussels *Musculus discors* and *Mytilus edulis* or horse mussels *Modiolus modiolus*, or ascidians, or the tube worm *Sabellaria spinulosa*. Ross coral *Pentapora foliacea* has been recorded from these reefs and elsewhere around Bardsey and south-west Llyn. Several Mediterranean-Atlantic species have been recorded from south-east Bardsey. Reefs formed by honeycomb worm *Sabellaria alveolata* are found south and east of Pwllheli. The Sarnau (Sarn Badrig, Sarn-y-Bwch and Cynfelyn Patches) are very unusual shallow subtidal reefs, which extend many kilometres from the coast into Cardigan Bay. The Sarnau are glacial moraines (resulting from the last glaciation) and are composed entirely of boulders, cobbles and pebbles mixed with various grades of sediments. Fast tidal streams and strong wave action have a profound influence on the marine communities present, and the reefs are characterised by a large number of species

Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>resistant to scour and sand cover. Algal communities are dominant over much of the reefs, with growths of foliose red and brown algae forming very dense beds in many places, in the absence of shading from kelp. The brown algae <i>Chorda filum</i> and <i>Laminaria saccharina</i> and red algae flourish on or near the reef crest, while the number of algae species on pebbles increases with depth. In certain areas there are extensive forests of sea-oak <i>Halidrys siliquosa</i>. Rich animal-dominated biotopes are found in the deeper parts of the reefs, including crustaceans, cnidarians, sponges, hydroids and encrusting bryozoans.</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <ul style="list-style-type: none"> • Mudflats and sandflats not covered by seawater at low tide; • Salicornia and other annuals colonizing mud and sand; • Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>); and, • Submerged or partially submerged sea caves. <p>Annex II species present as a qualifying feature, but not a primary reason for site selection:</p> <ul style="list-style-type: none"> • Bottlenose dolphin <i>Tursiops truncatus</i>; • Otter <i>Lutra lutra</i>; and, • Grey seal <i>Halichoerus grypus</i>. <p>(JNCC 2014i)</p>
<p>Conservation Objectives</p>	<p>Conservation Objective for Sandbanks which are slightly covered by sea water all the time</p> <p>The conservation objective for the sandbanks which are slightly covered by seawater all the time is to achieve the favourable conservation status of the feature.</p>

Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

The “subtidal sandbanks” feature will be considered to be in favourable conservation status when:

- The distribution of the sandbanks within the site is as indicated on the indicative features maps ii and iii
- The overall extent of sandbank habitat is as indicated in the indicative feature maps ii and iii.
- The supply and nature of sediment forming and sustaining the sandbanks structures is not hindered or modified
- The relative proportions of sediment types on each sandbanks are as listed in Appendix 4.3.1 of the Core Management Plan for the designation.
- The topography of each sandbank is maintained within the relative proportions described in Appendix 4.3.2 of the Core Management Plan for the designation.
- The patterns of physical, chemical and biological conditions and processes that form and sustain the sandbanks and their associated communities operate within the range of dynamic fluctuation that would be expected to satisfy the ecological requirements of the feature.
- The dynamic nature and pattern of hydrodynamic processes and the interaction and influence of these on the patterns of sediment movement that form and sustain the sandbanks and their associated communities continue to operate without constraint or interference

Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- Levels of nutrients in the water column and sediments remain:
- at or below existing statutory guideline concentrations
- at levels within ranges that are not potentially detrimental to the long-term maintenance of the biotic assemblages and species populations of the sandbanks
- The variety and distribution of infaunal communities of the sandbanks should include, but is not limited to that listed in Appendix 4.3.3 of the Core Management Plan for the designation.
- The species richness, population dynamics, biomass and range of typical species of the sandbanks are determined by and sustained in response to the prevailing physical, chemical and biological conditions and processes.
- The species richness of infauna at the base of the Tripods, Bastram Shoal and Devil's Ridge sandbanks is no lower than, and contains the species listed in Appendix 4.3.4 of the Core Management Plan for the designation.
- The assemblages (and their populations) of mobile species associated with the sandbanks (on the sediment surface and in the water column) are present for maintaining favourable conservation status and is secure in the long term.

Conservation Objective for Coastal lagoons * Priority feature

The conservation objective for the coastal lagoons is to achieve the favourable conservation status of the feature.

Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>The coastal lagoons feature will be considered to be in favourable conservation status when:</p> <ul style="list-style-type: none"> • The distribution of the lagoon within the site is as shown on the indicative features maps ii and iii • There is no reduction in the area (extent) of the lagoon • There is no modification to the physical structure of the lagoon • (There is no modification to the structure of the supporting/impounding shingle spit, bank and beach • The patterns of physical, chemical and biological conditions and processes that form and sustain the lagoon and its associated community operate within the range of dynamic fluctuation that would be expected to satisfy the ecological requirements of the feature. • There is no interruption to the input of seawater through percolation and input of freshwater through percolation and rainfall. • The salinity regime is within the range to support the lagoonal specialist species (10‰ - 40‰) • The temperature regime is within the range to support the lagoonal specialist species • Levels of nutrients in the water column and sediments remain: <ul style="list-style-type: none"> • at or below existing statutory guideline concentrations • at levels within ranges that are not potentially detrimental to the long-term maintenance of the
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Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>lagoonal specialist species and the biotic assemblage of the lagoon</p> <ul style="list-style-type: none"> • The level of dissolved oxygen in the water and sediments is within the range to support the lagoonal specialist species • The lagoon supports a community of species that is determined by and sustained in response to the prevailing physical, chemical and biological conditions and processes. • The lagoon supports a community of species that includes a minimum of three lagoonal specialist species and a variety of other species including, but not limited to the species listed in Annex/Appendix 4.9.1 of the Core Management Plan for the designation. • The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term. <p>Conservation Objective for Large shallow inlets and bays</p> <p>The conservation objective for the large shallow inlet and bay is to achieve the favourable conservation status of the feature. The large shallow inlet and bay feature will be considered to be in favourable conservation status when:</p> <ul style="list-style-type: none"> • The distribution of the large shallow inlet and bay within the site is as indicated on the indicative features maps ii and iii
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Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- There is no reduction in the area (extent) of the large shallow inlet and bay
- The structure of the bay (the sediments of the seashore and seabed, their topography and the bathymetry of the bay) are determined by and continue to evolve under the influence of uninterrupted environmental processes.
- There is no reduction in the variety and relative extent of the various sediment types within the bay.
- The structure of the shingle shore at Pwllheli is suitable to support the population of *Pectenogammarus planicrurus*.
- The supply and nature of the sediments and material forming and sustaining the large shallow inlet and bay feature and its associated communities are not hindered or modified.
- The patterns of physical, chemical and biological conditions and processes that form and sustain the large shallow inlet and bay and its associated communities continue to operate within the range of dynamic fluctuation that would be expected to satisfy the ecological requirements of the feature
- The nature and pattern of hydrodynamic processes and the interaction and influence of these on the patterns of sediment movement that form and sustain the varied habitats of the large shallow inlet and bay and their associated communities continue to operate without constraint or

Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>interference.</p> <ul style="list-style-type: none"> • The pattern and range of seabed surface and surface water temperatures sustains the continued presence of the communities and typical species of the large shallow inlet and bay. • Levels of nutrients in the water column and sediments remain: <ul style="list-style-type: none"> • at or below existing statutory guideline concentrations • at levels within ranges that are not potentially detrimental to the long-term maintenance of the biotic assemblages and species populations of the large shallow inlet and bay • The species richness, population dynamics, biomass and range of typical species of the large shallow inlet and bay are determined by and sustained in response to the prevailing physical, chemical and biological conditions and processes. • The variety of the biological communities of the large shallow inlet and bay (as categorised by intertidal and subtidal biotopes) includes, but is not limited to that listed in Appendix 4.2.1 of the Core Management Plan for the designation. • The distribution of the biological communities of the large shallow inlet and bay reflects the range of physiographic conditions present within the bay (a summary description of this distribution is provided in Appendix 4.2.2 of the Core Management Plan for the designation).
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Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- No reduction in the extent and quality of the 9 communities listed in Appendix 4.2.3 of the Core Management Plan for the designation.
- The 11 notable species listed in Appendix 4.2.4 of the Core Management Plan for the designation are present within, but not limited to, the large shallow inlet and bay.
- The bay functions as a nursery area for crustaceans and fish species without interference and/or constraint
- The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term.

Conservation Objective for Reefs

The conservation objective for the reefs is to achieve the favourable conservation status of the feature. The reefs feature will be considered to be in favourable conservation status when:

- The distribution of the reef feature within the site is as indicated on the indicative feature maps ii, ii and the reef feature map 1.1 - this includes rocky intertidal and subtidal reefs, the Sarnau cobble and boulder reefs, biogenic reefs (horse mussel, *Modiolus modilus*, mussel reefs formed by *Musculus discors* and honeycomb worm reefs formed by *Sabellaria alveolata*) and carbonate reefs structures formed by methane gas leaking from the seabed.
- There is no reduction in the overall extent of the reef habitat or the extent of the different

Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>components of the reef feature (rocky intertidal and subtidal reefs, the Sarnau cobble and boulder reefs, biogenic reefs (horse mussel, <i>Modiolus modiolus</i>, mussel reefs formed by <i>Musculus discors</i> and honeycomb worm reefs formed by <i>Sabellaria alveolata</i>) and carbonate reefs structures formed by methane gas leaking from the seabed.</p> <ul style="list-style-type: none"> • There is no change to the distribution, extent and variation of the rock types forming the reefs within the site. • The geomorphology (reef morphology, topography, orientation, aspect, bathymetry) of all components of the reef feature is determined by and evolves under the influence of uninterrupted environmental processes. • The supply and nature (granulometry and structure) of sediment deposits on reef surfaces and influencing the reef communities is not hindered or modified (this includes sediment supply to create scour conditions and provide material for construction of reef communities (e.g. reefs formed by <i>Sabellaria</i> spp.)). • The patterns of physical, chemical and biological conditions and processes that form and sustain the reefs and their associated communities operate within the range of dynamic fluctuation that would be expected to satisfy the ecological requirements of the feature. • The nature and pattern of hydrological and hydrodynamic processes (including wave –
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Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>exposures, tidal stream strengths, depth ranges, scour regimes, temperature) and the interaction and influence of these on the reefs and their associated communities continue to operate without constraint or interference.</p> <ul style="list-style-type: none"> • The levels of suspended particulate concentrations and water clarity/turbidity are within a range that sustains the continued presence of the communities and typical species of the reefs. • The water and sediment chemistry (includes salinity, dissolved oxygen, levels of contaminants) are within ranges that sustains the continued presence of the communities and typical species of the reefs. • Levels of nutrients in the water column and sediments remain: <ul style="list-style-type: none"> • at or below existing statutory guideline concentrations • at levels within ranges that are not potentially detrimental to the long-term maintenance of the biotic assemblages and species populations of the reef • The species richness, population dynamics, biomass and range of typical species of the reefs including assemblages of mobile species are determined by and sustained in response to the prevailing physical, chemical and biological conditions and processes. • The large variety of biological communities (as categorised by intertidal and subtidal biotopes²) includes, but is not limited to that listed in Appendix 4.1.1 of the Core Management Plan for the
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Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>designation.</p> <ul style="list-style-type: none"> • The distribution of the biological communities of the reefs reflects the range of physiographic conditions throughout the site (including a broad spectrum of rocky substrata, wave exposure, tidal stream strengths, depth ranges, turbidity and scour regimes). • The communities within the 7 different groupings of communities listed in Appendix 4.1.2 and shown on map 1.2 are present and there is no reduction in their extent, distribution and quality is as described. • The seaweed communities of the Sarnau are representative/characteristic of disturbed and scoured habitat and conditions (as indicated by the presence of extensive examples of a limited number of specific communities) • There is no reduction in the extent of the Horse mussel <i>Modiolus modiolus</i> community off the north Llŷn coast or the quality of this community in terms of its structural integrity (age structure, density of live <i>Modiolus</i>), community composition and species richness (epibiota and infauna). • The potential for expansion of the Horse mussel <i>Modiolus modiolus</i> community off the north Llŷn coast is not inhibited. • There is no reduction in the extent and distribution of the honeycomb worm reef <i>Sabellaria alveolata</i> in the intertidal and shallow infralittoral) or the quality of this community in terms of its
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Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>community composition and species richness and the presence of honeycomb worm reefs in varying stages of development and maturity.</p> <ul style="list-style-type: none"> • There is no reduction in the extent of the Carbonate reef structure formed by gas leaking from seabed or the quality of this habitat in terms of its species community (epibiota) and assemblage of mobile species. • The 20 notable species listed in Appendix 4.1.3 of the Core Management Plan for the designation are present within, but not limited to, the reefs. • The assemblages of fish species and other mobile species supported by and associated with the reefs are present. • The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term. <p>Conservation Objective for Mudflats and sandflats not covered by seawater at low tide</p> <p>The conservation objective for the mudflats and sandflats not covered by seawater at low tide is to achieve the favourable conservation status of the feature. The “intertidal mudflats and sandflats” feature will be considered to be in favourable conservation status when:</p> <ul style="list-style-type: none"> • The distribution of the intertidal mudflats and sandflats within the site is as indicated on the indicative feature maps ii and iii
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Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- There is no reduction in the extent of the intertidal mudflats and sandflats in estuarine conditions (as indicated in map 4.1)
- There is no reduction in the extent of the intertidal mudflats and sandflats in open coast situations (as indicated in map 5.1)
- The supply and nature of sediment forming and sustaining the intertidal mudflats and sandflats are not hindered or modified
- The geomorphology, topography and sediment characteristics of the mudflats and sandflats support the extent and distribution of the feature and its variety and populations of typical species
- The patterns of physical, chemical and biological conditions and processes that form and sustain the intertidal mudflats and sandflats and their associated communities operate within the range of dynamic fluctuation that would be expected to satisfy the ecological requirements of the feature
- The nature and pattern of hydrological and hydrodynamic processes (includes sediment transport patterns & processes; wave exposure; tidal range; tidal currents; temperature) and the interaction and influence of these on the intertidal mudflats and sandflats and their associated communities continue to operate without constraint or interference.
- The water and sediment chemistry (e.g. salinity, temperature, dissolved oxygen, levels of

Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>contaminants) are within ranges that sustain the continued presence of the communities and typical species of the intertidal mudflats and sandflats</p> <ul style="list-style-type: none"> • There is no increase in the levels of nutrients in the water column and sediments of the estuaries • Levels of nutrients in the water column and sediments of the open coast areas remain: <ul style="list-style-type: none"> • at or below existing statutory guideline concentrations • at levels within the ranges that are not potentially detrimental to the long-term maintenance of the biotic assemblages and species populations of the open coast intertidal mudflats and sandflats • The range of typical infaunal, epifaunal and mobile species (including their population dynamics and biomass) continue to be associated with the intertidal mudflats and sandflats. • The variety of biological communities (as categorised by intertidal biotopes) supported by the intertidal mudflats and sandflats in estuarine conditions reflects the gradient of sediment and salinity conditions typical of estuarine conditions and includes, but is not limited to the communities listed in Appendix 4.5.1 of the Core Management Plan for the designation. • The distribution of the intertidal mudflat and sandflat communities present in estuarine conditions reflects the gradient of sediment and salinity conditions typical of estuarine conditions is as
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Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>indicated in map 4.1</p> <ul style="list-style-type: none"> • The variety of biological communities (as categorised by intertidal biotopes) supported by the intertidal mudflats and sandflats in open coast conditions reflects the gradients of differing exposure to wave action and aspect and includes, but is not limited, to the communities listed in Appendix 4.5.2. • The distribution of the intertidal mudflat and sandflat communities present in open coast conditions reflects the gradients of differing exposure to wave action and aspect as is indicated in map 5.1 • The following communities are present and their extent, distribution and quality is as described: • The proportion of sand to mud and muddy sand communities within the estuaries is as indicated in Appendix 4.5.3 of the Core Management Plan for the designation. • There is no reduction in the geographical distribution of the nationally important community of <i>Mya arenaria</i> and polychaetes in muddy gravel gravel as indicated in map 5.2. • There is no reduction in the extent, distribution and quality (in terms of blade density) of eel grass <i>Zostera marina</i> (see map 5.3 for indication of location of intertidal eel grass beds). • The extent and overall community of species associated with the muddy gullies in the Mawddach
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Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

estuary is as described in Appendix 4.5.4

- The extent and community composition of examples of sediment zonation is as described in Appendix 4.5.5 of the Core Management Plan for the designation.
- The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term.

Conservation Objective for *Salicornia* and other annuals colonizing mud and sand

The conservation objective for the *Salicornia* and other annuals colonising mud and sand is to achieve the favourable conservation status of the feature.

The “*Salicornia*” feature will be considered to be in favourable conservation status when:

- The distribution of the *Salicornia* communities of the SAC is as indicated on map 7.1
- There is no reduction in the overall extent of the *Salicornia* and other annuals feature.
- The patterns of physical, chemical and biological conditions and processes that form and sustain the *Salicornia* and other annuals feature operate within the range of dynamic fluctuation that would be expected to satisfy the ecological requirements of the feature. (Also see structural and functional components under estuaries).
- A variety of geomorphological components are present within the *Salicornia* communities, e.g.

Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

saltmarsh creeks, saltpans and erosional cliffs.

- The variety of typical plant and animal species within viable populations continue to be present.
- The variety of the saltmarsh communities that form the Salicornia and other annuals feature includes the communities listed in Appendix 4.7.1.
- The distribution and quality of the saltmarsh communities that form the Salicornia feature is as described in Appendix 4.7.2 of the Core Management Plan for the designation.
- The nationally scarce community characterised by the species *Sarcocornia perennis* is present and there is no reduction in its extent and quality
- The notable plant species listed in Appendix 4.7.3 are present in the Salicornia and other annuals communities and there is no reduction in their populations.
- The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term.

Conservation Objective for Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

The conservation objective for the Atlantic salt meadow (*Glauco-Puccinellietalia*) is to achieve the favourable conservation status of the feature.

The “Atlantic salt meadow” feature will be considered to be in favourable conservation status when:

Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- The distribution of the Atlantic salt meadow of the SAC is as indicated on the indicative features maps ii and iii
- There is no reduction in the overall extent of the Atlantic saltmeadow.
- The patterns of physical, chemical and biological conditions and processes that form and sustain the Atlantic salt meadow and its associated communities operate within the range of dynamic fluctuation that would be expected to satisfy the ecological requirements of the feature. (Also see structural and functional components under estuaries)
- A variety of geomorphological components are present within the Atlantic salt meadow, e.g. saltmarsh creeks, saltpans and erosional cliffs.
- The morphology of the saltmarsh creeks and pans within the Atlantic salt meadow continues to evolve in response to the influence of uninterrupted environmental processes.
- The variety of typical plant and animal species within viable populations continue to be present.
- The variety of the saltmarsh communities that form the Atlantic salt meadow includes the communities listed in Appendix 4.6.1.
- The distribution and quality of the saltmarsh communities that form the Atlantic salt meadow is as described in Appendix 4.6.2 and shown on map 6.1.

Table 8.11: Pen Llyn a'r Sarnau / Lleyrn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

- No reduction in the extent and quality of the transitions between the Atlantic salt meadow and other communities as described in Appendix 4.6.3 of the Core Management Plan for the designation.
- The nationally rare and scarce communities listed in Appendix 4.6.4 of the Core Management Plan for the designation are present and there is no reduction in their extent and quality.
- The nationally rare, scarce and uncommon species listed in Appendix 4.6.5 are present and there is no reduction in their populations.
- The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term.

Conservation Objective for Submerged or partially submerged sea caves

The conservation objective for the submerged or partially submerged sea caves is to achieve the favourable conservation status of the feature.

The “sea caves” feature will be considered to be in favourable conservation status when:

- There is no reduction in the geographical distribution of the different types and sizes of sea caves present within the site
- There is no reduction in the overall area (extent and number) of the sea caves within the site

Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>(see maps ii and iii for an indication of the areas where sea caves are present within the SAC)</p> <ul style="list-style-type: none"> • There is no change to the distribution, extent and variation of the rock types where the sea caves are present within the site. • The morphology, topography, orientation, aspect and bathymetry of the sea caves is determined by and evolves under the influence of uninterrupted environmental processes. • There is a variety of sediment / rock deposits in base of sea caves determined by and evolving under the influence of uninterrupted environmental processes • The patterns of physical, chemical and biological conditions and processes that form and sustain the sea caves and their associated communities operate within the range of dynamic fluctuation that would be expected to satisfy the ecological requirements of the feature. • The sea caves support a variety and distribution of biological communities that includes, but is not limited to that described in Appendix 4.8.1 of the Core Management Plan for the designation. • The species richness, population dynamics, biomass and range of typical species of the sea caves are determined by and sustained in response to the prevailing physical, chemical and biological conditions and processes. • There are extensive examples of sea cave communities (as categorised by biotopes) present in,
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Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

but not limited to, certain caves as described in Appendix 4.8.2

- The larger caves near Hell’s Mouth, St. Tudwal’s Islands and Pen y Cil (Trwyn y Fulfran cave, Two-levels cave and Pen y Cil tunnel (Bunker & Holt 2003) continue to support a relatively high species and habitat richness and well-developed zonation of sea cave communities.
- The notable species listed in Appendix 4.8.3 are present within, but not limited to, the sea caves listed.
- The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term

Conservation Objective for Bottlenose dolphin *Tursiops truncatus*

The conservation objective for the Bottlenose dolphin *Tursiops truncatus* to achieve the favourable conservation status of the feature. The “bottlenose dolphin” feature will be considered to be in favourable conservation status when:

- The number of bottlenose dolphins within the SAC is stable or increasing
- The number of bottlenose dolphin calves produced in the SAC and beyond is sufficient to sustain the population
- There is a balance between the relative proportions of immature, mature, male and female

Table 8.11: Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>bottlenose dolphins within the SAC and beyond</p> <ul style="list-style-type: none"> • The physiological health of bottlenose dolphins within the SAC is good • The range of the bottlenose dolphin within the SAC and their contribution to the SW UK and Ireland population is not constrained or hindered • There are appropriate and adequate food sources for the bottlenose dolphins within the SAC and beyond. • The amount of supporting habitat for the bottlenose dolphins is stable or increasing • The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term. <p>Conservation Objective for Otter <i>Lutra lutra</i></p> <p>The conservation objective for the Otter <i>Lutra lutra</i> is to achieve the favourable conservation status of the feature. The “otter” feature will be considered to be in favourable conservation status when:</p> <ul style="list-style-type: none"> • The number of otters within the SAC is stable or increasing • The number of otter cubs produced in the SAC and beyond is sufficient to sustain the population • The physiological health of otters within the SAC is good • The range of otters within the SAC and adjacent inter-connected areas is not constrained or
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Table 8.11: Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>hindered</p> <ul style="list-style-type: none"> • Supporting habitats used by otters (e.g. for safe breeding, feeding, resting and travelling) are accessible to them, and the extent and quality of these habitats is stable or increasing. • There are appropriate and sufficient food sources for otters within the SAC and beyond • There are sufficient sources within the SAC and beyond of high quality freshwater for otter drinking and bathing • The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term. <p>Conservation Objective for Grey seal <i>Halichoerus grypus</i>.</p> <p>The conservation objective for the Grey seal <i>Halichoerus grypus</i> is to achieve the favourable conservation status of the feature. The “grey seal” feature will be considered to be in favourable conservation status when:</p> <ul style="list-style-type: none"> • The number of grey seals within the site is stable or increasing and there is a balance between the relative proportions of immature, mature, male, female components • The level of pup production within the SAC is stable or increasing • The physiological health of grey seals within the SAC is good • The range and distribution of grey seals within the SAC and beyond is not constrained or
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Table 8.11: Pen Llyn a'r Sarnau / Lleyen Peninsula and the Sarnau SAC Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<p>hindered</p> <ul style="list-style-type: none"> • Sites used by grey seals are accessible to them and the extent and appropriate quality of supporting habitats are stable or increasing. • There are appropriate and sufficient food sources for grey seals within the SAC and beyond • The management of activities or operations likely to damage or degrade the distribution, extent, structure, function or typical species populations of the feature, is appropriate for maintaining favourable conservation status and is secure in the long term. <p>(CCW,2005)</p>
<p>Current Condition Threats to Site Integrity</p>	<p>Site and Site</p> <p>Information on the condition of features is currently unavailable.</p>

Table 8.12: Ynys Seiriol / Puffin Island SPA Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	22km north
Qualifying Features	<p>Ynys Seiriol / Puffin Island is located just off the eastern tip of the Isle of Anglesey in North Wales. The site is of European importance for its breeding colony of Cormorant (<i>Phalacrocorax carbo</i>), which feed in the surrounding waters. The island also supports many other seabirds including puffins, razorbills, guillemots, black guillemots, herring gulls, kittiwakes and, in the past few years, eider, at their southern limit in the UK.</p> <p>This site qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of Cormorant <i>Phalacrocorax carbo</i>. The site supports a breeding population of 776 pairs representing at least 1.9% of the breeding Northwestern Europe population.</p>
Conservation Objectives	<p>Conservation objectives for Cormorant <i>Phalacrocorax carbo</i></p> <p>The conservation objective for the Cormorant is to achieve and maintain favourable conservation status, in which all the following conditions are satisfied:</p> <ul style="list-style-type: none"> • The number of breeding cormorants within the SPA are stable or increasing. • The abundance and distribution of prey species are sufficient to support this number of breeding pairs and for successful breeding. • The management and control of activities or operations likely to adversely affect the Cormorants, is appropriate for maintaining the feature in favourable condition and is secure in the long term." <p>(CCW 2008e)</p>
Current Site Condition and	The Cormorant <i>Phalacrocorax carbo</i> feature is considered to be in Favourable condition.

Table 8.12: Ynys Seiriol / Puffin Island SPA Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Threats to Site Integrity	<p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Human disturbance. <p>(CCW 2008e)</p>
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Table 8.13: Traeth Lafan / Lavan Sands, Conwy Bay SPA Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

Site Distance and Direction from the Development	11.8km north
Qualifying Features	<p>The glistening intertidal expanse of Traeth Lafan / Lavan Sands is located in Conwy Bay lying between Bangor and Llanfairfechan at the eastern end of the Menai Strait in north west Wales. The area has a range of wave and tidal exposures producing a diversity of conditions, enhanced by freshwater streams that flow across the flats. The site is of importance for wintering waterbirds, especially Oystercatcher. The site is also important for great crested grebes that gather here during their autumn moult and for stands of sea-grasses. Much of the site is managed as a Local Nature Reserve along with adjacent marshland and the North Wales Wildlife Trust maintain a small reserve and an observation hide at The Spinnies, adjacent to the site.</p> <p>This site qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of Oystercatcher <i>Haematopus ostralegus</i>. Over winter the site supports 4,931 individuals representing at least 0.5% of the wintering Europe & Northern/Western Africa population.</p> <p>(JNCC 2014k)</p>
Conservation Objectives	<p>Conservation objectives for Oystercatcher <i>Haematopus ostralegus</i>.</p> <p>The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:</p>

Table 8.13: Traeth Lafan / Lavan Sands, Conwy Bay SPA Qualifying Features, Conservation Objectives, Site Condition and Threats to Site Integrity

	<ul style="list-style-type: none"> • The 5 year mean peak of the number of wintering oystercatchers is at least 4,000. • The abundance and distribution of cockles of 15mm or larger and other suitable food are maintained at levels sufficient to support the population with a 5 year mean peak of 4,000 individuals. • Oystercatchers are not disturbed in ways that prevent them spending enough time feeding for survival. • Roost sites, including high tide roost sites, remain suitable for oystercatchers to roost undisturbed. • The management and control of activities or operations likely to adversely affect the oystercatchers, is appropriate for maintaining the feature in favourable condition and is secure in the long term. • (CCW, 2008f)
<p>Current Condition Threats to Site Integrity</p> <p>Site and Site</p>	<p>The Oystercatcher <i>Haematopus ostralegus</i> feature is considered to be in Favourable condition.</p> <p>Threats to site integrity include:</p> <ul style="list-style-type: none"> • Human disturbance. <p>(CCW, 2008f)</p>

APPENDIX B – SCREENING MATRICES

Habitats Regulations Assessment

Appendix B: Screening Matrices

Potential Impacts

Potential impacts upon the European site(s)* which are considered within the submitted No Significant Effects Report (AECOM, 2015a) are provided in the table below.

* As defined in Advice Note 10.
Appendix B Screening Matrices

Impacts considered within the screening matrices

Designation	Impacts in submission information	Presented in screening matrices as
Afon Gwyrfai a Llyn Cwellyn SAC	<ul style="list-style-type: none"> • Water Pollution 	<ul style="list-style-type: none"> • Effect 1
Eryri / Snowdonia SAC	-	•
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC Traeth Lafan / Lavan Sands, Conway Bay SPA Glynllifon SAC Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC; Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC	<ul style="list-style-type: none"> • Disturbance to species (Applicable to Glynllifon SAC only as there will be no construction or requirement to remove any habitat within any Natura 2000 sites. Habitat and roost loss within the Order Limits could affect Natura 2000 Bat sites within 10km). 	<ul style="list-style-type: none"> • Effect 2
Liverpool Bay / Bae Lerpwl (Wales) SAC Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar Corsydd Mon / Anglesey Fens SAC Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC Ynys Seiriol / Puffin Island SPA	<ul style="list-style-type: none"> • Flow Regime (applicable to Afon Gwyrfai a Llyn Cwellyn SAC only. There will be no discharges to/abstraction from other Natura 2000 sites. There is no abstraction 	<ul style="list-style-type: none"> • Effect 3

	<p>required from the Afon Gwyrfai SAC during construction or operation and therefore water flows will not be depleted as a result of the Development.)</p>	
	<ul style="list-style-type: none"> • Nutrient Enrichment (applicable to Afon Gwyrfai a Llyn Cwellyn SAC only. Due to dilution and dispersal, Natura 2000 sites beyond Llyn Padarn and the Afon Gwyrfai are unlikely to be affected by any nutrient enriched water discharged from Q1 or Q6 during operation.) 	<ul style="list-style-type: none"> • Effect 4

STAGE 1: SCREENING MATRICES

The European Sites included within the Applicant's assessment are:

Afon Gwyrfai a Llyn Cwellyn SAC

Eryri / Snowdonia SAC

Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC

Traeth Lafan / Lavan Sands, Conway Bay SPA

Glynllifon, SAC Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC

Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dune SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Liverpool Bay / Bae Lerpwl (Wales) SAC

Corsydd Môn a Llyn / Anglesey and Llyn Fens Ramsar

Corsydd Mon / Anglesey Fens SAC

Pen Llyn a'r Sarnau / Llyn Peninsula and the Sarnau SAC

Ynys Seiriol / Puffin Island SPA

Other sites within 30km have been scoped out of the assessment due to a lack of feasible effect pathways (Section 3.5; Tables 3.3 and 3.4 in main HRA document).

Evidence for likely significant effects on their qualifying features is detailed within the footnotes to the screening matrices below.

Matrix Key:

- ✓ = Likely significant effect cannot be excluded
- ✗ = Likely significant effect can be excluded

- C = construction
- O = operation
- D = decommissioning

Stage 1 Matrix A: Afon Gwyrfai a Llyn Cwellyn SA

Name of European site: Afon Gwyrfai a Llyn Cwellyn SAC									
Distance to NSIP 1.6km									
European site features	Likely Effects of NSIP								
	Effect 1			Effect 3			Effect 4		
	C	O	D	C	O	D	C	O	D
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or the Isoëto-Nanojuncetea	x a	x a	x c	x a	x a	x a	x g	x h	x g
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	x b	x b	x c	x f	x d	x f	x g	x h	x g
Atlantic salmon (<i>Salmo salar</i>)	x b	x b	x c	x f	x d	x f	x g	x h	x g
Floating water-plantain (<i>Luronium natans</i>)	x b	x b	x c	x f	x d	x f	x g	x h	x g
Otter (<i>Lutra lutra</i>)	x b	x b	x c	x f	x d	x f	x g	x h	x g

Evidence supporting conclusions

a. As stated in Section 4.2.1, the standing water Llyn Cwellyn (SAC feature Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*) is upstream from where the Nant-y-Betws discharges to the Afon Gwyrfai and as such there will be no discharge of water from the Development to this SAC feature.

b. As stated in Section 4.2.8, following best practice guidelines for construction sites, and during operation, on-site mitigation will be in place to help prevent and limit the effects of any water pollution and/or runoff, and the likelihood of such events. In addition, dilution between the Development and the SAC will reduce the significance of any accidental spills. Mitigation measures will be secured through the DCO Requirement 6 Code of Construction Practice (CoCP) which contains a Pollution Prevention Plan (PPP) and Water Management Plan (WTMP). An outline of the environmental measures to be incorporated is given in the WTMP, ES Chapter 7 Ecology, Section 7.8 and Chapter 16 Environmental Management (AECOM, 2015b)

c. Decommissioning will not require any works that may cause water pollution incidents.

d. As stated in Section 4.2.3 and 4.2.20 – 4.2.22 and Appendix C, during operation, discharge from the Q1 spillway has potential to increase the flow regime of the Afon Gwyrfai via the Nant-y-Betws. However, the discharge from the spillway will be infrequent and will not permanently increase the flow regime of the Afon Gwyrfai, and limited by an Environmental Permit secured through a Discharge Consent under the Environmental Permitting Regulations 2010 (as amended).

f. During construction and decommissioning there will be no discharges from the spillway and as such no change to the flow regime caused by the Development.

g. During construction and decommissioning there will be no discharges from the spillway and as such no inputs into Afon Gwyrfai a Llyn Cwellyn SAC from the Development.

h. As stated in Section 4.2.10 the water used to fill the pumped hydro system will be taken from Llyn Padarn, which is known to suffer from sporadic nutrient enrichment and algal blooms. The SAC is connected to the Development via the Q1 spillway and Nant-y-Betws watercourse; the discharge from the Q1 spillway will be infrequent. As stated in Sections 4.2.13 – 4.19 one of the most significant sources of phosphorus in Llyn Padarn are discharges from Llanberis Waste Water Treatment Works (WwTW). Measures are being put in place by Llanberis WwTW to limit the occurrences of eutrophication-causing incidences within Llyn Padarn. Water drawn into the system during occasional occurrences of increased level of nutrients (such as during overturn or a

stormwater event) will be diluted by the water taken from times when nutrient levels are low/normal. The water within the system will be monitored for nutrient enrichment and appropriate remedial action taken to prevent the addition of nutrient-rich water into the Afon Gwyrfai a Llyn Cwellyn SAC.

Stage 1 Matrix A: Eryri / Snowdonia SAC

Name of European site: Eryri / Snowdonia SAC						
Distance to NSIP 2.2km						
European site features	Likely Effects of NSIP					
	Effect 1			Effect 3		
	C	O	D	C	O	D
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	x a	x a	x a	x b	x b	x b
Siliceous alpine and boreal grasslands	x a	x a	x a	x b	x b	x b
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	x a	x a	x a	x b	x b	x b
Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and	x a	x a	x a	x b	x b	x b

<i>Galeopsietalia ladani</i>)						
Calcareous rocky slopes with chasmophytic vegetation	x a	x a	x a	x b	x b	x b
Siliceous rocky slopes with chasmophytic vegetation	x a	x a	x a	x b	x b	x b
Northern Atlantic wet heaths with <i>Erica tetralix</i>	x a	x a	x a	x b	x b	x b
European dry heaths	x a	x a	x a	x b	x b	x b
Alpine and Boreal heaths	x a	x a	x a	x b	x b	x b
Alpine and subalpine calcareous grasslands	x a	x a	x a	x b	x b	x b
Species-rich <i>Nardus</i> grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	x a	x a	x a	x b	x b	x b
Blanket bogs	x a	x a	x a	x b	x b	x b

Depressions on peat substrates of the <i>Rhynchosporion</i>	x a	x a	x a	x b	x b	x b
Petrifying springs with tufa formation (<i>Cratoneurion</i>)	x a	x a	x a	x b	x b	x b
Alkaline fens	x a	x a	x a	x b	x b	x b
Alpine pioneer formations of the <i>Caricion bicoloris-atrofuscae</i>	x a	x a	x a	x b	x b	x b
Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	x a	x a	x a	x b	x b	x b
Slender green feather-moss <i>Drepanocladus (Hamatocaulis) vernicosus</i>	x a	x a	x a	x b	x b	x b
Floating water-plantain <i>Luronium natans</i>	x a	x a	x a	x b	x b	x b

Evidence supporting conclusions

a. As stated in Section 4.3.1 – 4.3.2 small watercourses run from the SAC into Llyn Padarn, due to the direction of flow any feasible pathways for water pollution are eliminated. No watercourses flow into the SAC from the Order Limits.

b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC

Name of European site: Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC						
Distance to NSIP 7.0km						
European site features	Likely Effects of NSIP					
	<i>Effect 1</i>			<i>Effect 3</i>		
	C	O	D	C	O	D
Sandbanks which are slightly covered by sea water all the time	x a	x a	x a	x b	x b	x b
Mudflats and sandflats not covered by seawater at low tide	x a	x a	x a	x b	x b	x b
Reefs	x a	x a	x a	x b	x b	x b
Large shallow inlets and bays	x a	x a	x a	x b	x b	x b
Submerged or partially submerged sea caves	x a	x a	x a	x b	x b	x b

Evidence supporting conclusions

- a. As stated in Section 4.4.2 it is unlikely that pollution during construction, operation or decommissioning will reach or significantly affect this SAC due to distance, dilution and dispersal. As stated in Section 4.4.3 there will be no effect on any of the features of this Natura 2000 site as result of water pollution from any phase of the Development.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Traeth Lafan / Lavan Sands, Conway Bay, SPA

Name of European site: Traeth Lafan / Lavan Sands, Conway Bay, SPA						
Distance to NSIP 11.8km						
European site features	Likely Effects of NSIP					
	Effect 1			Effect 3		
	C	O	D	C	O	D
Population of European importance of Oystercatchers <i>Haematopus ostralegus</i>	x a	x a	x a	x b	x b	x b

Evidence supporting conclusions

- a. As stated in Section 4.5.2 it is unlikely that water pollution from any phase of the development will reach or significantly affect the features and/or integrity of the SPA due to distance, dilution and dispersal.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Glynllifon, SAC

Name of European site: Glynllifon, SAC									
Distance to NSIP 7.5km									
European site features	Likely Effects of NSIP								
	Effect 1			Effect 2			Effect 3		
	C	O	D	C	O	D	C	O	D
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	✗a	✗a	✗a	✗b	✗b	✗b	✗a	✗a	✗a

Evidence supporting conclusions

- a. There are no hydrological links between this SAC and the Development and therefore no water pollution or alteration of flow regime from any phase of the development will reach or significantly affect the features and/or integrity of the SAC.
- b. As stated in Section 4.6.1 – 4.6.6 there is potential for lesser horseshoe bats to be affected by the loss of habitat and loss of tunnel hibernation and summer roosts within the Order Limits. However, based on the lack of foraging habitat, lack of foraging and commuting bats recorded during summer walked transects and the retention of the broadleaved woodland there will be no LSE at any phase of the Development.

Stage 1 Matrix A: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC

Name of European site: Glannau Mon: Cors heli / Anglesey Coast: Saltmarsh SAC						
Distance to NSIP 9.8km						
European site features	Likely Effects of NSIP					
	<i>Effect 1</i>			<i>Effect 3</i>		
	C	O	D	C	O	D
Salicornia and other annuals colonizing mud and sand	x a	x a	x a	x b	x b	x b
Atlantic salt meadows (Glaucopuccinellietalia maritimae)	x a	x a	x a	x b	x b	x b
Estuaries	x a	x a	x a	x b	x b	x b
Mudflats and sandflats not covered by seawater at low tide	x a	x a	x a	x b	x b	x b

Evidence supporting conclusions

- a. As stated in Section 4.7.2 it is unlikely that water pollution from any phase of the development will reach or significantly affect the features and/or integrity of the SAC due to distance, dilution and dispersal.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes, SAC

Name of European site: Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes, SAC						
Distance to NSIP 11km						
European site features	Likely Effects of NSIP					
	Effect 1			Effect 3		
	C	O	D	C	O	D
Embryonic shifting dunes	× a	× a	× a	× b	× b	× b
"Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")"	× a	× a	× a	× b	× b	× b
"Fixed coastal dunes with herbaceous vegetation ("grey dunes")" * Priority feature	× a	× a	× a	× b	× b	× b
Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)	× a	× a	× a	× b	× b	× b
Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation	× a	× a	× a	× b	× b	× b
Petalwort <i>Petalophyllum ralfsii</i>	× a	× a	× a	× b	× b	× b

Shore dock <i>Rumex rupestris</i>	x a	x a	x a	x b	x b	x b
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Evidence supporting conclusions

- a. As stated in Section 4.8.2 it is unlikely that water pollution from any phase of the development will reach or significantly affect the features and/or integrity of the SAC due to distance, dilution and dispersal.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, SAC

Name of European site: Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, SAC									
Distance to NSIP 12.3km									
European site features	Likely Effects of NSIP								
	Effect 1			Effect 2			Effect 3		
	C	O	D	C	O	D	C	O	D
Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	x a	x a	x a	x b	x b	x b	x c	x c	x c
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) * Priority feature	x a	x a	x a	x b	x b	x b	x c	x c	x c
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	x a	x a	x a	x b	x b	x b	x c	x c	x c
Northern Atlantic	x a	x a	x a	x b	x b	x b	x c	x c	x c

wet heaths with <i>Erica tetralix</i>									
European dry heaths	x a	x a	x a	x b	x b	x b	x c	x c	x c
Tilio-Acerion forests of slopes, scree and ravine	x a	x a	x a	x b	x b	x b	x c	x c	x c
Bog woodland	x a	x a	x a	x b	x b	x b	x c	x c	x c
Lesser horseshoe bat <i>Rhinolophus</i> <i>hipposideros</i>	x a	x a	x a	x b	x b	x b	x c	x c	x c

Evidence supporting conclusions

- a. As stated in Section 4.9.1 the SAC and the Development are hydrologically linked. However the water source from the Development flows away from the SAC. Therefore there are no feasible effect pathways. As stated in Section 4.9.2 due to the lack of effect pathways there will be no effect on the features of this SAC at any phase of the Development.
- b. As stated in Section 4.9.3 the SAC is over 10km from the Development and therefore there are considered to be no effect pathways between this SAC and the Development for disturbance to bats.
- c. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfa SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Liverpool Bay / Bae Lerpwl (Wales), SPA

Name of European site: Liverpool Bay / Bae Lerpwl (Wales), SPA						
Distance to NSIP 17.6km						
European site features	Likely Effects of NSIP					
	Effect 1			Effect 3		
	C	O	D	C	O	D
Supports over wintering populations of red throated divers <i>Gavia stellata</i>	x a	x a	x a	x b	x b	x b
Supports wintering populations of common scoter <i>Melanitta nigra</i>	x a	x a	x a	x b	x b	x b
Supports an internationally important assemblage of birds	x a	x a	x a	x b	x b	x b

Evidence supporting conclusions

- a. As stated in Section 4.10.1 there are two hydrological links and feasible pathways between the SPA and the Development. As stated in 4.10.2 it is unlikely that any pollution at any phase of the Development will reach or significantly affect the features and/ or the integrity of the SPA due to the distance between the Development and the SPA and the level of dilution and dispersal between the spillways and watercourses/ waterbodies.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Corsydd Môn a Llyn / Anglesey and Llyn Fens, Ramsar

Name of European site: Corsydd Môn a Llyn / Anglesey and Llyn Fens, Ramsar						
Distance to NSIP 20km (Anglesey) 32km (Llyn Fens)						
European site features	Likely Effects of NSIP					
	Effect 1			Effect 3		
	C	O	D	C	O	D
Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp	x a	x a	x a	x b	x b	x b
Northern Atlantic wet heaths with <i>Erica tetralix</i>	x a	x a	x a	x b	x b	x b
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>).	x a	x a	x a	x b	x b	x b
Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>	x a	x a	x a	x b	x b	x b
Alkaline fens	x a	x a	x a	x b	x b	x b
European dry	x a	x a	x a	x b	x b	x b

heaths						
Neutral grassland	x a	x a	x a	x b	x b	x b
Calcareous grassland	x a	x a	x a	x b	x b	x b
Marshy grassland	x a	x a	x a	x b	x b	x b
Marsh gentian <i>Gentiana pneumonanthe</i>	x a	x a	x a	x b	x b	x b
<i>Antennaria dioica</i>	x a	x a	x a	x b	x b	x b
Fen pondweed <i>Potamogeton coloratus</i>	x a	x a	x a	x b	x b	x b
Marsh dandelion <i>Taraxacum palustre</i>	x a	x a	x a	x b	x b	x b
Olive Earthtongue <i>Microglossum olivaceum</i>	x a	x a	x a	x b	x b	x b
<i>Ophrys insectifera</i> (fly orchid)	x a	x a	x a	x b	x b	x b
Stonewort assemblage	x a	x a	x a	x b	x b	x b
Vascular plant assemblage	x a	x a	x a	x b	x b	x b
Higher plants: <i>Dactylorhiza traunsteineri</i> and <i>Eriophorum gracile</i>	x a	x a	x a	x b	x b	x b
Lower plants: <i>Nitella tenuissima</i>	x a	x a	x a	x b	x b	x b
Invertebrates:	x a	x a	x a	x b	x b	x b

<p><i>Vertigo geyeri</i>, <i>Vertigo moulinsiana</i>, <i>Coenagrion ercurial</i>, <i>Euphydryas aurinia</i>, <i>Chlaenius tristis</i>, <i>Asilus crabroniformis</i>, <i>Stratiomys chamaeleon</i>, <i>Acrometopia wahlbergi</i>, <i>Limnephilus tauricus</i> (caddis fly), variable damselfly <i>Coenagrion pulchellum</i>, scarce blue-tailed damselfly <i>Ischnura pumilio</i> and <i>Hirudo medicinalis</i>.</p>						
<p>Geyer`s whorl snail <i>Vertigo geyeri</i></p>	<p>× a</p>	<p>× a</p>	<p>× a</p>	<p>× b</p>	<p>× b</p>	<p>× b</p>
<p>Great crested newt <i>Triturus cristatus</i></p>	<p>× a</p>	<p>× a</p>	<p>× a</p>	<p>× b</p>	<p>× b</p>	<p>× b</p>
<p>Otter <i>Lutra lutra</i></p>	<p>× a</p>	<p>× a</p>	<p>× a</p>	<p>× b</p>	<p>× b</p>	<p>× b</p>
<p>Water vole <i>Arvicola terrestris</i></p>	<p>× a</p>	<p>× a</p>	<p>× a</p>	<p>× b</p>	<p>× b</p>	<p>× b</p>

Evidence supporting conclusions

- a. As stated in Section 4.11.1 the Ramsar and the development are hydrologically connected, however the watercourses within the Anglesey and Llyn Fens Ramsar flow out of the Ramsar sites and towards the Development. Therefore there are no feasible effect pathways. Due to the lack of effect pathways there will be no effects on the features of this Ramsar from any phase of the Development.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this Ramsar associated with alteration of flow regime.

Stage 1 Matrix A: Corsydd Mon / Anglesey Fens, SAC

Name of European site: Corsydd Mon / Anglesey Fens, SAC						
Distance to NSIP 20km						
European site features	Likely Effects of NSIP					
	Effect 1			Effect 3		
	C	O	D	C	O	D
Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp	x a	x a	x a	x b	x b	x b
Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> * Priority feature	x a	x a	x a	x b	x b	x b
Alkaline fens	x a	x a	x a	x b	x b	x b
Northern Atlantic wet heaths with <i>Erica tetralix</i>	x a	x a	x a	x b	x b	x b
Molinia meadows on calcareous , peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)	x a	x a	x a	x b	x b	x b

Geyer`s whorl snail <i>Vertigo geyeri</i>	x a	x a	x a	x b	x b	x b
Southern damselfly <i>Coenagrion mercuriale</i>	x a	x a	x a	x b	x b	x b
Marsh fritillary butterfly <i>Euphydryas (Eurodryas Hypodryas) aurinia</i>	x a	x a	x a	x b	x b	x b

Evidence supporting conclusions

- a. As stated in Section 4.12.1 the SAC and the development are hydrologically connected, however the watercourse flows out of the SAC and towards the Development. Therefore, there are no feasible effect pathways. Due to the lack of effect pathways there will be no effects on the features of this SAC from any phase of the Development.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Pen Llyn a'r Sarnau / Lleyen Peninsula and the Sarnau, SAC

Name of European site: Pen Llyn a'r Sarnau / Lleyen Peninsula and the Sarnau, SAC						
Distance to NSIP 21.7km						
European site features	Likely Effects of NSIP					
	Effect 1			Effect 3		
	C	O	D	C	O	D
Sandbanks which are slightly covered by sea water all the time	x a	x a	x a	x b	x b	x b
Estuaries	x a	x a	x a	x b	x b	x b
Coastal lagoons * Priority feature	x a	x a	x a	x b	x b	x b
Large shallow inlets and bays	x a	x a	x a	x b	x b	x b
Reefs	x a	x a	x a	x b	x b	x b
Mudflats and sandflats not covered by seawater at low tide	x a	x a	x a	x b	x b	x b
Salicornia and other annuals colonizing mud and sand	x a	x a	x a	x b	x b	x b
Atlantic salt meadows (<i>Glauco-Puccinellietalia</i>)	x a	x a	x a	x b	x b	x b

<i>maritima</i>)						
Submerged or partially submerged sea caves	x a	x a	x a	x b	x b	x b
Bottlenose dolphin <i>Tursiops truncatus</i>	x a	x a	x a	x b	x b	x b
Otter <i>Lutra lutra</i>	x a	x a	x a	x b	x b	x b
Grey seal <i>Halichoerus grypus</i>	x a	x a	x a	x b	x b	x b

Evidence supporting conclusions

- a. As stated in Section 4.13.1 the SAC and the development are hydrologically connected; however, the aquatic input source from the Development flows away from the SAC. Therefore there are no feasible effect pathways. As stated in Section 4.13.3 due to the lack of effect pathways there will be no effects on the features of this SAC from any phase of the Development.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SAC associated with alteration of flow regime.

Stage 1 Matrix A: Ynys Seiriol / Puffin Island, SPA

Name of European site: Ynys Seiriol / Puffin Island, SPA						
Distance to NSIP 22km						
European site features	Likely Effects of NSIP					
	Effect 1			Effect 3		
	C	O	D	C	O	D
Breeding colony of Cormorant <i>Phalacrocorax carbo</i> , populations of European importance	x a	x a	x a	x b	x b	x b

- a. As stated in Section 4.14.1 there are two hydrological links and feasible pathways between the SPA and the Development. However as stated in 4.14.2 it is unlikely that water pollution during any phase of the Development will significantly affect the features and/or the integrity of the SPA due to the distance between the Development and the SPA and the level of dilution and dispersal between the spillways and watercourses/ waterbodies.
- b. As stated in Table 3.2 of the main HRA document the alteration of flow regime is only likely to affect the Afon Gwyrfai SAC during operation. There will be no effect on any other Natura 2000 site associated with flow regime during all phases of the development. Therefore there will be no LSE on this SPA associated with alteration of flow regime.

REFERENCES

AECOM (2015a) Glyn Rhonwy Pumped Storage Development Consent Order No Significant Effects Report October 2015.

AECOM (2015b) The Glyn Rhonwy Pumped Storage Development Consent Order (6.02) Environmental Statement Volume 2. June 2015.

APPENDIX C – OPERATIONAL DISCHARGES TECHNICAL NOTE

Project Name:	Glyn Rhonwy DCO	Job Number:	60334725
Made By:	AECOM	Date	17th September 2015
Reference:	Technical Note to NRW on Requirement for Relief Valve at Q1 reservoir and scope of flow modelling for Nant Y Betws		

1 Purpose of the briefing note

Further to a meeting held with NRW on the 15th July 2015, with Gwynedd Council also in attendance, NRW queried the requirement for the relief valve at the upper reservoir.

It was agreed that any potential releases from the upper reservoir would be described and also modelled. This information would be provided in the consent applications for the operational discharges which may be required from Q1.

This briefing note seeks to:

- a. clarify the requirement for the relief valve, including how and why it will be used
- b. clarify the difference between relief valve operation and overflow operation, and
- c. inform the level of modelling required to inform the consent applications.

2 Requirement for Relief Valve at Q1

The proposed scheme includes a relief valve from Q1 to Nant y Betws stream.

An essential component of any raised reservoir is the ability to lower the water level behind the dam (draw-down); emptying the reservoir to the point where there is no hydraulic load on the structure. For the purpose of reservoir safety this facility must be available at all times.

The main and primary mechanism for draw-down of the Q1 reservoir is through the penstock to Q6. The penstock pipe has the capacity to provide draw-down of the reservoir in approximately 7 hours at a rate in the order of 46 m³/s. This is more than adequate to serve the draw-down need for the Q1 reservoir.

However, because of the variables in operation and maintenance of the scheme, and the need to have a draw-down capacity at all times; it is considered prudent to include a facility to lower the reservoir independent of the penstock and powerhouse.

Therefore the relief valve in the dam provides a secondary method for the reservoir to be drained down, if required, with water being discharged to the Nant y Betws. This will only occur if the penstock was unavailable. The relief valve is sized to allow the reservoir to be drawn down to 50% of the volume impounded by the dam within 7 days. This equates to a flow of approximately 0.60 m³/s.

The relief valve is manually activated i.e. it will only be opened when the operator intervenes. Such intervention will only take place one of two scenarios as follows:

- a. when there is a need to lower the water level behind the dam and the water cannot, for whatever reason, be drawn down through the penstock to Q6 i.e. it would only be in an unusual situation when drawdown of the reservoir is required and this cannot be achieved through the penstock.
- b. for maintenance; to ensure the valve is operational as part of the dam safety regime, it will be necessary from time to time to briefly operate the valve.

In short, emergency valve operation is considered an extremely unlikely situation and SPH wish to clarify that discharge to the Nant Y Betws, other than infrequent small amounts from valve testing, are not part of the normal operation of the scheme and would be very unlikely,

possibly never in an unplanned situation.

In the maintenance scenario (b above) the discharge would be managed as per the requirements of the discharge consent. In this scenario the valve can be used in a controlled manner, when the flows in Nant-y-Betws and the Afon Gwyrfaï are low enough to accept the flows from the reservoir without causing an increased risk of flooding from the watercourses.

The sensitivity of the Nant Y Betws is acknowledged by SPH, not just from an ecological perspective (the link to the Afon Gwyrfaï Special Area of Conservation (SAC)) but also the use of the watercourse for private water supplies. As such, it has been agreed that an Excess Water Strategy will be a Requirement of the DCO in addition to an additional Requirement which seeks to agree the detailed design of the outfall to minimise / avoid erosion of the Nant Y Betws.

We trust that this clarifies the requirement for the relief valve and its use. Please see attached Logic Diagram, Figure 1 Operational Flow Chart and also Table 1 which accompanies Figure 1 for further information.

3 Requirement for a Spillway at Q1

In the context of other discharges to the Nant Y Betws it is noted that there is the possibility of discharge to the watercourse from the Q1 dam spillway (also known as the overflow). Again we would note that the spillway is an essential reservoir safety feature (requirement of the Reservoirs Act) whose operation is likely to be extremely rare and dependent on prolonged inoperation of the scheme (penstock discharge route) and a build up of direct rainfall eventually causing the level in Q1 to increase above the spillway level.

Under normal operation the water level in Q1 will remain at or below the Maximum Operational Water Level of 392 mAOD; 1.0 m below the overflow level of 393 m AOD.

The reservoir has more than sufficient capacity to accommodate the direct rainfall from the Probable Maximum Precipitation (extreme rainfall event for reservoir safety design) above the Maximum Operational Water Level without spilling. Any excess water from direct rainfall will be released from the system via Q6 to Llyn Padarn.

4 Scope for the Discharge Consents & Nant Y Betws Modelling

It has been agreed that several consents are needed for the operational discharges from both Q1 (infrequently) and Q6. The following outlines the scope of the information to accompany the consent applications and comment from NRW is welcome to avoid any delays in new requests for information through the determination process:

1. Provide an outline de-watering methodology (including proposed pollution prevention measures) for the de-watering of Q1 and Q6, based on the initial water quality results and an assumed working method.
2. Provide accompanying documentation and figures to describe the proposed works, the operational regime and the expected releases of water to the environment.
3. Provide an Environmental Risk Assessment (following the EA / NRW Horizontal Guidance: H1 Environmental risk assessment for permits) for dewatering and releases of water from the system (relief valve and spill).
4. We will prepare a design which will comply with the requirements of the Reservoirs Act, including the appointment of a Construction Engineer in accordance with the Act. The Construction Engineer will confirm the suitability of the spill and relief arrangements.
5. Provide an estimate of the likely, maximum and typical flows and durations that could be expected to be released from the system. This will be based on the outline spill / relief arrangement and our understanding of the operational regime. A hydrological assessment of the Nant Y Betws will also be undertaken to evaluate the likely flood flows which are

expected to arise within the catchment from time to time.

6. Prepare construction and operational water monitoring and sampling programmes.
7. Analyse and summarise water quality results against EQS.

Point 5 outlines the modelling assessment to be undertaken on the Nant Y Betws and which will form the basis of the Excess Water Strategy.

5 **Consents required**

The following discharge consents will be applied for:

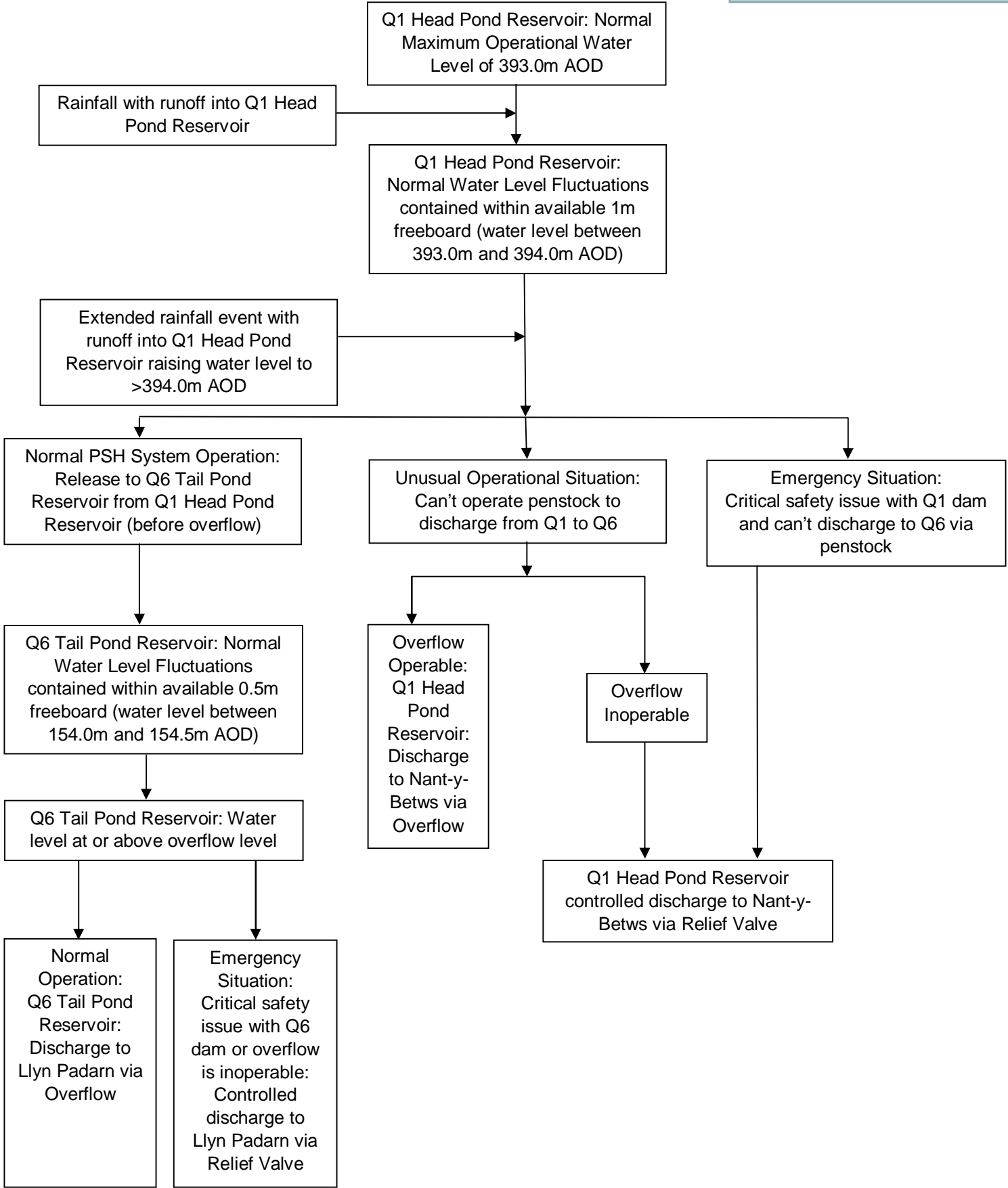
- 1) Q1 De-watering (construction phase)
- 2) Q6 De-watering (construction phase)
- 3) Q1 release of water (overflow of excess) or through the relief valve (for maintenance or in an emergency draw down situation)
- 4) Q6 release of water (overflow of excess) or through the relief valve (for maintenance or in an emergency draw down situation)

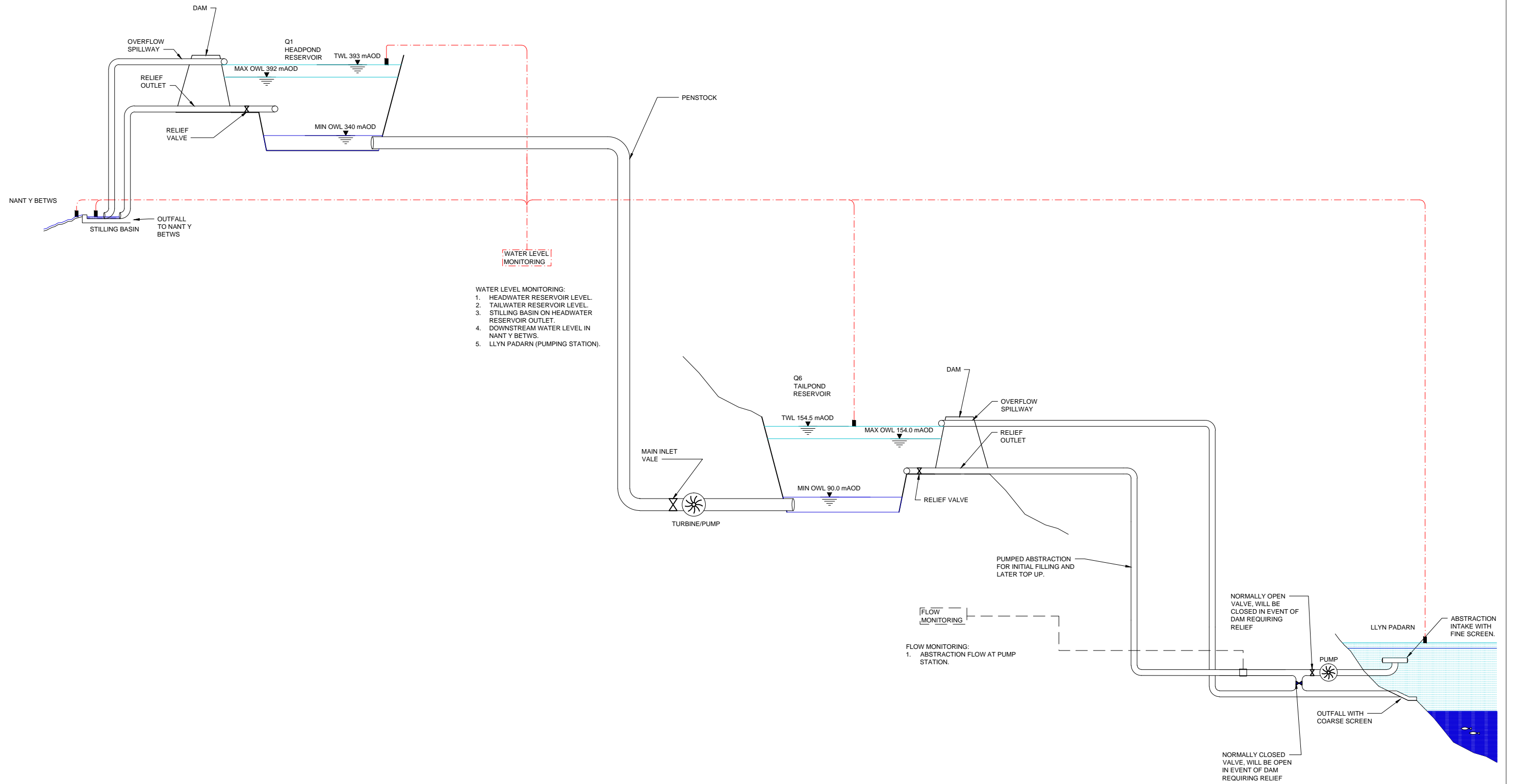
We believe than the release of excess water (from direct rainfall) can be considered together with the spill as these are fundamentally interrelated.

Table 1

Reservoir	Operation		Management and Release of Water
Q1 Headpond	Normal Operation	Inflow from Direct Rainfall. All direct rainfall accommodated within the 1.0m between MOWL and TWL.	Water transferred from Q1 to Q6 and returned by pumping to MOWL. i.e. excess water remains within Q6.
		Drawdown Condition	Water transferred to Q6. i.e. no release of water to the environment.
	Unusual Circumstance	Prolonged inflow over time from Direct Rainfall, with no transfer of water to Q6. i.e. WL allowed to build up to TWL.	Direct Rainfall may discharge to Nant y Betws via overflow if Q1 exceeds TWL.
		Drawdown Condition, without means to transfer water from Q1 to Q6.	Water discharged from Q1 to Nant y Betws; water released via Relief Valve at an appropriate rate (in consideration of flood risk downstream) until WL below the dam level.
Q6 Tailpond	Normal Operation	Direct Rainfall and excess water from Q1. All direct rainfall is temporarily accommodated within the 1.0m between MOWL and TWL.	Excess water released to Llyn Padarn.
		Drawdown Condition	Water transferred to Q1, and/or water released to Llyn Padarn. Preference would be to transfer water to Q1 for future use rather than release to Llyn Padarn.
	Unusual Circumstance	Prolonged inflow over time from Direct Rainfall, with no transfer of water to Q1. i.e. WL allowed to build up to TWL.	Direct Rainfall may discharge to Llyn Padarn if Q6 exceeds TWL.
		Drawdown Condition, without means to transfer water from Q1 to Q6.	Water discharged from Q6 to Llyn Padarn via Relief Valve at an appropriate rate (in consideration of flood risk downstream) until WL below the dam level.

Disclaimer - This flow diagram should be only read in conjunction with the accompanying Technical Note





WATER LEVEL MONITORING:
 1. HEADWATER RESERVOIR LEVEL.
 2. TAILWATER RESERVOIR LEVEL.
 3. STILLING BASIN ON HEADWATER RESERVOIR OUTLET.
 4. DOWNSTREAM WATER LEVEL IN NANT Y BETWS.
 5. LLYN PADARN (PUMPING STATION).

FLOW MONITORING:
 1. ABSTRACTION FLOW AT PUMP STATION.

LEGEND

TWL	TOP WATER LEVEL
OWL	OPERATING WATER LEVEL

NOTES

- DRAWING IS A SCHEMATIC AND DOES NOT INCLUDE ALL DETAIL.